TEACHERS IN TATWEER PRIMARY SCHOOLS IN SAUDI ARABIA AND INTERACTIVE WHITE BOARDS: TOWARDS A PROFESSIONAL DEVELOPMENT MODEL

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Teachers in Tatweer Primary Schools in Saudi Arabia and Interactive Whiteboards: Towards a Professional Development Model

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ABSTRACT

This study investigates the use of the Interactive White Boards (IWBs) in primary schools that participated in the *Tatweer* project in the city of Jeddah in Saudi Arabia. It presents teachers' attitudes towards using IWBs, evaluates their approaches in using this technology in classrooms, identifies the problems they encounter, and recognises their IWB training needs. It is a quantitative-dominant mixed method research study that mainly used a *sequential explanatory* strategy. 587 teachers (301 females and 286 males) completed a self-report questionnaire specially designed for this study, but also drawing on earlier research. Twenty teachers (10 female and ten male) were interviewed, of these seven female teachers were also observed teaching in their classrooms or the learning resources rooms. The TPACK model (Mishra and Koehler, 2006) and the CBAM *Levels of Use* (LoU) (Hall and Hord, 2006) were used in this study.

The findings of this study indicated that teachers within the sample reported a high level of the positive attitudes towards using IWBs in their classrooms. However, the majority of teachers reported that they used IWBs infrequently and only with a few interactive features, indicating that their choices were limited by their current technical capability. Moreover, they presented only a basic knowledge of pedagogy because they mainly used IWBs for whole class teaching. They occasionally varied this, such as when groups of students used the boards. Consequently, most teachers showed a limited range of IWBs use in their classrooms. However, in this study, teachers' experience in using IWBs and the opportunity to receive training were the two important factors to determine teachers' capability in using IWBs. The top three difficulties reported by teachers in this study when using IWBs were the lack of training courses, technical problems, and the lack of assistance and support, which had important effects on their skills and their satisfaction about their level of training. Hence, they tended to depend on themselves or their colleagues to improve their capabilities. Gender differences between male and female teachers were also investigated in this study. These findings were used to design a Proposed Training Model for Teachers (PTMT) to help the transition of new technologies (including IWBs) into *Tatweer* schools. Theoretical and practical implications arising from this study, limitations, recommendations for improvement, and suggestions for future research are also presented.

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LIST OF ABBREVIATIONS

BECTA: British Educational Communications and Technology Agency

CK: Content Knowledge

CBAM: Concerns-Based Adoption Model

CPD: Continuous Professional Development programmes

ICTs: Information and Communication Technologies

ICs: Innovation Configurations of the CBAM model

IWB(s): Interactive Whiteboard(s)

LEAs: Local Education Authorities

LoU: Levels of Use of the CBAM model

LRCs: Learning Resource Centres

M: Mean

MoE: Ministry of Education

MoHE: Ministry of Higher Education

SD: Standard Deviation

SES: Saudi Educational System

SoCs: Stages of Concerns of the CBAM model

SPSS: Statistical Package for the Social Sciences

TCK: Technological Content Knowledge

TK: Technological Knowledge

TPACK: Technological, Pedagogical, and Content Knowledge Model

TPK: Technological Pedagogical Knowledge

PCK: Pedagogical Content Knowledge

PK: Pedagogical Knowledge

PTMT: Proposed Training Model for Teachers

UK: United Kingdom

US: United States

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DEDICATION

I would love to dedicate this thesis to the person who gave me a lot and enlightened my way but sadly is not here to see this achievement. May Allah forgive him, shower his blessings on him, and settle him in Paradise.

My Dad, I miss you so much.

STATEMENT OF COPYRIGHT

DECLARATION

This thesis is as a result of my research and has not be been submitted for any other degree in any other university.

1. GENERAL INTRODUCTION

1.1. BACKGROUND TO THE STUDY

Recently, many countries from all over the world have considered the importance of employing ICTs in reforming education. Therefore, they have widely integrated ICTs into their educational system (Beauchamp, 2011). For this reason, it is essential to consider their impact on pedagogy and learning, as well as the effective use of these technologies in classrooms. The aim of instructional technologies is how they are successfully integrated into classrooms, especially when they have a considerable financial cost (Gruber, 2011).

The Interactive White Board (IWB) as an educational technology was originally designed for presentations in office situations, before being used in educational situations (Smith *et al.*, 2005; Cui *et al.*, 2012). IWBs have gradually become common in schools, and are now regarded all over the world as part of a suite of technological initiatives (Bennett and Lockyer, 2008). The IWB technology is described as a sensitive surface that is usually linked to a computer and projector (Tozcu, 2008), and two methods are used to control the computer and its programs through an IWB. These two methods are a touchable screen, and a special electronic pen designed to do computer mouse jobs (Glover and Miller, 2001).

The presence of IWBs in schools has encouraged many researchers to examine their effects on instruction and learning processes (Yanez and Coyle, 2011). Therefore, many studies have examined the usage of IWBs in the classroom and their power on education (Beauchamp, 2004; Higgins *et al.*, 2005; Reedy, 2008; Schmid, 2008; Essig, 2011; Turel and Johnson, 2012; Kneen, 2014; Šumak *et al.*, 2016). A general agreement regarding perceptions of the ability of IWBs to facilitate and improve learning has appeared across all studies, and a systematic review of the literature was conducted by Kyriakou and Higgins (2016). Moreover, it is claimed that IWBs have the ability to enable pedagogical change; however, this greatly depends on teachers' efforts (Higgins *et al.*, 2007; Becker and Lee, 2009; Beauchamp *et al.*, 2010). In other words, increasing the probability of effective teaching depends on teachers' capacities rather than the use of IWBs (Kyriakou and Higgins, 2016). Higgins *et al.* (2007) provided an excellent review of the literature regarding the introduction of IWBs in classrooms, the experiential evidence of their influence on teaching and learning, and the fundamental theoretical and conceptual concerns. They state in their review that,

> Good teaching remains good teaching with or without the technology; the technology might enhance the pedagogy only if the teachers and pupils engaged with it and understood its potential in such a way that the technology is not seen as an end in itself but as another pedagogical means to achieve teaching and learning goals (Higgins *et al.*, 2007, p. 217).

Thus, the teacher is one main factor that it is crucial to consider in research examining the effective use of technology in schools (Karasavvidis, 2009; Lan and Hsiao, 2011). Indeed, the majority of researchers have confirmed that teachers use technologies as an advanced transition teaching model, as contrasted with a constructivist teaching paradigm (Serow and Callingham, 2011). Moreover, the effective use and integration of innovative technologies in schools is still encountering practical and educational obstacles for both educators and learners (Schmid, 2006; Wood and Ashfield, 2008; Šumak *et al.*, 2016).

Therefore, to achieve the full advantages of using IWBs in classrooms, it is important to train teachers how to use these technologies effectively to improve the effect on student learning (Armstrong *et al.*, 2005; Glover *et al.*, 2005; Hall and Higgins, 2005; Shenton and Pagett, 2007; Slay *et al.*, 2008; Wood and Ashfield, 2008; Campbell and Kent, 2010; Kyriakou and Higgins, 2016). Consequently, teachers need more appropriate training courses which focus on changing their pedagogy (Higgins, 2010); if not, the outcome could be very unsatisfactory (Essig, 2011). According to Jewitt *et al.* (2007), most researchers believe that improving teachers' pedagogy is more important than developing their technological skills. This is because educators do not need higher abilities in using technology to enable a change in their pedagogy (Lewin *et al.*, 2008). Therefore, it is important to have training in both technical and instructional abilities (Beauchamp and Parkinson, 2005; Higgins *et al.*, 2007; Moss *et al.*, 2007; Turel and Demirli, 2010; Manny-Ikan *et al.*, 2011). Additionally, technical support is also considered an essential factor for the successful use of IWBs (Glover *et al.*, 2005; Kearney and Schuck, 2008; Šumak *et al.*, 2016).

Higgins (2010, p. 98) states that "evaluation of pedagogical change is at least as important as evaluation of technological change." Therefore, it is important to examine teachers' use of IWBs in classrooms and evaluate their teaching improvement. However, there was a very considerable lack of explanation and examination of how the teaching and learning methods have been enhanced with technology (Higgins *et al.*, 2007). Moreover, the context in which IWBs are used could have a great impact on the effective use of these technologies (DiGregorio and Sobel-Lojeski, 2010). As a result, more research about investigating teachers' use of IWBs in practice in various contexts should be considered.

Research conducted by McIntyre-Brown (2011) indicated that England, in 2010, was globally ranked first in providing schools with IWBs (73%), followed by Denmark and the USA (50% and 35%, respectively). In contrast, the introduction of IWBs in Asia was very low, at less than 2%. Indeed, IWBs have been strongly reinforced by administrations, especially in the United Kingdom (Beauchamp, 2004; Armstrong *et al.*, 2005; Bennett and Lockyer, 2008; Reedy, 2008). Conversely, this technology has not received enough attention in the Kingdom of Saudi Arabia, which, as a developing country, has heavily enhanced the use of advanced technologies in education. In 2016, 25% of the overall Saudi budget was spent on the education sector, and 23% has been allocated to education for 2017 (Ministry of Finance, 2017). These numbers give a clear picture about the great investment by the Saudi government in education and the implementation of ICTs in schools. However, technology has not been integrated effectively in Saudi schools, despite the prosperous economy of this country (Baker *et al.*, 2007; Oyaid, 2009; Al Mulhim, 2013). Particularly, the recent introduction of IWBs in Saudi Arabia has not been as well supported as in western countries, and has only been introduced in a few model schools. Moreover, most of these schools have just one IWB for the whole school, placed in the learning resources rooms for teachers to share (Alghamdi, 2013; Alghamdi, 2015).

Although several studies have focused on investigating the use of IWBs in classrooms, most of these studies have been carried out in advanced countries such as the UK, US, and Australia, and there is considerably limited research on the use of IWBs in Saudi Arabia (Alwazzan, 2012; Bakadam *et al.*, 2012; Isman *et al.*, 2012; Alghamdi, 2013; Hakami, 2013). All of these studies agree on the limited skills of Saudi teachers in using IWBs. Saudi teachers' limited skills in using ICTs, especially IWBs, in the classroom are likely to delay the effective introduction of educational technologies. However, if proper training courses are provided, their teaching approaches are likely to change. To date, no single study, to our knowledge, has investigated how Saudi teachers are trained to use IWBs, what the sources of training are, if they are satisfied with their training, and what their IWB training needs are. Therefore, this study aims to contribute to this field by adding new knowledge in this area, to fill the gap in the literature on the Saudi context.

Thus, the limited use of this technology in Saudi classrooms (Alwazzan, 2012; Alghamdi, 2013) could be explained by the lack of research on IWBs in this country. More research about IWBs is necessary because they may uncover the potential abilities and encouraging effects that IWBs can have in the teaching and learning environment. Indeed, such research could encourage the Ministry of Education (MoE) in Saudi Arabia to provide IWBs in all classrooms, not just learning resources rooms.

It has been seen that educators play a vital role in supporting or deterring the usage of IWBs in classrooms (Hennessy *et al.*, 2007; Higgins *et al.*, 2007; Wood and Ashfield, 2008). Thus, it is essential to examine: educators' use of IWBs in classrooms; their attitudes; the problems they encounter when using new technologies; and, the need to provide appropriate training courses (Turel and Johnson, 2012). From the above, therefore, this study aims to investigate teachers' current use, their attitude towards using IWBs, the difficulties they face, and their training needs.

Moreover, investigating gender differences has been considered in several educational studies relating to IWB technology. However, most of these studies (Higgins *et al.*, 2005; Hwang *et al.*, 2006; Martin, 2007; Morgan, 2008; Campbell, 2010; Aytaç, 2013; Kyriakou, 2016) have investigated students' gender differences. Only a very limited number of studies (Jang and Tsai, 2012; Muhanna and Nejem, 2013; Oguz Akcay *et al.*, 2015) have examined teachers' gender differences, focusing only on their attitudes towards using IWBs. However, so far, there have been no studies on teachers' gender differences relating to the use of IWBs (the frequency, the length of time using IWBs, the teachers' approaches, and their competencies). Moreover, no studies have examined teachers' gender differences regarding their training (the number of IWB training courses received, the need for further training, the types of training requirement, and the training method preference). The current study is conducted in the context of Saudi Arabia where the educational system is based on single-sex schools, in which males and females (teachers and students) communicate separately, and coeducational schools do not exist at all. Moreover, there are separate and different training courses for male and female teachers. Thus, this study contributes to filling this gap in Saudi literature specifically, and in the international literature more broadly, and compares male and female Saudi teachers regarding their attitude to using IWBs, their use of IWBs, and their IWB training.

The recent King Abdullah Project for developing general education (*Tatweer* Project) was launched in 2007 (Al-Eisa, 2009). This massive project aimed to improve the quality of education at all levels of public schools in Saudi Arabia to meet the requirements of the 21st century (ibid.). The environment in classrooms was enhanced by introducing modern technologies such as IWBs, demonstrating technologies, communication systems and web services (Abdul Ghafour, 2007). However, Hakami (2013) is the only study which investigated male teachers' usage of ICTs in secondary schools in the *Tatweer* project. Thus, what seems to be lacking in the Saudi-based literature is a focus on how female teachers participating in this project use IWBs in primary schools.

Indeed, primary schools were chosen as the focus of the current research because the researcher believes that primary education is a fundamental stage in students' lives. It provides the basis for which the young child is educated and equipped in preparation for the next stages of schooling. The necessary experiences, skills, and information are achieved in this crucial phase, which requires qualified, well-equipped teachers with effective skills, especially in the use of technologies. Consequently, from all the above, the current study aims to focus on teachers in *Tatweer* primary schools in the city of Jeddah, in Saudi Arabia.

1.2. PROFESSIONAL CONCERN

This research was inspired by the long experience of the researcher, who worked as a maths teacher before becoming an instructional supervisor in the Department of Education in Yanbu city in Saudi Arabia. My main job is to supervise female teachers by attending their lessons and guiding them to achieve high performance in teaching. During my school visits, I have noticed more active and enthusiastic students when using technology. These classrooms, as observed, become more interesting when using technology compared with traditional classrooms. This impact is not specific to students, as teachers also have similar feelings. I have found that the motivation and desire for improvement are greater in schools with various kinds of technologies compared to technology-poor schools.

I have high ambitions to improve teachers' skills and form a more attractive learning environment during my professional career. Therefore, I designed some courses to encourage and train female teachers to integrate technology into their teaching. Many teachers have attended these courses and as a result of this many interactive lessons were designed by those teachers, especially with regards to the special needs curriculum. Moreover, part of my role as an educational supervisor is writing regular reports about schools I have visited, and to consider any problems in these schools. Indeed, I have always reported about the lack of new technologies in classrooms, especially IWBs, teacher training programmes regarding the use of technology, and the lack of availability of maintenance in schools.

In 2011/12, I experienced an interesting year of study in academic English language in the UK, to achieve a suitable academic level of English language skills to study a Master's programme. In this experience, most Saudi students were more motivated to attend lessons and participate when using IWBs. Hence, this inspired me to create a small project to investigate the attitude to IWBs of Saudi students studying at Newcastle English language centres. The results of a distributed questionnaire revealed that the majority of these students had positive attitudes to using IWBs in their learning. After that, my passion for technology, especially IWBs, continued during my Master's degree in 2013. The findings of my dissertation (Alghamdi, 2013), which investigated Saudi teachers' use and attitudes towards using IWBs in teaching and learning in Yanbu city, indicated that all teachers had positive attitudes towards this technology. However, the participating educators had limited skills in using IWBs. Consequently, this inspired me to conduct further studies in this field and to address some important issues I have found during my Master's experience. For the reasons above, I decided to carry out this research. When I heard about the massive *Tatweer* project and its wonderful possibilities and facilities, I decided to investigate the use of IWBs in schools participating in this project in my Ph.D. study. The aim was to evaluate the use of IWBs in this project, define real problems faced by teachers, and identify their training needs, in order to improve the employment of educational technologies in *Tatweer* schools.

1.3. RESEARCH AIMS

This study will investigate teachers' attitudes towards using IWBs, evaluate their approaches in using this technology in classrooms, identify the problems they encounter, and recognize their IWB training needs.

1.4. RESEARCH QUESTIONS

How do teachers in *Tatweer* primary schools in Saudi Arabia use IWBs in classrooms? What are their IWB training needs?

1.4.1. Research Sub-Questions

Five sub-questions are planned for this study to achieve the research aims:

1) What are the views of teachers towards introducing IWBs in *Tatweer* primary schools?
2) How do teachers in *Tatweer* primary schools currently use IWBs?
3) What are the difficulties and challenges facing *Tatweer* primary school teachers in using IWBs?

4) How were teachers in *Tatweer* primary schools trained to use IWBs and what were their training needs?
5) Are there differences between male and female teachers in *Tatweer* primary schools regarding their attitudes, their use of IWBs, their training, the types of training need, and their training method preferences?

1.5. STRUCTURE OF THE THESIS

Eight chapters comprise the current thesis. Chapter One presents an introduction and background to the study, concentrating on the research aims, questions, and professional concerns. Then, the study context is described in detail in Chapter Two. Next, the literature is reviewed in Chapter Three, which concentrates on the research questions, while Chapter Four describes the research design and methodology. The findings from the quantitative method (questionnaire) are presented and interpreted in Chapter Five, and the findings from the qualitative methods (classroom observations and semi-structured interviews) are provided in Chapter Six. In Chapter Seven, the study findings are critically discussed and compared to previous studies, the TPACK model (Mishra and Koehler, 2006), and the CBAM *Levels of Use* (Hall and Hord, 2006). The final chapter includes the key findings, conclusions, a Proposed Training Model for Teachers (PTMT) in *Tatweer* Schools, the theoretical and practical contributions of this study, limitations, and recommendations for further research.

1.6. CHAPTER CONCLUSION

This chapter has mainly concentrated on providing a general introduction to the current research, which consists of the background to the study, the professional concern for conducting this study, the research aims and questions, and the structure of this thesis. The following chapter describes the research context.

2. CONTEXT OF THE STUDY

2.1. INTRODUCTION

This chapter presents the context of the current study, and aims to familiarise the reader with a cultural overview of the nature of Saudi Arabia and its educational system, to understand the relationship between this educational system and the context. Therefore, this chapter is structured into eight sections, starting with this introduction. Brief information about the Kingdom of Saudi Arabia is presented in Section Two. Next, its educational system is outlined in Section Three. ICTs in the Kingdom of Saudi Arabia are presented in the fourth section. The fifth section introduces teacher training in Saudi Arabia. The sixth section sheds light on the King Abdullah Project for developing public education (the *Tatweer* project), before reviewing previous studies on IWBs in Saudi Arabia in the seventh section. The final section summarises the key issues relevant to the study arising from this chapter.

2.2. BRIEF INFORMATION ABOUT THE KINGDOM OF SAUDI ARABIA

Saudi Arabia is an independent country established in 1932 by King Abdul Aziz Al Saud; its capital is Riyadh. By area, Saudi Arabia is one of the largest countries in the Middle East, at around 2,149,790 km2 (MoE, 2017). In comparison with the UK, Saudi Arabia is nearly five times the area of the UK. It has borders with Jordan and Iraq border in the north and northeast, Yemen in the south, Kuwait, Qatar, Bahrain and the United Arab Emirates in the east, Oman to the southeast, and the Red Sea in the west (ibid.). It consists of five main regions: the central, north, western, south, and eastern. It is divided into thirteen administrative provinces: Al Baha, Al Madinah, Makkah, Tabuk, Alhudud Ash Shamaliyah, Al Jawf, Al Qasim, Ash Sharqiyah, Asir, Al Riyadh, Ha'il, Jizan, and Najran (ibid.). The Saudi population, based on the Internet World Stats (2015), is a total of 27,752,316.

Because Saudi Arabia is an Islamic monarchy, Islamic Holy Law (Shari'a) is the basis on which Saudi laws and customs are built. Saudi Arabia represents the holy land to millions of Muslims worldwide, who target it in their pilgrimage. Consequently, Islamic education is compulsory in public education (Alhamid *et al.*, 2009). The precepts of Islam, with local tradition and culture, are the primary sources from which Saudi society take their values and ideas (ibid.). Indeed, the cultural and social life in Saudi Arabia is mostly determined by the Islamic religion. Arabic is the national language in this country, but English is taught as a foreign language in schools and universities.

2.3. THE EDUCATIONAL SYSTEM IN SAUDI ARABIA

It is important to present the educational system in Saudi Arabia, as the context of this study, as recommended by Linde (2003, p. 110), who states that: "teacher education has to be analysed and understood in the context where it takes place". The characteristics that may describe the Saudi Educational System (SES) are that: this system tends to be extremely centralised (Alzaidi, 2008; Oyaid, 2009); the process of decision making always takes one direction, starting with the Ministry of Education (MoE) and ending with schools, so the Ministry is described as the dominant administration; and, school autonomy is also non-existent in this context (Alzaidi, 2008).

Additionally, Saudi teachers used to employ traditional approaches to teaching and learning in classrooms (Al-Saadat, 2006; Al-Nassar, 2011). Indeed, using such approaches reduces any chance for students to be creative and think critically, compared with the typical approach of repeating knowledge (Al-Nassar, 2011). Developing self-regulation and learner autonomy was not traditionally part of the culture of Saudi schools. According to Alebaikan (2010, p. 25), "Saudi teachers at all levels in public schools do not use self-directed learning in their classroom, which has a negative impact on students' progress and study skills."

There are several factors which have led to the lack of *self-directed learning* in Saudi public schools, for instance: the strict curriculum; the lack of services and equipment at schools; a large number of students in the classroom; and a paucity of teacher professional development programmes (Alebaikan, 2010). Indeed, these factors may create challenges and pressures to facilitating teaching and learning processes, and add difficulties to the work of Saudi teachers and other school members. Therefore, the MoE in Saudi Arabia moved towards improving the educational system and increasing innovation in teaching and learning methods.

Moreover, according to the Islamic religion practised in Saudi Arabia, the educational context has been distinguished by the lack of availability of co-educational classes, where there is a separation of males and females in all schools and universities. Consequently, the Islamic religion is considered the driver of all Saudi government's rules in relation to this (Habbash, 2011). Therefore, the Saudi educational policy aims to "ensure that education becomes more efficient, to meet the religious, economic and social needs of the country and to eradicate illiteracy among Saudi adults" (Al-Maliki, 2013, p. 2). Indeed, the Saudi government has acknowledged the importance of improving the education system and increasing female roles in the Saudi community, for the sake of the economy of this country (Hamdan, 2005).

In the past, the MoE was responsible for supervising schools, whether public or private, special needs education, and international schools (MoE, 2017). Likewise, the Ministry of Higher Education (MoHE) was responsible for applying policies of Higher Education in Saudi Arabia and supervising all universities, colleges, and overseas Saudi student scholarships (ibid.). However, in 2015 the MoE and MoHE were combined into one institution called the Ministry of Education (MoE) and, therefore, all decisions and efforts are combined into one ministry (ibid.). Indeed, this decision is a significant change in the Saudi educational system and, consequently, this may help overcome many difficulties and confirm a more active management and direction in the employment of educational policies and programmes.

Because Saudi Arabia is a large country undergoing rapid educational expansion, smaller educational administrations were formed in all regions in the country (Oyaid, 2009). Each educational department consists of several districts, dependent on the size of the department, to provide a better organisation for the work of the Ministry and to enable its responsibilities to be carried out. In other words, these districts connect the MoE and all local schools in each educational region. All these educational regions in Saudi Arabia are directed by men and follow the MoE directly; therefore, they must report all their endeavours to the MoE. However, this centralised system of management causes delays and adds challenges to their work. These districts include educational supervision centres that differ in number between cities, according to their size. These centres have essential responsibilities in improving the students' curriculum, supervising, observing, and assessing the performance of both head teachers and teachers (Alzaidi, 2008).

Education in Saudi Arabia is free for students from primary through university, excluding private schools and universities. Free textbooks are also provided to all students from primary through to secondary levels, while students in universities are given monthly remuneration (around £181) to encourage them to complete their undergraduate studies.

2.3.1. The Structure of the General Saudi Educational System

The system of general education is centrally managed by the MoE, which sets all its own goals and policies (Alzaidi, 2008; Oyaid, 2009). It consists of the following stages:

1) **Pre-Elementary Stage:** In this stage, boys and girls are prepared for enrolment in primary schools by providing them with essential skills for two years. They are registered at the age of four and five years old in the nursery and preliminary schools, respectively (Alzaydi, 2010).
2) **Primary Stage:** This stage lasts six years, and children are registered at the age of six. There are no examinations in the primary stage, but educators frequently assess pupils. However, primary students have recently had some examinations to measure overall achievement. There are two semesters during the school year and the time of each class period is forty-five minutes (Albahiri, 2010).
3) **Intermediate Stage:** After finishing primary school, students, who are usually between twelve and fourteen years old, are expected to register in intermediate schools (corresponding to years 7-9 in the UK education system).
4) **Secondary Stage:** It is necessary that students should finish the Intermediate Stage before enrolling in high school. In this stage, students spend three years studying a general syllabus during the first year and must select one of these majors: *Natural Science, Shariah and Arabic Studies,* and *Management and Social Science* for the remaining two years (Habbash, 2011). The academic year in both the intermediate and secondary stages consists of two semesters of 18 weeks, including an examination period of two weeks. The time of a class period is forty-five minutes (Albahiri, 2010).

2.4. ICTs IN THE KINGDOM OF SAUDI ARABIA

Historically, with regard to education, there have been two phases of using ICTs in the education field in Saudi Arabia: in the first phase, in 1985, ICTs were introduced as a subject in schools; in the second phase, in 1991, they were integrated into teaching and learning in most students' syllabi (Al-Khathlan, 2007; Oyaid, 2009). Since 1999, several computer training courses have been introduced aimed to train both educators and their students (Oyaid, 2009). Therefore, the SES is now measured as one of the most significant sectors in Saudi Arabia and has been identified as the main concern in the Saudi government's improvement policies (ibid.).

The improvement in the SES reflects that the government of Saudi Arabia has made enormous efforts and expended a considerable amount of money to develop its educational system. The Saudi government has spent huge sums on ICT equipment and the computer learning of its residents (Al-Maliki, 2013). Similarly, Onsman (2011) stated that the Saudi government had invested billions of dollars in education to create a significant national position globally. This high investment led to the integration of many new technologies in the Saudi educational system (ibid.). 25% of the overall Saudi budget in 2016 was spent on the education sector, with 23% of the Saudi budget allocated for education in 2017 (Ministry of Finance, 2017). These numbers give a clear picture about the strong focus of the Saudi government on the education sector and the implementation of ICTs in schools.

Today, Saudi Arabia has reached a significant stage in its use of ICTs in organizations. Al-Zahrani (2011) stated that the population of Saudi Arabia has high use of technology in their lives. Similarly, Altowjry (2005) indicated that the majority of Saudi families have different kinds of technologies, such as mobile phones and computers. The spread of computers in the government sector is 97% (Saudi National Gate Website, 2015). Moreover, the internet is widely spread across Saudi Arabia, with the proportion of the internet-active population increasing from 5% in 2001 to approximately 41% in 2010 (ibid.). According to the Internet World Stats (2015), there were 16,544,322 million users of the internet in Saudi Arabia in 2013, compared with only 200,000 in 2000. The number of Facebook users in Saudi Arabia in 2012 was estimated at 5,852,520 million users (ibid.). Indeed, these different kinds of social media might lead to improved learning and teaching only if they are used effectively by individuals. According to Hall and Herrington (2010), the improvement of an online community is considered an essential factor in supporting social learning.

Consequently, projects have been constructed which demonstrate the effort of the MoE in Saudi Arabia. For instance, labs were supplied with computers to create chances for learners to experience more practical activities. These labs have changed the learning approach from the conventional system, which was based on teachers and memorization, to create opportunities for the student to try, observe and start using computer programs, especially those which create more interactive environments (MoE, 2014). Another project is the process of changing traditional school libraries into Learning Resource Centres (LRCs) (1999-2000). These LRCs are connected to the internet and provided with computers, projectors, and other multimedia, and this has created an environment that introduces rich information resources both in hard- and soft-copy formats (Al-Mezher, 2006). Recently, computer labs served most Saudi schools, with at least one in each school. Education establishments have developed around 2,000 LRCs (MoE, 2014). Moreover, the recent King Abdullah Project for developing general education *Tatweer* project has been established (more details in Section 2.6).

However, to improve and give greater importance to technology and science fields in Saudi Arabia, the availability of ICTs and their justifiable distribution in all Saudi cities should be considered (Al-Maliki, 2013), especially in terms of improving Saudi educational policies and training courses (ibid.). Therefore, the public and private sectors in Saudi Arabia should be supported by the Saudi government to increase the use of ICTs and improve their structure, as in advanced countries (ibid.). Additionally, the effectiveness of e-learning in Saudi Arabia could be maximized by providing more effective technical support, appropriate organizations, and active management (Al-Shehri, 2010).

2.5. BACKGROUND TO TEACHER TRAINING IN SAUDI ARABIA

Teacher training has been improved as an essential part of the SES. Training courses for pre-service or in-service teachers have been provided through two types of organisation. These two organisations are Teachers' Colleges and Educational Training Centres, which are scattered all over the country.

Teachers' colleges and the schools of education at universities are responsible for providing appropriate training (undergraduate programmes) for pre-service teachers including both theory and methods curriculum in the field of education. These institutes also have different departments for Arabic language, mathematics, biology, physics, English, and Islamic studies. Every student must study courses in their field of study besides educational courses. To become a teacher, students need to complete a 4-year bachelor's degree. Moreover, postgraduate programmes are also provided to some qualified teachers to achieve higher certificates, either in Saudi universities or universities abroad.

The Department of Professional Development is responsible for providing training courses for in-service teachers in different educational training centres all over the country (Al-Otaibi, 2007). These training centres usually provide teachers with different professional development programmes, covering various aspects relating to teaching and learning such as classroom management, the use of technology, teaching skills, and the assessment of student performance (ibid.).

It was hard to find websites or statistical data relating to the current position of professional development of teachers in Saudi Arabia. Therefore, several studies conducted in the Saudi context which evaluated teacher training programmes were reviewed (Alhajeri, 2004; Meemar, 2007; Al-Jadidi, 2012). These studies indicate that the real needs of teachers had not been effectively considered in terms of the content and activities of these professional development programmes. Additionally, the programmes focused more on the theoretical delivery of information than training teachers in practice.

There were other issues such as the short duration of these programmes and the use of unqualified trainers. For instance, a study was conducted by Al-Jadidi (2012) to examine the professional preparation of teachers in nurseries in Saudi Arabia. A multi-method approach was applied in this study, including a questionnaire, interviews, and documentary analysis. The findings indicated that teachers' knowledge improved during the training programme. However, teacher training was influenced by several important factors, such as the content of the training programme, the cultural perspective, the society, national policy, religion, self-learning, teaching and learning styles, and practice. Teachers in this study built their knowledge and teaching strategies on the broader socio-cultural aims of education in the Kingdom of Saudi Arabia. This training programme also had various limitations because of the principal style of teaching at the university, which affected the teacher training programme. Teachers were not progressively trained to teach children in practice because they only had one term to conduct fieldwork at the end of their training programme. Indeed, one term was not enough to embed the ideas of teaching practice, which should be more continuous and longer. However, this is the process applied in all teachers' programmes at Saudi universities.

In the same vein, Algarfi (2005) described the pre-service training programmes provided at Teachers' Colleges and Saudi universities as ineffective programmes. These programmes had many problems such as failing to improve teacher efficiency relating to the use of technology in classrooms, classroom management, and effective communication with parents (Alnassar, 2004). Teacher training colleges follow traditional methods of preparation of student teachers, with the absence of modern technology (Alsharari, 2010). Indeed, this does not reflect the actual picture of education in Saudi schools, which are equipped with modern technologies. Therefore, these pre-service teacher training programmes should be improved with more effective integration of technology.

With regard to in-service teacher training programmes, several studies conducted in Saudi Arabia agreed about the inefficiency of these programmes regarding the structure, management, and content (Alhajeri, 2004; Alsonbol *et al.*, 2008; Sywelem and Witte, 2013). For instance, a study was carried out by Alhajeri (2004) to investigate the problems faced by 300 Saudi teachers participating in in-service professional development programmes in Saudi Arabia. Teachers in this study complained about the deficiency of practical activities and the delay in the distribution of training packages to the end of these training programmes. Moreover, most school administrators did not provide teachers with sufficient support to attend professional development programmes because of the challenge of covering the absence of these teachers.

A further study was conducted by Sywelem and Witte (2013) to investigate the views of Saudi primary school teachers regarding the efficiency of the continuous professional development (CPD) programmes in schools in the city of Jazan, in Saudi Arabia, and to determine the facilitators/inhibitors of these programmes. Data were only collected by a questionnaire designed by the researcher, and this was completed by 295 Saudi teachers. The findings of this study showed that only half of the participants considered the importance of in-service training activities in improving their teaching skills and obtaining new knowledge, whereas the rest of the teachers disagreed. Additionally, teachers in this study agreed about several facilitators of CPD programmes in Saudi primary schools, such as the educated, excited, and well-organized trainers as well as the collaborative, comfortable, and respectful learning activities. However, many inhibiting factors of CPD programmes were reported in this study. The majority of the participating teachers indicated that the CPD activities ignored the existing knowledge of teachers, their different experiences, their real needs, and the goals of their schools. Additionally, most teachers reported that their opinions regarding the topics and content of these activities were not considered. Moreover, the majority of teachers complained about the unsupportive school administrations which prevented them from attending workshops and training courses. Indeed, the deficiency of support seems to be an important factor that could lead to ineffective teaching, particularly for beginner teachers (Darling-Hammond, 2005). Many teachers also stated that the opportunity for peer mentoring did not exist in their schools.

Moreover, several studies have been conducted in Saudi Arabia which indicate that Saudi teachers lack skills, particularly in using technology (Al-Qurashi, 2008; Oyaid, 2009; Bakadam *et al.*, 2012; Isman *et al.*, 2012; Alghamdi, 2013; Hakami, 2013). For example, Al-Alwani (2005) conducted a study to investigate the difficulties faced by science teachers when using technologies in Yanbu schools in Saudi Arabia. The findings of this study indicated that lack of professional development programmes that relate to using technology was ranked the second highest obstacle by teachers ($M= 2.02$, $p< 0.001$).

Moreover, teachers who received in-service training programmes indicated the more frequent use of technology than teachers who had not participated in these training courses (t=2.41, p=0.017) (ibid.). Furthermore, teachers who had both pre- and in-service training programmes also made use of technology more frequently than teachers who had not been involved in any training courses (t=2.61, P=0.01) (ibid.). Teachers in this study indicated that they have busy schedules and are required to do other tasks besides teaching, which leaves no time for teachers to improve by integrating technology into their teaching. The author concluded that schools needed more computers as well as more training courses for educators in the use of technology.

In the same vein, Al-Qurashi (2008) conducted a study to identify difficulties using a computer and the internet by mathematics teachers in an intermediate boys' schools in Al-Taif city in Saudi Arabia. Data were only collected using a questionnaire, and 215 male teachers completed it. The findings of this study revealed that educators with educational graduate degrees had the best use of computers (M=13.07, SD=0.55) and the internet (M=16.75, SD=2.77) in teaching mathematics, compared with teachers who did not have education degrees. Moreover, beginner teachers in this study (1-5 years) indicated more use of computers in teaching (M=16.09, SD=1.41) than the experienced teachers (who had more than ten years of experience). Furthermore, lack of suitable professional development and training courses in using computers in teaching was an important difficulty reported by teachers (79%) in this study. In fact, although Saudi schools and universities have been widely provided with modern technologies, many Saudi educators still have limited skills in integrating the computer and the internet in their teaching (Alsharari, 2010).

Another study was conducted by Oyaid (2009) to investigate the use of ICTs in Saudi secondary schools, in Riyadh city in Saudi Arabia. Data were collected using questionnaires and interviews, and 266 teachers completed the questionnaire. Additionally, 14 interviews were conducted with educators, head teachers, and ICT directors. Most of the educators in this study had positive attitudes towards using ICTs. However, several significant challenges affected their use of technologies, mainly the lack of training, time restrictions, the lack of technical support, inadequate computer facilities, and financial issues. Teachers reported that they anticipated the inclusive development of education, significant curriculum modification, and continuous professional development for a teacher.

A study conducted by Al Mulhim (2013) focused on the use of ICTs by novice female teachers in primary schools in Saudi Arabia. Data were collected using a questionnaire and semi-structured interviews aimed to determine the ICT training needs of female teachers. 135 female teachers completed the questionnaire, and a further 20 female teachers were interviewed. The findings of her study indicated that female teachers lacked basic technology technical and pedagogical skills. Additionally, their use of ICTs in their classrooms was very low because of the lack of availability of technology, time, and training. Moreover, the teachers’ responses indicated that they need training in both technical and pedagogical skills for using technology. Additionally, they preferred both face-to-face and online training courses, but also favoured collaborative training in small groups more than individual training or observing peers. Furthermore, they preferred the duration of their future training courses to be between one and four weeks within school time.

Recently, the Ministry of Education in Saudi Arabia has made active efforts to improve the professional development of teachers. However, teachers’ professional development programmes in Saudi Arabia are still not compulsory or regular in schools, and there is a lack of support for the educators (Alhajeri, 2004; Altrjmi, 2010). Additionally, teachers’ professional programmes lacked connection with classroom practice because Saudi teachers had not regularly participated in designing and driving the content of these programmes (Colbert *et al.*, 2008). Moreover, their opinions regarding the content of these activities were not considered (Sywelem and Witte, 2013). Thus, the CPD activities in Saudi Arabia ignored the existing knowledge of teachers, their different experiences, their real needs, and the goals of their schools (ibid.).

Moreover, lectures and discussions are used by most of the trainers in teachers’ training programmes in Saudi Arabia (Alhindi, 2009). Indeed, educators usually following a practical method when they are learning about employing new technology in their lessons (Wlodkowski, 2008). Furthermore, formal mentoring programmes were not applied in the Saudi education system (Sywelem and Witte, 2013). In fact, the centralised Saudi educational system could be an important reason for ignoring teachers’ needs and their experiences (ibid.). The top-down continuous professional development programmes produce a negative impression about these programmes (Robson, 2006) among Saudi educators.

To sum up, the picture given about teachers' professional development in Saudi Arabia was only based on the studies discussed in this section. Therefore, it is important to connect the professional development programmes with students' syllabus, effective teaching strategies, teachers' real needs, and school objectives to improve CPD programmes in Saudi schools. However, according to Alharbi (2011, p. 53), "professional development programmes in Saudi Arabia are designed nationally and delivered through Local Education Authorities (LEAs) with an absence of the voice of others."

Thus, the views of teachers in Saudi schools towards their current skills and their real needs should be accurately investigated in order to design successful training courses relating to the use of IWBs. However, the King Abdullah Project for developing public education (*Tatweer* project) concentrated on providing teachers with continuous professional development programmes (*more details in the next section*).

2.6. THE TATWEER PROJECT

In 2007, the Saudi Council of Ministries launched a large-scale project called the King Abdullah Project for General Education Development (*Tatweer* project). Tatweer is an Arabic word that means development in English. The budget of this project was approximately SR9 billion (Tatweer, 2014), which is equivalent to $2.4 billion and £1.5 billion. The planned duration of this project was six years from 2007 to 2013 (ibid.). In 2014 King Abdullah supported this project with SR80 billion (equivalent to approximately £13.5 billion), in order to improve Saudi public schools in the next five years (Saudi Gazette, 2014).

This massive project aimed to improve the quality of education at all levels of public schools in all cities in Saudi Arabia, to meet the requirements of the 21st century (Tatweer, 2014). It focused on five critical areas: training Saudi educators by improving the regular professional development programmes to successfully accomplish their tasks in classrooms; developing educational curricula to be more suitable for the social, mental, and psychological needs of students; improving the learning environment in all Saudi schools to motivate students and achieve high scores; employing ICTs to improve the quality of learning and teaching processes; and supporting students' extracurricular activities to increase their creativity, self-confidence, and social skills (ibid.).

This project has a high position in Saudi Arabia because it works independently of the MoE, and is directly managed and connected to the King (Hakami, 2013; Alyami, 2014). Therefore, this project mainly aims to decentralise the system of Saudi education by allowing schools and educational managers to have more responsibility and authority (ibid.). The project mainly considers the needs of students, and consequently, a learner-centred style is adopted in the system of education, which is regarded as a considerable change in the educational system in Saudi Arabia (ibid.).

The learning environment in classrooms was improved by introducing modern technologies such as IWBs, demonstrating technologies, communications systems, and web services. With regard to educator training, the *Tatweer* project has several goals which are: introducing suitable training courses for all teachers, arranging for the provision of computer knowledge learning for educators, as well as training in the active integration of technology in teaching, and preparing highly skilled trainers (Tatweer, 2014).

In the first stage of this project, fifty Saudi secondary schools (25 male schools and 25 female schools) from different educational regions in the Kingdom of Saudi Arabia were selected to be involved in this project (Hakami, 2013; Alyami, 2014). No primary or intermediate schools participate in this stage. The selected secondary schools are named *smart schools* and the equipped classrooms in these schools also called *smart classrooms* (ibid.). All these schools are provided with the same ICT tools, including *projector*, *wireless internet connection*, and IWBs, as well as *laptops* for all teachers and students. Moreover, these smart schools have a *computer lab* and *smart digital library* (ibid.). Importantly, all these smart schools are connected to the management centres located in Riyadh, the capital, in order to support these schools with educational and training programmes, as well as to deliver assistance related to technical difficulties that could appear during the year (Tatweer, 2014). In this stage, 1,658 Saudi teachers received high-quality training relating to the use of computers and their applications (Hakami, 2013). Moreover, professional development courses were provided for teachers, head teachers, and assistants in schools to understand the nature of the new curriculum and enable them to provide essential support for teachers (ibid.).

This project has a broader aim of providing ICTs to all levels in primary, intermediate, and secondary schools for both girls and boys (Tatweer, 2014). Therefore, in the second stage it was planned to increase the number of participating schools in the *Tatweer* project to 333 schools, including 50 primary schools, 50 intermediate schools, and 233 secondary schools, in 2010 (Hakami, 2013). However, this plan was not achieved by 2010, as planned, and the number of participating schools remained at 50 secondary schools (ibid.). The reason behind this delay could be because the supervision of this project has been transferred from the MoE to another company called the *Tatweer Education Holding Company* (ibid.).

However, the number of smart schools has significantly increased around the country. For example, according to the Education Department in Jeddah (2015), *Tatweer* schools in the city of Jeddah started with only two secondary schools (one male school and one female school) in 2007. Then, these schools increased to 30 (ten primary, ten intermediate, and ten secondary schools) by 2014. In 2015 this number had doubled to 60 (20 primary, 20 intermediate, and 20 secondary).

To sum up, student-centred learning and collaborative learning are emphasised in *Tatweer* schools, in which innovative technologies are introduced. Indeed, this differs from other Saudi schools where a teacher-centred approach and traditional teaching methods are dominant (Al-Aklobi, 2008; Al-Nefaie, 2010; Aba-AlKhail, 2011), as well as the lack of employment of collaborative learning in Saudi classrooms (Al-Aklobi, 2008; Alwazzan, 2012) (for more clarification about student-centred learning and the teacher-centred approach see Section 3.4.2 in Chapter Three). Furthermore, teachers in *Tatweer* schools are encouraged to attend training courses prepared by the Education Department to improve their content and pedagogic knowledge. Thus, the *Tatweer* project seeks to improve the whole educational system in Saudi Arabia with more independence and authority given to schools. Additionally, school performances are regularly evaluated to improve their standards. To improve this project, Saudi Arabia and the United Kingdom have recently had some arrangements to facilitate educational visits and connect selected schools from both countries, for example, the one arranged by the Education Department in Jeddah (2015). Indeed, these arrangements may be a useful step that enables educators to share operative ideas and methods.

The focus of the current research is on the teachers' use of IWBs in primary schools and their training needs. Therefore, the research sample was chosen from primary schools participating in the *Tatweer* project in the city of Jeddah, where the number of such schools is 20 primary schools (ten boys' schools and ten girls' schools) in 2015.

2.7. PREVIOUS STUDIES RELATING TO IWBS IN SAUDI ARABIA

There are several studies that investigate the use of ICTs in general in Saudi Arabia (Al-Alwani, 2005; Oyaid, 2009; Algahtani, 2011; Al Solami, 2013; Alharbi, 2013; Hakami, 2013). However, a few studies have been conducted in Saudi Arabia, mainly focusing on

IWB technology. All these studies focused only on investigating teachers' use or their attitudes towards using IWBs in Saudi classrooms. However, two similar studies (Al-Faki and Khamis, 2014; Gashan and Alshumaimeri, 2015) examined the difficulties that face English teachers relating to IWBs. These Saudi studies are presented as follows:

Alwazzan (2012), in an unpublished masters' dissertation, investigated if using the IWB aided the collaborative learning in a primary school for girls in Al-Qaseem in Saudi Arabia. She interviewed students and two teachers and observed four lessons of each teacher. The observations in this study were focused on students' engagement, asking and answering questions, and kinds of student interaction, mainly problem solving, collaboration and instructions. This research concluded that it was useful to apply collaborative learning and use IWBs for both teachers and pupils in Saudi classrooms. However, this study faced several obstacles that prevented this benefit being realised in the context of Saudi Arabia. The lack of availability of IWBs in Saudi classrooms was one of these limitations, and another was Saudi teachers who were reluctant to practise collaborative learning in their classrooms.

Another study conducted by Isman *et al.* (2012) investigated the attitudes of instructors in male secondary schools in Riyadh city in Saudi Arabia towards the use of IWBs in the classroom. One hundred teachers of different subjects participated in this study. An IWBs' Attitude Survey, a teachers' skills questionnaire in using IWBs, and student interviews were the three instruments used to approach this study. The outcomes of this study indicated that teachers had a positive view towards using this technology in classrooms; however, most teachers had not successfully used IWBs, which lead to the need for training programmes. Students' opinions about IWBs, in this study, were similar to several studies (Morgan, 2008; Lisenbee, 2009; Xu and Moloney, 2011) which demonstrate that the learners will have a positive view of IWBs only if their educators use it effectively.

A further study by Bakadam *et al.* (2012) aimed to gain the opinions of teachers about using IWBs in an intermediate male school called the School of Prince Sultan. This school is located in Jeddah and regarded as one of the most modern equipped Saudi schools, with more than 25 IWBs installed across the majority of the classrooms. A questionnaire and interviews were used in this study, in which fifty male teachers completed the questionnaire and three male teachers were interviewed. The results of this study indicated that the majority of educators agreed with the positive role of IWBs in delivering the information to the students and increasing their communication. Nevertheless, most teachers did not employ the full advantage of IWB' features due to their limited knowledge and skills. This study concluded that there is a need for teacher training, as well as a reduction in class size.

Moreover, an unpublished PhD thesis by Hakami (2013) investigated the use of ICTs in one Saudi secondary male school participating in the *Tatweer* project. A case study approach was applied using mixed research methods with both teachers and students. The questionnaire examined the ICT skills of teachers and students at school and home. In this study, 20 teachers completed the questionnaire, and at the same time, classroom observations were employed to focus on the use of IWBs in classrooms. Semi-structured interviews were also conducted with four teachers. The outcomes of this study indicated that teachers and students had limited ICT skills and had not had daily use of ICTs whether in school or home. Additionally, teachers' use of IWBs did not achieve the full advantage of this technology because they rarely used it in their teaching, despite the availability of high-quality technologies and the unavailability of traditional whiteboards in these smart classrooms. Moreover, teachers in this study used IWBs to present their lesson content and increase student attention. However, the students' e-book was the only main source that teachers used in their lessons. Importantly, students did not have the chance to use the IWBs by themselves.

Furthermore, Alghamdi (2013) (the researcher of the current study) conducted a master's dissertation that was also published in 2015 (Alghamdi, 2015) to investigate the attitudes of Saudi primary teachers towards IWBs, as well as their use of these technologies in teaching and learning in Yanbu city in Saudi Arabia. Mixed methods (questionnaire and semi-structured interview) were applied to gather data in this study. One hundred teachers completed the questionnaire, and three female teachers were interviewed. The outcomes of this research showed that Saudi educators acknowledged the influence of using IWBs on teaching and learning processes, as well as their desire to use this technology in their lessons.

However, they did not have regular use of IWBs in their lessons. The Saudi teachers' frequent use of IWBs in classrooms in this study was closely connected with three important factors: the attitude towards IWBs, the experience, and the location of IWBs. Furthermore, the lack of Saudi teacher training in using IWBs caused the limited use of IWB features. The majority of Saudi teachers who participated in this study had improved their abilities by themselves or via collaboration with their colleagues. This study examined the training needs of teachers in Yanbu city, where the majority of teachers (53%) preferred training on more effective teaching techniques using IWBs. This was followed by 28% of teachers who desired to have training in the technical skills of using IWBs, while a smaller percentage of teachers (19%) chose training on designing educational resources compatible with IWBs. Most teachers (57%) considered themselves competent users of IWBs, 38% of teachers viewed themselves as poor users of IWBs, and only 5% of teachers felt that they were proficient users.

The above study concluded with the importance of these findings in increasing both the use of IWBs in all Yanbu classrooms and IWB training courses for all Saudi educators. Importantly, it recommended the observation of Saudi teachers when using IWBs in their classrooms using a valued framework, to evaluate their performance in practice rather than only depending on a self-reporting questionnaire. Therefore, the researcher in the current study employed the observation method to assess teachers' approaches when using IWBs in their lessons in real settings.

A further study was conducted by Al-Faki and Khamis (2014) to investigate the difficulties that face English teachers during their use of IWBs in teaching English language classes in all primary, intermediate, and secondary male schools in the city of Jeddah in Saudi Arabia. The sample of this study (only 45 male teachers) was chosen randomly from all teachers who teach the English language in the city of Jeddah from different nationalities. This study applied a questionnaire and classroom observations to collect data. The findings indicated that English language teachers in the city of Jeddah had several problems and challenges during their use of IWBs in their lessons. These problems were classified into four groups relating to teachers, students, technical support, and school administrations.

In this study, educators used IWBs as presentation tools, and they applied a teacher-centred approach in their lessons. Approximately half faced difficulties in managing IWBs, and all teachers indicated that they had a lack of knowledge about fixing IWB problems. Moreover, more than 42% of teachers had full schedules. More than 35% did not use the internet as a learning resource in classrooms, and more than 15% had limited ICT skills. Additionally, teachers' performance in this study was affected by problems related to students, such as lack of motivation, not participating in IWB activities, and not accessing educational websites. Furthermore, some technical issues were indicated by teachers in this study such as the lack of technicians in schools, limited use of the internet in classrooms, lack of IWB training for both teachers and students, and ineffective anti-virus protection. With regards to school administration, the initial training programme that was provided to teachers was insufficient because this programme was only held once per school year. Moreover, the interactive learning materials (software) were inadequate. Indeed, these difficulties had negatively affected IWB integration into the teaching and learning of English language in classrooms. Therefore, this study recommended that English language teachers need continuing pedagogical and technical support. Importantly, school administrations should improve their role in effectively introducing IWBs in classrooms, providing appropriate materials, and increasing the number of technicians in schools.

Similarly, a recent study carried out by Gashan and Alshumaimeri (2015) aimed to explore the attitudes of Saudi female teachers, in secondary schools in the city of Riyadh, towards using IWBs in teaching English as a foreign language and to investigating the difficulties that face them when using IWBs. Data were collected only by questionnaire, with forty-three female teachers who teach the English language. The outcomes of this study showed that the female teachers had positive attitudes toward using IWBs in their classrooms. Additionally, the responses of these teachers indicated that they encountered some obstacles when using IWBs, such as the lack of sufficient training, difficulty in managing their students, and the lack of applicable curriculum content, class time, and financial support. These obstacles were reported only by questionnaire. However, qualitative methods seem to be more appropriate for validating these quantitative findings, which were ignored in this study.

Overall, studies that were conducted in Saudi Arabia regarding the use of IWBs are limited as well as they tend to use very small scales, one or two methods of collecting data except a study conducted by Hakami (2013), and are single gender. Moreover, no single study has examined how teachers in Saudi Arabia are trained to use IWBs, what their sources of training are, their satisfaction with their level of training, and their IWB training needs. Moreover, no single study has yet investigated and observed female teachers in primary schools participating in the *Tatweer* project, and their actual use of IWBs. Furthermore, the current study is the first study to compare male and female Saudi teachers in terms of their attitudes, use of IWBs, and training needs in a context based on single-sex schools only (a summary of these Saudi studies regarding using IWBs is provided in Appendix 1).

2.8. CONCLUSION OF THE CHAPTER

This chapter presented an overview of the Kingdom of Saudi Arabia, concentrating on the educational system, ICTs, teacher training, the *Tatweer* project, and previous Saudi studies regarding using IWBs. This chapter, moreover, emphasised the central issues in the Saudi context relating to the educational system, ICTs, and professional development of teachers. These main issues are the centralized educational system, lack of student autonomy, a large number of students in the classroom, a strict curriculum, time restrictions, lack of ICTs at schools, the spread of traditional teaching, the lack of teacher professional development programmes, the absence of practical activities in training courses, the deficiency of teachers' support, and the limited evidence regarding using IWBs in the Saudi context. All these issues pushed the researcher to conduct this study in a large-scale project (*Tatweer* project) to examine teachers' use of IWBs, and their training needs to improve the effectiveness of using IWBs in Saudi Arabia. A review of the literature is introduced in the next chapter.

3. LITERATURE REVIEW

3.1. INTRODUCTION

In this chapter, the benefits of using IWBs are introduced first in Section 3.2, followed by the attitudes towards the use of IWBs in classrooms in Section 3.3. Teachers' use of IWBs in classrooms is discussed in Section 3.4. The boundaries regarding using IWBs are outlined in Section 3.5. Technology and the professional development of teachers are emphasised in Section 3.6. Finally, technology and gender differences are highlighted in Section 3.7.

3.2. THE BENEFITS OF USING IWBS

3.2.1. The Teaching Process

It has been argued that IWBs may have the ability to help educators manage class time successfully. Lee and Boyle (2003) reported that all teachers who used IWBs in their lessons reflected that there was a need to reduce the timelines of their lessons because students were faster and better at completing their tasks. Educators in a study conducted by Higgins *et al.* (2005) were observed for two years in 184 literacy and numeracy lessons with and without IWBs. The authors of this study found that the gaps in IWB lessons were reduced; consequently, there was a faster pace in IWB lessons than those which do not employ IWBs. This faster pace was more apparent in numeracy than in literacy classes. In the same vein, Zevenbergen and Lerman (2007) carried out research which examined the role of using IWBs in teaching for middle schools. The outcomes revealed that the time expended by teachers in preparing lessons and the time used for the lessons decreased when using IWBs. Educators in this study used readymade sources in their lessons, thus saving educators' time. It could be argued that teachers in ordinary classrooms which do not use IWBs would do similarly by presenting predefined resources. However, this process seems to be more easily facilitated when using IWBs. The faster pace of lessons may improve learning chances by keeping learners' attention. Instructors in this study had an awareness of the faster pace of their lessons; therefore, they asked their students more questions that led to increased interaction in classrooms.

Additionally, using IWBs may have the ability to facilitate discussions in classrooms. Ball (2003) reported that when instructors use IWBs in their lessons, they might perceive themselves as becoming more able to concentrate on classroom discussion and answering questions. Levy (2002), in an earlier study conducted in England, found that when using IWBs the communications between educators and their students improved because of enhanced discussion, analysis, and students' participation in classrooms. As a result, the effectiveness of teaching will be developed by facilitating conversations in classrooms (ibid.). Similarly, the possibility of discussion and interaction in classrooms, according to Becta (2003), can be increased with IWBs. According to De Vita *et al.* (2014), students may be more motivated and engaged in classroom discussion and solving problems with IWBs. Consequently, IWBs have the ability to enhance a lesson's interactivity (Levy, 2002; Koenraad *et al.*, 2015). It has been shown that such interactivity and teacher-student dialogues in classrooms that use IWBs in the UK were greater than those without IWBs (Smith *et al.*, 2006).

Moreover, using IWBs aids teachers in preparing their lessons. For instance, 84% of teachers, in a study carried out by Latham (2002), revealed that IWBs had an active role in planning and arranging their lessons. Educators can save notes in their lessons using IWBs (Cox *et al.*, 2004) and can keep their lessons in order to improve them for further use (Glover *et al.*, 2007; Elaziz, 2008; Wood and Ashfield, 2008). Although educators, in a study conducted by Manny-Ikan *et al.* (2011), consumed many hours in designing learning resources for their IWB lessons, they indicated that the strategies they used to prepare attractive lessons were improved when using IWBs. Furthermore, these technologies provided them with a variety of innovative features such as employing animations in presenting their lessons.

IWBs, according to Kennewell and Beauchamp (2007), can produce visual materials that are regarded as interesting and attractive for both teachers and learners. Through employing IWBs, the content of the curriculum course can be more visual. Consequently, educators may become more flexible when dealing with resources and materials through IWBs. For instance, educators can add changes to their resources and save their lessons (Glover *et al.*, 2007; Elaziz, 2008; Wood and Ashfield, 2008), can highlight specific parts and change the size of texts and pictures (Turel and Demirli, 2010), and can apply various kinds of multimedia when presenting their lessons (Elaziz, 2008; Slay *et al.*, 2008).

Moreover, IWBs may be attractive tools for learners as well. For example, high school students in a study carried out by Schut (2007) in biology classes stated that the IWB was an attractive tool for them because of two features: assisting students to write down notes during their lesson; and, the potential to present web-based pictures, videos and audio files. They added that IWBs aid them to learn concepts, especially for visual learners. Thus, it seems that IWBs helped those students because their concentration and memory might be enhanced when presenting pictures, animations, and videos on IWBs. Holmes

(2009) states the importance of visual demonstration when introducing mathematics concepts using IWBs. However, the unsuitable use or the over employment of visual displays with IWBs was criticized by Reedy (2008), who states that IWBs could discourage higher-order thinking and cognitive processes among learners. Likewise, Schmid (2008) added to this by stating that if multimedia sources were used in an unsuitable method, this might lead to limited cognitive participation in classroom activities.

Thus, from the previous IWB benefits in the teaching process, IWBs may result in enlarging the level of enjoyment in the teaching process and change traditional pedagogical methods (Solvie, 2004; Bennett and Lockyer, 2008; Hammond *et al.*, 2009).

3.2.2. Student Learning

Interactive whiteboards seem to have the potential to meet the requirements of a wider range of pupils. Therefore, several studies have indicated that IWBs have a positive impact on enhancing student accomplishment (Elaziz, 2008; Slay *et al.*, 2008; Lopez, 2010; Kaya and Aydın, 2011; Aktas and Aydin, 2016). For example, a recent study was carried out by Aktas and Aydin (2016) to investigate the impact of smart boards on science education at a secondary school in Turkey. This study employed an experimental design with two experimental and control groups of two 7th grade classes, and used pre- and post-tests to measure the success of both groups. Additionally, the same test was also employed a third time to measure students' recall of the learning point four weeks later. The findings indicated that there was a significant difference between the two groups relating to their achievement and recall. This difference was in favour of the experimental group, in which students were taught with the smart board. Thus, students in the experimental group not only had more success than students in the control group, but their participation was more noticeable. Conversely, other studies appear to show that IWBs have no significant impact on enlightening students' achievement (Glover *et al.*, 2005; Higgins *et al.*, 2007; Solvie, 2007; Kearney and Schuck, 2008; Kyriakou, 2016).

Additionally, student recall could be improved with IWBs (Turel and Demirli, 2010; Aktas and Aydin, 2016) because they seem to have the ability to simplify student learning and enhance memory by presenting visual media (ibid.). The outcomes of a study conducted by Higgins *et al.* (2005) in primary schools revealed that IWBs caused improvements in some aspects of students' abilities, which were recall, consideration and knowledgeable skills. Furthermore, Morgan (2008) carried out a study in northeast

Florida to investigate the effect of IWBs on high school student engagement and behaviour. In this study, 226 students were observed at two secondary schools, and they also completed a survey to examine their attitudes towards using IWBs. The findings indicated that there were significant differences regarding student engagement and performance between instruction with and without IWBs, whereas no major association was presented relating to students' gender and ethnicity.

The evidence from the literature has indicated that student interaction could be increased with the use of IWBs (Hall and Higgins, 2005; Higgins *et al.*, 2007; Reedy, 2008; Lan and Hsiao, 2011; Aktas and Aydin, 2016). One explanation may be that students are able to discuss different topics with their classmates in groups when text, videos or images are presented on IWBs, and therefore this may increase the interaction between students in relation to what is displayed (Reedy, 2008). This is consistent with Vygotsky (1978), who concentrated on the importance of social communication between learners and clarified the role of tools in facilitating the interactions between individuals. Therefore, Vygotsky encouraged educators to design classroom activities that allow students to be more dynamic learners.

Although IWBs have a variety of impressive features (Glover and Miller, 2001), the exciting features of IWBs could lead to negatively affecting classroom interactions (Zevenbergen and Lerman, 2007). This might be explained because teachers are inspired by these features and concentrated on the capacity of IWBs in capturing students' attention. Therefore, they did not consider the importance of increasing social and communication relationships in classrooms. Moreover, when teachers use ready-prepared lessons and pervasive PowerPoint files, this may prevent them from considering individual student needs. Similarly, Higgins *et al.* (2005) state that employing IWBs in classrooms leads to a faster pace for lessons and, consequently, less time for the interaction between students in groups. This could be explained by Maor (2003), who stated that educators in classrooms using IWBs are likely to stand in front of their students, and this supports interaction between teachers and their students. Nevertheless, this kind of interaction seems to be challenged by Latane (2002), who recommends that teachers should improve the interaction between students in classrooms. Therefore, indeed, this kind of learning may merely be challenged when using IWBs. However, it depends on how teachers use this technology.

Consequently, collaborative learning could be reinforced with IWBs as a result of improving the interaction between students. This was explained by Reedy (2008), who said that one of the main features of IWBs is the ability to present texts and visual resources to a group of students in classrooms at a particular time. Similarly, Wood and Ashfield (2008) stated that students could use computer software and the internet through IWBs in front of other students who are observing their presentation. Thus, IWBs can be used to enhance group work. This is consistent with Bandura (1986) who stated that individuals may have a chance to learn better when they communicate with others, and the majority of their performance can be gained through this interaction and observation of other individuals. Consequently, students can learn how to use technology through their classmates. Bell (2002) conducted a study to examine the views of educators about the impact of using IWBs on collaborative learning in classrooms. The findings revealed that, based on evidence from the participating educators' viewpoints, student communication improved when using IWBs in their classrooms. Therefore, collaborative learning could be enhanced by using these technologies. However, Smith *et al.* (2006, p. 454) stated that "IWB lessons contained more a whole class teaching and less group work." Consequently, this may be determined by the way that teachers employ this technology in their lessons and how they design the activities during these lessons.

In the literature, there is a general agreement that educators appreciate the role of IWBs in improving students' attention in classrooms (Beauchamp *et al.*, 2010). According to Beeland (2002), IWBs may have an essential effect on increasing the students' focus in classrooms, due to IWBs having the ability to inspire students to be more concentrated on their tasks, improving their interest, and increasing their engagement in lessons. Similarly, Solvie (2004) indicated that there was an apparent improvement in students' attention in the literacy lessons when using IWBs in primary schools. Therefore, the focus of children could be managed effectively when teachers use IWBs in their lessons and this benefit may not be achieved so well when using other resources (Smith *et al.*, 2005). Similarly, a study was conducted by Christophy and Wattson (2007) to investigate if using IWBs in classrooms has more influence on students' attention than the traditional classrooms. The findings showed that although the results of students were better when participating in the activity when used in traditional classrooms, students' attention and engagement were higher in classrooms using IWBs because of using visual resources.

According to Tozcu (2008), IWBs seem to guide students' concentration in doing their activities and enhancing their interest. In the same vein, Tataroglu and Erduran (2010) found that IWBs increased the attention of mathematics students and, consequently, enhanced their learning. Indeed, IWBs may have the ability to increase student attention because educators generally employ these technologies to present internet websites and computer software (Wall *et al.*, 2005). Therefore, student attention may be retained and their understanding increased by introducing pictures, movies, and animation through IWBs. Additionally, according to Tozcu (2008), IWBs consist of a variety of tools and features that allow students to use texts, images and movies in front of their classmates. Thus, any activities designed using IWBs can inspire students to become enthusiastic to touch the board and its interactive features. Consequently, IWBs may attract students to be more active learners and improve their engagement in classrooms.

Moreover, it is argued that IWBs are a technology which has a positive effect on students' motivation and have been widely investigated in the literature (Hall and Higgins, 2005; Glover *et al.*, 2007; Schmid, 2008; Slay *et al.*, 2008; Manny-Ikan *et al.*, 2011). However, in some studies, weak and short-term motivation has been produced in classrooms that use IWBs (Moss *et al.*, 2007; Torff and Tirotta, 2010). Thus, the role of students' motivation in increasing their learning and achievement is still unclear and needs more exploration by researchers (Digregorio and Sobel-Lojeski, 2009).

Furthermore, students could use IWBs by themselves if their teachers offer chances for them to interact with these technologies. Schmid (2006) asserts that students desire to participate in activities that require movement between their seat and the IWB in the classroom. Nevertheless, educators frequently design classroom IWB activities for group work with students and avoid interaction between students and IWBs (ibid.). Consequently, teachers could encourage students to use IWBs in their lessons and design dynamic activities that encourage them to use the board.

The participating students in a study conducted by Higgins *et al.* (2005) had positive views towards using IWBs in their classrooms, and some students were very pleased because they used and interacted with these technologies. However, there were some undesirable factors stated by students in this research, which were the size of IWBs, technical difficulties, and limited chances for students to use IWBs. Similarly, students in a study conducted in Australia by Zevenbergen and Lerman (2007) to investigate the use of IWBs in improving mathematics learning in two middle schools did not have a chance to use IWBs by themselves, which is, indeed, a possible element for increasing students' motivation and autonomy. The educators in this study did not change their pedagogy, and whole class teaching was the main approach used. However, students are usually willing to use IWBs by themselves (Wall *et al.*, 2005; Schmid, 2006). Consequently, preventing students from using IWBs may lead to a decrease in their motivation and achieve a student-centred approach. Indeed, according to Chuang *et al.* (2008), identifying learning advantages of the IWB depends on direct student interaction with this technology instead of only watching their educators when using IWBs.

Consequently, from the previous educational abilities of IWBs, it is expected that student learning may be improved when using IWBs in classrooms. Students could learn better and faster using IWBs in their learning. This could be explained by Cox *et al.* (2004) who declare that IWBs seem to have the ability to offer a variety of selections and opportunities for teachers, leading them to recognise what their students require more effectively. Moreover, student learning may become better because they have chances to use and deal with the interactive features of IWBs in a collaborative style (ibid.).

3.3. THE ATTITUDES TOWARDS THE USE OF IWBS IN CLASSROOMS

Several studies have investigated student attitudes towards using IWBs (Hall and Higgins, 2005; Schut, 2007; Morgan, 2008; Tataroglu and Erduran, 2010; Kaya and Aydın, 2011; Xu and Moloney, 2011). However, concentrating on the aim of the current study, the emphasis in this section will be on teachers' attitudes. Educators' attitudes towards using IWBs in classrooms have also been examined in numerous studies (Beauchamp, 2004; Glover *et al.*, 2007; Moss *et al.*, 2007; Hammond *et al.*, 2009; Saltan *et al.*, 2010; Winzenried *et al.*, 2010; Manny-Ikan *et al.*, 2011; Turel and Johnson, 2012; Alghamdi, 2013; Muhanna and Nejem, 2013; Gashan and Alshumaimeri, 2015; Oguz Akcay *et al.*, 2015). For instance, educators in a study carried out by Beauchamp (2004) showed positive attitudes towards the use of IWBs in their classrooms due to their ability to enhance and simplify both instruction and learning environments. Glover *et al.* (2007) indicated that teachers had positive views about the use of IWBs for their teaching. Similarly, teachers in a study carried out by Saltan *et al.* (2010) showed positive views about IWBs, and they especially appreciate the simplicity and useful role of these technologies in enhancing their pedagogies. Additionally, Moss *et al.* (2007) reported that educators were apparently comfortable when using IWBs in their classrooms; consequently, they became more conversant with these technologies. Very positive opinions about employing IWBs in classroom lessons were also presented by all educators in six case studies conducted by Winzenried *et al.* (2010). These studies focused on educators in primary and secondary schools to investigate teachers' views about the effect of using IWBs in their teaching practice. Indeed, teachers seem more likely to change their views positively towards using technology after practice and training (Mumtaz, 2000; Hughes and Ooms, 2004; Glazer and Hannafin, 2008).

It is also argued that teachers' views towards using IWBs may differ depending on gender, their experience, and their teaching subjects. For example, Jang and Tsai (2012) conducted a study to investigate the perceptions of 650 mathematics and science instructors, in 52 Taiwanese primary schools, about their reasons for using or not using IWBs in their classrooms. They also aimed to examine the differences in these perceptions according to three domains: teaching subjects, gender, and teachers' experience. Data were collected using a survey randomly distributed to primary schools. The instructors in this study showed positive attitudes towards all the advantages of IWBs; however, they agreed that the greatest challenge to not using IWBs was the lack of availability. Additionally, there were differences between male and female teachers in terms of rating their reasons for using or not using IWBs. Male teachers who were using IWBs showed high ratings for increasing students' attention and interaction significantly more than female teachers, while male teachers who were not using IWBs ranked considerably higher for lack of time and limited teaching resources. Moreover, experienced teachers showed higher ratings than novice teachers for the usefulness of IWBs in increasing students' attention, explaining concepts, and improving the teaching process. However, in a study conducted by Glover and Miller (2001), expert educators were distrustful about using IWBs whereas beginner teachers had positive views towards this technology. Therefore, teachers' experience may affect their attitudes towards using technology.

Furthermore, teachers usually have progressive views about using IWBs in their lessons for different subject areas. For example, Turel and Johnson (2012) examined the attitudes of 174 instructors towards using IWBs. The findings revealed that those instructors showed their acceptance of IWBs in all subject domains. In addition, a study was conducted by Mathews-Aydinli and Elaziz (2010) to investigate the attitudes of 458 Turkish students and 82 teachers towards using IWBs. The results revealed that both teachers and students had an active tendency towards using IWBs in their second language lessons. The frequency of using IWBs was significantly associated with teachers' attitudes towards this technology, and students' consciousness of IWBs was considerably related to the duration of use of IWBs. Furthermore, Carson (2003) asserts that IWBs have the potential to improve mathematics teaching because teachers can create collaborative games using these smart technologies. However, the findings of a study conducted by Zevenbergen and Lerman (2007) indicated that the quality of mathematical learning and the ability to create autonomous learners seemed to be reduced when using IWBs. Moreover, there were more questions that focused on memory than those demanding higher levels of mathematical thinking skills.

Hence, in this study it was decided to investigate the attitudes of teachers towards using IWBs in *Tatweer* primary schools, for both the teaching and learning processes, to evaluate the efficiency of their use of IWBs (Slay *et al.*, 2008). According to Holmes (2009), teachers' attitudes to and knowledge of technology should be investigated to assess their teaching methods and enable pedagogy change. Moreover, Glover and Miller (2001) reported that investigating instructors' attitudes towards the use of technologies in classrooms may have a significant influence on how to integrate them effectively into lessons. Essig (2011) states that student learning could be positively affected when teachers view IWBs as technologies that can improve education and communication in classrooms. Therefore, it seems necessary to explore teachers' attitudes because their views may affect their methods of integrating technology into their lessons.

3.4. TEACHERS' USE OF IWBS IN CLASSROOMS

3.4.1. Examples of Studies Investigating the Use of IWBs in Classrooms

Several reviews of the literature have focused on the use of IWB technology in education (Glover *et al.*, 2005; Smith *et al.*, 2005; Higgins *et al.*, 2007; DiGregorio and Sobel-Lojeski, 2010; De Vita *et al.*, 2014; Kyriakou and Higgins, 2016). In addition, numerous single studies have been conducted to investigate the use of IWBs in classrooms (Cogill, 2002; Beauchamp, 2004; Higgins *et al.*, 2005; Zevenbergen and Lerman, 2007; Reedy, 2008; Schmid, 2008; Sweeney, 2010; Manny-Ikan *et al.*, 2011; Turel and Johnson, 2012; Jwaifell and Gasaymeh, 2013; Kneen, 2014; Aktas and Aydin, 2016; Kyriakou, 2016). For instance, a study was conducted by Cogill (2002) to investigate the use of IWBs in primary schools and their impact on educators and the teaching process. In this study, five teachers were observed and interviewed, and students' opinions were gathered directly after lessons. The outcomes indicated that the participating teachers employed several common methods when using IWBs. They used this technology to help them plan their lessons, save class time, and increase students' attention. Moreover, two educators had broadly used some IWBs resources and features to achieve teacher-student collaboration and improve students' thinking skills. Hence, from this study, it seems likely that the use of IWBs differs between educators based on their knowledge, goals and competencies.

One main large-scale pilot project, called *Embedding ICT in the Literacy and Numeracy Strategies*, was conducted in 2002 and 2004. IWBs were introduced in more than 80 primary schools in six educational districts in England for students in Year 5 and Year 6 (9-11-year-olds). Importantly, a regional director was employed in each of these districts to manage the project and offer training and recommendations about the use of IWBs for the educators involved. Indeed, this is a critical factor that should not be neglected in any IWB project to ensure its success. This is consistent with and confirmed by Armstrong *et al.* (2005), who state that the employment of IWBs in classrooms not only needs the board and software installation, but also requires constant training for teachers to ensure they use them appropriately. Moreover, this pilot project was evaluated by a team of highly experienced researchers Higgins *et al.* (2005) to assess the impact of using IWBs on the teaching and learning success. The aim of this assessment was to investigate the achievement of students, observe the structure of classroom lessons, record teachers' use of IWBs, and identify the views of both educators and students about using IWBs. There is no doubt about the diversity of methods used to collect data for the success of this evaluation, and these included classroom observations, surveys, group interviews, and analysis of online teachers' records of their weekly use of IWBs, as well as the students' results in *Key Stage 2* tests.

The findings revealed that there were significant changes in the classroom interaction and educators' practices in using technology. Importantly, in classroom observations, there was whole class teaching and less individual and group work when using IWBs, compared with traditional classes, and highly positive attitudes from both teachers and students were reported. However, there was a slight and short-term effect on students' achievement that appeared when the national examinations were considered. The most useful sources of information in using IWBs indicated by teachers were 'IWB consultant,' selected by approximately 40% of teachers, followed by training sessions, which were supported by 36% of teachers. Collaboration with other teachers was chosen by 33% of the participants, and the IWB website was chosen by 13%.

Another large-scale study was undertaken by Moss *et al.* (2007) to evaluate the success of *Schools Interactive Whiteboard Expansion* Project (SWE) which was in London. This project aimed to provide IWBs in each London secondary school, especially in core subject departments in these schools. This study focused on examining the effect of using IWBs on teaching and learning processes, the motivation of both teachers and students, the attendance and performance of pupils, and criteria in main subjects at KS3 and GCSE.

In this study, in-depth case studies were carried out in nine core-subject departments in secondary schools in London. These case studies involved different methods such as *structured observations*, video recording, surveying, and focus group interviews with students. The findings of this study indicated that teachers had an inclination to produce resources for their lessons by themselves, and the IWBs seemed to be a suitable tool for whole-class teaching. Moreover, teachers in mathematics and science departments used IWBs more than teachers in English departments. Mathematics and science teachers might have first access to IWBs, and this could explain their greater use of these technologies. Indeed, when teachers have access to the technology their confidence in using the IWBs effectively will increase (Armstrong *et al*., 2005).

Kennewell and Beauchamp (2007) conducted a small-scale study to investigate how teachers use IWB features in primary schools to enhance learning. Data were collected by observing six teachers and interviewing them regarding the activities observed in their lessons. The authors outlined the structure of IWB lessons in their study in four stages. These four stages were: lesson reviews and an introduction, in which the instructors controlled the activities through using IWBs. Then, there was an outline of concepts and skills where the instructors directed all group activities using IWBs. After that, there was individual or collaborative group work where students did the tasks without using IWBs. Finally, there was a review of the main points, and the instructors used IWBs again to direct all the group activities. In the final stage, students' participation may have been lower than in earlier stages, whereas the role of educators usually seems to be more apparent.

In the Australian context, Sweeney (2010) carried out a further study to examine the impact of using IWBs on educators' pedagogy in one primary school. Seven teachers participated in this study. Observations and interviews were the two instruments used to collect data. The author used the NSW Quality Teaching Framework (NSW, 2006) to measure teachers' skills when using IWBs in classrooms. Furthermore, activity theory was employed in this study to identify tensions and problems when teachers used IWBs. The results of this study revealed that new teachers focused on the technical skills of IWBs, and that could improve the first dimension of the NSW Quality Teaching Framework (*Intellectual Quality)*. In this case, changing teachers' pedagogy was not noticed, as expert teachers were more focused on their teaching and cooperative skills, and this could develop the third dimension (*significance*) of the framework used. These skilled teachers became more able to change their strategies for the most effective use of

IWBs. When instructors become more technically skilled in using IWBs, they will be stimulated to transform their teaching approaches and, accordingly, increase the effectiveness of the learning process (Sweeney, 2010). Nevertheless, the majority of participating teachers in the studies conducted by Glover and Miller (2001), Smith *et al.* (2005), Somyurek *et al.* (2009), and Turel and Johnson (2012) stated that they did not want any further practice relating to the use of IWBs in classrooms. This could be explained because these teachers were professional users of IWBs.

Moreover, Manny-Ikan *et al.* (2011) conducted a study to evaluate a *SMART* project that was installed in six middle and secondary schools in Israel. The aim of this evaluation was to examine the impact of incorporating technology into teaching and learning, as well as the school environment. Data were collected from 24 lessons observations, interviews, student focus groups, and different kinds of questionnaires which focused on school leaders, teachers, pedagogical coordinators, students, and the school community. The outcomes revealed that the motivation and engagement of students improved when using IWBs. The main uses for the IWBs as indicated by educators were: using the Internet, giving presentations, and engaging students in lessons; listening to songs using IWBs was the least common use. It seems likely that these teachers used IWBs in a basic way, and they still needed to improve their technical skills with IWBs. They used IWBs to aid their existing teaching rather than transform it, and collaborative learning groups were ignored in their lessons. Indeed, some serious problems appeared among the participating teachers when incorporating technology into teaching. Therefore, this study highlighted the importance of pedagogical training for teachers, by providing instructional materials for them, and increasing the use of IWBs in all schools.

A further study carried out in Turkey, by Turel and Johnson (2012), aimed to evaluate educators' use of IWBs and their views towards this technology. 174 teachers from different educational levels from grade 6 to 12 participated in this study. These teachers were carefully chosen as they were efficient users of IWBs. The research findings, which were presented using a questionnaire developed by the authors of the study, indicated that IWBs could be used for various subjects and educators had positive attitudes towards using IWBs in facilitating the learning and teaching processes. They agreed on three main factors: the importance of cooperation between teachers, teacher training on more effective teaching methods, and the frequency of using IWBs to improve teachers' skills. However, most teachers did not choose to involve students in active and cooperative activities with IWBs. Although the pace of their lessons increased with IWBs, they did not feel they had enough time to allow their students to use the board. Moreover, the majority of participating teachers responded that they did not need any more training relating to technical and pedagogical skills or designing educational resources. Only 33% of the teachers needed training in each of these three types of training. However, the questionnaire was the only method that was used in this study to address teachers' use of IWBs. It would have been better to observe the teachers in practice to compare their views based on a self-reported questionnaire and their actual use of this technology in the classroom.

Moreover, Jwaifell and Gasaymeh (2013) conducted a study to investigate English female teachers' use of IWBs in Jordan. The authors applied a qualitative case study approach with just four female English teachers. Data were gathered using semi-structured interviews, observations, and document analyses. Teachers' daily use of IWBs in this study shifted their teaching methods from traditional to more interactive methods, using conversations, group work, and open educational sources. This study concluded with recommending the provision of more training workshops relating to the effective integration of IWBs into teachers' practice.

Furthermore, a recent study was conducted by Kneen (2014) focusing on examining how English skills and content can be supported using IWBs in secondary classrooms. A case study approach was applied where seven experienced teachers were observed during their lessons. Data were collected through systematic observation, analysing the content of the interactive whiteboards during lessons, and interviewing the seven teachers. The findings indicated that the participating teachers were active users of IWBs, and they delivered significantly organised resources. The teachers successfully integrated IWBs into their lessons because IWBs offer chances for educators to design the curriculum content. Nevertheless, IWBs were used in limited ways, and programme selections limited the IWB affordances. Additionally, there was a lack of multimedia resources, training programmes, and student interaction. PowerPoint and electronic notebooks/flipcharts were the main and most common resources that teachers used during their lessons. In the majority of the observations (80%), teachers were the main users of IWBs, but students' use was approximately 19% of the total use of this technology. This was followed by the use of both the teacher and students (0.5%) and then the group of students (0.3%). Moreover, the whole class was the main audience for most of the observations (88%). Then, the teacher was the audience for 10% of the lessons, where students presented to their instructor alone. The smallest percentage (2%) was in favour of using IWBs with a group of students. Thus, traditional approaches clearly appeared in this study and affected both content and pedagogy as indicated by teachers. Furthermore, the most frequent use of IWBs was during the first, and the final ten minutes of each lesson and the majority of the resources (49%) were created by teachers. This was followed by commercially-produced resources, which accounted for 23% of the IWB content. Then, 28% of the resources were prepared by students. The study concluded with the importance of having a better understanding of the ability of IWBs to enhance English teaching.

3.4.2. Teachers and Effective Use of IWBs

It is worth considering whether IWBs are one of the most significant educational technology innovations in recent history; therefore, they should be used in different ways from any other kind of technology (Kennewell and Higgins, 2007). Consequently, for more effective use of IWBs, teachers should use them daily in the classroom (Armstrong *et al.*, 2005) so that they become confident and fluent in their use. Likewise, Smith *et al.* (2005) argued that teachers should consider using IWBs regularly in their lessons to benefit from these technologies, as instructor supports in classrooms. Consequently, this will lead to developing educators' skills (Glover and Miller, 2001). Indeed, when teachers use IWBs regularly, they become more capable because they are more experienced and familiar with these technologies and their features.

However, some obstacles prevent educators from using technology regularly, such as class time and the content of the curriculum. In a study conducted by Karasavvidis (2009), teachers reported that time and syllabuses are the most common difficulties that prevent them from using technology daily. These findings are consistent with the outcomes of other studies such as Norton et al. (2000) and Cuban *et al.* (2001). Moreover, the location of IWBs could play an essential role for the more consistent use of IWBs, and, consequently, more efficient use of this technology. It seems likely that the daily use of IWBs could be guaranteed when IWBs are installed in classrooms (Hunt *et al.*, 2006). However, daily interaction and consistent use of IWBs may not be reached when IWBs are not located in classrooms, for instance, in the learning resource rooms (Hunt *et al.*, 2006; Alghamdi, 2013). Indeed, this is the case in most schools in Saudi Arabia where the majority of them have an IWB installed in resource rooms (Alghamdi, 2013).

Moreover, to increase the teaching effectiveness when using IWBs, according to Hodge and Anderson (2007), educators should consider two essential elements: the length and the frequency of use of IWBs. Somekh *et al.* (2007) stated that teachers need to practise daily use of IWBs for two years to improve their confidence in using this technology. Baylor and Ritchie (2002) claim that it takes approximately five to six years for teachers to be more confident in when and how to use educational technologies in their lessons. Therefore, time and practice should be offered to ensure the effective use of IWBs. However, ongoing training should also be provided for all teachers to improve their high-level abilities (Somekh *et al.*, 2007). Beauchamp (2004) examined teachers' use of IWBs in UK primary schools. He found both that there was an association between the attitudes of teachers towards IWBs and the regularity of using IWBs, and that the period of using these technologies was significant. Similarly, the same findings were confirmed by Turel and Johnson (2012).

According to De Vita *et al.* (2014) in their review of the literature, many teachers still use IWBs as traditional white/ blackboards or just as presentational devices. Indeed, using IWBs as presentational tools, especially in a context in which educators control the learning environment, could lead to a reduction in student motivation and their ability to reflect (Hall and Higgins, 2005). Consequently, this could negatively affect the effectiveness of teaching (ibid.). From my point of view, indeed, using IWBs poorly but frequently must be less efficient than using them infrequently but well. Thus, these technologies should be used effectively.

Therefore, teachers should be aware of the interactive features of IWBs (Glover *et al.*, 2007), which is a significant element that distinguishes this technology from other educational technologies. Betcher and Lee (2009) state that IWBs could have a similar role as an ordinary board, but they are distinguished by the variety of tools and features that can be used to enhance collaboration, and employ a constructivist approach in the teaching and learning process. Six types of interactive features that could be employed in lessons through using IWBs were identified by Miller *et al.* (2005). These features are drag and drop, colour, hiding and reveal, shading and highlighting, matching corresponding elements, presenting motion and animation, and direct feedback (ibid.). Indeed, direct feedback could be useful because it inspires students to keep trying until they reach the correct answer (Cheng and Chen, 2007). Moreover, it stimulates independent learning and allows students to observe their improvement immediately while undertaking assessment activities (Irons, 2008). Therefore, students like the immediate feedback because it keeps the activities and their outcomes closely associated, expressive, and up-to-date (Denton *et al.*, 2008).

IWBs have some features that have pedagogical effects when they are employed in lessons. These features are: interactivity, which could enable active learning; size, which could aid in facilitating cooperative learning; the availability of various types of learners; and the recording capacity, which allows teachers to reuse their lessons (Glover and Miller, 2002). However, educators still have to develop new strategies and techniques to create autonomous learners and achieve the full potential of IWBs and how to employ them in their classrooms (ibid.). Thus, greater attention should be made to the pedagogic use of IWBs as well as designing new types of learning environments (De Vita *et al.*, 2014).

Nevertheless, most educators cannot often manage to use the interactive features of IWBs by themselves, starting from the simple use to more complex pedagogical practices in teaching and learning, and therefore they need training (Koenraad *et al.*, 2015). Thus, moving from novice users of IWBs to being more active users is an essential requirement that teachers should consider. Educators should also contemplate improving their IWB technical and pedagogical skills for more effective use of these technologies and improvement in their teaching quality (Beauchamp and Parkinson, 2005; Higgins *et al.*, 2007; Moss *et al.*, 2007; Turel and Demirli, 2010; Manny-Ikan *et al.*, 2011).

Consequently, the effectiveness of using IWBs is limited by the ability of educators in choosing suitable pedagogical methods more than just *technical interactivity* (Webb, 2005; Hennessy *et al.*, 2007). According to Smith *et al.* (2005), *technical interactivity* refers to the physical communication of students with the board, whereas *pedagogical interactivity* means the interaction between learners and others in classrooms that employ IWBs. In their review, the authors argued that the distinctiveness of IWBs depends on the probability of a connection between *technical* and *pedagogical interactivity*.

Effective *pedagogical interactivity* necessitates teachers being able to plan effective and organized lessons that are focused on cognitive development and pace of activity, and which aim to achieve the teaching and learning objectives (Higgins *et al.*, 2007). Therefore, teachers should change their pedagogy and allow their students to participate more in classrooms (Hall and Higgins, 2005). Thus, effective teaching basically relies on the teachers' skills and how they incorporate IWBs in their pedagogy (Higgins *et al.*, 2007).

Similarly, the findings of a systematic review conducted by Kyriakou and Higgins (2016) indicate that the existence of IWBs in classrooms does not necessarily result in improving interaction or raising student scores. However, there is a general agreement across all studies that IWBs have the ability to facilitate and improve learning. Moreover, this review revealed that improving the quality of interaction in classrooms, and consequently increasing the probability of effective teaching, depends on teachers' capacities and effort, rather than using IWBs. However, this requires appropriate teacher training and support.

Thus, the effect of technologies on students' achievement relies significantly on instructors' abilities, their teaching methods, the types of technology tools used, and the goals of their lessons. Educators could integrate instructional technologies into their lessons by designing tasks and activities rather than use them as teaching assistance tools (Cox *et al.*, 2004).

Moreover, according to DiGregorio and Sobel-Lojeski (2010) in their review, the pedagogy and level of interaction in classrooms that use IWBs are greatly affected by vital factors regarding the context. The authors suggested a framework consisting of three sets of common themes on IWBs that were reported heavily in the literature, which are: 1) *Contextual Factors*, including school culture, technical support, teacher training, teacher confidence, and time; 2) *Interactive Whiteboard Usage*, including level of interaction and pedagogy; and 3) *Student Outcomes*, mainly perception, motivation, learning, and attainment. They indicated that these contextual factors have a direct impact on both the pedagogy and the level of interaction in classrooms that use IWBs, whereas the pedagogy and interaction in turn affect students' perception, motivation, learning, and success. Thus, researchers should consider these contextual factors when investigating the use of IWBs in schools.

According to Hennessy *et al.* (2007), expert educators can encourage their students to be active learners in classrooms that use IWBs, where students can progress ideas and assumptions and become more able to employ critical thinking in their learning. Consequently, by doing this, students' self-efficacy and autonomy could be increased when using IWBs (Walker, 2003; Somekh *et al.*, 2007).

To improve higher order thinking skills in lessons, teachers have to acquire sufficient abilities in presenting the learning material, introducing explanations, and making visual presentations, to facilitate difficult concepts. This can be achieved by encouraging student participation in lessons and giving them more time to improve their learning (Smith *et al.*, 2005; Kennewell *et al.*, 2007). However, IWB technology may be perceived as any other innovation (Levy, 2002). In this manner, higher thinking skills might not be enhanced when using IWBs as a presentation tool (Becta, 2008). Therefore, it is important to aid and support teachers to integrate their pedagogy with technology by providing constant training for them which focuses on improving student learning.

It is suggested that interactive teaching can be promoted when using IWBs, and therefore not only do educators seem to be more likely to use higher order questioning, but students also become more dynamic in lessons. This is because they check their comprehension in contrast to the collective meaning (Jones and Tanner, 2002; Hennessy *et al.*, 2007), and therefore tend to think critically before giving an answer.

Indeed, the abilities of IWBs to transform the content into digital form and to present audio and visual resources are considered essential to increase students' interaction with IWBs, teachers, and peers (Xu and Moloney, 2011). Therefore, effective teaching needs educators to have more understanding of the different learning styles of their students in classrooms, and how to use IWBs to teach those students (DiGregorio and Sobel-Lojeski, 2010). Therefore, technology should not be used as an aid or addition in classrooms, but must be used as a transformative tool to improve learning (McCormick and Scrimshaw, 2001; Higgins *et al.*, 2007; DiGregorio and Sobel-Lojeski, 2010).

Several studies have indicated that the integration of instructional technology in classrooms not only has a considerable effect on changing content delivery methods but also plays an important role in transforming teachers' styles from traditional to more constructivist (Cronje, 2006; Levin and Wadmany, 2006; Rakes *et al.*, 2006). Teachers with traditional styles of teaching tend to manage the learning process without considering the individual learning of their students. Indeed, this approach could lead to a decrease in students' level of autonomy and communication. On the other hand, a constructivist style is regularly considered student-centred, since learners build their own knowledge and educators facilitate, supervise, and allow students to learn based on self-discovery and practice (Hoic-Bozic, 2009). Therefore, students in this approach can form an understanding through cooperation and communication with other students in the classroom via pair work or groups.

However, several studies have proven that instructional technology does not always change teachers' traditional style, as they alternatively fit the technology into their current pedagogical methods (Cuban *et al.*, 2001; Windschitl and Sahl, 2002; Knight *et al.*, 2004; Wood and Ashfield, 2008). Indeed, this might be explained by the fact that educators could be inspired by the technical possibilities of IWBs more than their pedagogical affordances (Higgins *et al.*, 2005). Consequently, IWBs “do not suggest a fundamental change in teachers’ underlying pedagogy” (Smith *et al.*, 2006, p. 454). Indeed, it seems easier to integrate IWBs into current teachers’ teaching methods rather than to transform these methods (Higgins *et al.*, 2007; DiGregorio and Sobel-Lojeski, 2010).

However, IWBs could lose their effectiveness when educators refuse to change their method of teaching (Glover and Miller, 2001). In the same vein, Slay *et al.* (2008) claim that changing teachers’ pedagogy is essential to achieve the goal of using an interactive technology device. Similarly, Shenton and Pagett (2007) report that a teacher-centred teaching approach may deter educators from discovering the full potential of IWBs. Therefore, Glover *et al.* (2005) state that pedagogical change seems to be enhanced when using IWBs in teaching. By using these technologies, teachers can present different kinds of media in their lessons, such as images, movies, voice and text (Elaziz, 2008; Reedy, 2008; Slay *et al.*, 2008), to introduce more active lessons (Levy, 2002). However, the capability and experience of educators are the main factors that lead to pedagogical change (Rogers and Finlayson, 2004) and better lesson quality (Wood and Ashfield, 2008).

Nevertheless, it is important to mention that most educators have only used the new technology in the short-term, and have not had enough time for reflection on its use in their lessons (Hall and Hord, 2006). Therefore, educators become more able to change their pedagogy when they start using new technology as a pedagogical tool for student learning development (Glover *et al.*, 2007). However, the effort of changing teaching remains unachieved (Karasavvidis, 2009). Therefore, progressive change can be achieved using technology in classrooms and providing teachers with effective professional development programmes (Glover and Miller, 2009). Hennessy *et al.* (2005) state that IWBs have the ability to change teachers’ pedagogy, but require the introduction of effective professional development programmes. Consequently, teachers need consistent training and more time for practice to become fluent and confident in using IWBs (Shenton and Pagett, 2007), and consequently can then change their pedagogies.

To sum up, transforming traditional teaching is one of the main reasons for using technology in education; however, this aim has not been achieved because of the limited use of technology in schools (Williams *et al.*, 2000; Cuban, 2001; Cuban *et al.*, 2001) and using technology is enhancing current teachers’ practices (Ilomaki *et al.*, 2004; Hennessy *et al.*, 2005; Smeets, 2005). Indeed, when teachers only use technology to support their traditional methods, their pedagogy cannot be changed (Gillen *et al.*, 2007). Thus, teachers should consider students' real interaction and active engagement when using technology to enable such a learning change (Burden, 2002).

Several studies have indicated that teacher-centred approaches are still highly supported in Saudi classrooms (Al-Saadi, 2007; Al-Aklobi, 2008; Alzaidi, 2008; Al-Nefaie, 2010), where a traditional teaching style is the standard method. Therefore, the Ministry of Education in Saudi Arabia has launched several projects and programmes to increase the quality of teaching methods to become more student-centred. Indeed, the *Tatweer* project, as indicated previously, is one such project which concentrates on training teachers and encouraging them to use various teaching methods, such as inquiry-based learning and cooperative learning. Therefore, it is important to examine teachers' actual use of IWBs in classrooms and evaluate their teaching improvement.

3.5. THE BOUNDARIES REGARDING USING IWBS

Although IWBs have several benefits, as introduced previously, some limitations have been acknowledged in the research. These limitations relate to IWBs as technological tools and their users in classrooms, including both teachers and students.

Technology is susceptible to weaknesses and faults, and this is true of IWBs, which experience some shortages and technical problems that lead to a decrease in their potential in education settings. Therefore, there are some faults and technical issues which have been distinguished by either students or their teachers. The greatest common issue is related to the software used to operate IWBs, electricity supply, and the hardware used in these technologies (Wall *et al.*, 2005; Al-Qirim, 2011). Other technical problems have been investigated in a small-scale study (Levy, 2002), which focused on the introduction of IWBs in two secondary schools in Sheffield. The problems that had occurred before or during lessons included problems in the association between some parts of the smart boards, a delay in reaching the IWB software, unresponsive images, and technical issues relating to digital pens. Indeed, teachers usually have difficulties dealing with IWB technical problems when they occur (Slay *et al.*, 2008).

Moreover, IWBs are considered costly compared with other display technologies (Higgins *et al.*, 2005). Therefore, the cost of these technologies might play a major role in reducing their existence in schools. Slay *et al.* (2008) state that cost restrictions are considered one of the reasons for the limited use of IWBs in classrooms.

IWBs may have a significant role in inspiring and attracting students in classrooms. However, these technologies may also have some difficulties that could destructively affect their learning. The size of the IWB is one such problem that may have a negative impact on students because of the inability of some students, particularly those who have a seat at the back, to see the screen because of the small size of these technologies (Hammond *et al.*, 2009). Moreover, young and short students may have difficulties reaching high-level icons on the top of the board (Beauchamp, 2004; Smith *et al.*, 2005). Indeed, this issue could affect educators as well. Hall and Higgins (2005) said that students showed no tendency toward IWB technology because of mechanical problems, the difficulty to watch what is presented on it while they are sitting far away from it, and the limited teachers' skills.

Importantly, students in IWB classrooms may focus on and view this technology as a technical tool instead of concentrating on what is being taught by their educators (Slay *et al.*, 2008; Serow and Callingham, 2011). However, this adverse effect usually exists only at the start of using IWBs in classrooms, when students are unaccustomed to using new technologies (Tozcu, 2008). This difficulty seems to be overcome when students become familiar with the technology, once they use it more repeatedly in their various classroom activities, such as doing presentations and playing games through IWBs (ibid.). In time, students consider IWB technology as a regular educational tool in classrooms.

Moreover, there are some difficulties relating to the effectiveness of educators' use of IWBs in classrooms. An essential problem is their lack of availability and training (Smith *et al.*, 2005; Oyaid, 2009; Al-Qirim, 2011; Bakadam *et al.*, 2012; Isman *et al.*, 2012; Alghamdi, 2013; Al-Faki and Khamis, 2014; Gashan and Alshumaimeri, 2015; Šumak *et al.*, 2016). Technical problems, lack of technical support, and lack of knowledge and training were also huge obstacles faced by teachers in Slovenia in a study conducted by Šumak *et al.* (2016). Educators usually have limited skills to solve IWB technical problems (Slay *et al.*, 2008). Thus, when technical difficulties occur, teachers become more likely to use traditional methods to introduce their content (Cuban *et al.*, 2001; Bauer and Kenton, 2005). Therefore, they need consistent training on both technical and pedagogical abilities to be more capable when they use IWBs in classrooms (Beauchamp, 2004; Higgins *et al.*, 2005; Turel and Johnson, 2012).

Additionally, the insufficiency of educational software linked to the curriculum was also a significant concern among teachers in a case study conducted by Somyurek *et al.*

(2009), to examine the new inclination of IWB's investment in primary and secondary schools in Turkey. In this study, the quantity and quality of the educational resources were the second concern among teachers that could decrease their chances of using this technology. Gursul and Tozmaz (2010) state that teachers' concerns usually focus on the deficiency of instructive software, and therefore they need such resources. Similarly, digital learning resource shortages, as well as the time invested in organising lessons, were the main problems named by educators in a pilot project conducted by Manny-Ikan *et al.* (2011). Indeed, this lack of suitable digital educational resources may cause failures regarding introducing the content (Wall *et al.*, 2005) and resistance from educators who use technology (Glover and Miller, 2002). Therefore, these resources are crucial for both teachers and students, according to Beauchamp (2004), and producing these educational resources may ensure that teachers will improve their effectiveness in using IWBs. Correspondingly, according to Koenraad *et al.* (2015), particular teaching skills and educational resources are important requirements for effective use of IWBs in classrooms.

Moreover, educators also have other reasons that prevent them from using IWBs such as the lack of availability of installed IWBs in all classrooms (Slay *et al.*, 2008; Manny-Ikan *et al.*, 2011; Alwazzan, 2012; Alghamdi, 2013; Šumak *et al.*, 2016) and the fact that teachers do not have enough time to design pedagogical lessons using IWBs (Higgins *et al.*, 2007; Šumak *et al.*, 2016). A study was carried out by Glover and Miller (2002) to investigate the use of IWBs by 35 primary teachers and their views of the benefits and problems of this technology. Data were collected using a questionnaire, observations, and interviews. The lack of time for designing lessons and unavailability of a technical consultant were the major difficulties that teachers encountered in this study. Similarly, a lack of technical support was also indicated by the teachers in a study conducted by Oyaid (2009), to investigate the use of ICTs in Saudi secondary schools, in Riyadh City, in Saudi Arabia.

A study conducted by Karasavvidis (2009) investigated teachers' concerns regarding the use of technology in their teaching; it reported that time and syllabuses were the greatest difficulties that kept them from using technology daily. Khan *et al.* (2012) stated that teachers in Bangladesh have busy schedules; therefore, they had a lack of time to prepare technology resources and integrate them into their teaching or to attend training courses. Similarly, the lack of time was also reported in several studies as one of the main restrictions to integrate technologies into the teaching and learning processes (Afshari *et al.*, 2009; Ihmeideh, 2009). According to Koehler and Mishra (2009, p. 62), "acquiring a new knowledge base and skill set can be challenging, particularly if it is a time-intensive activity that must fit into a busy schedule.”

Similarly, time issues have also been confirmed by several Saudi research studies (Al-Alwani, 2005; Oyaid, 2009; Al-Maini, 2011; Al Mulhim, 2013; Al-Faki and Khamis, 2014). For example, a study was conducted by Al-Maini (2011) to investigate the issues facing the employment of computers in teaching English as a Foreign Language (EFL) in secondary schools in Al-Qaseem in Saudi Arabia. He stated that educators’ resistance to the use of ICTs and providing virtual learning in Saudi Arabian schools was linked to the inflexible and overcrowded curriculum, as well as insufficient teacher training programmes. Moreover, more than 42% of teachers in a study conducted by Al-Faki and Khamis (2014) reported that they had long schedules that affect their use of IWBs. Similarly, time restrictions were one of the main challenges that affect teachers’ usage of ICTs in a study carried out by Oyaid (2009). In a study conducted by Al-Alwani (2005), teachers indicated that they had a heavy workload and were required to do other tasks besides teaching, which left no time for them to improve the integration of technology into their teaching.

Furthermore, teachers encountered some difficulties in integrating IWBs in their current teaching methods in a study conducted by Schmid (2008), to investigate the use of multimedia for teaching the English language in a classroom supported by interactive whiteboard technology. Therefore, when teachers face these problems, they may reject using IWBs. The lack of teachers’ skills and the difficulty of integrating IWBs in the teaching were also found in several Saudi studies (Bakadam *et al.*, 2012; Isman *et al.*, 2012; Alghamdi, 2013; Hakami, 2013; Al-Faki and Khamis, 2014; Gashan and Alshumaimeri, 2015).

Importantly, the location of IWBs’ installation is considered essential for successful use. It is essential to install resources in the appropriate place, and therefore IWBs should not be installed in a computer room. If they are inside classrooms, they can then be used as a tool for simplifying curriculum learning as teachers can make full use of them (Hunt *et al.*, 2006). Moreover, IWBs should be located in an appropriate place in the classroom to enable visualisation for the whole class (Glover and Miller, 2002). However, the installing of IWBs should not eliminate the importance of the presence of traditional whiteboards in classrooms. Indeed, providing traditional boards in classrooms that have IWBs may also be important in case of technical problems, as well as to write some important concepts or ideas which can remain on display throughout the lesson period. DiGregorio and Sobel-Lojeski (2010, p. 261) in their review of the literature said,

> Teachers often need a traditional whiteboard in addition to the IWB for their lessons, especially for information that needs to remain visible for the entire class period. Traditional whiteboards can also serve as a backup, for occasions when there is a technical problem with the IWB setup.

Thus, school administrators should provide both types of board in each classroom to give teachers a variety of possible options that fit with the content of their lessons.

3.6. TECHNOLOGY AND THE PROFESSIONAL DEVELOPMENT OF TEACHERS

3.6.1. The Definition of Professional Development

The concept of professional development is fairly broad and definitions are largely unexplored, as most writers in this field do not define the concept explicitly (Evans, 2002). Some authors have concentrated on describing the positions of particular cases of educator development; for instance, the forms of professional development for skilled teachers were identified by Grossman (1994, p. 58), who said that:

> This has taken a number of different forms, including workshops, study groups, fireside chats, a district-wide colloquium for middle school teachers, action research projects, and conversations with the professor-in-residence.

Moreover, three activities relating to teachers' professional development were recognised by Miller and Silvernail (1994, pp. 40–42). These activities were "*training for cooperative teachers*", "*videotaped observation process*", and "*the presence of interns*."

The OECD (2009, p. 49) defined professional development "as activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher." These activities could be formal or informal, inside or outside schools, provided via external expertise or through collaboration between teachers. However, this definition does not indicate the broad purpose of providing these activities. A clearer definition of professional development was suggested by Day (1999, p. 4), who said that:

> Professional development consists of all natural learning experiences and those conscious and planned activities which are intended to be of direct or indirect benefit to the individual, group or school, which contribute, through these, to the quality of education in the classroom. It is the process by which, alone and with others, teachers review, renew and extend their commitment as change agents to the moral purposes of teaching; and by which they acquire and develop critically the knowledge, skills, planning and practice with children, young people and colleagues through each phase of their teaching lives.

Indeed, this definition includes all actions which are anticipated to make a change in classrooms whether formal (*planned activities*) or informal (*natural* and *conscious* *learning experiences*). It also considers the context in which teachers work, collaboration with colleagues, and lifelong learning. Importantly, it concentrates on considering the purposes and outcomes of providing activities for obtaining meaningful continuous professional development (CPD).

Moreover, the aim of professional development has been clarified by Lowden (2006, p. 62), who indicated that:

> Much of the literature and research states that the goal of professional development is to provide opportunities for teachers to learn and grow within the profession, thereby making an impact on student learning.

This view indicates that the outcome of teachers' professional development means not only improving their skills but also considering the possible *effects* of these skills on students' knowledge. Therefore, educators need suitable training and support, especially in the case of teacher-centred learning, in order to expand student knowledge. In the same view, Glickman *et al.* (2007, p. 52) reported that "instructional improvement takes place when teachers improve their decision making about students, learning content, and teaching." Consequently, there are some special requirements for effective professional development, as reported by Joyce and Showers (1988, p. 76), which are: "individual needs, the needs of the schools and systems, the particular learning programmes in place, and the students, their needs, abilities and characteristics." Indeed, when these requirements are considered in educators' professional development programmes, this could lead to improvement in both learning and teaching processes.

Teacher professional development is a wide-ranging topic that involves many types and different shapes. However, it is essential to examine precisely the professional development of teachers and how this relates to technology (Adams, 2005). Therefore, concentrating on the main aim of the current study, which is investigating teachers' use of IWBs and their training needs, teacher professional development relating to the use of technology will be mainly discussed in detail in the next section.

3.6.2. Teacher Professional Development in Using Technology

There is an inevitable effect of technology in both the teaching (Bennett and Lockyer, 2008; Manny-Ikan *et al.*, 2011) and learning processes (Elaziz, 2008; Slay *et al.*, 2008). According to Wood and Ashfield (2008), many opportunities can be offered to teachers when new technologies are introduced in classrooms, and this can lead to enhancing their teaching abilities as well as improving their creativity. Therefore, incorporating new kinds of technology into classrooms is regarded as a vital issue for all teachers in the twenty-first century (Brooks-Young, 2007). However, Dawes (2000) stated that difficulties could appear when using technologies in classrooms as instructive tools. In the same view, Schmid (2006) reported that introducing innovative technologies in schools could create conflict and problems, and consequently instructors and learners could be affected. Therefore, Miller and Glover (2007, p. 329) stated that:

> The introduction of technology without sufficient appropriate training in technology and teaching and learning may inhibit the realisation of the full value of the equipment.

Hall and Higgins (2005) also claim that the engagement of students in the classrooms could be unsuccessful when educators have inadequate training to use IWBs effectively. Thus, teacher training should be considered when using IWBs (Hall and Higgins, 2005; Wall *et al.*, 2005) to improve the quality of their teaching (Compeau and Higgins, 1995; Turel and Demirli, 2010).

Indeed, providing educators with appropriate skills and approaches to face technology obstacles is essential for more effective use of technology (Kopcha, 2010). Educators need adequate preparation in how to use IWBs in classrooms to protect them from failure and embarrassment when difficulties occur because of the inappropriate use of these technologies; such frustration could impact learning development (Hall and Higgins, 2005).

The process of teacher improvement when using technology has been explored by several studies (Becker and Ravitz, 2001; Burden, 2002; Beauchamp, 2004; Adams, 2005; Holmes, 2009; Lai, 2010). These studies concentrate on the importance of teachers' improvement in both technical and educational skills, as well as students' use of technology. In terms of interactive whiteboard use, they agreed that new IWB users should have gradual and constant training in their use. Furthermore, according to Becker and Ravitz (2001), advanced courses should be progressively delivered during the year by educational leaders, who also offer equipment and time for teachers to practise with these technologies. Indeed, educators usually have different ways and speeds in improving their skills; therefore, they need a comfortable and helpful environment (Beauchamp, 2004).

Importantly, Higgins *et al.* (2005) stated that interactivity in some classrooms may be negatively shaped when most of the contact is confined between educators and technology. In the same view, it is argued that, according to Glover and Miller (2003), if instructors do not have appropriate support, they may not consider the interactivity with their students when using IWBs and, as a result of this, a more teacher-centred instruction might develop. Indeed, some research evidence suggests that teachers perhaps prefer to use an IWB as a traditional whiteboard, as reported by McCrummen (2010), who said that educators feel more comfortable when using whiteboards that are designed to be more easily adapted to a traditional teaching style. Additionally, Glover and Miller (2001) state that there are limited training programmes for teachers in particular subjects because the focus of IWB suppliers is usually on improving teachers' technical abilities in using the equipment and software. Therefore, the professional development of teachers is an essential factor in ensuring the production of active lessons (Hall and Higgins, 2005; Glover *et al.*, 2007; Holmes, 2009; Torff and Tirotta, 2010). Consequently, appropriate training should be introduced so that educators can use IWBs effectively for learning.

Specifically, training teachers how to use ICT skills in their lessons has become an essential issue in approaches that relate to the professional development of teachers (Somyurek *et al.*, 2009), and therefore they need both computer and operational skills (Cogill, 2002). Moreover, when using IWBs, in their early training stages teachers need adequate time to practise alongside their training to explore their affordances and how to incorporate them in their lessons (ibid.). Indeed, teachers need to be aware of acquiring computer skills to ensure successful practice with IWBs. According to Cogill (2002), acquiring ICT skills may continue to be an obstacle and challenge for teachers who wish to be more efficient users of IWBs. Therefore, it is important to consider continuity in the process of training teachers in both technical and pedagogical IWB skills so that teachers can improve their ICT abilities (Hall and Higgins, 2005).

The significance of teacher training could be reflected in the more effective use of IWBs. For instance, Armstrong *et al.* (2005) conducted a study to examine the interaction that occurred between educators, learners, and technology in classrooms. Four teachers participated in this study, one of whom had formally trained with IWBs, and another had self-trained. The remainder were beginner users of IWBs and had not received any training. The findings indicated that those teachers who had training, whether formal or self-taught, made daily use of IWBs in their lessons; therefore, they showed high levels of confidence in using the full potential of IWBs. In contrast, limited use of the affordance of IWBs was made by the untrained teachers.

A study was conducted by Blau (2011) to investigate to what extent teachers in primary schools in the North of Israel employed an IWB professional development programme in their instructional practices. 43 primary teachers attended this training course. They were teachers of different subjects and had different levels of ICT skills. Nevertheless, all of the participants were inexpert in using IWBs in their teaching. Teachers in this course were trained in three groups by the same trainer, at the same time, and in the same centre of professional development. During training, all the teachers used the same syllabus, IWB program, and learning resources through the course website. The data were collected directly after finishing this training programme using a questionnaire considering specific strategies learned during the course to assess IWB lessons organised and distributed online on the website of this programme by the participants. The content and format of these lessons varied depending on the teachers' choices. The results of this study revealed that teachers frequently applied the fundamentals learned and experienced during the training course into their lessons. Additionally, the analysis of these lessons indicated a link between the technological tools used by teachers and the pedagogical objectives.

The majority of the time in all these lessons was spent on whole class teaching (50%), followed by individual learning (28%), and then small group activities (22%). Moreover, the interactivity between teachers and students (pedagogical interactivity) was high, as were the interactions between students and IWBs (technical interactivity). However, communication between the students themselves was limited.

The role of the teachers in most of the lesson time supported student-centred learning (57.3%), where the teachers are not the main sources of knowledge. Instead, they work as guiders for their students and scaffold their learning. In contrast, teacher-centred education accounted for 42.7% of the lesson time, and was thus reduced in this study. In other words, although the teachers in this study employed pedagogical approaches, they widely used constructivist activities in their lessons. Indeed, this finding does not support the claim of Way *et al.* (2009), which revealed that IWBs generally stimulate teacher-centred instructional style where students have a low-level of dynamic contribution. However, this result is in line with several studies which reported that IWBs have the ability to facilitate pedagogical change and that highly depends on teachers' efforts (Higgins *et al.*, 2007; Becker and Lee, 2009; Beauchamp *et al.*, 2010; Kyriakou and Higgins, 2016).

Furthermore, teachers who participated in this study tended to regularly employ the basics of multimedia learning during this training programme, by using various visual and oral presentations. Indeed, the multimodal feature of IWB resources plays an essential role in engaging and attracting learners by merging visual and verbal demonstrations of content through active multimedia learning (Kennewell and Beauchamp, 2007; Gillen *et al.*, 2008). To conclude, this study proved that the adequate training of teachers during the IWB training programme led to the successful employment of IWB technology in the lessons prepared by the teachers.

Therefore, the effectiveness of using IWBs in classrooms seems to be strongly linked to teacher training (Wall *et al.*, 2005). According to Merriam *et al.* (2007), training courses act as a moderator that aids educators to be autonomous and self-guided learners, so developing their IWB skills and gaining in confidence with this technology. Balanskat *et al.* (2006) stated that there is a direct association between educators' level of knowledge and the quality and quantity of the training courses that are provided to them. Consequently, regular training in using the full potential of IWBs could help increase educators' capabilities (Hall and Higgins, 2005) and enhance teachers' satisfaction (Parkes and Stevens, 2000), as well as increase their confidence, skills, and pleasure (Darling-Hammond and Baratz-Snowden, 2005).

98% of participating teachers in the study by Higgins *et al.* (2005) indicated that their confidence increased when using IWBs. Indeed, teachers need to develop their skills in order to use IWBs effectively. Therefore, they need more than just the installation of IWBs in their classrooms; they need adequate training and support, as stated by Armstrong *et al.* (2005). When educators have suitable training, they can meditate and integrate IWBs into their lessons to improve the value of interactions in classrooms (ibid.). However, the lack of provision of technical assistance facilities in schools led to a decrease in teachers' use of technologies in their lessons (Hew and Brush, 2007). Thus, educational administrators should provide technical support and maintenance in schools to guarantee the quality of technology devices and, consequently, increase the usefulness of technologies in education (Balanskat *et al.*, 2006).

Moreover, in addition to formal training courses, teachers need continued and individually designed training, through which more experienced users of IWBs collaborate with beginner teachers (Glover and Miller, 2001). According to Windschitl and Sahl (2002), communal preparation time with colleagues could be essential in the effective use of the technology. In the same view, Levin and Wadmany (2008) state that holding dialogues with colleagues, as well as cooperative thinking developments seem to be beneficial for the best use of technology. This is consistent with Social Cognitive

Theory (SCT) (Bandura, 1986) as individuals learn through observing the behaviours of their colleagues when they are cooperating with them. Indeed, observation-based learning is an essential instrument to improve the efficiency of educators (Lortie, 2002).

The results of a study conducted by Shenton and Pagett (2007) aimed to explore the use of IWBs in the UK, indicating that self-training and collaborating with colleagues were the most appropriate teacher training sources, and they could be more effective factors in improving teachers' skills for best use of IWBs. In contrast, the findings of a study carried out by Turel and Johnson (2012) revealed that most educators (67%) received their training from the educational institution or provider of IWBs, and a lower percentage (26%) of educators were self-trained. However, 81% of the instructors in the pilot project (*Embedding ICT in the Literacy and Numeracy Strategies*), mentioned previously, had trained via their colleagues and by their local IWB consultants (Higgins *et al.*, 2005). Furthermore, training courses were the most common IWB training sources for the majority of teachers (86%) in this project (ibid.). Indeed, from my perspective, the use of IWBs is fundamentally linked to teachers' efforts, embedding their desire to learn, their ambition to improve themselves, and the cooperation between instructors. Nevertheless, it seems that no one could argue that the role of supportive organisations in developing teachers' skills should be neglected.

It is suggested that educators' views will be positively developed when they receive suitable training and, therefore, teachers who have incorrectly used technology commonly need training (Mumtaz, 2000). Thus, teachers' professional development programmes should be continuous and a lifelong process for all teachers during their working lives (Robertson, 2008). However, the necessity for continual, cooperative training is not only required for basic use, but is also needed to develop the full potential of IWBs and should be concentrated on improving teachers' effectiveness (Hall and Higgins, 2005). Nevertheless, educators usually lack technical and instructional abilities for more varied use of IWBs, despite their constant training (Elaziz, 2008; Somyurek *et al.*, 2009). Additionally, educators frequently lack training courses from providers and these courses only focus on the basic skills of IWBs (Glover and Miller, 2001; Smith *et al.*, 2005). Thus, it is essential to examine educators' use of IWBs in classrooms, as well as their attitudes, needs and problems when using new technologies to provide appropriate training courses (Turel and Johnson, 2012).

Therefore, teacher professional development models have been outlined in several studies to improve teachers' technical and pedagogical skills. Consequently, by doing this, teachers might overcome unexpected technological challenges. One of these models, for instance, was outlined by Burden (2002) in a two-year research project examining the actual use of IWBs in schools. The data were gathered through questionnaires and interviews, and by observing two hundred instructors using IWBs in their lessons. This model consisted of three phases when IWBs were used by both the teachers and students in the project: *infusion, integration, and transformation*. In each stage, schools have specific features, as identified by Burden (2002). In the first stage of improvement (*infusion),* IWBs were often installed in ICT rooms, and they were usually used as presentation tools. A lack of interaction in classrooms was also noticeable, as was the fact that students in this stage were more passive. Importantly, combining IWBs within the curriculum was not considered at this stage.

However, schools in the *integration* stage of improvement had successfully established the use of IWBs and made more effort and time to create suitable strategies which combined the new technology with the syllabus or curriculum. Therefore, IWBs in this stage are described as curriculum tools rather than isolated tools in ICT rooms. Additionally, IWBs are used to enhance student participation, in which a broader variety of tools is used.

Significant changes relate to the use of IWBs identified in the *transformation* stage because here interactivity has been considered. IWBs in this stage are used as interactive tools rather than presentation tools, and most classrooms have them installed. Students are actively participating in the classroom activities where they use new technologies to build their knowledge. Moreover, different types of multimedia resources are also utilized in this stage.

In contrast, the professional development model developed by Beauchamp (2004) consists of five phases of instructor and student progress. This model specially classifies teachers and learners based on the level of IWB features and activities used in classrooms, and, therefore, these five stages describe the change from novice user of IWBs to the *synergistic* user. In other words, according to Beauchamp (2004, p. 330), there are five kinds of users "*black/whiteboard substitute; apprentice user; initiate user; advanced user; and synergistic user*." Beauchamp suggests that the interactive whiteboard moves from being a "*passive tool"* that is only controlled by the teacher to an "*active tool"* in learning for students and teachers to interact and build meaning (Beauchamp, 2011).

Black/whiteboard substitute is the first phase in this model, where the IWB is used as a *passive tool* that is only used by the teacher as an alternative tool for the traditional white/blackboard, on which they write and draw. In this phase, teachers do not make any changes regarding their approach. In the second phase, *apprentice user*, teachers employ a variety of computer skills and allow their students to use the board themselves as part of prearranged activities within lessons. Students in this stage learn to write, highlight, and drag items on the board. However, the direction of these lessons is still linear. Moreover, teachers widely used PowerPoint to structure their lessons, and present clip art and pictures. However, there is a limited use of the Internet as well as the external material in this stage.

In the third phase, *initiate user*, the teacher has "*an awareness of the potential of the IWB to change and enhance practice*" (Beauchamp, 2004, p. 338). Therefore, teachers plan their lessons for more student use of the IWB as an essential factor in improving their learning. Teachers in this stage start to use a wider range of computer skills, such as maximising and minimising files, opening multiple programs and stored files, and organising folders. PowerPoint files may be used with more effects, such as sound files. Moreover, teachers use external resources and can import files from the Internet. In the fourth phase (*advanced user*), teachers concentrate on discovering the effect of using IWBs on their teaching and student learning rather than technical skills (Beauchamp, 2004). IWBs in this stage have become an "*active tool*" in learning (Beauchamp, 2011) to be used by both teachers and students. Students in this stage have more power to use IWBs in lessons frequently and confidently. They can import scanned images, use video clips, use sound files and external resources, develop their own material, and use hyperlinks and websites.

Both students and teachers indicated great levels of proficiency at the highest level, *synergistic user,* of the model of Beauchamp (2004, pp. 343,344), who said that:

> A synergistic user demonstrates an intuitive interaction with technology, which facilitates a fluid lesson structure. Both teacher and pupils are able to construct meaning and dictate the direction, momentum and scale of the next step in the lesson, although the teacher retains control of the central theme, which is dictated by the learning objective of the lesson.

When students interact with IWBs, according to Beauchamp (2004), this could create an environment where students are the centre of the learning process, whereas teachers, in this case, are classified in more progressive phases of using IWBs. Advanced teachers were more effective at using IWBs than novice teachers, possibly because progressive teachers usually use high-scale features of IWBs, in an interactive approach, to present their lessons when communicating with IWBs; in contrast, beginner teachers use IWBs as an ordinary whiteboard (Beauchamp, 2004).

The majority of educators' skills in this study were developed when using IWBs frequently, and they reported that their colleagues had trained them to use IWBs. Thus, IWBs certainly might support cooperation between teachers. However, teachers could not enable cooperative learning among students when using IWBs in their lessons. Although IWBs help teachers to manage their lesson time, most teachers reported that they did not allow students to use IWBs because of limited lesson time. According to Beauchamp (2004), training large numbers of educators in the initial basic use of IWBs could be valuable. Then, these educators should have adequate time to integrate their acquired training skills into their lessons and develop confidence in the effective use of IWB features. He added that teachers would allow students to participate more in their lessons when their confidence improves; consequently, in this case, students will become more confident in using IWBs by themselves (ibid.).

As seen above, these two models concentrate on both teachers' and students' use of IWBs. Thus, the three phases of the Burden's (2002) model could be linked to the five stages of the Beauchamp (2004) model, as indicated in Figure 3.1.

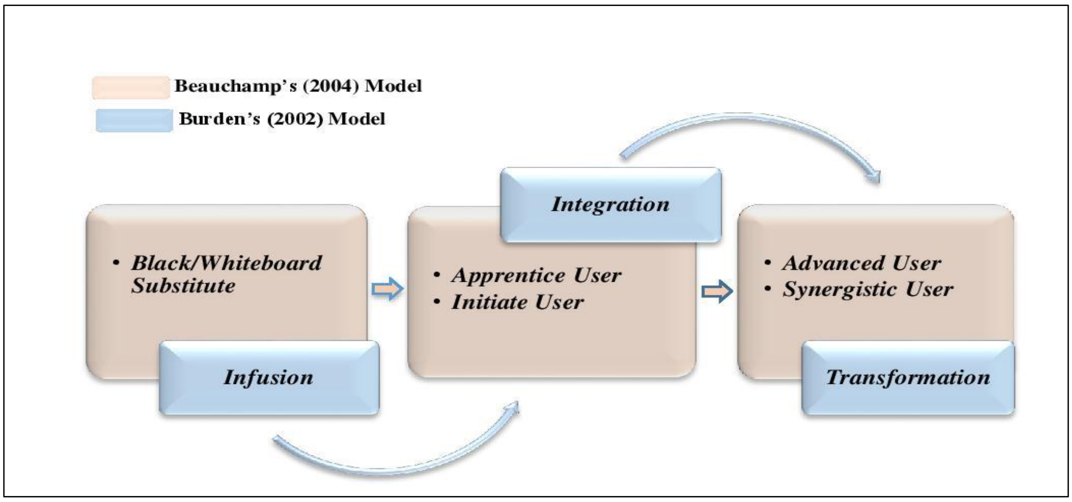

Figure 3.1: Burden's (2002) and Beauchamp's (2004) models

Moreover, collaborative professional development has been emphasised in some studies (Darling-Hammond, 2005; Colbert *et al.*, 2008; Dahlberg and Philippot, 2008; Holmes, 2009; Lai, 2010). This kind of professional development considers the type of cooperation between educators during their training which involves at least two fellow educators (Cordingley *et al.*, 2005). It enables instructors to cooperate with their colleagues and learn new technical and pedagogical skills (Dahlberg and Philippot, 2008). Collaborative educator development aims to share teachers' opinions in designing and implementing training courses, to facilitate teacher support and offer teachers the opportunity to choose more efficient methods (Colbert *et al.*, 2008). Indeed, when these features are considered in the design of professional development courses, both educators' effectiveness, and teaching and student progress, may be improved (ibid.). Therefore, teachers should be involved in the decision-making process (Cordingley *et al.*, 2005).

The cooperation between educators, according to Darling-Hammond (2005), has found the acceptance of the majority of teachers to be an effective technique for improving teachers' professional development. This, indeed, is consistent with the view of Vygotsky (1978), which concentrated on the importance of social collaboration in learning. Similarly, it is consistent with social cognitive theory, in which individuals build new skills appropriately when they interact in groups (Bandura, 1986). Furthermore, a high percentage of human behaviours could be created because of interaction with other individuals (ibid.). Hence, according to this viewpoint, educators can acquire new skills related to using technology when communicating with colleagues.

Additionally, technological professional development could be better when "teachers work together to learn technologies, and trial and error approaches are encouraged" (Buckenmeyer, 2010, p. 33). Moreover, Sergiovanni and Starratt (2006, p. 276) said that "the most innovative and provocative approaches to teacher growth and development are those that rely on exploration and discovery by teachers." Furthermore, Lewin *et al.* (2009), in a study conducted in the UK, found that educators improved both their technical and teaching skills in using IWBs during conversations and contact with colleagues. Similarly, Winzenried *et al.* (2010) recommended that dialogue between teachers on the appropriate use of IWBs to enhance student participation in the learning environment are more valued than official external experts. Therefore, sharing ideas and collaboration between teachers should be encouraged in schools, and school administrators should provide support for teachers during their professional development programmes (Boling and Beatty, 2012).

According to the previous views, teachers should indeed not only work together in their professional development courses but also have the chance to reflect on their current skills, future needs, and preferred training methods, to discover common useful techniques for their learning and teaching. Consequently, it would seem better to design training courses based on these characteristics. Moreover, to evaluate the effectiveness of collaborative professional development, according to Becta (2004), it is critical to assess its quality and measure the improvement in the performance of both educators and students.

A study conducted by Holmes (2009) examined the lesson activities that were produced by thirteen student teachers in their final year of a secondary mathematics undergraduate programme. These student teachers had had a training course on technical IWB skills, and were asked to design an activity using an IWB for the mathematical content. Moreover, they were given a chance to work in collaborative groups to discuss their ideas to improve their designed activities. The participating pre-service teachers employed both fundamental and pedagogical IWB skills in their lessons. In this study, the framework of Technological Pedagogical Content Knowledge, which was developed by Mishra and Koehler (2006), was applied to guide the analysis of the findings. The outcomes indicated that the participants had successfully integrated IWB features in their mathematical lessons, which led, consequently, to improvement in the TPACK framework. Moreover, different visual demonstrations and the effective manipulation of the features of IWBs, which result in understanding various mathematical concepts, were the main advantages of using IWBs in engaging students. Despite the importance of educators' technology skills in determining the efficiency of using IWBs in their lessons, Holmes (2009) asserts that information about technology or the effectiveness of pedagogy are insufficient for educators if they do not know how to use technology effectively regarding content knowledge. Therefore, teachers' professional development should consider training teachers in specific subject content.

Additionally, a qualitative case study was conducted by Lai (2010), in Taiwan, to investigate the attitudes of teachers in secondary schools towards IWB training workshops, as well as the possible difficulties related to the design of these workshops when aimed at developing their efficiency. The data were collected from two observations and interviews with six teachers at two secondary schools where IWBs had been installed in ten classrooms. All educators in this study attended prepared training workshops run by proficient educators and the supplier of IWBs. These training workshops consisted of two phases: one day of initial training (six hours) to identify basic and advanced interactive features of IWBs, and then a subsequent course of two weeks after primary training, focused on practical performance with IWBs for specific subjects. The findings indicated that teacher development is vital to the effective use of IWBs, as is teacher collaboration, sharing experiences, and consistent support through and after training courses. Teachers in this study reflected that acquiring IWB skills in a practical way helped them to use this technology expressively in their teaching.

Adams (2005), moreover, carried out a case study to evaluate a course of professional development technology for in-service primary educators. The participating teachers acknowledged themes that they were interested in related to their field of teaching. The participants were divided into teams and had to teach one another with support from a mentor. Finally, these educators became able to teach individually using technology. Self-assessments of teachers' technological abilities were distributed at the beginning and end of the professional development course, and focus group interviews were held at the end of the course. The findings of this study revealed that this course helped teachers increasingly apply most of the abilities they had learnt during the training course into their teaching. Additionally, their self-assessment of their use of technology was improved, as the majority achieved high levels (at the intermediate and advanced levels). Moreover, 50% of the educators felt that their confidence had increased, whereas approximately 33% had a considerable change in their attitude towards using computers in their lessons. The majority of teachers suggested that they needed further training in technology mainly via their colleagues.

Indeed, this kind of on-site training course might be useful for the school and educators' circumstances. Moreover, the technique of this course was different from training traditional methods. In other words, the goal of this course was not training teachers in a specific planned skill of technology, but the subjects included in this course were identified by the participating teachers, who worked together in teams to determine their topics, and then design and teach the course. The role of the trainer in this course was to facilitate, supervise, and train teachers to acquire new skills by themselves, with the supervision of the instructor. Indeed, this method of learning was consistent with a constructivist approach, where learners make an active contribution to activities and shape understanding rather than requiring knowledge of the educators, and their role is limited to facilitating and leading activities (Vygotsky 1978; Vanderstraeten, 2002). Similarly, this approach is consistent with the Concerns-Based Adoption Model (CBAM) (Hall and Hord, 2006), where teachers' interests, concerns, and needs are mainly considered in order to improve their professional development in using technology. This model suggests that teachers progress through seven stages of concerns or eight levels of use (Hall and Hord, 2006) before technologies can be successfully integrated into their lessons (*more details about this model are addressed in Section 3.6.3.2*).

Importantly, DeSantis (2012) identifies three guiding factors for educational leaders when designing and introducing sufficient professional development for in-service instructors. These three factors, according to DeSantis (2012, p. 52), are:

> …Building technical efficacy among teachers by scaffolding the training of new technical skills and instructional techniques over time, building a culture of teacher collaboration, including the use of teacher-mentors, and maintaining positive instructional supervision that promotes student-centred instruction and student interaction with IWBs.

Peer mentoring is a method or strategy that could be used to develop cooperation in professional development IWB programmes. In these programmes, teachers who are highly skilled in using IWBs were integrated with beginners (Feiman-Nemser, 2006). In a study conducted in Australia by Jones and Vincent (2010) to evaluate a programme of IWB educator mentoring, the findings revealed that mentored educators were more experienced in using IWBs, and employed more student interaction with them in their teaching, than educators who had not had a chance to employ peer mentoring. This programme seems to have created autonomous teachers who were willing to use IWBs effectively, by offering common support for new users of IWBs. Therefore, peer mentoring could be crucial to encouraging educators in the best use of IWBs.

Professional development-based mentoring is an appropriate method for preparing teachers to overcome any problems related to the use of technology in teaching. Several studies have indicated that mentored educators are more likely to have abilities to incorporate technology into their teaching than educators who have not mentored (Swan and Dixon, 2006; Zhao and Bryant, 2006; Lowther *et al.*, 2008). For example, Lowther *et al.* (2008) carried out a large-scale study involving 26 schools and investigated educators' views and their use of technology. The findings revealed that teachers who had been mentored were more competent users of technology and more commonly encouraged student communication with IWBs than teachers who had not mentored. Similarly, Zhao and Bryant (2006) indicated that those participating educators who did not have consistent support after their training were less effective at employing student-centred instruction when using technology. Moreover, mentored educators had the ability to deal with technology problems effectively during their teaching even when they had not had supplementary support (Franklin *et al.*, 2001; Swan *et al.*, 2005; Boulay and

Fulford, 2009) because they had sufficient knowledge and constructive views about integrating technology into their instruction (Franklin *et al.*, 2001; Owston, 2006). Consequently, mentored teachers were seen to be using technology more often in their teaching than teachers who had not been mentored.

3.6.3. Models of Technology Professional Development Used in This Study

The current study mainly focused on IWB technology, and so the two relevant approaches employed are the Concerns-Based Adoption (CBAM) model and Technological, Pedagogical, and Content Knowledge (TPACK). These are models of professional development that include technology usage, and each framework is addressed in the following two sections.

3.6.3.1. The Technological, Pedagogical, and Content Knowledge (TPACK) Model

The TPACK model was developed by Mishra and Koehler (2006) (see Figure 3.2). It is widely used as a theoretical concept in research that on educational technology to help researchers and educators recognise the multifaceted relationship between three important factors: technology, pedagogy, and content knowledge achievement (Doering *et al.*, 2009). The idea of the TPACK framework was based on Shulman (1986) model of teachers' knowledge. Shulman was a pioneering researcher in the field of teacher knowledge, and he focused on the importance of combining both content knowledge and pedagogical approaches using the concept of pedagogical content knowledge (PCK).

Researchers in the field of digital technology added technology to Shulman's model to involve the three domains of technology, pedagogy, and content, thus creating a new theoretical model called Technological, Pedagogical, and Content Knowledge (TPCK) to concentrate on the effective integration of technologies in teachers' lessons (Mishra and Koehler, 2006). Thompson and Mishra (2008) changed the abbreviation TPCK to TPACK for ease of recall and to build a more united field of the three types of knowledge: technology, pedagogy, and content.

The TPACK framework represents the interactions between these three important areas (Mishra and Koehler, 2006). Niess (2012) states that the TPACK framework includes all three knowledge types so that it can be used for a particular context, subject, grade level, and set of student requirements. The combination of these kinds of knowledge in the TPACK framework is essential for the effective use of technology in classrooms (Koehler *et al.*, 2007). Therefore, the deeper consideration of the interrelationship of the TPACK framework by teachers can lead to the most efficient use of new technologies in classrooms (Koehler and Mishra, 2005; Mishra and Koehler, 2006).

Thus, TPACK is considered a different set of knowledge created from integrating educators' knowledge relating to technology, pedagogy, and content in their teaching (Angeli and Valanides, 2005). In order to understand technology knowledge, therefore, it should not to be investigated in isolation; alternatively, it has been argued that knowledge in all areas of technology, pedagogy, and content have to be explored in combination to recognise the process of acquiring knowledge for use (Blanchard *et al.*, 2010).

However, the mere availability of new technologies in classrooms does not ensure that teachers will use them effectively (Koehler and Mishra, 2005). Therefore, teachers' knowledge relating to educational technologies in classrooms should be improved (Harris *et al.*, 2009). Indeed, the employment of technology in the teaching process leads to the importance of training teachers in the effective use of technology as well as how to combine teaching methods and the understanding of classroom content. However, Koehler and Mishra (2009, p. 62) stated,

> Many approaches to teachers' professional development offer a one-size-fits-all approach to technology integration when, in fact, teachers operate in diverse contexts of teaching and learning.

Thus, training teachers should involve all the types of knowledge regarding technology, content, and pedagogy (Mishra and Koehler, 2006).

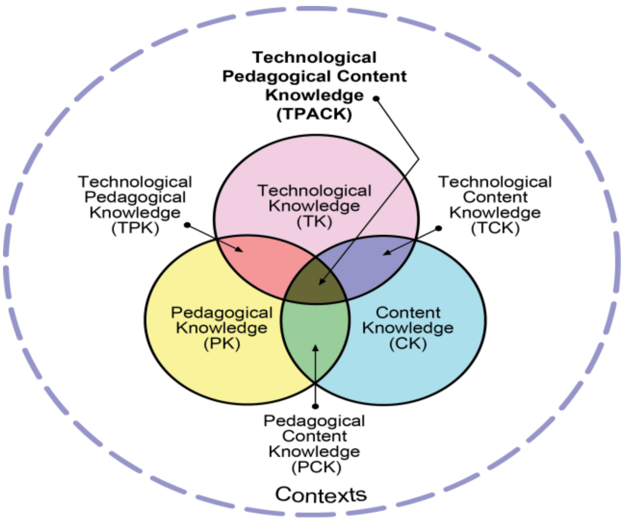

Figure 3.2: The TPACK model

Importantly, therefore, there are actually seven forms of knowledge proposed by Koehler and Mishra (2005) that are produced because of the interactions between the three-domain knowledge of pedagogy, content, and technology, which are as follows:

Content Knowledge (CK)

CK is defined as what a teacher may know about the subject s/he teaches in the classroom (Shulman, 1986). It concentrates on the main actualities, predominant philosophies, and comprehension of concepts that relate to the subject matter (Mishra and Koehler, 2006). Instructors apply their consideration of the subject matter to verbalise and link concepts, to give subject matter-based examples in their schools, and improve future knowledge attainment. The understanding of content knowledge seems to be essential because when educators do not have a suitable consideration of this kind of knowledge, the required information could be misrepresented and consequently, this may negatively affect the understanding of students in classrooms (Ball and McDiarmid, 1990).

Pedagogical Knowledge (PK)

PK can be defined as the knowledge used by instructors in their teaching space to simplify and augment the process of teaching and learning (Mishra and Koehler, 2006). PK consists of three main domains: how to manage classrooms, how to build learning theories, and how to gain an understanding of the teaching and learning environs (ibid.). Shulman (1986), however, gave the definition of PK as being to gain knowledge of four elements: teaching and learning approaches, students, the evaluation process, and classroom control. The above PK characterizations clarify that PK is a wide domain of knowledge because it not only focuses on classroom control but also concentrates on how learners build their own knowledge, as well as educational, societal and progressive philosophies. Indeed, educational ability enables instructors to find out what factors encourage their learners. PK supports the instructors with skills to improve attractive lesson preparation strategies and attain course objectives.

Pedagogical Content Knowledge (PCK)

PCK is defined by Shulman (1986) as knowledge about how educators teach students in a specific subject matter. This knowledge requires specific teaching methods suitable for presenting the content and at the same time knowing how to arrange the components of content to increase the quality of teaching (Mishra and Koehler, 2006). PCK concentrates on the clarification of concepts, pedagogical methods, and how to present concepts to students (ibid.).

Technology Knowledge (TK)

It is difficult to define the term technology because it changes regularly, and as a result our knowledge of technology is also rapidly changing over time (Mishra and Koehler, 2006). TK is the knowledge that educators refer to when they integrate instructional technologies into their lessons (ibid.). Although technology is a broad concept with different meanings, TK, according to Mishra and Koehler (2006), means knowledge of both traditional technologies such as books, black/whiteboards and advanced technologies such as computers, the internet, and interactive whiteboards. Indeed, teachers need little training to use traditional technologies, but require effective training and sufficient time to employ innovative technologies in classrooms. It is claimed that increasing teachers' confidence in TK is an essential step because it is the basis for confidence in the three kinds of knowledge that connect to this part (Graham *et al.*, 2009). When the educators' technical knowledge improves, they will be more comfortable permitting their students to use the board without fear of damaging it (Harris *et al.*, 2009). Thus, when teachers require more technical training, they appear to have a lack of a basic technology knowledge (Harris, 2008). Therefore, all educators firstly need effective training that represents basic knowledge of integrating innovative technologies in their lessons, before moving to advanced training.

Technological Pedagogical Knowledge (TPK)

This kind of knowledge is formed because of the connection between technological knowledge and pedagogical knowledge (Mishra and Koehler, 2006). TPK refers to knowledge of understanding the abilities of different technologies that may be used in classrooms, and considering how a specific technology can reform the teaching process (ibid.). Consequently, TPK increases educators' capacity to choose and use suitable technologies to deliver their lessons (Barbour *et al.*, 2009). Indeed, educators need to have a full understanding of the limitations and possibilities of these technologies before integrating them into their content teaching.

Technological Content Knowledge (TCK)

TCK is the knowledge produced from the relationship between technological knowledge and content knowledge (Mishra and Koehler, 2006). Additionally, Niess (2005) defined it as the ability to understand the effective use of instructional technologies in classrooms to reform the teaching process by providing new techniques to present content.

Technological Pedagogical Content Knowledge (TPACK)

When the interaction is between the knowledge of technology, content, and pedagogy, this represents Technological Pedagogical Content Knowledge (TPACK). It refers to the capacity to understand how such a combination of technology, content, and pedagogical techniques can improve student achievement (Angeli and Valanides, 2005; Mishra and Koehler, 2006).

Several studies have employed the TPACK model to measure the improvement of teachers' levels when using technology (Hewitt, 2008; Graham *et al.*, 2009; Schmidt *et al.*, 2009; Lee and Tsai, 2010). Hewitt (2008) states that the TPACK framework seems to be a productive model that provides educators with a new understanding in order to integrate technologies into their lessons. This framework has gained improved acceptance as a useful model for improving teachers' usage of technologies, and understanding how they combine their knowledge of both content and pedagogy and employ it to improve their technical knowledge. In other words, teachers focus on how to deliver the content to their students but also think about the adaption of their teaching methods with the use of technologies in classrooms. Mishra and Koehler (2006) claim that the importance of TPACK is a combination of the three domain knowledge content, pedagogy and technology, alongside the ability to produce transformative knowledge that combines these domains and reforms them to improve effective use of instructional technology in lessons. Therefore, it has been suggested that educators who have high levels of TPACK seem to be better at integrating innovations in their lessons (ibid.).

Moreover, TPACK differs from other training frameworks that focus on how to integrate technologies in the teaching process. TPACK mainly concentrates on improving content teaching using technology, under the assumption that educators will successfully integrate technology into their lessons when they have special training that emphasises two important factors, which are: students' learning needs and examples which relate and depend on content (Harris, 2008). Therefore, to improve TPACK knowledge, these two factors need to be considered in the teachers' teaching fields (Koehler *et al.,* 2004). Instructors may concentrate on improving their skills in a specific domain in which they have some limitations. Thus, teachers seem to have the responsibility for evaluating their needs and consequently determine the type of training required. However, choosing effective strategies and suitable technologies to apply TPACK seems to be a critical concern (Niess, 2012).

Therefore, designing teaching approaches is essential when employing the TPACK framework so that students can actively participate in lessons and educators can use suitable technologies to present their content, depending on their knowledge (ibid.). Educators should act as "*curriculum designers*" to produce educational activities using their knowledge regarding pedagogy, content, and technology (Koehler and Mishra, 2008, p. 21). According to Koehler and Mishra (2009, p. 62),

> There is no "one best way" to integrate technology into the curriculum. Rather, integration efforts should be creatively designed or structured for particular subject matter ideas in specific classroom contexts.

Therefore, these teachers were capable of designing activities regarding their content and had independent abilities to adapt their technological approaches (Mishra and Koehler, 2006).

To sum up, this theory identifies that to incorporate technology in classrooms effectively, teachers should recognise how the three fields of knowledge regarding technology, pedagogy, and content can be combined to introduce effective content-based teaching with technology (Shin *et al.*, 2009). Moreover, teachers have the capacity to learn and employ new technology into their pedagogical approaches and content demonstrations for teaching particular subjects aiming to improve student learning (Mishra and Koehler, 2006). Furthermore, teachers' TPACK can be improved through discussion and dynamic interaction (Koehler *et al.*, 2007). Thus, sharing ideas and collaboration between teachers should be considered when applying TPACK, and school administrators should provide support for teachers during their professional development programmes (Boling and Beatty, 2012).

3.6.3.2. Concerns-Based Adoption Model (CBAM)

The Concerns-Based Adoption Model (CBAM) is used to assess changes in a curriculum and concentrates on how individuals behave and respond to these reforms (Hall and Hord, 2006). In this model, teachers' interests, concerns, and needs are mainly linked to their professional development in using technology. This model, according to Anderson (1997), is regarded as one of the more theoretically and practically strong models to investigate change. It was devised firstly by Fuller (1969) then at the beginning of the 1980s it was further developed by investigators at Texas University at Austin. It consists of three dimensions that work as lenses through which to understand the process of a change as practised by both individuals and groups. These three dimensions are *Stages of Concerns (SoCs),* which focus on individuals' feelings, anxieties and views towards applying change in their context, *Levels of Use (LoU),* which measure the behavioural sides of change, and *Innovation Configurations (ICs),* which define the different methods and approaches that teachers apply when using innovations.

The CBAM model considers that the change is not framed as a sudden event but usually occurs as a process through which individuals move. This process consists of *stages of concerns* as well as various *levels of use* (Hall and Hord, 2006). Although the CBAM model involves seven stages of concerns, teachers move through these stages in different ways and speeds (ibid.). However, the change may be affected negatively, for example, if teachers do not have enough time in the *personal* stage or they skip this crucial phase (Khoboli and O'toole, 2012). Similarly, individuals move through the CBAM *levels of use* at different rates and methods (Hall and Hord, 2006).

There are seven Stages of Concerns (SoCs) in the CBAM model which determine teachers' progress, before technologies can be successfully integrated into their lessons. These stages are *awareness*, *informational*, *personal*, *management*, *consequence*, *collaboration*, and *refocusing* (Hall and Hord, 2006). In the *unconcerned* stage, teachers may be conscious of new technologies and have a little information on how to use them. Therefore, they do not respond or take action at this stage, which is recognised as *unrelated-concerns* (George *et al.*, 2006). In the *informational* stage, teachers show an interest in learning how to use new technologies by asking other teachers or searching websites. After this, teachers move toward looking for the effects of technologies on themselves in the *personal* stage, and decide if these technologies will be helpful in teaching their lessons. The *informational* and *personal* stages were categorised, according to George *et al.* (2006), as *personal or self-concerns.* When teachers find these innovations are valuable, they enter the fourth period of change called the *management* stage. In this stage, teachers learn how to use and employ technologies in their lessons and how to solve difficulties they encounter when using innovations. The *management* stage is known as *task-concerns* (ibid.).

When teachers succeed in the management of the innovation, their focus may move to the *consequence* stage, in which teachers reflect on their methods of using new technology and evaluate its effects on their teaching and their students. When the impacts of technology on the delivery of content are valuable, teachers keep using the technology and may move on to the sixth stage called the *collaborative* stage. Educators in this stage are distinguished by high enthusiasm for employing innovations in their lessons. They tend to be supporters of the technology and communicate with their colleagues about what they are doing. Finally, in the *refocusing* stage in the CBAM model, educators are looking for new and effective ways of using technologies in their teaching. By doing this, they seem to achieve high levels of technology usage. The *consequence, collaborative, and* *refocusing* stages are called *impact-concerns* (ibid.). As seen above, four, comprehensive stages of concerns were identified by George *et al.* (2006). These are *unrelated*, *self*, *task*, and *impact* concerns.

Considering the CBAM *Levels of Use* (LoU), these concentrate on the general behaviour of teachers when implementing innovations in classrooms. This is in contrast to the Stages of Concerns (SoCs), which focus on the attitudes of the educator toward a change. Eight levels define the LoU framework: *non-user*, *orientation*, *preparation*, *mechanical*, *routine*, *refinement*, *integration*, and *renewal* (Loucks *et al.*, 1975). Progress in this framework is determined by teachers' decisions and conforming behaviours in applying innovations in classrooms (Anderson, 1997).

At the *non-user* level, teachers have little information about innovation and no plans to implement it (Anderson, 1997). Teachers move to *orientation* level when they decide to search for information about the innovation, but have still not made a decision to apply it (ibid.). Teachers enter the *preparation* level when they are aggressively arranging to use the innovation, but have also not yet actually started to apply it (ibid.). According to Loucks *et al.* (1975), the previous three levels (*non-user, orientation, and preparation*) were categorised as *non-users*, whereas teachers at the *mechanical* level start using innovation in classrooms. At this level, teachers need to acquire new teaching skills besides learning technical skills (Anderson, 1997). Indeed, teachers may find difficulties at this level because they work hard to make the innovation more adaptable and easy to use. Therefore, being teacher-centred seems to be more apparent at this level (ibid.). When teachers have regular use of innovations in their lessons with no consideration to change the innovation, they will progress to the *routine* level, where most teachers remain (ibid.).

However, some teachers may have a more active contribution to evaluating the effects of using the innovation on their students, and they make changes relating to the innovation or their approach. In doing this, their level will develop to *refinement* level, where a more student-centred approach is apparent about the changes in using innovations (ibid.). Teachers who collaborate with their colleagues are at the *integration* level, as they seek to improve their use of innovations to achieve student success (ibid.). Indeed, teachers at this level tend to reach a more expansive stage in which they think about how to improve the learning process. Finally, some teachers move to the *renewal* level, when they find the necessity of significant improvements in the use of innovation or discover other performs (ibid.). The last three levels (*refinement, integration, and renewal)* were grouped as *users* (Loucks *et al.*, 1975).

While the third dimension of the CBAM model (*innovation configurations*) (ICs) describes differences in employment for different instructors when implementing a new technology, because they will usually have various methods of practice (Anderson, 1997). According to Hall and Hord (2006), there is a relationship between the CBAM *LoU and SoCs.* Individuals in the (*non-user)* level seem to have more powerful *self-concerns,* and this will lead to these individuals in the higher *levels of use* being more likely to have *impact concerns*. Nevertheless, this association has not been supported by research (ibid.), and educators' concerns (e.g. their feelings, views, and attitudes toward the technology) appear to be essential for designing training programmes. This can enable the successful adoption of technologies and decrease teachers' frustration and conflicts (Surry and Land, 2000; Hall and Hord, 2006). Indeed, teachers have different concerns, as framed by Hall and Hord (2006), about using advanced technologies, and it is normal for people to have various concerns whether positive or negative when dealing with innovation (Holloway, 2003). Therefore, educators are considered the main element in determining the successful implementation of technology in classrooms, in addition to the effective integration of technology in the syllabus (Gatlin, 2004). Thus, if educators are not satisfied with their training programme, they are unlikely to be able to integrate the new skills in their teaching methods effectively.

The CBAM model has been described as a well-known tool for allowing participants to recognise reforms in educational situations, and therefore it has widespread approval in the field of educational research because it concentrates on the concerns of individuals toward using innovations (Newhouse, 2001; Adams, 2002). In other words, according to Hall and Hord (2006), the fundamental assumption of this model is that an essential aspect of any revolution procedure is the individual involved because institutions cannot make any improvements before the individuals involved improve. The CBAM model enables the investigation of the different levels of individuals' concerns and their use in the process of the adoption of advanced technologies, through investigating what is defined by SOCs and LoU (Hall and Hord, 2006).

Studies have found that the characteristics of individuals, such as gender, age, amount of training, teaching subject, and availability of support, may affect their level of concern. Additionally, these studies have reported useful information for improving and supporting the institutions and individuals when adopting new technologies (Adams, 2002; Rakes and Casey, 2002). Consequently, the individuals' concerns will have different levels of power based on these characteristics. For instance, the individuals' contribution to professional development programmes that relate to advanced innovations is one of these factors that determine the individuals' levels of concern (Adams, 2002; Crawford, 2003; Hall and Hord, 2006). When people become more trained in using advanced technologies, their concerns will significantly change (Hall and Hord, 2006). Thus, the CBAM model seems to be useful in understanding the process of change in using technologies, and in designing effective strategies for change, such as workshops or action research programmes (Khoboli and O'toole, 2012). Moreover, it affords valid and reliable methods of evaluating the effect of change relating to the use of innovations (Hall and Hord, 2006).

3.6.4. The CBAM Levels of Use and Beauchamp (2004) Model

Comparing these two models (see Figure 3.3) indicates that the *black/whiteboard substitute* level in Beauchamp (2004) model could be linked to the *mechanical* LoU, where teachers start using IWBs in classrooms as a presentation tool. In contrast, *apprentice and initiate users* of Beauchamp (2004) model appear to fit better with the *Refinement* LoU, where a more student-centred approach appears and teachers focus on both the technical and pedagogical skills of using IWBs. However, both *advanced* and *synergistic users* of Beauchamp (2004) model seem more likely to be consistent with the *renewal* level, which is the highest LoU, in which teachers tend to discover new methods to improve their use of IWBs.

It can be seen that Beauchamp (2004) model, which consists of five stages, classifies both teachers and students based on their level of using IWB features and activities in classrooms from the simple use to the advanced. However, the LoU only focus on teachers and measures the change in their behaviour when implementing innovations in classrooms from *non-users* to *users,* through eight levels. Moreover, Beauchamp (2004) model did not explicitly consider the frequency of using IWBs. In contrast, teachers' regular use of IWBs is considered in the *routine* level, which is one LoU. Although there are some indications of improving teachers skills in using IWBs through collaborations with colleagues in Beauchamp (2004) study. However, this model did not clearly involve teachers' collaboration as a categorical level, even though this is found in the CBAM *levels of use* (the *integration* level).

Indeed, Beauchamp's framework seems to be an effective tool which allows teachers to map their use of IWBs in five phases across four domains. This model assumes that teachers have IWBs and progress differently through five stages towards the highest level (*synergistic user*). Moreover, in Beauchamp's study (2004), teachers had been trained for two years to use IWBs and then they practised using these technologies for one year. Therefore, this model could be more appropriate for evaluating teachers' use of IWBs in advanced countries which heavily use IWBs in their classrooms. Since the CBAM model contains three levels (*non-user, orientation*, and *preparation),* which teachers go through before using IWBs, the CBAM model may be more effective for evaluating teachers' levels of use in developing countries which have recently started to use IWB technology in their classrooms. As a result, the eight levels of the CBAM LoU model were found more appropriate and fitted with the design of the current study, which mainly focused on teachers' use of IWBs in *Tatweer* schools. Therefore, for the reasons addressed above, the researcher decided to employ the CBAM model to classify Saudi teachers' levels when using IWBs. Hence, for this study, the TPACK and the CBAM LoU models were used as conceptual lenses and not as practical methodologies, to understand the research findings from logical justifications and enhance the internal validity of this research when comparing the research results with challenging models (Yin, 2003).

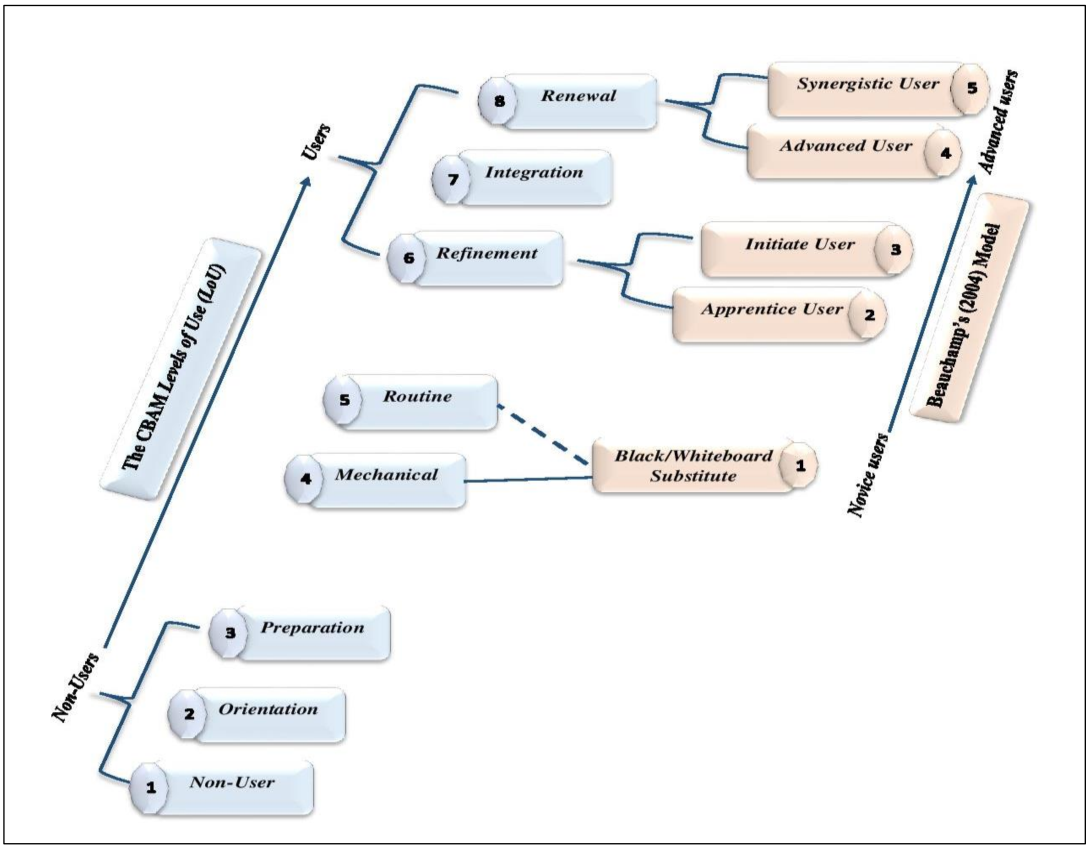

Figure 3.3: The CBAM Levels of Use and Beauchamp's (2004) Model

3.7. TECHNOLOGY AND GENDER DIFFERENCES

Gender difference is a fascinating issue that may affect the attitude to and use of technologies, and as such it has been considered in several educational studies. A case study conducted by Yusuf and Balogun (2011) examined gender influence on student teachers' skills and their attitude toward information and communication technology (ICT) in teacher education programmes in a Nigerian university. There were 382 participating student teachers, including 181 males and 201 females. A questionnaire was the only research method used to collect data in this study. The outcomes indicated that most participants had positive attitudes towards using ICT, and this could be the first step in incorporating ICT in the syllabus effectively. Moreover, the majority were capable of using technology but with core competencies. Importantly, no significant differences were found regarding attitudes and competencies between male and female teachers. However, the low skills presented by student teachers in this study raised a great concern about the need to develop the quality of teacher education programmes in Nigerian universities.

It has been argued that female use of and interest in computers is lower than in men (Schaumburg, 2001; Tsai *et al.*, 2001). Similarly, Sefyrin (2005) indicated that males are more concerned about using ICT than females. Bebetsos and Antoniou (2008) stated that females had negative views about using a computer, and therefore they frequently had low computer knowledge compared with males (Schaumburg, 2001). Consequently, their use of computers differs from men (Jackson *et al.*, 2001). However, Kirpatrick and Cuban (1998) argued that male and female students achieve similar results and have comparable views towards computers if they obtain similar computer experiences.

A study was conducted by Alharbi (2014) to investigate the use of ICTs in the classrooms in secondary schools in Kuwait, from the view of students, educators and administrators. A mixed-methods approach was employed in this study to collect data. Questionnaires were completed by both teachers and students, and semi-structured interviews with teachers and administrators were conducted. The findings of this study show the infrequent use of ICTs in Kuwaiti secondary schools, but that educators and students had the ability to use ICTs effectively, especially on a basic or technical level. Moreover, regarding educators' gender, there was a significant difference in perception of confidence and the impact of ICT use in the classroom, in favour of male teachers. However, there were no significant differences between male and female teachers regarding their use of ICTs, and there was no difference between male and female students regarding their use of technologies in either school or the home. Similarly, there was no difference relating to any effect on their learning. However, female students showed more self-confidence than males. This study concluded that both the government and the teaching profession had failed to implement ICTs successfully in Kuwaiti secondary schools.

With regards to the use of IWBs, several studies have investigated student gender differences regarding their scoring, attitudes to using IWBs, and behaviour (Higgins *et al.*, 2005; Hwang *et al.*, 2006; Martin, 2007; Morgan, 2008; Campbell, 2010; Aytaç, 2013; Kyriakou, 2016). For example, students' gender difference was investigated in a large-scale study conducted by Higgins *et al.* (2005) in primary schools in six educational districts in England, aiming to investigate the achievement of students, observe the structure of classroom lessons, record teachers' use of IWBs, and identify the views of both educators and students about using IWBs. The majority of teachers in this study indicated that there were no significant differences between boys and girls regarding IWB use, although 40% of teachers stated that there were differences in motivation, interest, attention, and involvement in favour boys.

Moreover, students' gender difference was also examined in a study carried out by Morgan (2008) in northeast Florida to investigate the effect of using IWBs on high school student engagement and behaviour. In this study, 226 students were observed at two secondary schools, and they also completed a survey to examine their attitudes towards using IWBs. The findings indicated that there were significant differences regarding students' engagement and performance between instruction with and without IWBs in classrooms. No major associations were presented relating to students' gender and ethnicity.

Furthermore, Aytaç (2013) carried out a study aimed at investigating the views of students towards using IWBs in classrooms, as well as identifying the difficulties they face when using these technologies. The sample consisted of 202 students from one primary school (98 pupils) and one secondary school (104 students) in Ankara, Turkey. These two schools were chosen for the primary pilot employment of the *FATIH* project. These schools were equipped with the Internet, IWBs, and tablet computers for all educators and students in grades 5-12. This massive project was launched by the Ministry of Education in Turkey to change all traditional classrooms in public primary, intermediate, and secondary schools to be smart and modern classrooms. Moreover, it aimed to improve teachers' professional development programmes. Data were gathered using a questionnaire with 19 Likert-scale statements, and student interviews were also conducted. The outcomes of this study showed that there were no significant differences relating to gender, and students had positive views towards the use of IWBs in classrooms.

However, female students showed a more positive attitude towards using these technologies than males. Moreover, there was a significant difference regarding the views of primary and secondary school students on the use of IWBs, in favour of students at the primary level. Furthermore, a significant difference was found between the attitudes of students and the duration of using IWBs in classrooms. Students' views were improved when the length of using IWBs was increased. Students in this study stated that they had certain problems while using IWBs in classrooms, such as the ineffectiveness of the teacher in using IWBs, a deficiency of e-resources, technical difficulties, and concerns about eye health and emissions.

Muhanna and Nejem (2013) conducted a study to examine the attitudes of mathematics teachers toward the use of IWBs in teaching mathematics. It aimed to evaluate the impact on their views of the teachers' gender, experience, and qualifications. 74 teachers (39 females and 35 males) participated in this study from private schools in the city of Amman, in Jordan. A tailored questionnaire was the only instrument for collecting data in this study, and it consisted of 25 statements to address attitudes towards using IWBs. The outcomes of this study showed that the mathematics teachers had positive views toward using IWBs in teaching mathematics over a traditional board. Additionally, there was no statistically significant difference between males and females regarding their attitudes towards using IWBs. However, there were statistically significant differences relating to teachers' experience and qualifications. Teachers with fewer than five years' experience had a higher mean score (M=4.28, SD=0.65) than teachers with more than five years (M=3.54, SD=0.91). Moreover, master's degree teachers had a higher mean score (M=4.38, SD=0.79) than bachelor degree teachers (M=3.75, SD=0.83). Furthermore, the teachers in this study faced many challenges when using IWBs in the classroom because of the lack of IWB training programmes.

Similarly, Oguz Akcay *et al.* (2015) conducted a study to investigate the attitudes of teachers in secondary schools in Turkey towards using IWBs in their lessons. 260 secondary teachers (189 males and 71 females) participated in this study, and all of them had an IWB in their classroom. These schools were involved in the *FATIH* project (as mentioned previously). Data were collected by an online survey that consisted of 20 Likert-type questions and four demographic questions relating to teachers' age, gender, teaching subject, and teaching experience. The findings of this study indicated that there were significant differences between male and female teachers in their view of using IWBs in their lessons. Male teachers presented more positive attitudes toward employing these technologies in their classrooms than females. Moreover, significant differences were shown in teachers' opinions toward using IWBs relating to the teaching subject, in favour of information technology teachers. However, there was no significant difference regarding educators' age and teaching experience. Furthermore, teachers in this study stated that IWB training programmes were unsatisfactory, and they needed training to use this technology more efficiently. Indeed, providing schools with new equipment and technologies is not enough for best use of technology, and so the integration of technology in classrooms should be combined with training. Therefore, teachers should have effective IWB training based on their needs.

As seen above, several educational studies relating to IWB technology have investigated student gender differences regarding technology. Other studies (Jang and Tsai, 2012; Muhanna and Nejem, 2013; Oguz Akcay *et al.*, 2015) examined teacher gender differences with respect to their attitudes towards using IWBs. However, so far, no studies have investigated teacher gender differences relating to the use of IWBs (the frequency, the length of using IWBs, teachers' approaches, and their competences). Moreover, no studies have examined teacher gender differences on training (the number of IWB training courses received, the need for further training, the types of the training needs, or the training method preferences). Particularly, the current study was conducted in Saudi Arabia, where the educational system is single-sex and separate training courses are provided for male and female teachers. Thus, this study contributes to filling a gap in Saudi literature specifically and in the international literature more broadly. The current study also aimed to compare male and female Saudi teachers regarding their attitude towards using IWBs, their use of IWBs, and their IWB training.

3.8. CONCLUSION OF THE CHAPTER

This chapter reviewed the literature regarding the use of IWBs including benefits, attitudes, teachers' use, restrictions, the professional development of teachers, and gender differences. Overall, although there are several limitations for using IWBs in classrooms, research has shown that IWBs have the ability to improve both the teaching and learning processes. However, these technologies should be used effectively, and this relies on teachers' abilities to choose the most suitable pedagogical methods and plan effective lessons aimed at improving student learning. Given this, it is important to provide educators with continual, cooperative training, more time for practice, and technical support, so that they more fluently and confidently embrace the full potential of IWBs. However, the most robust evidence regarding using IWBs in classrooms is from the UK and USA, and there is a lack of evidence in the Middle East context. Direct evidence from Saudi Arabia is also limited and tends to be very small scale, employ just one or two methods of data collection, and have single gender participants, as indicated in the previous chapter. Therefore, this calls for a large-scale study with better design and more concentration to include a gender comparison that builds on what is already known about the use of this technology in Saudi Arabia. The next chapter includes the details of the research methodology used in this study.

4. THE RESEARCH METHODOLOGY

4.1. INTRODUCTION

This chapter aims to clearly present and critically discuss the methodological framework used to investigate the use of IWBs and the training needs of primary teachers in *Tatweer* schools in the city of Jeddah in Saudi Arabia.

Research methodology was defined by Hennink *et al.* (2011, p. 274) as “what was actually done, how it was done and why it was done in this way.” Research methods are “specific research techniques” (Silverman, 2005, p. 98), categorised into three forms: quantitative, qualitative, and mixed methods (Cohen *et al.*, 2007; Bryman, 2008; Berg, 2009; Creswell, 2012). Selecting a particular style of research approach mainly depends on the type of the study, the research objectives and assumptions, the research questions, and the population (ibid.). The methodology and research techniques used in the current study have been selected to: gain more comprehensive information and develop a greater understanding of how teachers, in *Tatweer* primary schools in the city of Jeddah, actually use IWBs; investigate their attitudes towards using this technology; identify the problems they encounter; and, recognise their IWB training needs. Therefore, these teachers were chosen to assist in answering the following central questions: *How do in-service primary teachers in Tatweer schools use IWBs? What are their training needs?*

Five sub-questions were selected to answer the primary question, as follows:

1) *What are the views of teachers towards introducing IWBs in Tatweer primary schools?*
2) *How do teachers in Tatweer primary schools currently use IWBs?*
3) *What are the difficulties and challenges facing Tatweer primary school teachers in using IWBs?*
4) *How were teachers in Tatweer primary schools trained to use IWBs, and what were their training needs?*
5) *Are there differences between male and female teachers in Tatweer primary schools regarding their attitude, use of IWBs, training, types of training need, and preferred training methods?*

The research methods and techniques utilized in the current study “should follow from questions” (Punch, 2014, p. 7). As seen from the research questions above, the central research question could be considered as more quantitative than qualitative, while the sub-questions are a combination of quantitative and qualitative. Thus, a *mixed methods approach* was chosen in this study to answer these questions.

In this chapter, the methodological approach is first presented, and then the research design is discussed. The research sample is indicated, followed by a pilot study. Data collection methods are also demonstrated in detail including both quantitative and qualitative instruments in the two stages. The triangulation of the research methods is illustrated. After that, the data analysis is presented before dealing with the research reliability and validity. Finally, ethical considerations, issues of access, and the positionality of the researcher are also discussed.

4.2. METHODOLOGICAL APPROACH

Several types of epistemological paradigm are acknowledged in the literature for conducting research (Creswell *et al*., 2003), and can generally be classified as positivist, interpretive, transformative, and pragmatic (Johnson and Duberley, 2000). Positivism assumes the existence of a single objective reality that can be explored and examined without bias using consistent quantitative methods (Creswell *et al*., 2003) such as structured surveys, questionnaires, and experiments. Therefore, this paradigm is objectivist in nature, and the researcher seeks a natural position (Robson, 2011). This scientific paradigm uses quantitative methods to increase the objectivity, generalizability and reliability of results by using quantitative data which can be statistically analysed. This allows inferences from the findings to be generalised to the target populations (Harwell, 2011). According to Creswell (2009), positivists assume that different investigators will gain similar results when investigating the same realistic problem; however, this requires using accurate statistical tests as well as conducting a similar research procedure by examining a large sample in which variability is understood. In contrast, interpretivism posits that there are multiple subjective realities (Lincoln and Denzin, 2003). In this paradigm, aspects of the social world is more complicated and can only be understood through exploring the context and views of participants (Creswell, 2009). Therefore, this paradigm tends to be more subjective because it depends on investigators' interpretations and individuals' views (ibid.). Thus, qualitative methods tend to be more favoured in this perspective (Eriksson and Kovalainen, 2008).

Therefore, in this study, the epistemological assumptions followed the perspectives of positivism in the first stage, including developing the questionnaire, measuring variables, and conducting numerical findings. In the second phase, an interpretive approach was used to gain more detail through conducting observations and interviews. Accordingly, because of using a mixed methods approach, the philosophical assumptions of both positivism and interpretivism were combined and synthesised (Creswell and Plano Clark, 2011). As a result a pragmatic philosophy was found more appropriate to be adopted for this study. Indeed, pragmatism tends to avoids the argumentative concerns of truth and reality (Feilzer, 2010). It mainly concentrates on research questions of interest to the inquirer and consequently, applying the most appropriate research methods for obtaining valuable answers (Johnson and Onwuegbuzie, 2004), whilst accepting the limitations of this positioning.

Thus, as a pragmatic researcher, I do not have an overarching philosophical or epistemological position about truth and the nature of knowledge (Savin-Baden and Howell Major, 2013). I prefer to concentrate more on solving problems using practical solutions (ibid.). Therefore, my primary emphasis was on how to best answer the research questions with the most appropriate methods (Johnson and Onwuegbuzie, 2004) as well as how to have a balance between objectivity throughout collecting and analysing data and subjectivity when presenting my own reflections and interpretations (Feilzer, 2010; Shannon-Baker, 2016). Consequently, pragmatism shapes the design of this research leading to the adoption mixed methods approach (see the research design in the next section 4.3).

4.3. THE RESEARCH DESIGN

Research design is defined by Bryman (2008) as a structured plan for gathering data and analysing them. Educational research includes different designs, whose selection is based on factors such as the kind of data collection instrument (Creswell, 2008). In the current study, *a mixed methods approach* was used to achieve triangulation, which is considered necessary for any research to decrease possible bias when using a single research method, and improve the validity and reliability of the research (Bryman, 2008; Jang *et al.*, 2008). Creswell (2008, p. 62) defined mixed methods approaches as "*procedures for collecting, analysing, and mixing both quantitative and qualitative data in a single study*." Moreover, the term *multi-strategy research*, created by Layder (1993), also refers to the incorporation of both quantitative and qualitative approaches in one study (Bryman, 2004). However, the terminology *mixed methods approach* was used in this study.

Several researchers have acknowledged the value of using a mixed methods approach. For instance, Jang *et al.* (2008) recommended using this kind of data collection method because it can be an aid to clarify and confirm the research validity. In the same vein, Bryman (2008) indicated that using mixed methods approaches to collect data is a flexible method that helps researchers understand the issue in a more appropriate way. Similarly, Denscombe (2010) indicates that using both qualitative and quantitative methods in the research provides greater depth and vision of the research problem, and increases the researcher's confidence in analysing the data in different ways. This can strengthen the research results. Moreover, Johnson and Christensen (2016) clarified some of the advantages of using this type of research approach as: combining the numeric data with the written data strengthens the research findings; better possibilities for answering various research questions; collecting data in the first stage aids in the process of gathering data in the second phase; and, overcoming the restrictions of the ability to generalize the outcomes and increasing the level of reliability.

Nevertheless, mixed methods research also has some weaknesses. For instance, it may require teamwork to employ different research techniques effectively (Johnson and Christensen, 2016). Moreover, researchers need the necessary skills and a high level of knowledge about using multiple approaches (Bryman, 2012; Johnson and Christensen, 2016). Indeed, conducting this type of method is often considered more time-consuming and more costly than when using only one technique (ibid.), and there is the difficulty of analysing and merging data (Bryman, 2007).

Therefore, this type of data collection is not suitable for studies with different assumptions (Bryman, 2008), and a researcher has to identify convincing reasons for the use of a mixed methods approach. Three possible justifications for the use of mixed methods research have been suggested by Hammersley (1996):

1) *Triangulation* refers to the utilization of both quantitative and qualitative research to achieve mutual reinforcement of the research outcomes
2) *Facilitation* means employing one research strategy to facilitate and assist the other research method
3) *Complementarity* refers to applying the two research methods to merge all various aspects of any study.

In the study under consideration, the questionnaire as a quantitative technique was used in the first phase to gather numerical data from a large sample, as well as to determine the volunteer teachers who wish to participate in the second stage. Then, the qualitative methods (classroom observations and interviews) were employed in the second phase to create a clear picture and obtain more detail, as well as increase the research validity and reliability. Therefore, this is consistent with all Hammersley (1996) terminologies (*Triangulation, Facilitation,* and *Complementarity*).

Importantly, according to Bryman (2007) and O'Cathain *et al.* (2007), a mixed methods approach should not be considered as just the addition of its quantitative and qualitative methods, but rather the two collections of findings should be linked and integrated to maximise the strength of the research results. “Integration might be in the form of comparing, contrasting, building on, or embedding one type of conclusion with the other” (Creswell and Tashakkori, 2007, p. 108). Bryman (2008) recommended that the research outcomes of mixed methods studies should be thematically presented based on fundamental issues rather than the different techniques used for these studies. It has been suggested that a large amount of data can be collected by starting with a questionnaire and then applying a number of qualitative research methods, such as observations and interviews, to gain a more comprehensive clarification (Gay and Airasian, 2003; Gass and Mackey, 2007). As a result, the questionnaire is a helpful tool when the targeted sample is large, while observation and interview approaches could be better employed with limited numbers of participants.

Consequently, in the case of the current study, to collect appropriate data to answer the research questions in realistic settings, and to achieve *triangulation*, it is valuable to use a mixed methods approach (Bryman, 2008). There are six types of mixed methods design, according to Creswell (2012, p. 540):

- *the convergent parallel design*
- *the explanatory sequential design*
- *the exploratory sequential design*
- *the embedded design*
- *the transformative design*
- *the multiphase design.*

The researcher applied certain criteria to determine the type of mixed methods study by answering four questions indicated by Creswell (2012, pp. 539-540):

1) *What priority or weight does the researcher give to the quantitative and qualitative data collection?*
2) *What is the sequence of collecting the quantitative and qualitative data?*
3) *How does the researcher actually analyse the data?*
4) *Where in the study does the researcher “mix” the data?*

Thus, an *explanatory sequential mixed methods design* was applied in this thesis (see Figure 4.1), in which quantitative data were collected and analysed, followed by the collection and analysis of qualitative data (Creswell, 2012, p. 542). Priority was given to the quantitative methods while the qualitative methods were used secondly to explain sincerely the primary results, and then the data produced by these two methods were mixed while discussing the findings. This approach was chosen in order to gain a broad understanding of teachers' use of IWBs and their training needs by collecting the quantitative data and then using qualitative methods to improve and explain the numerical results by discovering the views of participants, as recommended by Creswell *et al.* (2003). Therefore, in this study, all five sub-questions were answered quantitatively in the first stage, and then also examined qualitatively in the second phase for more detail.

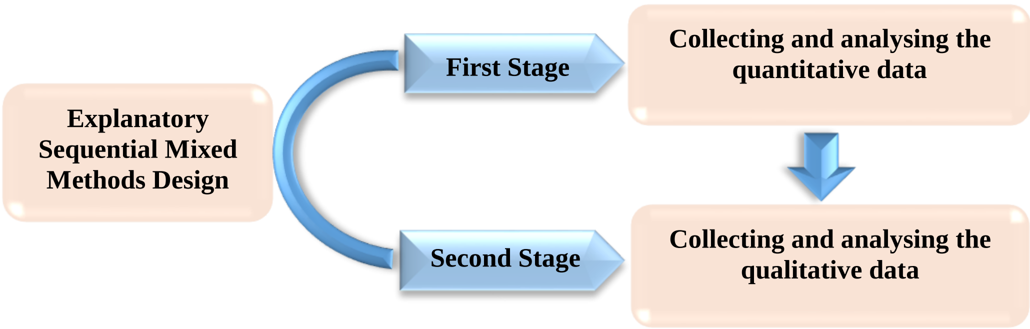

Figure 4.1: The research design of this study

In the current study, based on the recommendation of Gass and Mackey (2007) and Gay and Airasian (2003), a questionnaire was used in the first stage as an essential tool for gathering data from the targeted sample (teachers in primary schools participating in a *Tatweer* project in the city of Jeddah). This was then followed by observing and interviewing a sub-sample of applicants (twenty volunteer teachers) in the second stage. This process in gathering data seemed very helpful for collecting the majority of the research data and then clarifying issues, as well as developing more in-depth explanations. Additionally, according to Bryman (2004, p. 457), starting with "*quantitative research can prepare the ground for qualitative research*", and this was useful in terms of gathering more data from a large sample and choosing the volunteer teachers in the second stage of this study. Moreover, the combination of quantitative and qualitative methods can enhance the researcher's understanding of a phenomenon more than using a single method (Bryman, 2004; Johnson *et al.*, 2007). Indeed, using this approach can increase confidence in the findings and ensure validity and reliability (Jang *et al.*, 2008; Denscombe, 2010; Johnson and Christensen, 2016). Therefore, a quantitative-dominant mixed methods design, mainly an *explanatory sequential strategy*, was used in the present study to collect both quantitative and qualitative data and achieve the research aims.

4.4. THE SAMPLE

The sample is defined according to Bryman (2008, p. 168) as "the segment of the population that is selected for investigation." Similarly, Field (2013) describes sampling as a small sample of components that is employed to represent a larger group aiming to explore facts and details about that group. A population is defined by Creswell (2012, p. 142) as "a group of individuals who have the same characteristics."

Six sampling approaches are recorded by Passmore and Baker (2009), which are *random*, *purposive*, *convenience*, *stratified*, *cluster*, and *complete censuses*. According to Neuman (2007, p. 142), "*Purposive sampling* is used in situations in which an expert uses judgment in selecting cases with a specific purpose in mind." Therefore, in the research under consideration, *purposive sampling* was the chosen strategy in the first stage of data collection due to the targeted sample being teachers from primary schools participating in the *Tatweer* project, in which schools are equipped with IWBs. In the second stage of this study, a sub-sample of participants was created from those who volunteered to be involved in classroom observations and interviews.

Concerning sample size, an appropriate sample size is not clearly identified in the literature (Field, 2013). However, Bryman (2008, p. 180) states that, "The bigger the sample, the more representative it is likely to be." Therefore, it is important for researchers to collect enough data to increase the reliability of the research findings. The sample size could be related to the research type and its goals, the kind of data collection instruments, and the number of the targeted population (Gay and Airasian, 2003; Cohen *et al.*, 2007).

The aims of the current study are to evaluate teachers' approaches to using IWBs in *Tatweer* primary schools; investigate their attitudes towards using this technology; identify the problems they encounter; and, recognise their IWB training needs. Consequently, data were collected using the *representative sample* model, which is one form of sampling category, because of the large target population used in the current study (Perry, 2005). A *representative sample* according to Bryman (2008, p. 168) is "a sample that reflects the population accurately so that it is a microcosm of the population." Moreover, when researchers employ a representative sample in their research to collect data, they will become more capable of generalising their research results (Gay *et al.*, 2009).

In this study, teachers in *Tatweer* primary schools in the city of Jeddah (728 teachers) were selected as the target population of this study. Therefore, the representative sample of these teachers was 587 Saudi teachers (301 female and 286 male) working in *Tatweer* primary schools in Jeddah. These 587 teachers completed the questionnaire in the first stage of this study. Moreover, a sub-sample of these teachers (20 male and female teachers) volunteered in the second stage (see Figure 4.2).

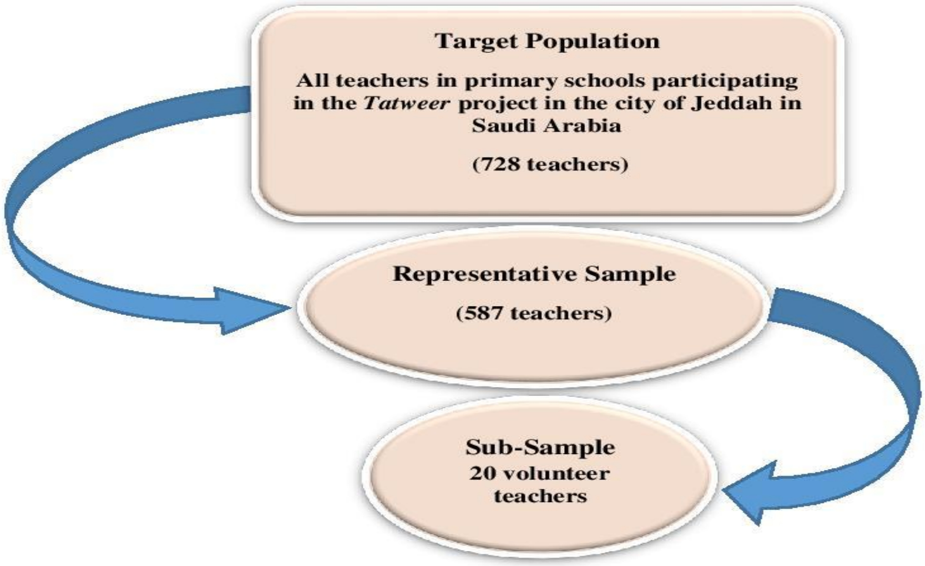

Figure 4.2: The research sample

The city of Jeddah was chosen for a number of reasons. It is considered the second biggest city in the Kingdom of Saudi Arabia, which has a high number of teachers. According to recent statistics from the General Secretariat of the Department of Education (2016), the number of teachers in Saudi Arabia is estimated as 516,052 teachers (both male and female). The highest number of teachers was in the capital city of Riyadh (87,136). Followed by the city of Jeddah, with 48,310. The number of teachers who only work in primary schools in Jeddah is 21,239 teachers (9,826 males and 11,413 females). Moreover, the city of Jeddah had 60 schools (primary, intermediate, and secondary) participating in the *Tatweer* project for boys and girls in the academic year 2015/2016. In aligning with the research purpose, specifically, there were 20 primary *Tatweer* schools in the city of Jeddah distributed in eight educational supervision centres (see Table 4.1); it is also the city where the researcher's family live.

Table 4.1: The location of Tatweer primary schools in the city of Jeddah

<table>
<tr><th rowspan="2">Educational supervision centres</th><th colspan="2">Number of Tatweer primary schools</th><th colspan="2">Number of teachers in Tatweer primary schools</th><th rowspan="2">Percentage</th></tr>
<tr><th>Boys</th><th>Girls</th><th>Male</th><th>Female</th></tr>
<tr><td>Northern Centre</td><td>2</td><td>2</td><td>65</td><td>72</td><td>19%</td></tr>
<tr><td>Southern Centre</td><td>1</td><td>-</td><td>35</td><td>-</td><td>5%</td></tr>
<tr><td>Eastern Centre</td><td>1</td><td>-</td><td>25</td><td>-</td><td>3%</td></tr>
<tr><td>Southern East Centre</td><td>-</td><td>2</td><td>-</td><td>78</td><td>11%</td></tr>
<tr><td>Southern West Centre</td><td>-</td><td>2</td><td>-</td><td>73</td><td>10%</td></tr>
<tr><td>Middle Centre</td><td>3</td><td>4</td><td>100</td><td>175</td><td>38%</td></tr>
<tr><td>Alsafa Centre</td><td>2</td><td>-</td><td>65</td><td>-</td><td>9%</td></tr>
<tr><td>Alnaseem Centre</td><td>1</td><td>-</td><td>40</td><td>-</td><td>5%</td></tr>
<tr><td rowspan="2">Total</td><td>10</td><td>10</td><td>330</td><td>398</td><td rowspan="2">100%</td></tr>
<tr><td colspan="2">20</td><td colspan="2">728</td></tr>
</table>

As indicated in Table 4.1, there were 20 primary schools participating in the *Tatweer* project, distributed equally between boys and girls in the city of Jeddah, with 728 male and female teachers. As mentioned previously in Section 2.6 in Chapter Two, *Tatweer* schools, as planned, are equipped with new technologies and many facilities. Consequently, teachers' use of IWBs and their training needs in the sample would probably be representative of other teachers in *Tatweer* primary schools in the city of Jeddah in Saudi Arabia. Thus, the outcomes of this study may be generalised to include all such teachers. In the current study, 587 teachers (301 female and 286 male), from *Tatweer* primary schools in Jeddah in Saudi Arabia, completed the questionnaire (both web and paper-based). These teachers taught different subjects and had diverse teaching experiences and different workloads (more details about the participants are indicated in Chapter Five, Section 5.2). The twenty teachers who were interviewed, including the seven observed female teachers, were volunteer teachers who agreed to participate in the second phase of this study (more details about these teachers are presented in Chapter Six, Section 6.2).

4.5. PILOT STUDY

A pilot study is defined by McBurney (2001) as a minimal study used to examine and amend the design and methods of any research project. Gorard (2003) differentiates between a pilot study and the main study in that the former needs a smaller sample than the sample used in the latter. Moreover, the researchers can ask more questions about the planning of the research and its methods and instruments. The aim of carrying out a pilot study of any research is to test the research instruments in order to explore any limitations that could affect the *validity* and *quality* of the research outcomes (Blessing and Chakrabarti, 2009). Consequently, a pilot study is important for researchers to test the accuracy and clarity of the research methodology and data collecting instruments before starting the main study. Moreover, it aids in discovering any ambiguity and problems related to the research instruments such as unclear questions, suitable length, and the possibility of using certain types of data collecting tools.

Researchers can apply a pilot study of their research with any instruments they intend to use including a survey, observation, interviews, and experiments (Gorard, 2003). Several studies have recommended piloting a quantitative questionnaire before sending it officially in order to ensure its validity and reliability (Gay and Airasian, 2003; Wilkinson and Birmingham, 2003; Cohen *et al.*, 2007; Bryman, 2008). However, others believe that conducting a pilot study in qualitative research is not crucial (Holloway, 1997). Gillham (2000, p. 9) stated that "*piloting the interview"* could be difficult to conduct. Nevertheless, Wilkinson and Birmingham (2003) reported that testing the interview questions is critical because it aids in reducing vague questions and creates valuable feedback on the structure, clarity, and flow of the interview questions.

In this study, the researcher considered two important factors before piloting the research instruments: Annual Progress Review Outcomes, which showed approval to proceed on the proposed research, and approval from the School of Education Ethics Committee of Durham University; the latter has also been received. Thus, the research methods of the current study were piloted as follows: ten Saudi colleagues studying for Ph.D. degrees in the UK participated in piloting the questionnaire. These students have experience with educational technologies. Moreover, five teachers currently studying and living in the UK, with experience of using IWBs in their classrooms in Saudi Arabia, completed the questionnaire. Although testing the questionnaire with colleagues was criticised by Aldridge and Levine (2001)) because colleagues do not represent the targeted sample, Cohen *et al.* (2007) recommend using experts when piloting questionnaires. Indeed, this encourages the researcher to pilot the questionnaire with colleagues who have experience in using Educational Technology. Therefore, this was the process that the researcher applied.

The questionnaire was not only reviewed by the participants in the pilot study but was also completed to assess its validity as recommended by Gay and Airasian (2003) and

Wilkinson and Birmingham (2003). For this study, *face validity* and *content validity* were both applied to validate the questionnaire. *Face validity* directly refers to the accuracy of the questions in determining the construct (McLeod, 2013). According to Nevo (1985), tests with high *face validity* are those with a clear purpose for all participants including naïve applicants, whereas tests with low *face validity* are those with an unclear aim. *Face validity* was ensured by asking the participants in the pilot study about the suitability of the questionnaire. *Content validity* refers to the investigation of the appropriateness of the questionnaire to cover all the main aspects of the construct. According to McLeod (2013), *content validity* will be more suitable when conducting the process of questionnaire assessment by proficient participants. Therefore, *content validity* was also evaluated here as the participants in the pilot study are Ph.D. students with the experience of educational technologies.

Additionally, to examine the questionnaire's *internal consistency* and *reliability*, the responses from the pilot study (n=15) were statistically tested using Cronbach's Alpha coefficients. An acceptable level of reliability was indicated (0.77) for all the Likert scale questions (7-24, 26, 35, 36, and 37) because of using this test. Importantly, the received feedback was valuable regarding the clarity, length, and design of the questionnaire, and suggestions were made to improve the questionnaire, as proposed by Bell (2005). Therefore, piloting the questionnaire resulted in changing the order of some questions, such as Q1 on the availability of IWBs in school. This question was the fourth question in the first version of the questionnaire. When piloting the questionnaire, one of the participants suggested starting with this question. The researcher found this suggestion useful to ask about the existence of IWBs before asking general information about the teachers. Therefore, the decision was made to start with this question.

Moreover, some questions were reformulated in the Arabic version of the questionnaire to be clearer for the target population. For example, Q15 "*using IWB helps me to design content-based activities in classrooms*" in the first Arabic version of the questionnaire, which was done by the researcher, was unclear to some colleagues in the pilot. Therefore, an expert in translation was contacted to create a second Arabic version of the questionnaire, in particular for some unclear questions. The two Arabic versions of the questionnaire were compared, and then the clearest translation was chosen based on opinions of the participants in the pilot study. Furthermore, Q5 (*teachers' workload*) was added. The rest of the comments acknowledged the suitability of the questionnaire regarding its design, length, and clarity. Regarding the qualitative data methods, the observation checklist and interview questions were tested by the same ten Saudi Ph.D. students and the same five teachers who participated in piloting the questionnaire. The feedback received indicated the suitability of the qualitative data collection for achieving the aims of the current study. Therefore, no changes were made regarding these two instruments.

As seen above, the pilot study was conducted on a different sample to the target sample (Saudi teachers in primary schools participating in the *Tatweer* project). This is consistent with Bryman (2008) who criticises piloting the study with a group considered part of the targeted population of the research, because this may disturb upcoming demonstrations. Overall, although conducting the pilot study was time-consuming and sometimes frustrating, the researcher learned important issues through the process of testing the study and during conversations with the participants. For instance, testing the suitability of the research instruments before doing the main study, thinking about the process of conducting these methods, and considering difficulties and critical issues. Therefore, necessary changes were made, especially in terms of the questionnaire. Additionally, the researcher learned about test validity and reliability of the questionnaire using SPSS software, and how to enter multiple responses when analysing data. Consequently, conducting a pilot study is considered a vital step that should be applied before starting the main study to ensure the suitability of the research and resolve any difficulties that may negatively affect its employment.

4.6. DATA COLLECTION AND TRIANGULATION

A mixed method approach was employed in the current study. Consequently, the research design of this study shaped the technique used of data collection. Three instruments distributed in two stages were used to gather data: a questionnaire, which informed the design of the qualitative method, classroom observations, and semi-structured interviews. These tools are discussed in detail below.

4.6.1. First Stage Data Collection –Questionnaire

The questionnaire is a widespread instrument in the field of social science research for collecting data, either as the only method of data collection or in combination with other methods (Bryman, 2008). The questionnaire is defined as a self-report data technique that is completed by each research participant (Johnson and Christensen, 2016). Bull and McKenna (2004) state that using a questionnaire to collect data in an educational situation is worth considering to obtain participants' replies about digital programmes. It offers an unbiased way of gathering data that relates to participants' knowledge, views, beliefs and performance (Cohen *et al.*, 2007; Bryman, 2008). There are three types of questionnaire: s*tructured, semi-structured,* and *unstructured* questionnaires, which rely principally on the size of the sample (Cohen *et al.,* 2007). In other words, the questionnaire tends to be more structured the larger the sample size. This shows a positive correlation between the size of the sample and the extent of the construction of the questionnaire.

The questionnaire method was chosen for this study to collect quantitative data from a large sample from a population (teachers in *Tatweer* primary schools in Jeddah) (Gay and Airasian, 2003; Gass and Mackey, 2007). Indeed, according to Bryman (2008), several characteristics are encouraged when using a questionnaire as a quantitative data collection method. For instance, the questionnaire can offer privacy, which encourages participants to complete it and provide truthful answers. Additionally, it may be more popular with researchers because of the possibility of saving time and money, and it is considered cheaper than other research instruments (ibid.). In today's world, using free web-based questionnaires is an easier way to collect data because they help the researchers distribute and collect their questionnaires quickly using different kinds of social media (Wright, 2005).

On the other hand, using questionnaires may have some limitations, such as the probability of non-response to some essential questions, the potential for a lack of truthfulness in some answers, and the length of time it takes to analyse the data; there is also the requirement for a high level of validity and reliability when designing the questionnaire (Cohen *et al.*, 2007; Johnson and Christensen, 2016). However, it has been indicated that the findings achieved from using questionnaires may be generalised, and so questionnaires have a high validity (ibid.). Moreover, questionnaires have the capacity of evaluating attitudes and providing useful knowledge about participants' perceptions and their thoughts (ibid.). Indeed, the questionnaire can deepen data by presenting a larger vision besides the view of the researcher. Furthermore, by using a structured questionnaire, the researchers can obtain the particular information that they require, and this facilitates the process of data analysis (Cohen *et al.*, 2007). Moreover, as indicated in the fifth research sub-question in this study, the aim was to investigate the existence of significant differences relating to gender among Saudi teachers, in terms of their attitude, use of IWBs, and training needs. Indeed, using the questionnaire and interviews to answer this question was appropriate because of the regulations of Saudi culture. Furthermore, using the questionnaire as a quantitative tool for collecting data statistically enabled the examination of the associations between different research variables, such as teachers' experience of IWBs and their use of these technologies, or their training needs.

4.6.1.1. The Design of the Questionnaire

The design of the questionnaire is a critical task to certify a high degree of validity and reliability. The questionnaire was specifically designed for this study and was prepared based on the previous literature in the field of IWBs. It was designed based on the research sub-questions as recommended by Bryman (2008), and consisted of closed- and open-ended questions (Wilkinson and Birmingham, 2003; Cohen *et al.*, 2007; Bryman, 2008). The researcher first reviewed the specific IWB literature which mainly focused on the four relevant dimensions: teachers' attitudes to the use of IWBs in the teaching and learning processes; teachers' use of IWBs; difficulties and challenges in using IWBs; and teachers' training in using IWBs (see Table 4.2). Then, the questionnaire was created to emphasise these four dimensions. After that, it was translated into the Arabic language, as the official language of the research sample, and appropriate statements were chosen to avoid any complication and vagueness. Then, it was piloted and feedback obtained before distributing it.

It is involved 40 closed- and open-ended questions, which were distributed into six parts, including the four main domains. The first part contains general background about participants such as gender, experience, field of teaching, teachers' workload, and the availability and location of IWBs. The second part consists of 18 statements in the form of a five-point Likert ranking scale from strongly agree to strongly disagree. These investigated teachers' attitudes towards the use of IWBs in both the teaching (11 statements) and learning processes (seven statements). The third part involves six multiple-choice questions evaluating teachers' use of IWBs. Different kinds of difficulties and challenges in using IWBs (nine types of problems) are introduced in the fourth part. The fifth section of the questionnaire was designed to address teachers' IWB training with eight multiple-choice items. The last part is an open-ended question that asks teachers for more suggestions to improve their IWB use and training. Finally, at the end of the questionnaire, there was a request for volunteer female teachers to participate in the second stage of the study (see Appendix 2). Questions 24, 25, 29, 31, and 37 were adapted from a study conducted by Turel and Johnson (2012). The idea for questions 32 and 33 was adapted from a Ph.D. study conducted by Alsharari (2010). The remaining questions were designed by the researcher based on the literature in the field. The web-based questionnaire was also created by the researcher and used in addition to a paper-based questionnaire to cover all aspects of the sample at different levels. Some teachers prefer to use an online survey, and they find it easier to complete, but others may not have a device or internet access or may dislike using them, so they prefer a paper-based questionnaire. Indeed, the use of both kinds of the questionnaire should be advisable in research to decrease the researcher's bias.

Table 4.2: The reviewed studies emphasising the significance of the main dimensions

The Main Dimensions of the Questionnaire	The Reviewed Studies Emphasising the Significance of the Main Dimensions
Teachers' attitudes towards the use of IWBs in teaching and learning processes	Mumtaz (2000); Glover and Miller (2001); Edwards *et al.* (2002); Carson (2003); Kennewell and Morgan (2003); Beauchamp (2004); Gatlin (2004); Hughes and Ooms (2004); Gray *et al.* (2005); Glover *et al.* (2007); Moss *et al.* (2007); Glazer and Hannafin (2008); Hammond *et al.* (2009); Mathews-Aydinli and Elaziz (2010); Saltan *et al.* (2010); Winzenried *et al.* (2010); Yusuf and Balogun (2011); Bakadam *et al.* (2012); Isman *et al.* (2012); Jang and Tsai (2012); Turel and Johnson (2012); Alghamdi (2013); Muhanna and Nejem (2013); Gashan and Alshumaimeri (2015); OguzAkcay *et al.* (2015).
Teachers' use of the IWB	Glover and Miller (2001); Cogill (2002); Beauchamp (2004); Armstrong *et al.* (2005); Beauchamp and Parkinson (2005); Glover *et al.* (2005); Higgins *et al.* (2005); Smith *et al.* (2005); Schmid (2006); Glover *et al.* (2007); Kennewell and Beauchamp (2007); Kennewell and Higgins (2007); Higgins *et al.* (2007); Hodge and Anderson (2007); Shenton and Pagett (2007); Zevenbergen and Lerman (2007); Reedy (2008); Schmid (2008); Tozcu (2008); Wood and Ashfield (2008); Karasavvidis (2009); Somyurek *et al.* (2009); Way *et al.* (2009); DiGregorio and Sobel-Lojeski (2010); Sweeney (2010); Turel and Demirli (2010); Manny-Ikan *et al.* (2011); Al-wazzan (2012); Turel and Johnson (2012); Alghamdi (2013); Jwaifell and Gasaymeh (2013); Hakami (2013); De Vita *et al.* (2014); Kneen (2014); Koenraad *et al.* (2015); Aktas and Aydin (2016); Kyriakou (2016); Kyriakou and Higgins (2016); Šumak *et al.* (2016).
Difficulties and challenges in using IWBs	Miller and Glover (2002); Levy (2002); Loveless (2003); Beauchamp (2004); Higgins *et al.* (2005); Slay *et al.* (2005); Higgins *et al.* (2007); Schmid (2008); Slay *et al.* (2008); Tozcu (2008); Hammond *et al.* (2009); Karasavvidis (2009); Somyurek *et al.* (2009); Gursul and Tozmaz (2010); Al-Qirim (2011); Manny-Ikan *et al.* (2011); Serow and Callingham (2011); Khan *et al.* (2012); Turel and Johnson (2012); Alghamdi (2013); Al Mulhim (2013); Al-Faki and Khamis (2014); Gashan and Alshumaimeri (2015); Koenraad *et al.* (2015); Šumak *et al.* (2016).
Teachers' training in using IWBs	Mumtaz (2000); Becker and Ravitz (2001); Glover and Miller (2001); Burden (2002); Beauchamp (2004); Adams (2005); Armstrong *et al.* (2005); Higgins *et al.* (2005); Feiman-Nemser (2006); Miller and Glover (2007); Shenton and Pagett (2007); Elaziz (2008); Holmes (2009); Lewin *et al.* (2009); Somyurek *et al.* (2009); Cogill (2010); Jones and Vincent (2010); Lai (2010); Torff and Tirotta (2010); Turel and Demirli (2010); Winzenried *et al.* (2010); Blau (2011); Manny-Ikan *et al.* (2011); Turel and Johnson (2012); Alghamdi (2013); Šumak *et al.* (2016).

4.6.1.2. Translation of the Questionnaire

English is not the official language in Saudi Arabia despite its widespread use all over the world. Therefore, the questionnaire was translated into Arabic before being distributed (see Appendix 3). The method used in translating the questionnaire was a *back-translation* technique to ensure the correctness of translation (Gamborino, 2007; Chen and Boore, 2009). Hence, the English version of the questionnaire was translated into Arabic by the researcher, and then another interpreter (a Ph.D. student in TESOL and Applied Linguistics) translated the Arabic version of the questionnaire back into English. Both English versions of the questionnaire were compared to evaluate the correctness of the translation. Moreover, for further confirmation, the Arabic version was sent to an expert in Arabic currently studying for a PhD in the UK to check the accuracy of sentences and their suitability for all participants. Following this, some changes were made to the first Arabic version of the questionnaire after piloting the study, leading to a second Arabic version (as previously explained in the Pilot Study Section 4.5).

4.6.1.3. Distribution of the Questionnaire

On 6 January 2015, a letter was sent by the manager of the Educational Department in Jeddah, based on an official letter from the Saudi Arabian Cultural Bureau (see Appendices 11 and 12), explaining the aims of the current research, and including the paper-based questionnaire and online survey. Then both types of questionnaire were officially distributed to the whole targeted sample of the study: all the male and female teachers in primary schools participating in the *Tatweer* project in Jeddah. This ensured a large number of participants was obtained, as recommended by Cohen *et al.* (2007). There are three requirements for improving the frequency of replies and consequently successful statistical analysis of the questionnaire (ibid.): the questionnaire needs to be more structured when a large number of participants is involved; it should be in the form of numerical and closed-ended questions (ibid.); and, it is important to choose the most appropriate time for distributing and answering the questionnaire (ibid.).

Therefore, after obtaining the formal permissions from the Educational Department in Jeddah to allow distribution of the questionnaire, both web-based and paper-based questionnaires were delivered to head teachers (both males and females). Indeed, the researcher was not able to meet male teachers face-to-face because of Saudi culture. Additionally, the researcher could not meet all female teachers due to the rules of the Ministry of Education in Saudi Arabia on avoiding wasting teachers' time. Especially, the period at the beginning of January in which the researcher visited the schools to distribute the questionnaire is a time of examinations. Therefore, the aims of the research and some issues were explained in detail to female head teachers who, in turn, distributed the questionnaires to their teachers. Male head teachers and some male teachers in *Tatweer* schools in Jeddah had been contacted with the help of a personal contact currently working as a teacher in one of these *Tatweer* schools.

4.6.2. Second Stage Data Collection

4.6.2.1. Classroom Observation

Observation is a qualitative research method that can be used efficiently in social science research to detect and define issues (Bryman, 2008; Jonson, 2008; Lasagabaster and Sierra, 2011; Ho and Kane, 2013). It has several advantages that encourage investigators to apply it. For instance, Lasagabaster and Sierra (2011, p. 461) state that:

> Classroom observation can be a valuable tool in giving us a more comprehensive picture of what actually happens in class, and helps attain a higher standard of teaching and more effective teaching methods.

Using the observation method is considered a successful technique to triangulate and complement other methods and accordingly improve the quality of research findings (Bryman, 2004; Ho and Kane, 2013). Additionally, the data resulting from this method is dependent on the behaviour of the participants rather than reporting what they say via using questionnaires (Bryman, 2004). Moreover, the context of the study can be clearly described and investigated using the observation method (ibid.), and consequently, this may build a wide understanding of the issue under consideration. For instance, individuals sometimes try to present information about themselves to show their effectiveness and their skills with IWBs. Hence, observation can uncover and investigate the practical skills of the participants, and so it is one of the most efficient ways to support improvement in the professional development of teachers (Montgomery, 2002; Jonson, 2008).

However, this type of data collection may be not suitable for investigating motivation, attitude, reasoning and psychological factors relating to the participants (Flick, 2009), and it is not favoured by many teachers (Aubusson *et al.*, 2007; Borich and Martin, 2008; Li, 2009). Moreover, the individuals may alter their normal performance during the period of observation because of the presence of the investigator (Flick, 2009). Furthermore, using observation to collect data has a higher cost than a funded research project and takes longer in terms of the procedures and analysis of the collected data than most other research techniques (Bryman, 2004; Ho and Kane, 2013). A further potential disadvantage of using an observation method is that observer bias (ibid.) may negatively affect the reliability and validity of the collected data. Observer bias can occur when investigators record events compatible with their inclinations and expectations, rather than report what happened. Indeed, according to Hennink *et al.* (2011, p. 170), observation consists of many complex tasks, by “systematically watching, listening, questioning and recording people’s behaviours, expressions and interactions as well as noting the social setting, location or context in which the people are situated. ”

Therefore, observation is not often applied in studies despite its scientific usefulness, possibly because of the difficulty of preparation, costs, and time (Bryman, 2004; Ho and Kane, 2013) as well as teachers' reluctance to be observed (Aubusson *et al.*, 2007; Borich and Martin, 2008; Li, 2009). Hence, before conducting formal observation, it has been acknowledged that the researcher should create a comfortable and friendly relationship with the participants (Aubusson *et al.*, 2007). They should be convinced of the importance of their participation, and that it is only for research purposes, and will not be used to evaluate their teaching performance or even discussed with school administrators. Indeed, this is the procedure that was followed by the researcher in the present study.

Observations can be conducted in various forms in social research. For instance, it can be used as a form of *unstructured observation* when the investigator has no plan or preformed idea for conducting the observation, which is based on the nature of the observed classroom (Bryman, 2008). Moreover, it can also be undertaken in the form of *structured observation*, sometimes called *systematic observation* (Croll, 2004), which is defined according to Bryman (2008, p. 254), as "a method for systematically observing the behaviour of individuals in terms of a schedule of categories". In other words, for this type of observation, the researcher has made a decision and designed rules about the nature of the observation relating to the *purpose*, *time*, *place*, a *method of recording*, and the *process of analysis*. These rules are combined and called an *observation schedule* (ibid.).

Classroom observation method has been widely used in several studies (Cogill, 2002; Glover and Miller, 2002; Beauchamp, 2004; Higgins *et al.*, 2005; Jewitt *et al.*, 2007; Moss *et al.*, 2007; Somekh *et al.*, 2007; Zevenbergen and Lerman, 2007; Wood and Ashfield, 2008; Sweeney, 2010; Essig, 2011; Manny-Ikan *et al.*, 2011; Serow and Callingham, 2011; Kneen, 2014) to obtain information about the actual use of IWBs in classrooms.

Specifically, *structured observations* were used in some of these studies (Cogill, 2002; Beauchamp, 2004; Higgins *et al.*, 2005; Moss *et al.*, 2007; Sweeney, 2010; Manny-Ikan *et al.*, 2011) as discussed previously in Section 3.4. For example, in a study conducted by Beauchamp (2004), classroom observations were undertaken over two days across the various curricula in the first stage of data collection. Seven teachers were observed in this study during a series of lessons. Notes and unstructured interviews were undertaken after each lesson. These observations concentrated on how teachers use ICTs in their lessons and their main concerns in terms of ICT skills and teaching practice. Teachers in these schools were trained for two years to use IWBs and then practised for over a year before conducting the second stage of observations. The focus of this second series of observations was on linking teachers' ICT skills with the developmental model for schools with IWBs. Therefore, teachers were classified into five levels from novice to *synergistic* users. Moreover, a series of *structured* observations were undertaken in a study carried out by Higgins *et al.* (2005) in 2003 and 2004. 184 lessons were observed in this study with and without using IWBs for literacy and mathematics in more than 80 primary schools in six educational districts in England, as indicated previously (in Section 3.4.1). This study concentrated on differences between these lessons and identifying variations in classroom interaction. The sample size was large enough to achieve this aim. In 2003, 30 teachers from both genders (18 female and 12 male) participated in this study. Therefore, 114 lessons were observed with and without using IWBs, whereas 70 lessons were observed in 2004. 15 teachers were observed again when using IWBs in literacy and numeracy. A *structured coding schedule* was used during observations using *'The Observer'* software (Higgins *et al.*, 2005, p. 17). For literacy and mathematics lessons, teachers were observed four times in 2003 with and without using IWBs, and then in 2004 teachers were observed twice when using IWBs.

Furthermore, *structured observations* were conducted by Moss *et al.* (2007), who focused on observing the core subject's lessons. Through these observations, the authors mainly concentrated on three essential areas: the lesson's physical environment, the topic used, and information relating to student achievement, gender, and social relations. These structured observations took two weeks for core subjects and two days for other subject areas. *Systematic observation* was also used in a study conducted by Kneen (2014) where seven experienced teachers were observed during their lessons. The author of this study designed an observation sheet based on the research questions and the previous literature, structured around eight variables and different sets of answers for each variable. This sheet was a tight time-schedule where the time of each classroom observation was measured for every minute. The researcher was the only observer in this study to consider the analysis of the content of the interactive whiteboards during lessons.

In the present study, the *structured observation* was chosen because it is easier in terms of analysing the research findings, and it is more reliable than using an *unstructured observation* technique (Burns and Dobson, 2012; Suen and Ary, 2014). The use of *structured observation* to report on the behaviour of participants is considered more precise than asking via questionnaires (Bryman, 2008). By using this method, the researcher can distinguish between how the participants reflect on their behaviours through questionnaires and their actual performances in real situations (ibid.).

Importantly, Spradley (1980, p. 78) reported nine essential factors that could help the investigator when conducting the observation. These nine factors are *space*, *actor*, *activity*, *object*, *act*, *event*, *time*, *goal*, and *feeling*. In this study, therefore, an *observation schedule* was designed to consider these factors and to observe how the participants use IWBs in their lessons (a copy of the *observation schedule* is presented in Appendices 4 and 5). This schedule was used to ensure the validity of the results obtained from answering the questionnaire, as well as to gather more detail about the observed lessons and using the IWB features. Indeed, the *observation schedule* was designed by the researcher mainly focusing on the third and the fourth sections of the questionnaire (*teachers' use of IWBs and the actual difficulties observed during lessons*) to answer the second and third research questions. The *observation schedule* has more detail about the observed teacher, the physical location of IWBs in the observed classrooms, the users of IWBs, the audiences, the frequencies of interactive IWB features, the difficulties teachers faced when using IWBs, and finally details about the observed lesson, such as the content and activities. Table 4.3 indicates the main studies that were used to design the *observation schedule* in this study in relation to the different sections.

Table 4.3: The main studies that led to design the observation schedule

The Main Dimensions of the Observation Schedule	The Reviewed Studies Used to Design the Observation Schedule
The physical environment	Moss *et al*. (2007).
The audiences	Higgins *et al*. (2005); Zevenbergen and Lerman (2007); Blau (2011); Turel and Johnson (2012); Kneen (2014).
The users of the IWB	Beauchamp (2004); Higgins *et al*. (2005); Schmid (2006); Zevenbergen and Lerman (2007); Blau (2011); Kneen (2014).
The interactive features	Glover and Miller (2002); Beauchamp (2004); Miller *et al*. (2005); Glover *et al*. (2007); Kennewell and Beauchamp (2007).
Difficulties	Miller and Glover (2002); Levy (2002); Loveless (2003); Beauchamp (2004); Higgins *et al*. (2005); Slay *et al*. (2005); Higgins *et al*. (2007); Schmid (2008); Slay *et al*. (2008); Tozcu (2008); Hammond *et al*. (2009); Karasavvidis (2009); Somyurek *et al*. (2009); Gursul and Tozmaz (2010); Al-Qirim (2011); Manny-Ikan *et al*. (2011); Serow and Callingham (2011); Khan *et al*. (2012); Turel and Johnson (2012); Alghamdi (2013); Al Mulhim (2013); Al-Faki and Khamis (2014); Gashan and Alshumaimeri (2015); Koenraad *et al*. (2015); Šumak *et al*. (2016).
Stage of lessons	Kennewell and Beauchamp (2007).

The procedure

In this study, the researcher contacted the director of female *Tatweer* schools in Jeddah to obtain official agreement to visit these schools and observe these seven female teachers. All the information needed relating to the location of *Tatweer* schools was obtained. Moreover, some statistics regarding teachers in these schools were also gathered, such as the number of teachers and students in each school. The researcher visited all seven female teachers individually in their schools several times before observing them formally. This procedure helped them become familiar with the investigator, break down barriers, and ask questions about the study. Nine female teachers from *Tatweer* schools in Jeddah agreed to participate voluntarily in classroom observations. However, only seven female teachers working in five *Tatweer* primary schools were observed, because the IWB installed in the classroom of the other two teachers had broken down during the period of field study (from October to January) during the school year 2015/2016 (*For more detail about the seven teachers, see Chapter Six, Section 6.2*).

The aim was to observe each teacher twice to overcome the restrictions of the observation method and decrease the chance of the teacher having designed a lesson for this study. However, only two teachers (F3 and F5) were observed twice in their classrooms because of the time limitation and teachers' circumstances. Thus, nine classroom observations were conducted with seven female teachers during the period of conducting the field study. However, the second lesson of these two teachers was only observed for twenty minutes because of the occurrence of school events. Therefore, only seven complete lessons were selected and reported for this study.

The findings of a study conducted by Ho and Kane (2013) to assess the reliability of classroom observations indicated that several factors should be undertaken when using this type of investigation. These factors are: avoiding *surprise observations* to decrease teachers' anxiety, using *multiple observers* to increase the reliability of observations and treat all teachers fairly, and observing all teachers equally. Moreover, observers should choose a suitable place in the classroom to limit their interaction with the students (Ing, 2010). Therefore, in this study, all the observations were arranged with teachers in schedules that fit their circumstances, timetables, and school occasions. Indeed, arranging these observations was not easy because teachers in *Tatweer* schools frequently have weekly internal meetings or occasionally external training programmes. Moreover, some teachers changed the arranged observation day because of particular circumstances, such as illness.

The duration of all seven lessons was forty-five minutes, and involved students from years 2-6. In these lessons, the researcher only concentrated on teachers' use of IWBs and their pedagogical skills by using the observation checklist in combination with descriptive and reflective field notes. However, using *multiple observers* was not applied here. At the end of each lesson, the teacher and students were thanked for facilitating the process of observation. The data gathered from the seven selected lessons were qualitatively and quantitatively analysed. All seven observed female teachers completed the questionnaire during the first stage so they had enough information about this study and its aims. Moreover, all of them signed a consent form which contained information about their contribution to the study and how this information would be saved. It is unacceptable to use tape and video recordings inside female classrooms because of Saudi cultural restrictions (*ethical considerations and permissions are discussed later in more depth in Section 4.9)*. Therefore, all the observations were recorded only by completing the observation checklist and taking notes. Indeed, the designed observation checklist was effective and sufficient for recording teachers' lessons. No real names were used to define the participating female teachers; alternatively, symbols were used (F1 to F7 were used). After each lesson, the seven female teachers were interviewed (*more details about the interview are discussed in Section 4.6.2.2*).

The conclusion to be drawn is that classroom observations are considered the most useful method to evaluate aspects of teachers' performance and give comments on their practice to develop their teaching effectiveness, and accordingly their learner achievement (Ho and Kane, 2013). Therefore, this method was used in this study to genuinely investigate the use of IWBs in *Tatweer* primary schools, to introduce a clear picture of the context and the nature of these schools in terms of using these technologies.

4.6.2.2. Semi-Structured Interview

Using interviews as a data collection instrument is a widespread method to collect data by social science researchers (Packer, 2011). The interview technique was employed in this study to collect data to increase the research validity by triangulating methods (Bryman, 2008), provide detailed information that could not be gathered when using questionnaires and observations (Blaxter *et al.*, 2006), and investigate people's attitudes and feelings (teachers in this study) (Bryman, 2008; Packer, 2011), which are vital for achieving the present research aims.

However, using an interview instrument as data collection can have some weaknesses, such as high cost, being time-consuming, and the possible existence of investigator preference (Bryman, 2008; Irvine *et al.*, 2013). Nevertheless, in this study, this technique was triangulated with other data collection methods (questionnaire and classroom observations), which help to keep the benefits and "*eliminat[e] weaknesses in any one method*" (Jack and Raturi, 2006, p. 345). Similarly, teachers' interviews have been widely applied in several IWB studies in combination with other research methods (Jones and Tanner, 2002; Beauchamp, 2004; Higgins *et al.*, 2005; Glover *et al.*, 2007; Somekh *et al.*, 2007; Zevenbergen and Lerman, 2007; Wood and Ashfield, 2008; Torff and Tirotta, 2010; Essig, 2011; Kneen, 2014).

The interviews can be conducted individually or in small groups in the form of face-to-face meetings, by telephone (Bryman, 2008) or online chatting (Roulston, 2010). Additionally, the interview method consists of different types that can be used to gather data in social research. These types are *structured*, *semi-structured*, and *unstructured interviews* (Fielding and Thomas, 2008). The use of these types of meetings depends on the chosen theme as well as the necessities of the methods and theories employed in any study (King and Horrocks, 2010). *Semi-structured* interviews were mainly employed in several IWB studies (Cogill, 2002; Beauchamp, 2004; Higgins *et al.*, 2005; Schmid, 2006; Shenton and Pagett, 2007; Jwaifell and Gasaymeh, 2013; Kneen, 2014). For instance, a consistent interview schedule was applied to a study conducted by Higgins *et al.* (2005). It consists of closed and open-ended questions. All sixty-eight interviews in this study were conducted by telephone because the targeted sample was broadly spread in six areas in the north and south of England. Moreover, each interview was short nearly 20 minutes and limited to only central questions hence the authors prefer to use telephone when interviewing teachers rather than a-face-to face interview.

In a study conducted by Jwaifell and Gasaymeh (2013), a semi-structured interview was the main data collection instrument designed by the investigators besides observations and document analyses. This study aimed to explore the use of four female English teachers of IWBs in modern schools in Jordan and their views of using these technologies in their teaching. The semi-structured interview questions focused on the benefits and drawbacks of using IWBs, the challenges when using IWBs in teaching, the current skills of teachers, and teachers' views of the instructional use of IWBs and online resources.

Similarly, a *semi-structured* interview was used in the study by Kneen (2014). This study applied a case study approach, in which seven experienced English teachers in secondary classrooms were observed during their lessons, as indicated previously in Section 3.4. The interview was employed to collect data in combination with systematic observation and content analysis of teachers' lessons. The interview questions were designed based on research questions focusing on three key areas: the experience of teachers, the teachers' chosen IWB features and patterns, and teachers' decisions and reasons for the selected resources and procedures in their lessons. These interviews were short, about twenty minutes for each meeting. All the interviews followed a designed schedule and were recorded. The interviews were carried on approximately one week after observing each lesson. Key screen printouts of IWB lessons were used during interviews, which is considered a helpful step to enhance teachers' discussion and remind them of the content of their teachings.

In this study, a *semi-structured* interview was employed because of its capacity to ask the participants unprepared supplementary questions (Howitt, 2013), as well as its capability to change the order of interview questions (Fielding and Thomas, 2008). Moreover, using this sort of interview provides the applicants with a chance to present their views and feelings "*in their own words to obtain a first-person account*" (Packer, 2011, p. 43). Indeed, using a *semi-structured* interview in the present research was preferred over using *structured* and *unstructured* interviews. *Structured* interviews, according to Bryman (2008), have a similar structure to a questionnaire. In other words, the questions in *structured* interviews are prepared in the form of closed questions and asked in the same order for all applicants (ibid.). In the case of *unstructured* interviews, the researchers have no specific prepared questions for conducting this type of interview; instead, they can ask any questions about particular issues (Fielding and Thomas, 2008; Irvine *et al.*, 2013). In fact, *unstructured* interviews are usually used when the researcher has to investigate and cover several topics (Bryman, 2008). Therefore, the *semi-structured* interview was chosen in this study because "it allows depth to be achieved by providing the opportunity on the part of the interviewer to probe and expand the interviewee's responses" (Rubin and Rubin, 2005, p. 88). Thus, the researcher is free to ask any questions in any order (Fielding and Thomas, 2008; Howitt, 2013). Moreover, the researcher can ask the participants for examples or more explanations of their thoughts and visions (Grix, 2001). Indeed, structured interviews are more likely to have a high reliability, whereas unstructured ones seek to be strong on validity. Consequently, semi-structured ones attempt to manage a balance between these, with sufficient reliability in the structure; however, they seek to achieve a greater validity through their flexibility.

Moreover, the analysis of the questionnaire, which was in the first stage of this study led to addressing some essential issues (based on the main themes of the questionnaire) that needed to be explained in more detail. Therefore, the interview was used in the second stage together with classroom observations to gain a better understanding and provide more detail about the use of IWBs in *Tatweer* schools. Therefore, a basic interview checklist (see Appendices 6 and 7) was designed by the researcher, covering the four main themes addressed in the questionnaire. Using an interview checklist was a helpful technique because it “allows for in-depth probing while permitting the interviewer to keep the interview within the parameters traced out by the aim of the study” (Berg, 2007, p. 39). Thus, this interview checklist worked as an “*interview guide*” (Hennink *et al.*, 2011, p. 112) to stimulate teachers’ conversations.

The procedure

In the present study, twenty teachers (ten female and ten male) from seven *Tatweer* primary schools in Jeddah were interviewed after obtaining official agreement to visit schools and interview the twenty teachers (*more details about these teachers are indicated in Chapter Six, Section 6.2*). All of them answered the questionnaire in the first stage and, therefore, had sufficient information regarding the main points that comprised the interview. Each interview lasted around twenty to forty-five minutes. Importantly, all teachers signed the consent form containing information about their contribution to the study and privacy. All the interviews relating to the seven observed female teachers were organised directly after the observed lessons. This procedure was followed to reduce the chance of forgetting what had happened in these lessons and the reasons for teachers’ choice of selected IWB features. In contrast, the other three female teachers were interviewed at times appropriate for them. All these interviews were directed by the researcher, who is female, using the interview checklist to stimulate dialogue.

Concerning male teachers, these teachers were interviewed with the help of a male relative of the researcher because of Saudi cultural restrictions. The male researcher was the best available solution to interview male teachers. He is a PhD student and has sufficient knowledge about conducting interviews. He had undertaken several courses on research methods, especially interviews. Importantly, the same procedure followed with the female teachers, of using the interview checklist, was described to him to achieve consistency. Thus, the researcher was confident that her husband would similarly interview male teachers following the same procedure as she used. The male interviews were arranged in schedules based on their choices. Indeed, the researcher created long conversations with the interviewees, both males and females, using Whats App. In this way, the participants felt more comfortable talking about their use of IWBs and, consequently, the researcher received a significant amount of data from both genders, and this information was used to achieve the goals of this study.

All the interviews were conducted in Arabic through face-to-face discussions and were arranged in the participants’ schools during the period of field study (from October to January) during the academic year 2015/2016. Notes were used to record all the male interviews, except for two male teachers who agreed to audio recording of their interviews. However, notes were the only tool used to record female interviews, due to Saudi cultural restrictions. Importantly, all the participants’ interviews were anonymously transcribed and coded. The ten female interviewees were named anonymously from F1 to F10, whereas the male teachers were named M1 to M10. After completing the transcription, a copy was given to each teacher for confirmation. Most interviewees confirmed the content of their transcript. However, two were not concerned about revising their interview transcripts. All the transcripts and codes were in Arabic and were later translated into English by the researcher. Then, the English transcripts were reviewed by a Ph.D. student in TESOL and Applied Linguistics to ensure their accuracy.

Overall, using a *semi-structured* interview as one of the research methods in the present study provides in-depth information (Bryman, 2008) about teachers’ use of IWBs in classrooms that can be combined with other collected data instruments (observations and questionnaire) to present a clear picture of the context of the study and, consequently increase the research validity. By using *semi-structured* interviews, moreover, extended replies can be stimulated from teachers on some issues that occurred through using questionnaires and applying observations.

4.6.3. Triangulation

The term triangulation has been defined by Moran-Ellis *et al.* (2006, p. 47) as “an epistemological claim concerning what more can be known about a phenomenon when the findings from data generated by two or more methods are brought together.”

Triangulation has been recommended in several studies to gain the advantage of using both qualitative and quantitative approaches (Bryman, 2004; Hussein, 2009; Wilson, 2014). Methodological triangulation has many advantages, such as increasing the research validity, reducing the researcher's bias, providing a complement to the research findings, investigating the phenomenon precisely by comparing the outcomes resulting from the use of different research instruments, and producing applicable types of data for more efficient explanation of the phenomenon (Bryman, 2008). Moreover, Hussein (2009, p. 10) states that,

> triangulation can indeed increase the credibility of scientific knowledge by improving both internal consistency and generalizability through combining both quantitative and qualitative methods in the same study.

Triangulation reduces the weaknesses of using a single data collection method and provides a wider vision and more examination of the research findings (Bryman, 2008). Therefore, in social science research, it is considered a helpful method to increase the research validity, accuracy, and reliability (Golafshani, 2003).

As indicated previously, one of the justifications for using a mixed research method in this study is to enable triangulation, which is one of Hammersley (1996) terminologies, where various kinds of data collection instruments can be combined. The use of triangulation in any research minimises the researcher's bias, improves the validity and reliability of the study (Bryman, 2008; Jang *et al.*, 2008), and provides '*complementary information'* (Hammersley, 2008, p. 27) about the issue under consideration. Therefore, three different data collection instruments were used in the current study: a questionnaire, classroom observations, and semi-structured interviews (see Figure 4.3).

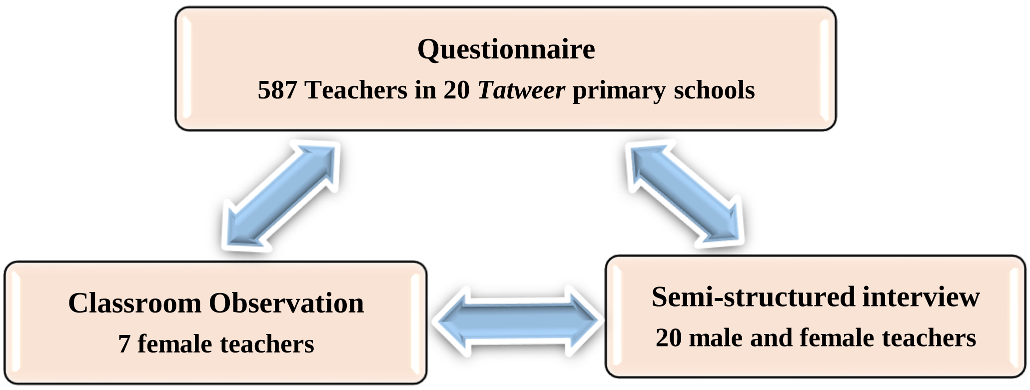

Figure 4.3: Triangulation of the research instruments

4.7. DATA ANALYSIS

A *mixed methods approach* was employed in this study, mainly following a *sequential explanatory strategy*; therefore, the process of collecting data and the order of analysis were directed by this design. Thus, the research findings were analysed separately, both quantitatively and qualitatively (see Table 4.4). The quantitative data collected by questionnaire was analysed first, and then the analysis of the second stage data followed (classroom observations and the semi-structured interviews).

Table 4.4: Data analysis techniques

The Research Instruments		**Data analysis techniques**	
		Quantitative	**Qualitative**
First Stage	Questionnaire	√	–
Second Stage	Classroom Observations	√	√
	Semi-structured interviews	–	√

Quantitative analysis concentrates on "*variables"* and forms of associations between these *variables*, instead of considering the context, whereas the qualitative analysis focuses on "*cases*" that are usually "*sensitive to context and process*" (Punch, 2014, p. 307). Therefore, after collecting the quantitative data, the Statistical Package for Social Sciences (SPSS v 21) was used to analyse the quantitative data and consider associations between the main variables (*more details are presented in Chapter 5, Section 5.1*). This software is broadly used to examine quantitative data (Bryman, 2004; Howitt and Cramer, 2011). Therefore, the quantitative data were analysed by applying descriptive statistics, and bar charts were produced using Excel. Mean and standard deviations were also compared when discussing the findings, and two types of tests (Chi-Square and Fisher's exact tests) were used to indicate the associations between variables in this study, which were unlikely to be a chance result. Indeed, the SPSS program was found to be very useful in the analysis of the quantitative findings and presenting the involved associations.

Throughout the classroom observations, the researcher only concentrated on teachers' use of IWBs and their pedagogical skills by using the observation checklist in combination with descriptive and reflective field notes. The data obtained from the observation checklist were analysed qualitatively first by giving general information about the seven observed female teachers, their schools, the type of IWBs, and general use of IWBs. Then, all seven lessons were described separately to introduce a clear picture for the reader about the procedure that teachers employed in these lessons. Finally, factors relating to the use of IWBs were quantitatively analysed and compared between the seven observed teachers (*more details are presented in Chapter Six in Section 6.3.2*). Therefore, the data obtained from classroom observations were qualitatively and quantitatively analysed.

With regards to analysing the interview data, According to Neuman (2007), qualitative interviews produce large amounts of data. In this study, therefore, several stages were undertaken when analysing the interview data: a) Transcription, b) Coding, and c) Thematic analysis.

In the transcription phase, notes were the only tool used to record all the interviews, except for the two male teachers who agreed to audio recording of their interviews. In this stage, teachers were politely asked to speak slowly to help the researcher catch each word. After completing the transcription, a copy was given to each teacher for confirmation. Regarding the two audio recordings, the researcher listened several times to the recordings when transcribing them to avoid any confusion.

Regarding the coding stage, according to Braun and Clarke (2006, p. 18),

> Coding will to some extent depend on whether the themes are more "data-driven" or "theory-driven" – in the former, the themes will depend on the data, but in the latter, you might approach the data with specific questions in mind that you wish to code around.

Neuman (2007) states that there are two helpful steps of coding in social science research to simplify the amount of data produced. These two steps are: 1) categorising the raw data to create units of meaningful data considering the aims of their study, and then 2) classifying and managing the order of these units. In this study, therefore, the themes were more likely to be "*theory-driven*," as the researcher reviewed the answers of all the teachers and chose unique responses relevant to the research questions, and importantly have more explanations and details. According to Braun and Clarke (2006), coding can be conducted manually or with a software program such as Nvivo. In this study, the researcher coded the interview data manually by writing notes in different coloured pens on each transcript of the interview to reveal possible patterns. Teachers' responses were categorised based on the aims of this study and then classified into small units (sub-themes). After choosing the codes (sub-themes), teachers' extracts were matched to them.

In the thematic analysis stage, the researcher connects and gathers the codes by simply categorising them (Neuman, 2007). Importantly, researchers in this phase should concentrate on classifying general and distinctive codes from all the interview data (ibid.). Moreover, they should reflect on the interview data during the analysis process (Creswell, 2009). In this study, the interview checklist was carefully designed to cover all four central themes as addressed in the questionnaire, which were also based on the research sub-questions. These four themes were: teachers' use of IWBs, the difficulties relating to the use of IWBs, teachers' training, and their attitudes. Therefore, the focus of the researcher was on finding these main themes from teachers' responses. Moreover, all the codes (sub-themes) introduced in the coding stage were also classified under the appropriate main theme. As appropriate, the researcher followed all six steps reported by Braun and Clarke (2006, pp. 16-23) to use the thematic analysis for the interview data analysis. These steps are: "1) *familiarising yourself with your data*, 2) *generating initial codes*, 3) *searching for themes*,4) *reviewing themes*, 5) *defining and naming themes*, and finally 6) *producing the report.*"

The interview transcriptions were in Arabic, the teachers' mother tongue. Therefore, all the extracts, codes, and main themes were in Arabic. Only the final main themes and sub-themes were translated into English by the researcher and then reviewed by an expert to ensure their accuracy.

4.8. RELIABILITY AND VALIDITY

4.8.1. Reliability

The degree of reliability is one of the important factors that should be considered to evaluate the significance of any research. According to Robson (2011), reliability refers to the constancy of a produced score. Bryman (2004) states that reliable research should ensure "*repeatable*" results. He defines three fundamental conceptions that should be considered for reliable studies. These conceptions are *constancy*, *internal reliability*, and *inter-observer stability*. C*onstancy* can be achieved by employing a pre- and post-test (ibid.). However, a pilot study is an acceptable method of ensuring constancy (Coombes, 2001). As a result, the current study was piloted to achieve consistency and stability. *Internal reliability* was obtained by triangulation using a questionnaire, classroom observation, and semi-structured interview (Hussein, 2009). The questions presented in the questionnaire in the first stage were also requested in the second phase during classroom observations and interviews to obtain more in-depth information and examples. Additionally, the internal reliability and validity of the findings also improved by examining and analysing the associations between variables using SPSS (Chan, 2009; Howitt and Cramer, 2011). However, *inter-observer stability* cannot be applied in this study. This concept necessitates at least two observers to gain more accurate results by comparing the findings. The reliability of each method is discussed more in the following sections.

4.8.1.1. Reliability of the Quantitative Method

With regard to the questionnaire, great care was taken in reviewing the literature and classifying the dimensions of the questionnaire based on the four important areas: teachers' attitudes towards the use of IWBs in teaching and learning processes; teachers' use of IWBs; difficulties and challenges in using IWBs; and teachers' training in using IWBs. The process of designing, translating, piloting and distributing the questionnaire was described in detail in Section 4.6.1, to provide guidelines for applying a similar study in different times and context.

The questionnaire's *reliability* was first tested when piloting the questionnaire with fifteen Ph.D. students (see Section 4.5). Then, the *internal consistency* was tested again for the entire sample using Cronbach's Alpha coefficients (Gay and Airasian, 2003; Cohen *et al.*, 2007). The test was conducted for all the questions in the questionnaire and for each Likert-scale question, as summarised in Table 4.5. Thus, a high level of reliability (0.942) was indicated because of using this test for all the subscales of questions in the questionnaire (22 questions). Cronbach's Alpha coefficient was measured as 0.876 for all fifty-nine questions.

Table 4.5: Cronbach's Alpha coefficients for the subscales of the questionnaire

Subscale	Cronbach's Alpha	N of Items
Teachers' attitudes towards IWBs in the teaching process	0.967	11
Teachers' attitudes towards IWBs in student learning	0.940	7
Teachers' attitudes towards IWBs in both teaching and learning	0.976	18
All Likert scale questions: Questions (7-24, 26, 35, 36, and 37)	0.942	22
All questions in the survey	0.876	59

4.8.1.2. The Trustworthiness of the Qualitative Methods

In the case of the second stage methods (classroom observations and interviews), reliability requires both accuracy and good documentation when reporting the information-gathering procedures (Flick, 2009). Therefore, the process of conducting fieldwork should be explicit and constant (ibid.) to be replicable or enable a comparison between case studies. Indeed, as long as the research process is successfully documented and detailed, the reliability of the research will be improved (ibid.). Therefore, the procedures of conducting both classroom observations and interviews were described in detail in this study in Chapter Four in Section 4.6.2. ‘Thus, the criterion of reliability is reformulated in the direction of checking the dependability of data and procedures, which can be grounded in the specificity of the various qualitative methods’ (Flick, 2009, p. 387).

Regarding classroom observations, the observation checklist was used as a guide in the process of observing teachers. This list involved the main factors that focus on teachers’ use of IWBs in classrooms and was used to observe all the teachers, besides keeping detailed notes for each lesson. Importantly, careful coding was applied to ensure constancy when using this method.

Several researchers have argued that interviews may lack reliability. For example, (Creswell, 2009, p. 153) argues that the reliability of interviews seems to be “elusive.” This is possibly because “their openness to so many types of bias, interviews can be notoriously unreliable, particularly when the researcher wishes to draw comparisons between data sets” (Brewerton and Millward, 2001, p. 74). However, in this study, a designed interview checklist was used with all the interviewees to stimulate teacher dialogue. Therefore, a consistent approach was followed when interviewing the participants, recording their answers, writing the transcriptions, and analysing the data. Moreover, the researcher conducted all the interviews with female teachers. However, the male teachers’ interviews were carried out with the help of a male researcher with sufficient knowledge about conducting interviews. Additionally, the procedure that was followed with the females was also described to him. Therefore, the same procedure relating to the question framework was applied for all participants to ensure a high degree of reliability and constancy.

Overall, reliability was gained in this study through using the carefully designed questionnaire, observations, and interview schedules developed by the researcher to preserve constancy within each instrument.

4.8.2. Validity

The validity of any research method has been defined as the capacity of that method to successfully evaluate what it is aimed to evaluate (Muijs, 2010). Silverman (2010, p. 275) described it as "another word for truth" and the correctness of the research findings (Robson, 2011). Although validity has been classified in the literature into diverse types, in social science research, *internal* and *external* validity are the two kinds of validity that are most often discussed (Berg, 2007). Internal validity can be explained as the results of any research being affected by the internal variables and associated factors in that research, so that there is no influence from external aspects (De Vaus, 2001). This study focuses on the educational environment, and thus there are many factors which could have an unavoidable impact on the teaching and learning processes. Nevertheless, this study mainly concentrates on investigating teachers' use of IWBs in classrooms, their attitudes, the problems encountered by them, and their training needs. Additionally, the research's internal reliability and validity have been enhanced, as previously mentioned, by analysing the associations between variables (Chan, 2009; Howitt and Cramer, 2011).

Concerning external validity, or what is defined by Bryman (2012) as the ability of generalising research outcomes to other social research, the population of this study was 728 Saudi teachers in primary schools participating in the *Tatweer* project in Jeddah in Saudi Arabia. Therefore, the sample in the first stage (587) was large enough to be a representative sample of other teachers in Jeddah, who are working in primary schools participating in this project. According to Bryman (2008, p. 187), "any findings can be generalised only to the population from which that sample was taken". Therefore, the results of this study can be generalized to involve all teachers in primary *Tatweer* schools in Jeddah, in Saudi Arabia.

Moreover, both quantitative and qualitative methods were used in this study to achieve triangulation, aiming to increase confidence in the research findings and ensure the research validity and reliability (Moran-Ellis *et al.*, 2006; Jang *et al.*, 2008; Johnson and Christensen, 2016). However, "assessing the validity of findings can be particularly complex, yielding a problem of integration" (Onwuegbuzie and Johnson, 2006, p. 60). Nevertheless, "clarifying the theoretical drive reduces the risk of using invalid inductive or deductive operations or strategies during the conduct of the research, thereby enhancing validity" (Morse *et al.*, 2006, p. 290). In this study, both TPACK and CBAM *levels of use* models were used as frameworks to understand the research outcomes and, consequently, to enhance the internal validity of this research when comparing the research findings with challenging models (Yin, 2003).

Additionally, the probability of researcher bias was controlled during this study because the results from both quantitative and qualitative methods were anonymous and only analysed by the researcher, and not deliberated on, particularly with anyone having a connection to the study (Chan, 2009). Furthermore, the valuable educational outcomes of this study could enhance other researchers concerned about the use of IWBs in classrooms and training needs. Importantly, according to Peräkylä (2011), the validity of any research will be based on the kind of data collection method used in this research, and therefore the validity of each type of research method utilised in the current study is further discussed next.

4.8.2.1. Validity of the Quantitative Method

The questionnaire requires high validity and reliability (Cohen *et al.*, 2007; Johnson and Christensen, 2016). Therefore, in this study, the study was piloted to ensure high validity and reliability (Gay and Airasian, 2003; Wilkinson and Birmingham, 2003; Bell, 2005; Cohen *et al.*, 2007; Bryman, 2008).

Both *face validity* and *content validity* were applied to validate the questionnaire as indicated previously in Section 4.5. The questionnaire, in its primary phases (the first English version), was revised by the supervisor of this study for both *face* and *content validity*. Then, a pilot study resulted in a second English version of the questionnaire. This assessment was conducted by proficient participants, as recommended by McLeod (2013), who were Ph.D. students with sufficient experience in the field of educational technologies. The views of experts towards the content of the questionnaire and its structure were considered, and this led to obtaining high external validity of the questionnaire (Gay and Airasian, 2003; Bryman, 2008).

Moreover, the *back-translation* technique was employed to ensure the correctness of translation (Gamborino, 2007; Chen and Boore, 2009) by a Ph.D. student in TESOL and Applied Linguistics. This process improved the accuracy and suitability of the Arabic version of the questionnaire. Furthermore, an expert in Arabic checked the accuracy of sentences in the Arabic version of the questionnaire and their comprehensibility. As seen above, several factors relating to the questionnaire were considered to achieve a high degree of *face validity* and *content validity*.

4.8.2.2. Validity of Classroom Observation Method

Wellington (2000, p. 30) states that validity refers to whether a research instrument "actually measures what it is supposed to measure." Therefore, the validity of the observational data may concentrate on to what extent it reflects and expresses the reality of the observed situation (Peräkylä, 2011). In this study, the *observation schedule* was designed by the researcher and piloted. It was used to report all the observed lessons to capture the actual use of the IWB in six *Tatweer* primary schools in Jeddah. Consequently, the observation method was used to reflect the reality of the observed situation as well as to investigate what it was planned to investigate in this study. Moreover, two teachers were observed twice in an attempt to decrease the opportunity of observing a lesson designed particularly for this study. Additionally, similar analysis procedures were applied to all these lessons.

4.8.2.3. Validity of the Semi-Structured Interview Method

Several biases indicated by Cohen *et al.* (2007, p. 150) should be avoided to maximize the validity of interviews. These biases include: (a) the attitude, views and prospects of the interviewer; (b) a tendency for interviewer to see the interviewee on his/her own merits; (c) a tendency for interviewers to seek answers to support their preconceived notions; (d) misperceptions on the part of the interviewer with regard to what the interviewee is saying; (e) and misunderstanding on the part of the interviewee with regard to what is being asked (p.150). Therefore, to ensure the validity of the interview, the collected data from interviews should reflect the opinions of applicants. Additionally, researchers should be careful when conducting interviews and follow specific skills to increase their validity and reliability. For example, the researcher was aware of asking leading questions that could prompt desired answers. Additionally, the interviewees were given enough time to explain their responses, and prepared interview questions were carefully designed and piloted to provide a coherent data method that appropriately fitted with other research techniques. In the interview checklist, the purpose of this study and questions of the interview were used with all the participants before conducting the formal interviews. All the interviewees were informed about the privacy of their interviews. Additionally, the researcher asked the participants for more explanations, reasons, and details regarding the interview questions. Furthermore, appropriate coding and analysis were applied (*as discussed before in Section 4.7*).

As indicated earlier in Section 4.6.2.2, semi-structured interviews were chosen in this study because of their sufficient reliability and greater validity. Indeed, using the interview method allows the researcher to provide detailed information about teachers' inner beliefs and views, as recommended by Ho (2006). However, in the present study, seven of the interviewees were also observed in classrooms. In other words, the observation was applied as a complement to the interview method. Therefore, teachers' external behaviour was explored through classroom observations, and their personal views were gained through interviews. Consequently, the research findings would be greatly validated by this procedure.

Overall, the questionnaire seems to have high reliability while the qualitative methods appear to have strong validity. Therefore, the main purpose of using the qualitative methods was to check and extend the validity of the responses to the questionnaire. Consequently, a mixed methods approach was applied in this study to benefit from combining both methods to enhance the research validity and reliability.

4.9. ETHICAL CONSIDERATIONS AND PERMISSIONS

Ethical issues have been seriously considered by a number of researchers in the field of social science because of their importance in protecting involved individuals' rights and safety, as well as the roles of the investigator (Gay and Airasian, 2003; Cohen et al., 2007; Creswell, 2009; King and Horrocks, 2010; Howitt, 2013). The analysis of researchers in the field of social science identifies three main ethical dimensions regarding any research involving humans. These areas are: signing consent forms, ensuring participants' privacy, and avoidance of any kind of harm to the participants whether "*physical or emotional*" (Denzin and Lincoln, 2005, p. 715).

In this study, the approval of the School of Education Ethics Committee of Durham University was received on 18 November 2014 (see Appendix 8). With regard to the online survey and paper-based questionnaire, a brief explanation of the objectives of this study as well as the assurances of participants' privacy were presented at the beginning. All questionnaires were anonymous so the identities of the participants cannot be recognised. In terms of classroom observations and interviews, the participants were informed about the methods of recording (taking notes, using audio and video recordings). However, according to Saudi culture, it is not acceptable to record female teachers using audio and video recordings, and therefore a consent form was designed asking female teachers about their agreement to use audio recordings or just take notes (see Appendix 9). Each teacher signed this consent form. All applicants were aware that their involvement in this study was voluntary, and they had the right not to proceed at any time or stage. Moreover, the researcher avoided unnecessary contact with students during observing lessons. For the interview method, the privacy of the participants was ensured by conducting the interviews in a private room in each school, such as a meeting room. To protect teachers' privacy, their real names were replaced with symbols so they will not be identified in any report or other subsequent publications. Moreover, all the data were kept anonymous and stored on a secure drive on the researcher's own computer with a secure password. Furthermore, all sensitive data will be destroyed after completing this study. There were unlikely to be any direct effects from this study on the research participants, although they may be interested in the implications for their professional practice in the future. The outcomes of this study could lead to improving teachers' skills in using IWBs as well as improved teacher professional development programmes that relate to using these technologies. Importantly, the aim of this research is to improve educational outcomes by understanding technology use. Thus, the broad purpose of the research is a moral one.

Before conducting the field study, Saudi Arabian Cultural Bureau in London was contacted first to send an official letter to the Educational Department in Jeddah in Saudi Arabia. This letter confirmed the academic status of the researcher and explained the aims of the current research based on an official letter created by the supervisor of this study (see Appendices 10 and 11). Then the Educational Department in Jeddah was contacted to obtain formal agreement for conducting this study, which was eventually received on 6 January 2015 (see Appendix 12). The official agreement allowed the researcher to distribute the questionnaire (both online survey and paper-based questionnaire) and visit a number of primary schools participating in the *Tatweer* project in Jeddah, as well as to attend lessons in classrooms with IWBs. Additionally, the permission of female head teachers was obtained to arrange appropriate schedules for classroom observations and interviews.

4.10. ISSUES OF ACCESS

The process of gaining official approval from the responsible authorities to conduct the field study in Saudi Arabia took a long time and needed personal contact, emails or posts were not efficient for receiving such agreement, which is a significant obstacle in the process of conducting any research in Saudi Arabia. I hope that the service of obtaining such agreement will be possible by email or online in future. Unfortunately, a small number of head teachers were reluctant to cooperate with the researcher, and they refused to visit their schools despite the official agreement obtained from the Education

Department in Jeddah. Thus, the schools in which the head teachers disapproved were excluded from the researchers' school visits. Additionally, observing and interviewing male teachers was also challenging because of Saudi culture restrictions. Therefore, the researcher observed and directed all the interviews with female teachers. However, male teachers were only interviewed with the help of a male researcher as the best available solution.

Recording the observations and interviews of female Saudi teachers digitally was also another difficulty faced in this study because of Saudi culture restrictions. Indeed, using tapes or video to record observations and discussions when dealing with females is not acceptable in Saudi Arabia. Surprisingly, most male teachers also refused to record their interviews and only two agreed. Therefore, only notes were used in this study to record the male and female interviews, and audio recording was only used with two male teachers who agreed to record their interviews. Thus, capturing the teachers' responses exactly was difficult only using notes, as this meant that the teachers had to talk slowly and repeatedly to help the researcher to write their answers correctly, which affected the flow of the interviews. Moreover, these interviews took more time than the two interviews with male teachers that were audio recorded. However, the researcher created long conversations with the interviewees using Whats App, so the participants, whether male or female, felt more comfortable conducting long conversations with the researcher. Indeed, using this application, the researcher overcame some of the challenges of interviewing male and female teachers and, therefore, a large amount of data was obtained to achieve the goals of this study. Moreover, the researcher found some difficulties regarding the interview method including the process of transcription, analysis, and translation, which needed a great deal of work and time.

Furthermore, teachers' interviews were carried out at different schools and different times, as appropriate for the teachers. Indeed, I found this process challenging because *Tatweer* schools are located in different educational supervision centres across large distances in Jeddah. Travelling by car took three hours and more to move between *Tatweer* schools because of the vast distance between schools and the traffic. Therefore, all school visits were arranged to cover only one school a day. However, multiple visits were required for each school to conduct interviews and observations appropriately.

4.11. THE POSITIONALITY OF THE RESEARCHER

It is critical to clarify the positionality of the researchers and their personal experiences because they may affect the shape of their research, understanding, interpretation of the results, and all phases of the research process (Foote and Bartell, 2011). Researcher positionality is identified as "the position that the researcher has chosen to adopt within a specific study" (Case *et al.*, 2017, p. 152). It is important to identify researcher positionality regarding three crucial areas: the subject being investigated, the research participants, and the research context (Savin-Baden and Howell Major, 2013).

Indeed, I am aware that I researched in the field of Education, not in the natural sciences. I am a part of this social world, which is more complicated and can only be understood through exploring the context. This depends, at least in part, on investigators' interpretations and individuals' views (Creswell, 2009), leading to more subjectivity (ibid.). Moreover, I am aware that I undertook research that interests me personally and therefore, my positionality and my own opinions might influence my choices in the conduct of this research, my understanding, and my interpretation of the outcomes. However, I tried to be as transparent as possible and described what I have done in detail so other researchers can draw their own conclusions regarding my research.

Because of using a mixed methods approach, a pragmatic philosophy was found more appropriate to be adopted in this study. As a pragmatic researcher, I focused more on how to apply the appropriate methods to answer the research questions (Johnson and Onwuegbuzie, 2004). Therefore, questionnaire, classrooms observations, and semi-structured interviews were employed in this study in two phases. According to Ivankova (2014), in the quantitative phase of mixed methods studies, researchers take a natural role (an *outsider* view) when collecting numeric data (referred as *etic* data) using quantitative tools. Whereas, in the qualitative phase, researchers collect data (referred as *emic* data) through investigating the individuals who are *insiders* in the context being studied and interpreting their views using qualitative methods (ibid.). Therefore, I had to balance between employing *emic* and *etic* data as well as presenting both *insider* and *outsider* perspectives during conducting this study (Johnson and Onwuegbuzie, 2004). Indeed, I tried my best to achieve a balance between objectivity during collecting and analysing data and subjectivity when presenting my reflections and interpretations (Feilzer, 2010; Shannon-Baker, 2016).

Thus, in the first stage of this study, both web-based and paper-based questionnaires were distributed to all the *Tatweer* primary schools in Jeddah to encourage all teachers to participate and therefore, decrease the researcher's bias. Indeed, I tried to reach as many teachers as possible with a paper version, but this was not practical in some schools due to some reasons relating to head teachers, Saudi culture, and the structure of the school system. Then, classroom observations and interviews were applied in the second stage to deepen my understanding of the responses and enabling me to interpret the findings from the survey. I carefully designed the questionnaire (see Section 4.6.1.1) and developed observation and interview schedules (see Section 4.6.2) to enhance the research validity and reliability. All these instruments were also piloted and examined before conducted the formal study as indicated in Section 4.5. I used the SPSS software program to analyse the quantitative data while thematic analysis was used with the qualitative data (see Section 4.7). Thus, I believe that I followed a rigorous scientific method to conduct this study, aiming to minimise the subjectivity and consequently, achieve greater objectivity.

My former supervisory position as an instructional supervisor did not facilitate the access to *Tatweer* schools and that because I conducted this research in a different city, where I was unknown, and I was received as any researcher who was doing a PhD study. I had spent a long time away from schools before starting my research and I had left all the supervision duties since I have started studying in the UK seven years ago. Consequently, I identified myself to the participants as a researcher who was conducting a PhD study in a British university. In this case, I perceived of myself as an *outsider* and not a member of the Education Department, aiming to seek a natural position to separate myself from the social groups, teachers in this case, to be able to investigate them without bias (Kusow, 2003). Indeed, this encouraged the participants to be more open and truthful about certain issues because they perceived myself as being as an outsider to the culture being studied. In addition, there was no future contact planned with myself as the researcher and so no direct consequences from this relationship. Moreover, my earlier experience did not affect the analysis of data; where the same outcomes could be achieved by other researchers without having a similar experience. Thus, the data analysis reflected my *outsider* position.

However, I believe that my previous experience might have a useful effect when conducting the observations and interviews. I had the skills and the confidence to observe teachers in their lessons. Moreover, I was able to understand the issues that face teachers when using IWBs in schools and consequently, discuss these issues more deeply with the teachers. Thus, I had a feeling that I had an *insider* position to the population because of my former position as a teacher and then an educational supervisor. Moreover, I could understand the language of the participants and their culture because we share the same ethnic Arabic identity, which allows me to achieve an *insider* view. Thus, I was appropriately positioned to conduct this study. In this case, I can say that the participants also viewed me as an *insider* because of familiarity. I visited all the female teachers individually in their schools several times before conducting the formal observations and interviews to create a comfortable and friendly relationship. Indeed, the emotional effort was made by the researcher through the informal meeting, phone calls, and social media (Whats App) helped to build trust with the female teachers and to arrange meetings. This procedure helped teachers become familiar with the investigator, break down barriers, and ask questions about the study. I made a considerable effort to convince them of the importance of their participation, and that it is only for research purposes, and will not be used to evaluate their teaching performance or even discussed with school administrators. In this case, it seems that the participants considered the researcher as an *insider* to the culture being studied.

Consequently, as an Arabic speaking female researcher from Saudi Arabia who was also studying in the UK for a long time (seven years), my position combined both Arabic and western perspectives. I had multiple positions as an *outsider* and *insider* for the current study, and this is considered a challenge in mixed methods studies because I had to balance both perspectives during conducting this study (Johnson and Onwuegbuzie, 2004) to gain the confidence with applicants (Creswell and Plano Clark, 2011).

4.12. CONCLUSION OF THE CHAPTER

The current study is a quantitative-dominant mixed method research study that mainly used a *sequential explanatory* strategy. The quantitative method was employed in the first stage of data collection followed by the qualitative methods in the second stage. This type of research design helped to provide rich and deep data about teachers' use of IWBs in *Tatweer* primary schools, and their training. Data were collected using questionnaires, classroom observations, and semi-structured interviews. The SPSS software program was used to analyse the quantitative data while thematic analysis was used with the qualitative data. A summary of the methodological framework of the research design is shown in Figure 4.4.

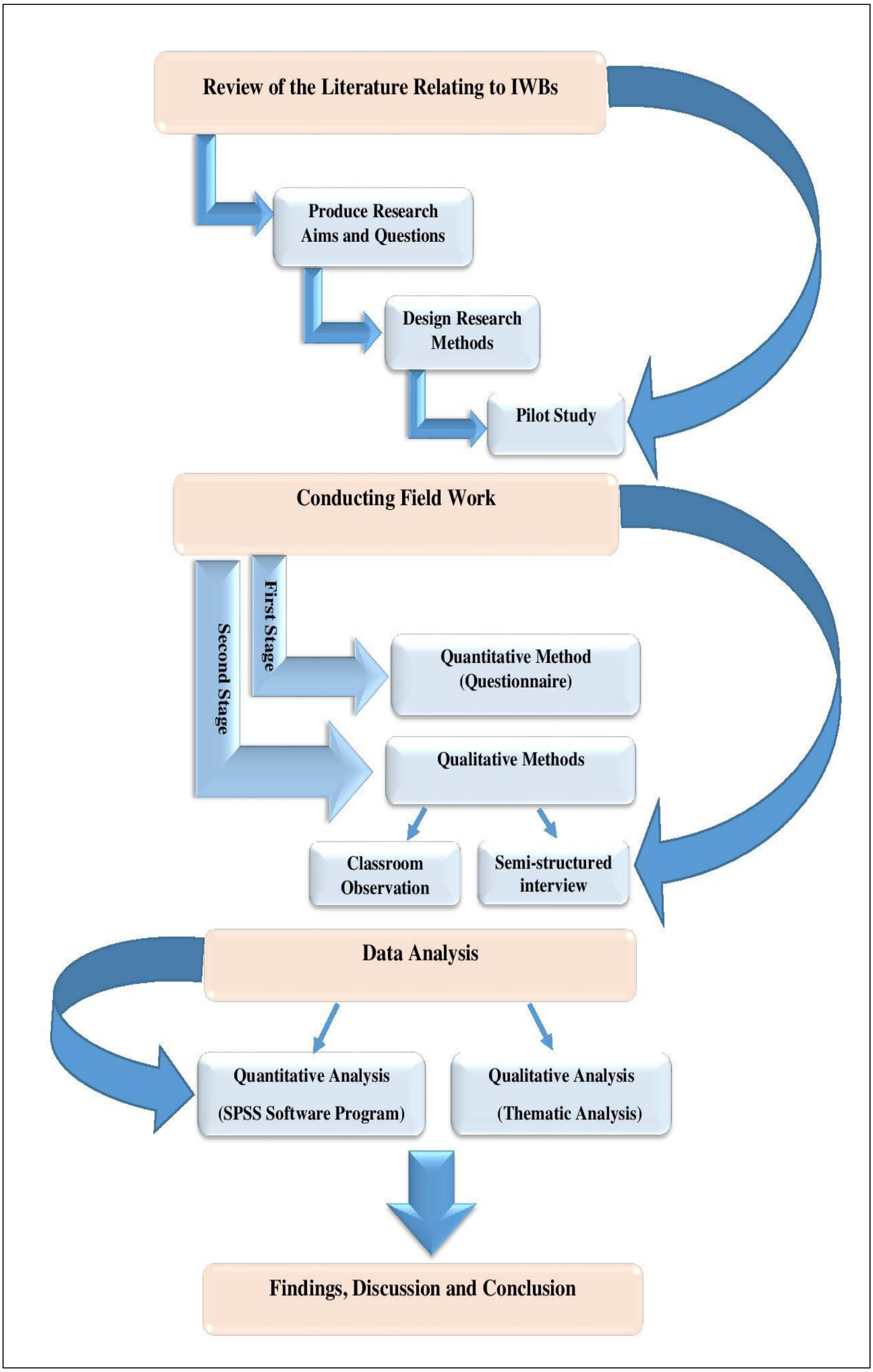

Figure 4.4: The methodological framework of the research design

5. THE RESULTS OF FIRST STAGE DATA COLLECTION

5.1. INTRODUCTION

As indicated previously, the current study is a quantitative-dominant mixed method research study that mainly used a *sequential explanatory* strategy. Therefore, the quantitative findings of the questionnaire were used to answer all five research sub-questions. Thus, in this chapter, the main outcomes of the questionnaire survey relating to Saudi teachers in primary schools participating in *Tatweer* schools in Jeddah are reported.

SPSS was used to analyse the quantitative data. Descriptive statistics were used to examine several categories (general information about the participants, teachers' attitudes, teachers' use of IWBs, difficulties faced by teachers, and teachers' training). Additionally, Excel was used to produce figures for these categories. Two types of statistical tests (Chi-Square and Fisher's exact tests) were applied to clarify the significant differences between selected variables: the location of IWBs, the frequency of use of IWBs in lessons, the experience in using IWBs, using IWB features, teachers' competence, the need for further training, teachers' attitude to using IWBs in teaching and learning, the ability of using IWBs in lessons, untrained teachers, teachers' approaches to using IWBs in classrooms, the number of IWB training courses, teachers' satisfaction with the level of training, teachers' gender, training needs, and training method preferences.

Chi-square is a useful statistical test to examine the significance of associations between two categorical variables (Bryman, 2008). According to Muijs (2004), it compares observed and expected data in particular assumptions: the two variables should be categorical (nominal or ordinal), and both should have more than two independent groups. All the selected variables in this study achieved these two assumptions, and therefore the Chi-Square test was used. Fisher's exact test is another statistical test used to evaluate the significance of the difference between two groups that have small frequency counts (Routledge, 2005). Fisher's exact test should be run in cases when more than 20% of the expected counts were less than five, in the case of tables larger than 2x2. However, for a small sample (2x2 tables), this test should be used in cases that had any expected counts of less than five. Therefore, in this study, the Chi-Square test was only used to examine the significance of associations between variables in some cases that had no more than 20% of the expected counts with less than five. However, if not, this could lead to adding an element of unreliability to this statistical test. Consequently, Fisher's exact test was run in other cases (greater than 20% of the expected counts were less than five).

The quantitative results of this study are indicated in six sections. Section 5.2 shows general information about the participants. Section 5.3 presents the findings on teachers' attitudes towards the use of IWBs in both the teaching and learning processes. The results of Saudi teachers' use of IWBs are described in Section 5.4, while Section 5.5 clarifies the difficulties that faced these Saudi teachers. Section 5.6 demonstrates the outcomes regarding participants' training. Finally, the associations between the main variables are presented in Section 5.7. Moreover, some of the descriptive statistics and the Chi-square and Fisher's exact outputs related to this chapter are introduced in Appendices 13 and 14, respectively.

5.2. GENERAL INFORMATION

a) The participants

587 teachers (301 female and 286 male) working in *Tatweer* primary schools in Jeddah completed the self-reporting questionnaire (both paper-based questionnaire and online survey) designed for this study. These teachers had different levels of teaching experience, but the majority (424) had more than ten years' teaching experience; only eight teachers had less than one year's experience. They taught different subjects. Mathematics, Science, Arabic Language and Literature, and Islamic Sciences, as the core subjects in Saudi Arabia, had the highest percentage of all subjects. In contrast, computer sciences and special needs had the lowest percentage at 3% and 2%, respectively. 5% of teachers in the sample were specialists in learning resources. Moreover, the participants in this study involved 74 English language teachers, as English has recently become compulsory in primary schools in Saudi Arabia. As seen above, the results of this study express the views of teachers of various teaching subjects. The participants had different workloads, ranging from less than ten to more than 24. The majority (257) had an acceptable workload of between 10-19 classes per week. In contrast, 223 teachers had a higher workload of 20-24 classes, which prevented them from having training during the school day. 103 teachers had fewer than ten classes per week, which indicates that they had sufficient time to improve their skills with IWBs during the school day. By contrast, four participants had such a busy timetable that it represented a serious difficulty to include training because they had more than 24 classes per week (see Table 5.1).

Table 5.1: Descriptive results (The participants)

		Male	Female	N	Percent
Experience in teaching	less than one year	8	0	8	1%
	1-5 years	36	50	86	15%
	6-10	39	30	69	12%
	More than ten years	203	221	424	72%
	Total	286	301	587	100%
Fields of teaching	Mathematics	47	63	110	19%
	Science	57	42	99	17%
	Social Sciences	20	34	54	9%
	Computer Sciences	8	8	16	3%
	Foreign Language (English)	31	43	74	13%
	Islamic Sciences	48	46	94	16%
	Arabic Language and Literature	55	44	99	17%
	Special needs	7	4	11	2%
	Other (specialist of learning sources)	13	17	30	5%
	Total	286	301	587	100%
Teachers' workload	Less than 10	71	32	103	18%
	10-19	81	176	257	44%
	20-24	130	93	223	38%
	More than 24	4	0	4	1%
	Total	286	301	587	100%

b) The location of IWBs in Tatweer schools

According to Figure 5.1, unexpectedly, only 55% of the teachers who completed the questionnaire indicated that they had IWBs in their classrooms, whereas 45% of the respondents did not have IWBs in their classrooms. Additionally, approximately half of the participants (50%) had IWBs in resource rooms and only a few, around 10%, had IWBs in laboratories. Two percent of the participants reported that they had IWBs in other places, mainly libraries, according to the teachers within the sample.

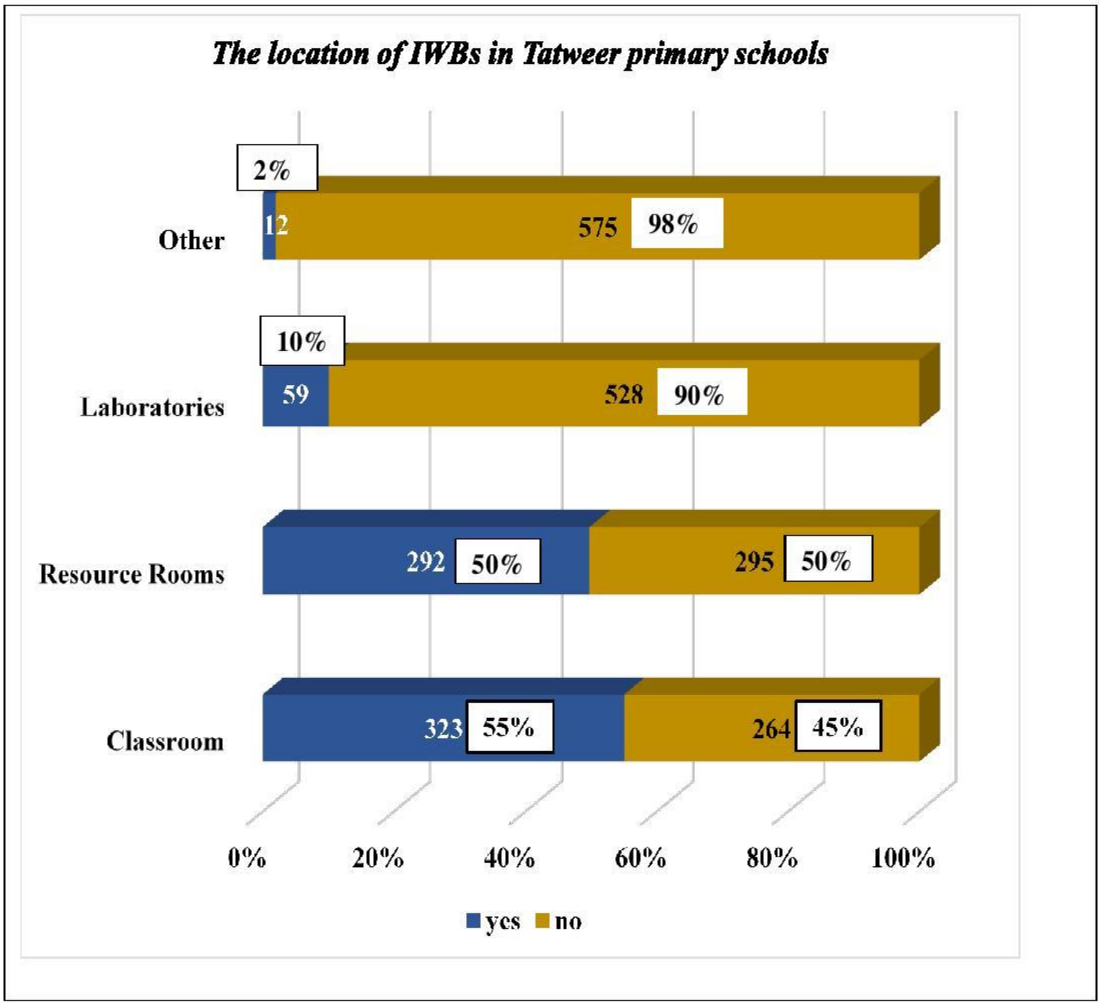

Figure 5.1: The location of IWBs in Tatweer primary schools

5.3. TEACHERS' ATTITUDES TOWARDS THE USE OF IWBs

This part of the questionnaire consisted of 18 statements in the form of a five-point Likert ranking scale from strongly agree to strongly disagree. All the teachers' responses were coded accordingly: Strongly agree=1, agree=2, neutral=3, disagree=4, and strongly disagree=5. This means that the teachers with lower value responses were more positive towards the attitudes statements than those, with the higher-numbered responses. Lower overall means indicate more positive and higher means indicate the teachers were more negative.

5.3.1. The Teaching Process

This section indicates the results of the respondents' views about eleven elements relating to the use of IWBs for teaching. Table 5.2 shows the mean, median, mode and standard deviation of each of these eleven elements. Comparing the values of the means of these eleven elements revealed, the eighth element in the questionnaire (*Using IWBs strengthens my content knowledge*) had the highest average score (*M*=2, *SD*=0.95), indicating the least positive views. Then, the third component (*Discussions in class will be facilitated when using IWBs*) (*M*=1.74, *SD*=0.82) was in second place, followed by the fifth element (*Using IWBs helps me to prepare lessons*) (*M*=1.73, *SD*=0.87) and the first element (*Class time will be managed successfully by using IWBs*) (*M*=1.73, *SD*=0.82), respectively. However, the sixth element (*Course content will become more visual when using IWBs*) had the lowest mean score (*M*=1.48, *SD*=0.74), showing the most positive views. Overall the modal score for all eleven elements was 1 (*strongly agree*) or 2 (*agree*), which clearly indicated that the views of these Saudi teachers were very positive in terms of the effectiveness of using IWBs in the teaching process. (*For more details about each benefit, see Appendix 13*).

Table 5.2: Descriptive statistics (The teaching process)

Variables	**N**	**Mean**	**Median**	**Mode**	**S. D**
Using IWBs strengthens my content knowledge	587	2	2	2	0.95
Discussions in class will be facilitated when using IWBs	587	1.74	2	2	0.82
Using IWBs helps me to prepare lessons	587	1.73	2	1	0.87
Class time will be managed successfully by using IWBs	587	1.73	2	2	0.82
Using IWBs helps me to design content-based activities	587	1.69	2	1	0.89
I can use IWBs with appropriate teaching style to teach the content	587	1.69	2	1	0.80
Using IWBs improves my teaching methods to develop student learning	587	1.64	2	1	0.78
Using IWBs makes content teaching easier	587	1.60	1	1	0.78
The lessons will be more active when using IWBs	587	1.58	1	1	0.77
Using IWBs makes teaching more enjoyable	587	1.52	1	1	0.74
Course content will become more visual when using IWBs	587	1.48	1	1	0.74

5.3.2. Student Learning

The results of teachers' attitudes towards seven elements regarding student learning are presented in this section. Table 5.3 shows the values of central tendency (mean, median, mode and standard deviation) of these seven elements. The second component in student learning in the questionnaire (*collaborative learning will be facilitated by using IWBs*) had the highest mean score (*M*=1.80, *SD*=0.83), indicating the least positive views. Followed by the seventh element (*using IWBs helps students to understand difficult concepts*) (*M*=1.79, *SD*=0.89). Then the fifth element (*using IWBs increases student interaction in class*) (*M*=1.74, *SD*=0.85) and the sixth element (*students may have chances to use IWBs in the classroom by themselves*) (*M*=1.72, *SD*=0.84) respectively. The lowest mean score between these elements was for the third component (*using IWBs enhances students' attention in class*) (*M*=1.63, *SD*=0.82), showing the most positive views. However, the mode of all these results relating to teachers' opinions about these benefits in student learning was 1 (*strongly agree*) or 2 (*agree*), which clearly revealed the perception of the efficiency of using IWBs in improving the learning of pupils (*for more details about each of these benefits, see Appendix 13*).

Table 5.3: Descriptive statistics (Student learning)

Variables	N	Mean	Median	Mode	S. D
Collaborative learning will be facilitated by using IWBs	587	1.80	2	2	0.83
Using IWBs helps students to understand difficult concepts	587	1.79	2	1	0.89
Using IWBs increases student interaction in class	587	1.74	2	1	0.85
Students may have chances to use IWBs in the classroom by themselves	587	1.72	2	1	0.84
Student learning will be improved using IWBs	587	1.68	2	1	0.83
Using IWBs makes students more motivated in class	587	1.65	1	1	0.84
Using IWBs enhances students' attention in class	587	1.63	1	1	0.82

5.3.3. Teachers' Attitudes towards Using IWBs in Teaching and for Student Learning

This section aims to present the attitudes of primary teachers, in *Tatweer* schools in Jeddah towards the use of IWBs for both teaching and learning processes. Therefore, all the variables that have been included in the two previous sections (5.3.1) *teaching process* and (5.3.2) *student learning process* were first recorded as different variables and then computed to provide a scale of *teachers' attitudes towards using IWBs in both the teaching and students' learning*. Moreover, all five categories were combined into only two sets *agree* and *disagree* to enable a better understanding of teachers' views. According to Table 5.4, approximately 11% of the teachers within the sample disagreed about the role of IWBs in improving the teaching and learning process. However, a majority of nearly 89% agreed with this statement. Consequently, it is clearly shown that the teaching and learning process had been affected positively by using IWBs from the participants' point of view.

Table 5.4: Teachers' attitudes towards using IWBs

	Frequency	Percent	Valid Percent	Cumulative Percent
Agree	523	89.1	89.1	89.1
Disagree	64	10.9	10.9	100.0
Total	587	100.0	100.0	

5.4. THE USE OF IWBs

The findings regarding teachers' use of IWBs in primary *Tatweer* schools are provided in this section. Firstly, the descriptive statistics presented in Table 5.5 indicate that the second element (*the frequent use of IWBs in lessons*) had the highest mean score (M=2.42, SD=1.03), indicating the least positive views. Then, *the use of IWB features* and *teachers' approaches to using IWBs in the classroom* had equal values (M=2.20, SD=0.73). After that, teachers' ability (M=1.68, SD=0.63) and their experience of using IWBs (M=1.63, SD=0.59) followed, respectively.

Table 5.5: Descriptive statistics (The use of IWBs)

Variables	N	Mean	Median	Mode	S.D.
The experience of using IWBs	587	1.63	2	2	0.59
The frequency of use of IWBs in lessons	587	2.42	2	2	1.03
Using IWB features	587	2.20	2	2	0.73
Teachers' approaches to using IWBs	587	2.20	2	2	0.73
The ability to use IWB and its tools in lessons	587	1.68	2	2	0.63

a) Experience of using IWBs

Figure 5.2 shows the teachers' experience of using IWBs in *Tatweer* primary schools in Jeddah. More than half of these teachers (52%) had employed IWBs in their lessons for a period of 1-5 years. Additionally, 43% of teachers had used this technology for less than one year. Only 34 teachers had more than five years' experience. Therefore, nearly 57% of the participants had fairly extensive practice with using IWBs for more than one year.

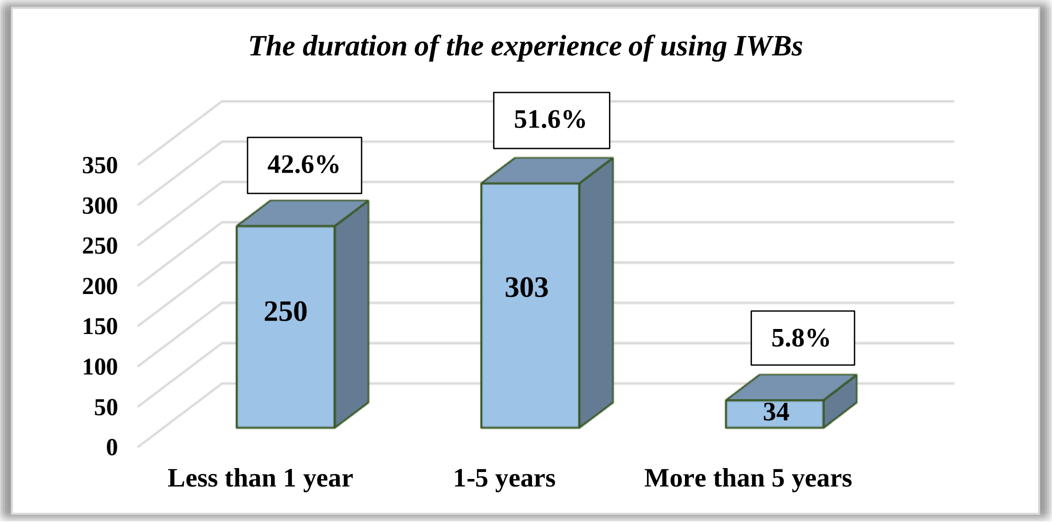

Figure 5.2: The experience of using IWBs

b) The frequency of using IWBs in lessons

Figure 5.3 presents the findings of the teachers' frequency of using IWBs in lessons. Approximately 31% of teachers indicated that they sometimes used IWBs in their lessons, followed by about 29% who often used them. However, around 23% of the respondents rarely used IWBs, probably because of the unavailability of this technology in their classrooms. Only 18% of teachers indicated that they had daily use of IWBs in their lessons, suggesting that these teachers were more likely to have IWBs in their classrooms.

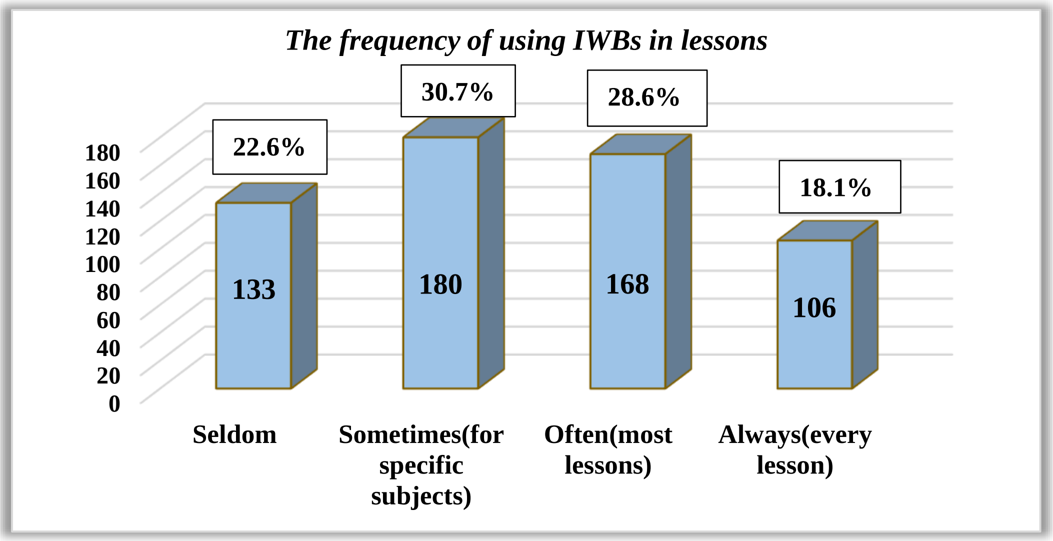

Figure 5.3: The frequency of using IWBs in lessons

c) Using IWB features

Figure 5.4 shows the outcomes of how teachers in *Tatweer* primary schools used IWB features. The results indicate that a high number of respondents (43%) used IWBs with a few interactive features. This was followed by 39% of teachers who employed most of the interactive features in their lessons. However, the lowest percentage of respondents (18) used the IWB as an ordinary white/ blackboard.

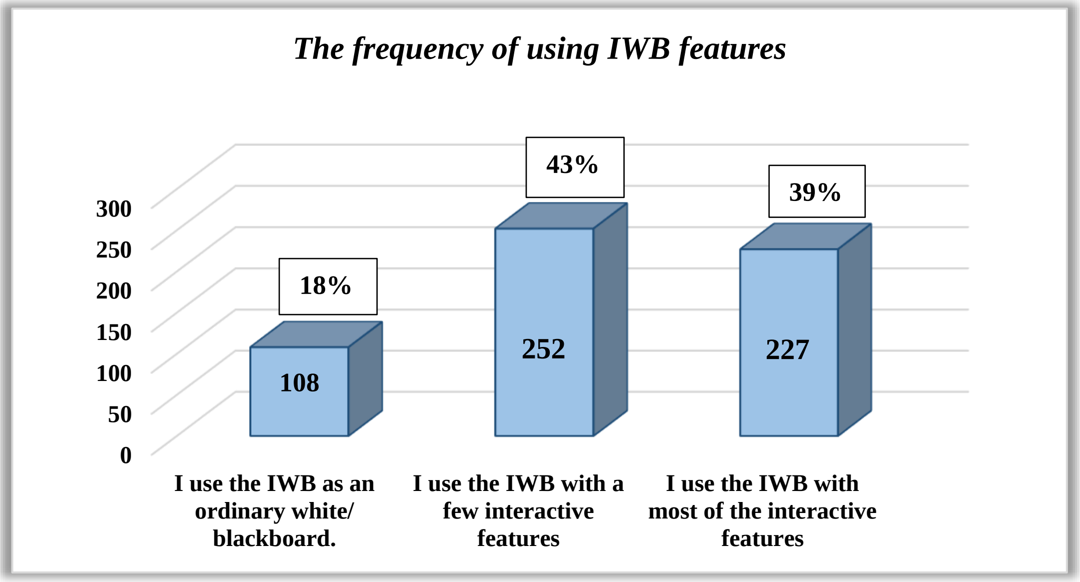

Figure 5.4: Using IWB features

d) Teachers' approaches to using IWBs in classroom

Figure 5.5 shows the methods that teachers in primary *Tatweer* schools followed when using IWBs in the classroom. 43% of these teachers revealed that students occasionally use the IWB in their lessons, while 39% of the teachers indicated that students had frequent use of the IWB. However, 18% of the respondents acknowledged the fact that they were the only users of this technology in their classrooms.

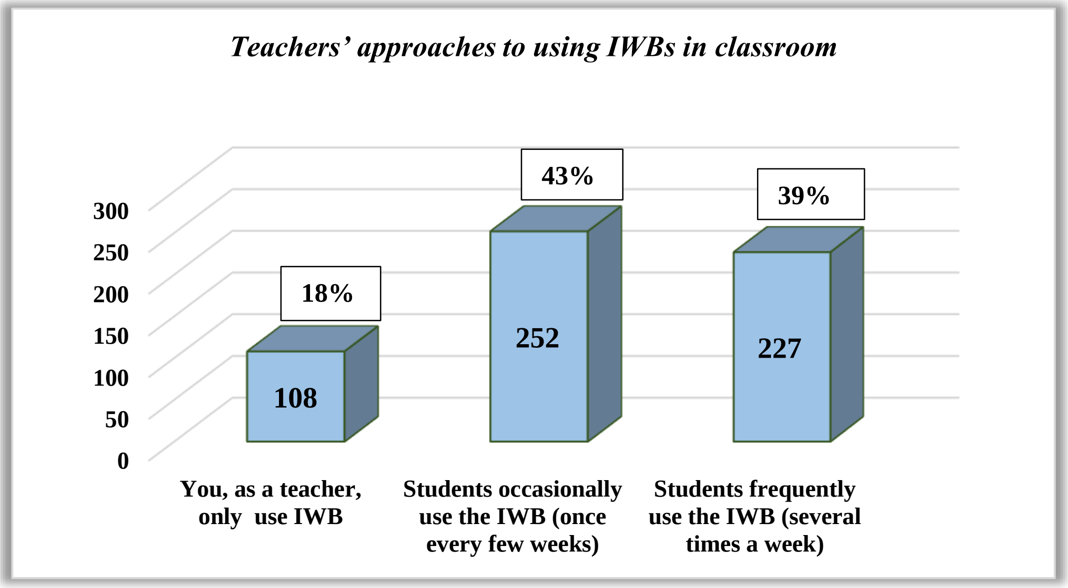

Figure 5.5: Teachers' approaches to using IWBs in classroom

e) Teachers' ability to use IWBs and their tools in lessons

Figure 5.6 presents the views of teachers in *Tatweer* primary schools regarding their own competence in using IWBs in their lessons. Most of the respondents approximately (51%) classified themselves as competent users of IWBs while nearly 41% of the teachers were unable to use IWBs in their lessons. Conversely, only 52 teachers considered themselves expert users of IWBs.

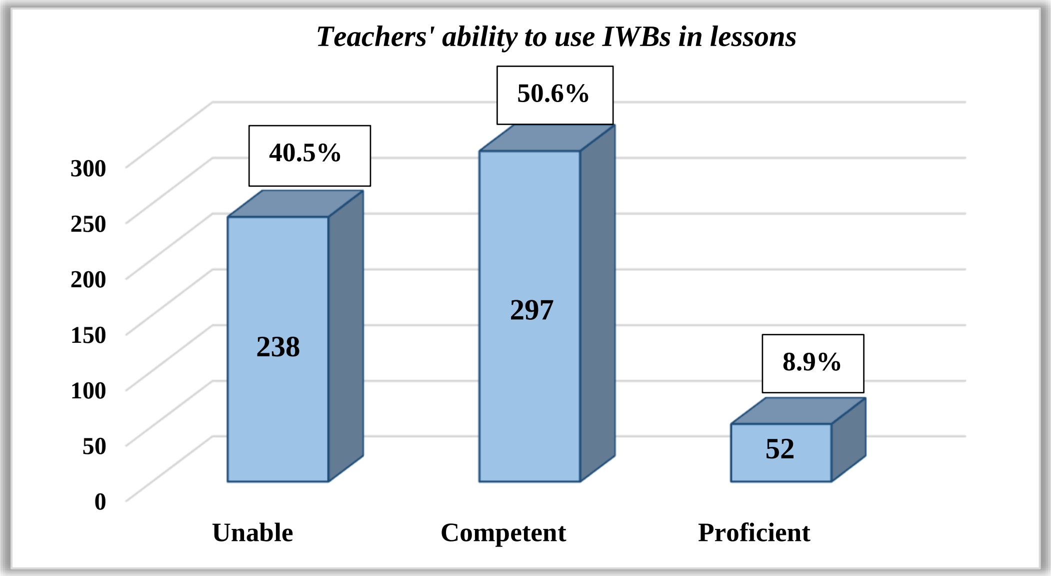

Figure 5.6: Teachers' ability to use IWBs and their tools in lessons

f) The audience

Figure 5.7 indicates the results relating to the audience when teachers in *Tatweer* primary schools use IWBs in their lessons. The majority of teachers (526) revealed that they use IWBs for whole class teaching, followed by 119 teachers who employed these technologies in small groups. In contrast, 46 respondents revealed that they used IWBs with individuals.

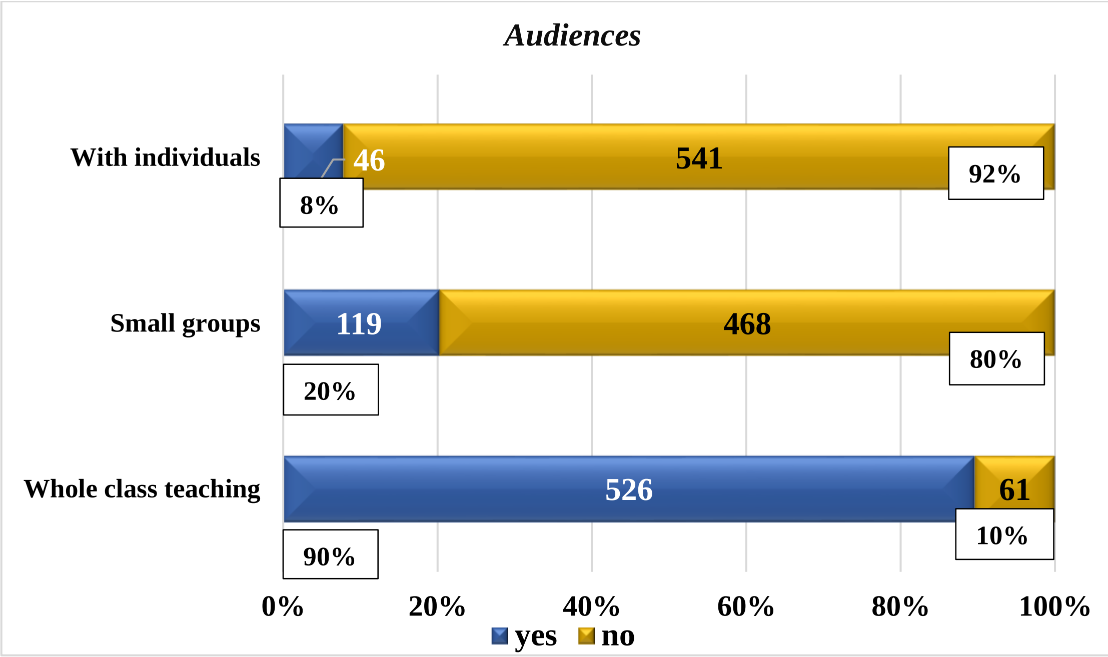

Figure 5.7: The audiences in classrooms when using IWBs

5.5. DIFFICULTIES AND CHALLENGES IN USING IWBs

Figure 5.8 shows the difficulties and challenges that face primary school teachers in *Tatweer* project when using IWBs. Most educators (54%) selected the option of "*Lack of training courses*" as the greatest challenge for them in using IWBs, followed by the option "*Technical problems when using IWBs*", which was chosen by 52% of participants. However, 48% of teachers chose the "*Lack of assistance and support*" option as a serious problem faced when using IWBs in classrooms. 34% of teachers also chose the option of "*Lack of educational resources*". Moreover, 28% of educators revealed that they did not have enough time to design educational resources. More than a quarter of respondents to this questionnaire (27%) indicated that they did not have IWBs in their classrooms. In contrast, "*students find difficulties with IWBs*", "*location of IWBs*", and "*difficulties in integrating IWBs in my teaching lessons*" were classified as the bottom three barriers faced by teachers in the sample when using IWBs.

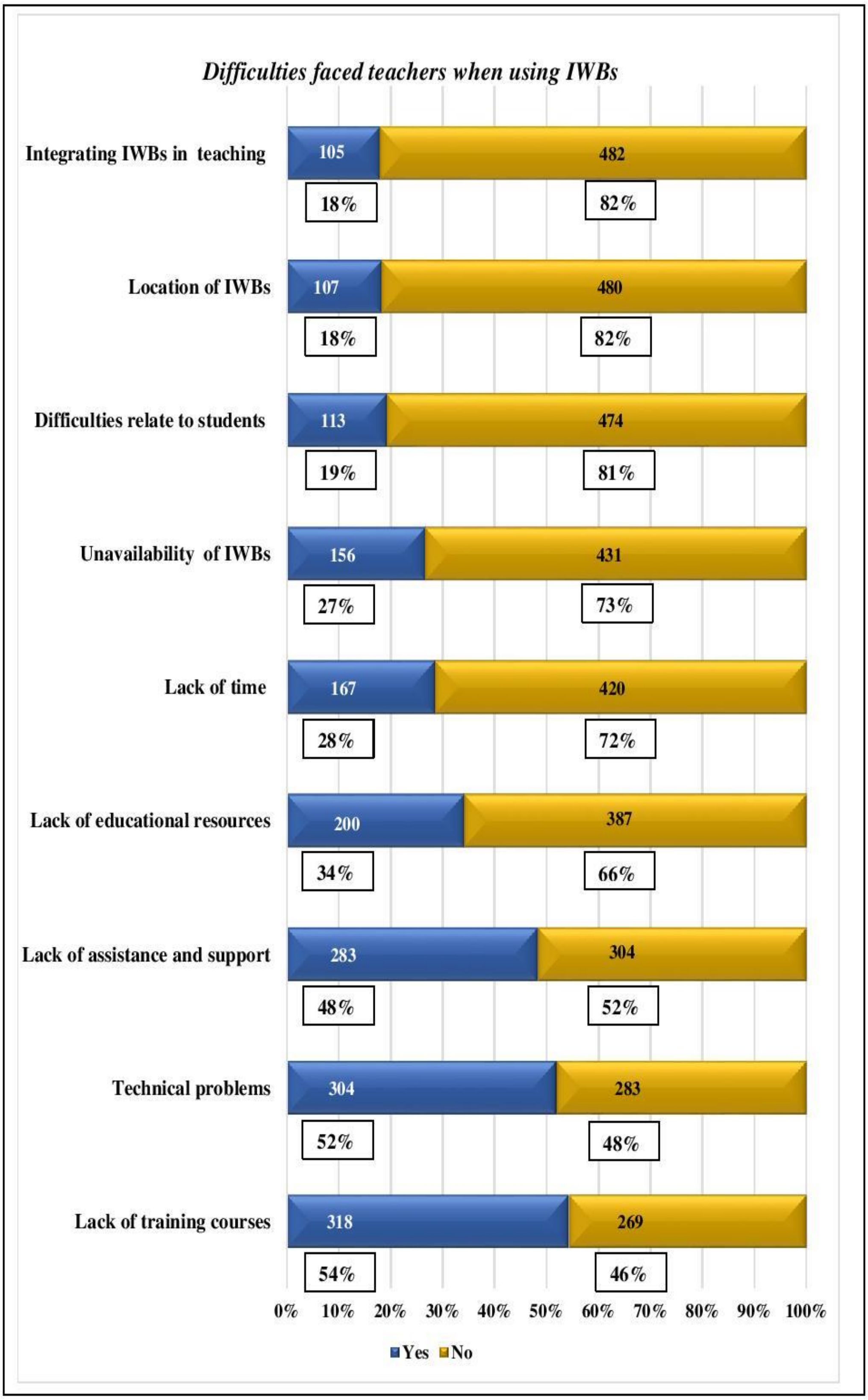

Figure 5.8: Difficulties reported by teachers when using IWBs

5.6. TEACHERS' TRAINING

a) Training Sources

In this section, Saudi teachers were asked to identify their sources of training, and they could select more than one choice based on how they were trained to use IWBs. Figure 5.9 indicates the training sources of teachers in *Tatweer* primary schools in Jeddah. It shows that the majority of teachers approximately (41%) were self-trained followed by nearly 32% who had been trained by their colleagues. Additionally, almost 26% of participants received their training from the education department. However, 15% of the respondents revealed that they did not receive any training, and the lowest percentage around (6%) of teachers were trained by private organizations.

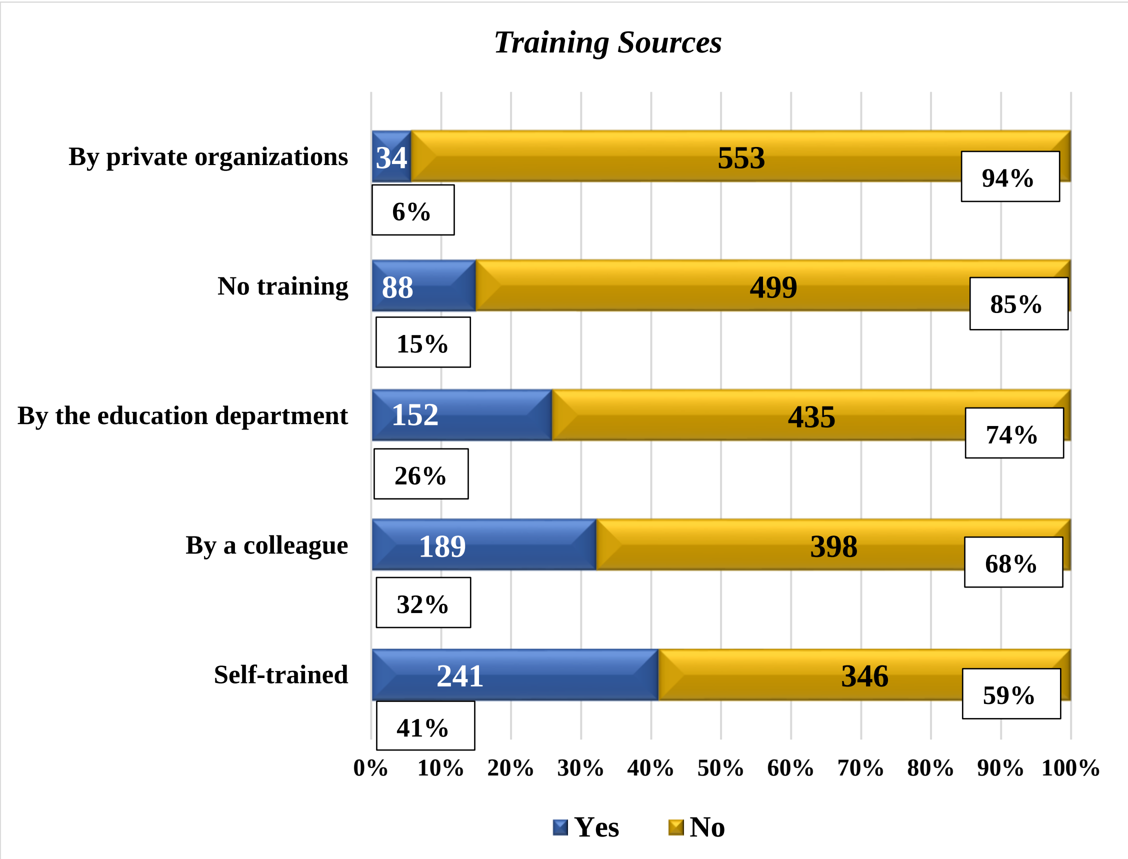

Figure 5.9: Teachers' training sources

b) The number of IWB training courses

Figure 5.10 presents the number of IWB training courses that have been obtained by teachers in primary schools participating in the *Tatweer* project. The majority of these teachers, nearly 60%, did not receive any training courses either from the education department or private organizations. Around 39% of teachers had had between 1-3 training courses. However, only eight teachers (about 1%) had received more than five training courses relating to the use of IWBs.

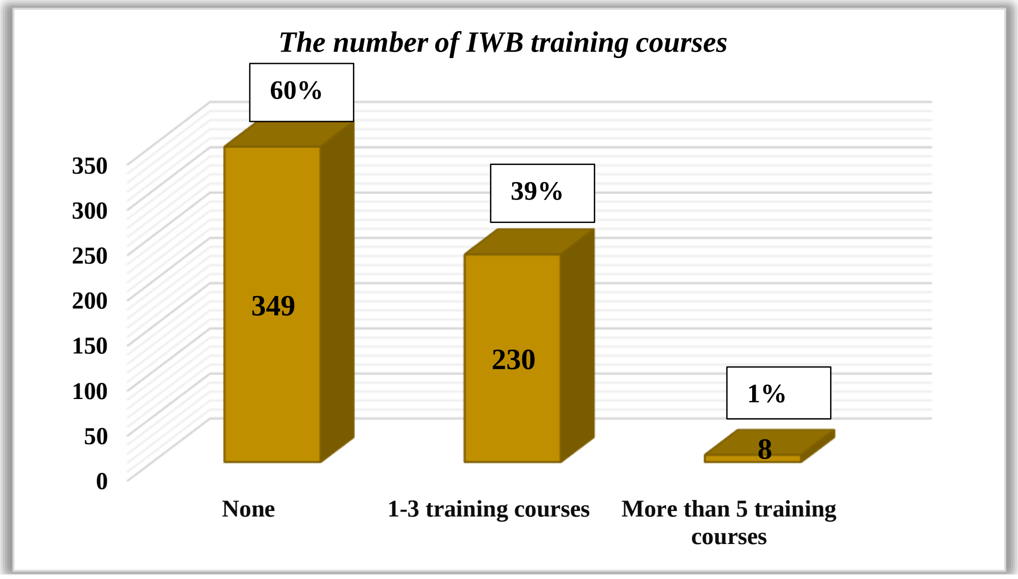

Figure 5.10: The number of IWB training courses

c) Reasons that prevent teachers from attending training courses

Figure 5.11 clarifies the reasons that prevented teachers in *Tatweer* schools in Jeddah from attending training classes regarding the use of IWBs in classrooms. Remarkably, the unavailability of IWB training courses was chosen by most teachers (52%), while the rest of the reasons had a very small percentage. Thus, this section gives a clear picture of the acceptance of most teachers in *Tatweer* schools to attend training courses and their belief about the importance of these courses in improving their teaching. However, the skills of these teachers had been negatively affected because IWB training courses were not available.

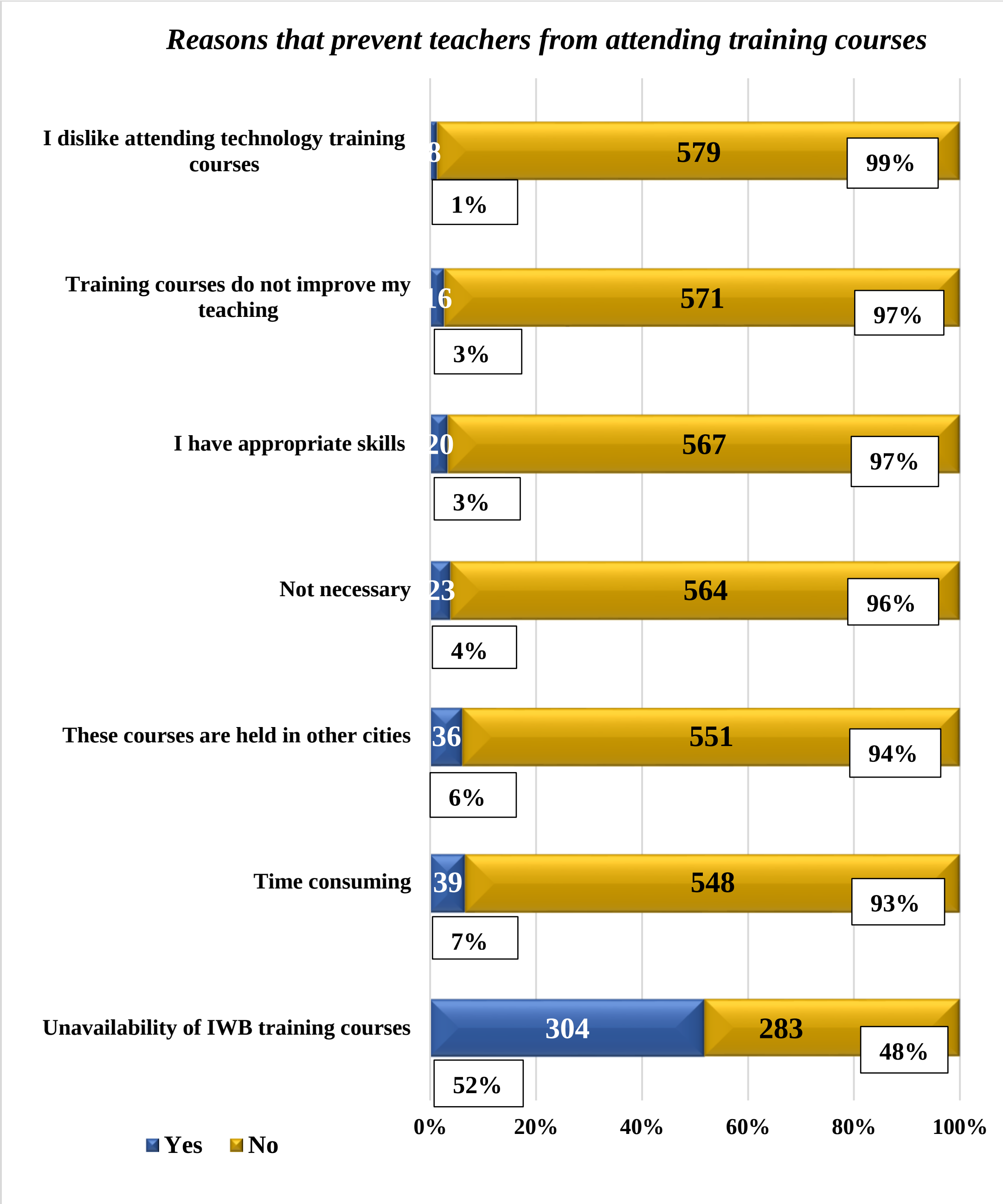

Figure 5.11: Teachers' reasons for not attending training courses

d) Teachers' satisfaction towards the training they have received

Figure 5.12 shows teachers' appreciation of the level of training they had received. A large portion of teachers (57%) in the sample were neutral about showing their satisfaction towards their level of training, while around 22% of them were satisfied with their level of training. A further nearly 10% were very satisfied. However, approximately 11% of the respondents were dissatisfied with the level of training they had received.

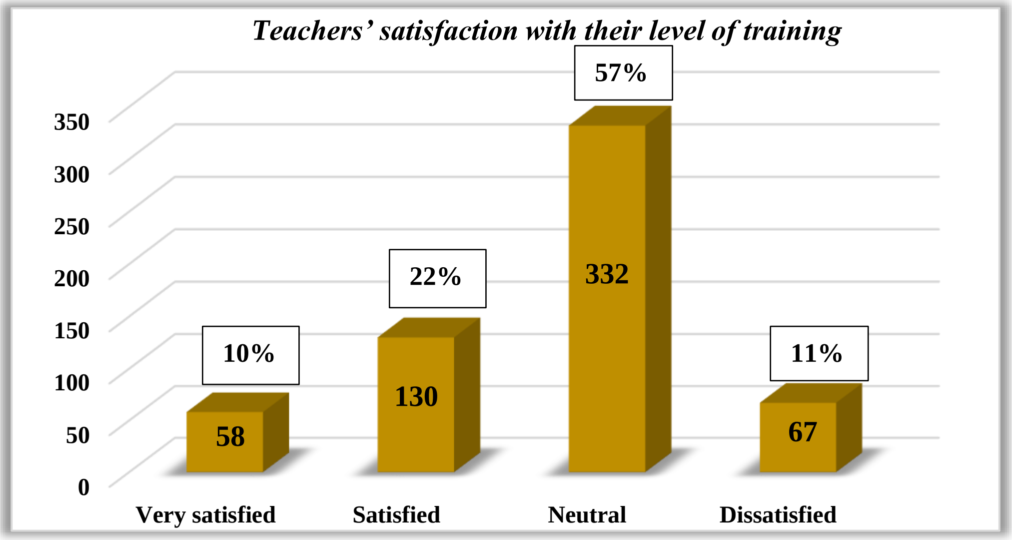

Figure 5.12: Teachers' satisfaction with their level of training

e) Teachers' answers regarding receiving the assistance when using IWBs

Figure 5.13 presents teachers' replies to the availability of assistance in their schools. The majority of respondents, approximately 49%, indicated that they were sometimes given assistance, while almost 24% of teachers revealed that this rarely occurred. Only 14% of teachers always received help. In contrast, nearly 13% of teachers had never been provided with any assistance when problems occurred. Thus, these findings indicated that there was a lack of assistance in these *Tatweer* primary schools, which is considered a serious problem faced by teachers and, therefore, their use of IWBs was affected.

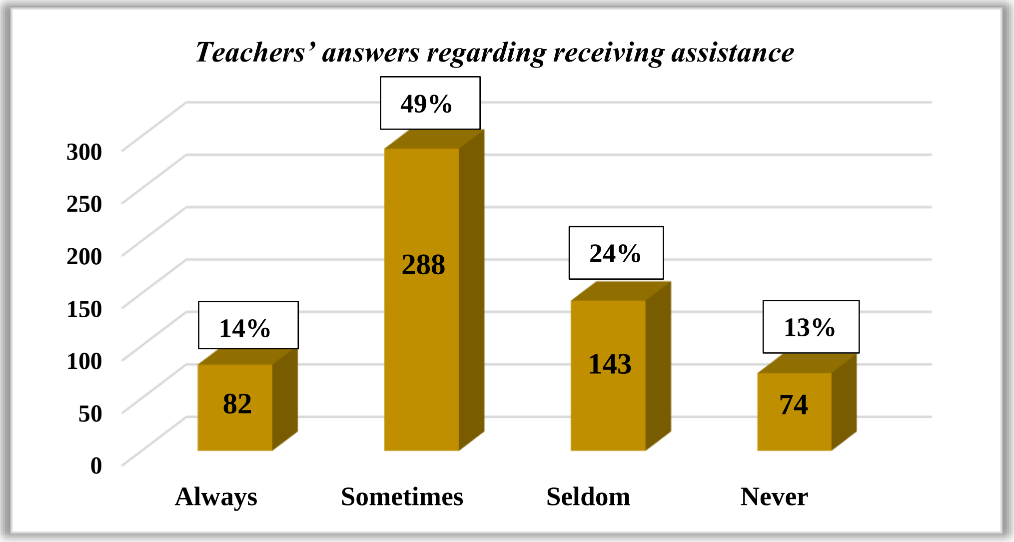

Figure 5.13: Receiving assistance when using IWBs

f) Teachers' answers regarding the need for further training in using IWBs

Figure 5.14 shows the responses of teachers in *Tatweer* primary schools when asking them about their needs for further training in using IWBs. Most teachers in the sample (55%) responded that they comprehensively need further training on the use of IWBs, while 40% of teachers said they had little need for training. Nevertheless, a small percentage (5%) of teachers revealed that they did not need any more training, indicating that these teachers were proficient teachers in using this technology.

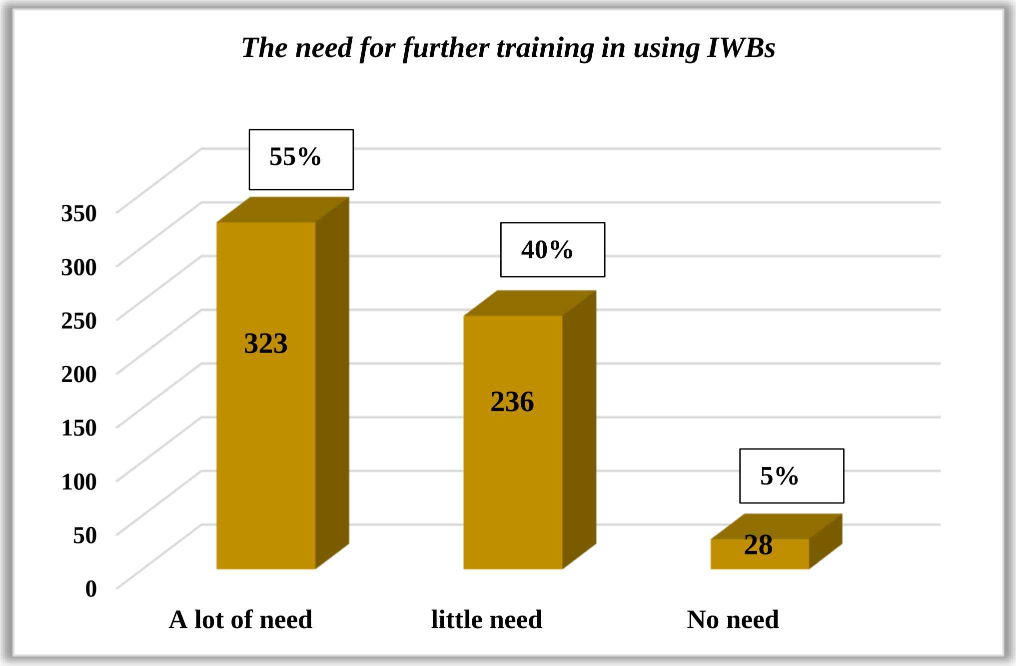

Figure 5.14: The need for further training

g) Teachers' answers relating to the types of training they thought they need to be effective users of IWBs

Figure 5.15 clarifies the type of training chosen by teachers in *Tatweer* primary schools for the best and most efficient use of IWBs in classrooms. The option of "*Technical skills in the use of IWBs"* was chosen by the majority of teachers approximately (66%). In contrast, the "*effective teaching techniques by using IWBs*" option was presented by nearly 56% of the participants. Finally, about 47% of educators selected "*designing educational resources compatible with IWBs*" option.

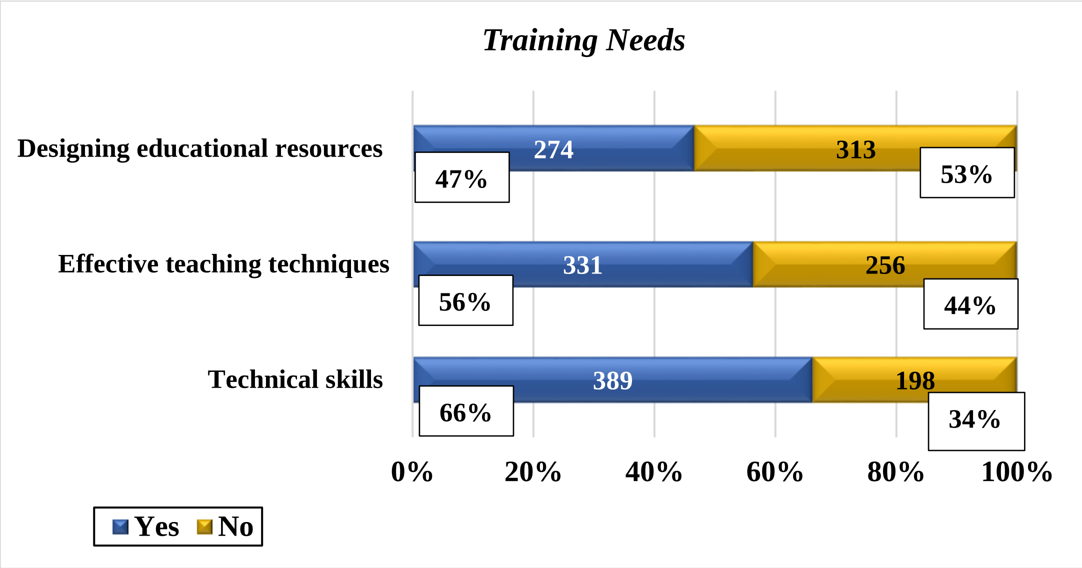

Figure 5.15: Teachers' training needs

h) Teachers' training method preferences

Figure 5.16 presents the training methods most favoured by teachers in the sample. 71% of these teachers preferred to attend training courses and workshops to improve their skills. Followed by approximately 53% of teachers who chose to observe the lessons of skilled educators for their IWB training, while the "*collaboration with colleagues*" option was selected by nearly 36% of educators. Finally, a quarter of respondents (25%) indicated that they need more time for self-training.

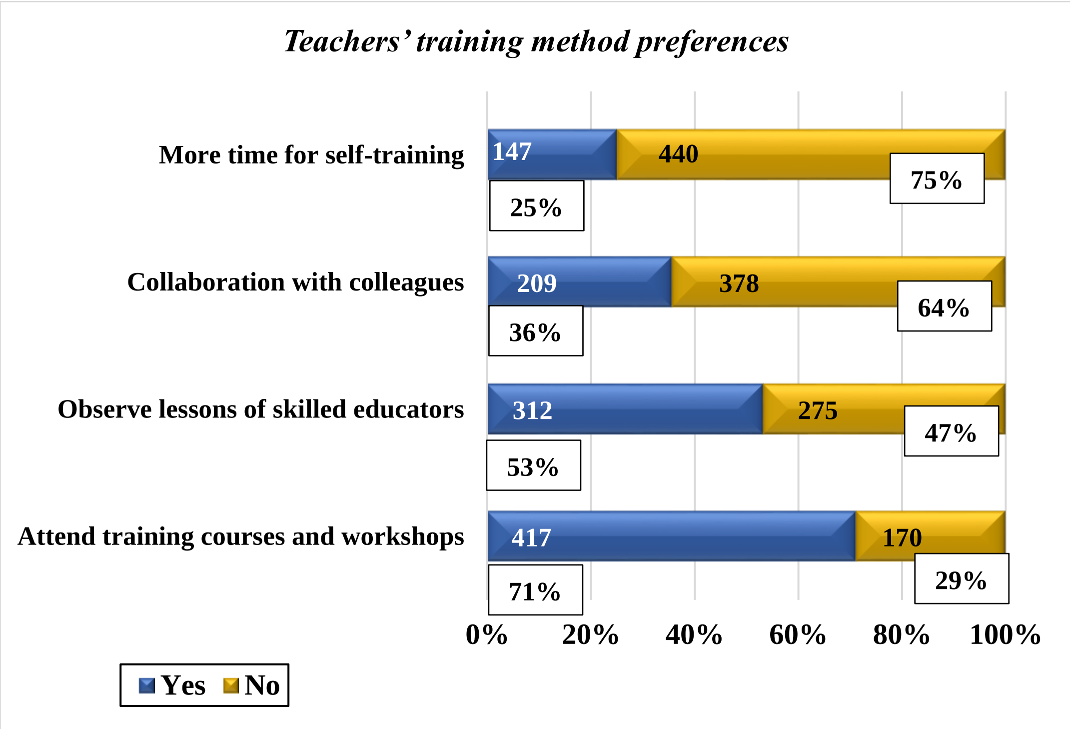

Figure 5.16: Teachers' training method preferences

5.7. ASSOCIATIONS BETWEEN SOME SELECTED VARIABLES

In this section, the associations between selected variables identified in Section 5.1 are examined to help analyse the results and increase understanding of the underlying aims behind teachers' choices. This is to explore the variation in teacher level, attitudes, experience, training, and gender. Two types of tests (Chi-Square and Fisher's exact), which were discussed previously in Section 5.1, were used to explore whether or not these relationships are significant. All the outputs related to the Chi-square and Fisher's exact tests can be found in Appendix 14.

5.7.1. The Frequent Use of IWBs and their Locations

The results gained from cross-tabulation of the frequent use of IWBs and their location are discussed separately in this section. With regard to classrooms and resource rooms, Chi-square scores were [$\chi2$ (3, N=587) =52.39, $p<0.001$] and [$\chi2$ (3, N=587) =56.05, $p<0.001$], respectively. Therefore, highly significant associations were indicated between the frequent use of IWBs on the one hand, and their location in classrooms and resource rooms on the other, at 0.001 level of significance. Moreover, no single cell had a count less than five, showing a reliability of this statistical test, and hence there was no need for further testing. Consequently, the alternative hypothesis of the existence of associations between the frequent use of IWBs and their location should be accepted, with a risk of making a Type I error (the possibility of providing false positive associations). Type I error means the risk of rejecting the null hypothesis when it should be confirmed (Bryman, 2008, p. 334). These significant relationships could clarify the importance of the existence of IWBs in either classrooms or resource rooms to determine the frequent use of these technologies. Teachers tend to use IWBs daily when they are placed in each classroom. Similarly, when these technologies are also placed in resource rooms, the teachers working there tend to employ them in their lessons constantly.

However, there was no significant association between the frequent use of IWBs in lessons and their location in laboratories because the value of chi-square was [$\chi2$ (3, N=587) =3.40, p= 0.33]. Thus, the alternative hypothesis of an association between the frequent use of IWBs and their location in laboratories should be rejected, with a risk of making a Type II error (the possibility of providing false negative associations). Type II error means the risk of confirming the null hypothesis when it should be rejected (Bryman, 2008, p. 334). It might be suggested that when IWBs are placed in laboratories, their use could not be constant in each lesson, because teachers in laboratories, such as science teachers (17%) in the sample (see Table 5.1), possibly prefer to focus on practical experiences during lessons more than showing these lessons on the board.

However, a cross tabulation between the frequent use of IWBs and their location in other places, which were libraries in the current study based on the responses of the participants, indicated that the value of chi-square was [$\chi2$ (3, N=587) =11.51, *p*=0.01]. Therefore, a significant association was shown. Nevertheless, this cross-tabulation contains four cells (50.0%) that were expected to count less than five. This could result in adding an element of unreliability to this statistical test. Consequently, Fisher's Exact Test [$\chi2$ =11.29; *p*= 0.003] was run here to ensure the significance of this relationship, indicating that this association was also statistically significant. As a result, the alternative hypothesis of an association between these two variables should be accepted. Indeed, this might suggest the importance of placing IWBs in libraries to enhance the daily use of these technologies, where teachers or the librarians need to visit websites and databases, as well as organise their work using IWB applications. In other words, if IWBs are located in libraries they will be probably used frequently.

5.7.2. Experience in Using IWBs

5.7.2.1. Experience in Using IWBs and Frequency of Use

The value of Chi-square between the experience of teachers in using IWBs and their frequency of use was [$\chi2$ (6, N=587) =211.23, *p*<0.001]. This value indicated an extremely significant association between the two variables at the level of 0.001 significance. Consequently, this association may suggest that the frequency of use of IWBs might be affected by Saudi educators' experience in using IWBs, suggesting that the more experience the teachers had of using IWBs, the more frequent their use of these technologies.

5.7.2.2. Experience in using IWBs and their Interactive Features

A highly statistically significant association between experience in using IWBs and the use of IWB features at the 0.001 level because of Chi-square was [$\chi2$ (4, N=587) =150.96, *p*<0.001]. Thus, there was a significant difference between expert and novice teachers in applying IWB features in this study, confirming that teachers with more experience in using IWBs tended to be more frequent users of the interactive features in their lessons.

5.7.2.3. Teachers' Experience in Using IWBs and their Competence

Chi-square was [$\chi2$ (4, N=587) =12.09, *p*= 0.02], indicating a significant association between those two variables at the level of 0.05. Conversely, this cross-tabulation involves one cell (11%) which was expected to count less than five. Therefore, Fisher's exact test as an additional test was applied in this case. This association was also significant [$\chi2$=12.18; p=0.01], indicating that skilled educators were possibly more able for active use of IWBs while novice teachers were less competent.

5.7.2.4. Experience in Using IWBs and the Need for Further Training

Chi-square was [$\chi2$ (4, N=587) =53.12, p<0.001] through a cross tabulation between teachers' experience in using IWBs and their need for further training. This demonstrates a highly significant association between these two variables at the 0.001 level. However, one cell (11%) was expected to count less than five. Therefore, Fisher's exact test [$\chi2$=54.16; p<0.001] was also run, showing that this association was still highly significant. Consequently, this indicates that beginner teachers in the sample often required more training in using IWBs, while skilled teachers were less keen to acquire more training.

5.7.3. Teachers' Use of IWBs and their Attitude towards Using these Technologies

As mentioned earlier in Section 3.4.2, according to Hodge and Anderson (2007), two essential elements should be considered to increase the effectiveness of teaching when using IWBs. These elements are the length and the frequency of using of IWBs. Hence, Chi-Square and Fisher's exact tests were used to examine how teachers' attitude towards IWBs associates with both variables *the experience in using IWBs* and *the frequent use of them*. Therefore, two phases should be undertaken to clarify the relationship between the use of IWBs and the attitudes.

5.7.3.1. The Frequent Use of IWBs and Teachers' Attitude

When conducting a cross tabulation between teachers' attitude towards using IWBs and the frequency of using them, the Pearson Chi-Square was [$\chi2$ (3, N=587) =11.63, p=0.01], indicating a significant association at the 0.05 level. The significant relationship suggests that teachers with positive attitudes towards using IWBs tended to report that they used IWBs more frequently than those teachers with less positive views.

5.7.3.2. The Experience in Using IWBs and Teachers' Attitude

The value of Chi-square between the experience in using IWBs and teachers' attitude towards using them was [$\chi2$ (2, N=587) =4.70, p=0.10]. Therefore, there is a non-significant relationship between these two variables at the level of 0.05. However, one cell was expected to count less than five. Therefore, a further test was applied in this case to undertake this association. Fisher's exact value was [$\chi2$=5.44; p=0.06], indicating that the result was similarly non-significant. Thus, there was no major difference between beginner and expert teachers in terms of their positive views about using IWBs in their lessons. As indicated formerly (see Table 5.4), the majority of teachers within the sample (89%) had positive views about using IWBs in their lessons.

Accordingly, from the previous associations (5.7.3.1) and (5.7.3.2), the attitude of teachers in *Tatweer* primary schools towards using IWBs affected their frequent use of IWBs, whereas these attitudes were not influenced by the experience of teachers in using IWBs.

5.7.4. Teachers' Training

5.7.4.1. Untrained Teachers and their IWB Competence

A cross-tabulation between untrained teachers and their ability to use IWBs indicated a highly significant association at the level of 0.001, where Chi-square was [$\chi2$ (2, N=587) =43.85, p<0.001]. Thus, it could be stated that untrained teachers reported they were less able to use these technologies effectively. This is confirmed in Table 5.6, where 63 teachers classified themselves as unable to use IWBs, compared with 25 competent users. None of the untrained teachers described their use of IWBs as proficient, indicating that their responses were reliable.

Table 5.6: Untrained teachers and their IWB competence

		No training		Total
		No	**Yes**	
The ability to use IWBs	Unable	175	63	238
	Competent	272	25	297
	Proficient	52	0	52
Total		499	88	587

5.7.4.2. Untrained Teachers and their Use of Interactive Features

Chi-square between the two elements, untrained teachers, and their use of IWB features in lessons, was [$\chi2$ (2, N=587) =40.38, p<0.001]. Therefore, an extremely significant association was identified between these two elements (at the 0.001 level). This suggests that the untrained teachers were rarely using IWB features in their lessons or only used a few of these functions.

5.7.4.3. Untrained Teachers and their Approach to Using IWBs in Classrooms

The value of Chi-Square between untrained teachers and their approach to using IWBs in classrooms was [$\chi2$ (2, N=587) =40.38, p<0.001], showing a highly significant association at the level of 0.001. Consequently, it might be suggested that these untrained teachers tended to report more use of IWBs in classrooms than their students.

5.7.4.4. The Number of IWB Training Courses and Using IWB Features

The findings of a cross-tabulation of the number of IWB training courses that were obtained by teachers and their use of IWB features revealed that Chi-square was [$\chi 2$ (4, N=587) =50.77, p<0.001]. This confirms that there is a highly significant association in this case at the level of 0.001. However, there were three cells (33.3%) with an expected count of less than five, and therefore, Fisher's exact test [$\chi 2$=52.62; p<0.001] was also employed. The p-value was also highly significant at the level of 0.001. Based on these findings, the more IWB training courses had been undertaken, the greater the use of IWB features.

5.7.4.5. The Number of IWB Training Courses and Teachers' Satisfaction

A cross-tabulation of the number of IWB training courses obtained by teachers and their satisfaction with their level of training indicated a highly significant association at the 0.001 level, where the Pearson Chi-Square was [$\chi 2$ (6, N=587) =602. 84, p<0.001]. However, four cells (33.3%) had an expected count of less than five, which could add an element of unreliability for this statistical test. Therefore, Fisher's exact test [$\chi 2$=709.60; p<0.001] was also run, confirming an incredibly significant association between these variables. Consequently, this suggests that teachers with a greater number of IWB training courses tended to be more satisfied with their level of training.

5.7.5. Teachers' Gender

5.7.5.1. Teachers' Gender and their Attitude towards Using IWBs

The findings of conducting Chi-square test between teachers' gender and their attitudes towards using IWBs in both the teaching and student learning was [$\chi 2$ (1, N=587) =2.38, p=0.12], demonstrating that this association was not significant at the 0.05 level because the value of p was greater than 0.05. Consequently, this suggests that there was no difference between male and female teachers in terms of their attitudes towards using IWBs in both the teaching and learning processes. Table 5.7 shows that 87% of male teachers had positive views about the usefulness of using IWBs in teaching and student learning, compared with 91% of female teachers, indicating no difference in this case relating to gender.

Table 5.7: Teachers' gender and their attitude towards using IWBs

		Teachers' attitudes towards using IWBs in both the teaching and student learning		Total
		Agree	**Disagree**	
Gender	**Male**	249	37	286
	Female	274	27	301
Total		523	64	587

5.7.5.2. Teachers' Gender and their Use of IWBs

a) The frequent use of IWBs

The value of Chi-square between teachers' gender and their frequent use of IWBs in lessons was [$\chi2$ (3, N=587) =21.82, p<0.001], presenting a highly significant association between these two elements at the level of 0.001. Thus, this high association could indicate that there was a difference between male and female teachers in the current study relating to the frequent use of IWBs in classrooms. According to Table 5.8, the percentage of female teachers (23%) who always used IWBs was more than male teachers approximately (13%). However, the percentage of male teachers (24%) who rarely used IWBs in their lessons was greater than female teachers (nearly 21%). Overall, female teachers reported more frequent use of IWBs than male teachers.

Table 5.8: Teachers' gender and their frequent use of IWBs in lessons

		The frequent use of IWBs in lessons				Total
		Seldom	**Sometimes (Specific Subjects)**	**Often (Most Lessons)**	**Always (Every Lesson)**	
Gender	**Male**	70	78	102	36	286
	Female	63	102	66	70	301
Total		133	180	168	106	587

b) The experience in using IWBs

The Chi-square between teachers' gender and their experience in using IWBs was [$\chi2$ (2, N=587) =25.32, p<0.001], which indicated a highly significant association at the level of 0.001. Hence, this might confirm the suggestion of a significant difference between male and female teachers relating to their experience in using IWBs. Based on Table 5.9, the percentage of female teachers (nearly 48%) who had less than one year of experience was greater than male teachers (37%). Additionally, there was a similarity between the percentage of males and females in terms of one to five years of experience. However, the proportion of male teachers (10%) who had more than five years of experience was greater than females (1%), indicating that male teachers reported more experience in using IWBs in this study.

Table 5.9: Teachers' gender and their experience of using IWBs

		The experience of using IWBs			Total
		Less than one year	1-5 years	More than five years	
Gender	Male	106	150	30	286
	Female	144	153	4	301
Total		250	303	34	587

c) The use of IWB features

A highly significant association appeared between teachers' gender and their use of IWB features, where Chi-square was [$\chi 2$ (2, N=587) =18.60, $p<0.001$], revealing that the use of IWB features was significantly different between male and female teachers. As indicated in Table 5.10, female teachers, nearly 21%, used the IWB, as an ordinary white/blackboard or with a few interactive features, more than male teachers (16%). Conversely, male teachers approximately (48%) reported more use of the IWB interactive features than females (30%).

Table 5.10: Teachers' gender and their use of IWB features

		How do you usually use IWB features?			Total
		I use the IWB as an ordinary white/ blackboard.	I use the IWB with a few interactive features	I use the IWB with most of the interactive features	
Gender	Male	46	104	136	286
	Female	62	148	91	301
Total		108	252	227	587

d) The ability to use IWBs in lessons

Teachers' gender and their ability associated significantly at the level of 0.05; the Chi-square was [$\chi 2$ (2, N=587) =7.89, p=0.02]. Therefore, this suggests that teachers' capacity to use IWBs was different between male and female teachers in the current study. According to Table 5.11, and within the sample, the percentage of female teachers (approximately 42%) who classified themselves as unable to use IWBs was more than male teachers (39%). In contrast, the percentage of male teachers (12%) who described their use of IWBs as proficient was greater than female teachers (nearly 6%).

Table 5.11: Teachers' gender and their ability to use IWBs

		The ability to use IWBs and their tools in lessons			Total
		Unable	**Competent**	**Proficient**	
Gender	**Male**	112	139	35	286
	Female	126	158	17	301
Total		238	297	52	587

e) Teachers' approach to using IWBs in classrooms

There was a highly significant association between teachers' gender and their approach to using IWBs in classrooms at the 0.001 level of significance, where Chi-square was [$\chi 2$ (2, N=587) =18.60, p<0.001]. Thus, this might suggest that teachers' approach to using IWBs in this study differed based on their gender. In the current study, as shown in Table 5.12, female teachers (about 21%) were more frequent users of IWBs in classrooms than their students, compared with male teachers (16%). Consequently, male teachers (approximately 48%) reported that they allowed their students to frequently use the board more than females (30%).

Table 5.12: Teachers' gender and their approach to using IWBs in classrooms

		Which of the following describes the use of IWBs in your classroom?			Total
		You, as a teacher, only use IWB	**Students occasionally use the IWB (Once every few weeks)**	**Students frequently use the IWB (Several times a week)**	
Gender	**Male**	46	104	136	286
	Female	62	148	91	301
Total		108	252	227	587

5.7.5.3. Teachers' Gender and their Training

a) The number of IWB training courses

The value of Chi-square between teachers' gender and the number of the received of IWB training courses was [$\chi 2$ (2, N=587) =4.18, p=0.12], demonstrating that there was a non-significant association between these two variables at the level of 0.05 of significance. However, there were two cells (33.3%) with an expected count of less than five, and therefore Fisher's exact test [$\chi 2$=4.23; p=0.13] was also run. Hence, there was no difference between female and male teachers in this study in terms of the number of IWB training courses they had received. Table 5.13 indicates that 35% of male teachers had received 1-3 training courses, compared with 43% of females. In contrast, there was equality between the genders (1%) regarding receiving more than five training courses.

Table 5.13: Teachers' gender and the number of the received IWB training courses

		How many IWB training courses have you received?			Total
		None	1-3	More than 5	
Gender	**Male**	182	100	4	286
	Female	167	130	4	301
Total		349	230	8	587

b) The need for further training

Chi-square through a cross tabulation between teachers' gender and the need for further training was [$\chi2$ (2, N=587) =10.36, p=0.01], indicating that there was a significant association between these two elements at the level of 0.05 of significance. Consequently, this means that teachers' need for further training was different between male and female teachers.

Table 5.14 clarifies that a small percentage of both genders, 6% males and 4% females, indicated that they did not need any more training courses. However, female teachers (61%) reported a greater need for further training than males (48%). This could be explained by what was found before, in that male teachers, based on their responses, were more experienced in using IWBs (see Table 5.9), used more IWB interactive features (see Table 5.10), and were more competent in using this technology (see Table 5.11). Therefore, they were less demanding of further training programmes than females.

Table 5.14: Teachers' gender and their need for further training

		Do you need further training in using IWBs?			Total
		Significant need	Low need	No need	
Gender	**Male**	138	132	16	286
	Female	185	104	12	301
Total		323	236	28	587

5.7.5.4. Teachers' Gender and their Training Needs

a) Technical skills in the use of IWB

There was a non-significant association at the 0.05 level between teachers' gender and their choice of technical skills in the use of IWB because Chi-square was [$\chi2$ (1, N=587) =2.22, p=0.14]. Thus, there was no significant difference between male and female teachers concerning their needs for technical training skills courses for IWBs. Table 5.15 indicates that 389 Saudi teachers from both genders chose technical skills in the use of IWBs, and therefore most teachers from both genders (63% of males and 69% of females) strongly expressed their desire to obtain training in IWB technical skills.

Table 5.15: Teachers' gender and their choice of technical skills in the use of IWBs

		Technical skills in the use of IWBs		Total
		No	Yes	
Gender	Male	105	181	286
	Female	93	208	301
Total		198	389	587

b) *Effective teaching techniques using IWBs*

A cross tabulation between teachers' gender and their choice of effective teaching methods by using IWBs indicated that Chi-square was [$\chi 2$ (1, N=587) =9.26, p=0.002]. Therefore, there was a significant association between these two factors, suggesting that there was a significant difference between males and females regarding their reported need for training courses in relation to effective teaching techniques using IWBs. As indicated in Table 5.16, 331 teachers from both genders selected training in effective teaching techniques using IWBs. Thus, female teachers (57%) reported a greater need for improving their skills in this type of training course than males (43%).

Table 5.16: Teachers' gender and the effective teaching techniques using IWBs

		Effective teaching techniques using IWBs		Total
		No	Yes	
Gender	Male	143	143	286
	Female	113	188	301
Total		256	331	587

c) *Designing educational resources compatible with IWBs*

Chi-square between teachers' gender and their choice of developing educational resources compatible with IWBs was [$\chi 2$ (1, N=587) =0.01, p=0.93]. Therefore, this association was non-significant at the level of 0.05 of significance. According to Table 5.17, 274 teachers of both genders indicated that they needed training in designing educational resources compatible with IWBs. Hence, there was no significant difference between male teachers (49%) and females (51%) relating to their need for training focused on designing educational resources compatible with IWBs.

Table 5.17: Teachers' gender and their choice of designing educational resources

		Designing educational resources compatible with IWBs		Total
		No	Yes	
Gender	Male	153	133	286
	Female	160	141	301
Total		313	274	587

5.7.5.5. Teachers' Gender and their Training Method Preferences

a) Attending training courses and workshops

The results of Chi-square [$\chi2$ (1, N=587) =3.20, p=0.07] between teachers' gender and their preference for attending training courses and workshops showed a non-significant association, at the level of 0.05. In other words, as indicated in Table 5.18, the majority of both male (74%) and female teachers (68%) in the sample preferred to attend training courses and workshops to improve their IWB skills. Moreover, 417 teachers from both genders preferred to attend training courses, and consequently, there was no difference between males (51%) and females (49%) with respect to their preference for this type of training method.

Table 5.18: Teachers' gender and their preference for attending training courses

		Attending training courses and workshops		Total
		No	**Yes**	
Gender	**Male**	73	213	286
	Female	97	204	301
Total		170	417	587

b) Observe lessons of skilled educators

Chi-square, through cross-tabulation between teachers' gender and their preference for observing lessons of experienced educators, was [$\chi2$ (1, N=587) =0.00, p=0.998]. Thus, there was a non-significant association between these two elements because the p-value was greater than 0.05. According to Table 5.19, 312 teachers from both genders showed their agreement with observing the lessons of expert educators, as nearly half of the males (49%) and females (51%) preferred to observe skilled teachers during their lessons to improve their IWB use. This means that there was no significant difference between them with regards to observing the lessons of skilled educators.

Table 5.19: Teachers' gender and their preference for observing lessons

		Observe lessons of skilled educators		Total
		No	**Yes**	
Gender	**Male**	134	152	286
	Female	141	160	301
Total		275	312	587

c) Collaboration with colleagues

Chi-square was [$\chi2$ (1, N=587) =0.44, p= 0.51], through a cross tabulation between teachers' gender and their preference for collaborating with colleagues, indicating no significant differences between these two variables at the level of 0.05 significance. From Table 5.20, 209 teachers from both genders indicated their preference for collaborating with colleagues, and accordingly, there was no difference between males (47%) and females (53%) in the current study with respect to their preference for cooperating with their colleagues to develop their ability to use IWBs.

Table 5.20: Teachers' gender and their preference for collaboration with colleagues

		Collaboration with colleagues		Total
		No	**Yes**	
Gender	**Male**	188	98	286
	Female	190	111	301
Total		378	209	587

d) More time for self-training

Teachers' gender and their preference for self-training presented a significant association at the level of 0.05, where Chi-square was [$\chi2$ (1, N=587) =6.74, *p*=0.01]. Thus, it might be suggested that there was a difference between male teachers and females regarding their preference for self-training to improve their IWB skills. According to Table 5.21, 147 teachers from both genders revealed that they were in agreement with self-training to develop their competence when using IWBs. As a result, female teachers (61%) were considerably more than males (39%) in preferring self-training to develop their abilities to use IWBs.

Table 5.21: Teachers' gender and their preference for self-training

		More time for self-training		Total
		No	**Yes**	
Gender	**Male**	228	58	286
	Female	212	89	301
Total		440	147	587

5.8. SUMMARY OF THE CHAPTER

a) A summary of the quantitative results regarding the four main dimensions of the questionnaire (teachers' attitudes, their use of IWBs, difficulties when using IWBs, and their training)

Table 5.22: A summary of the results of the four main dimensions of the questionnaire

		N	The Majority of Teachers		The Rest of Teachers	
Attitudes	Teachers' attitudes towards using IWBs in both the teaching and students' learning	587	89%	Positive	11%	Negative
The Use of IWBs	The experience of using IWBs (M=1.63, SD=0. 59)	587	51.6%	1-5 years	42.6 %	Less than one year
					5.8%	More than five years
	The frequency of use of IWBs in lessons (M=2.42, SD=1.03)	587	31%	Sometimes	23%	Seldom
					29%	Often
					18%	Always
	Using IWB features (M=2.20, SD=0.73)	587	43%	a few interactive features	18%	use the IWB as an ordinary white/ blackboard
					39%	use the IWB with most of the interactive features
	Teachers' approaches that describe the use of IWB in classroom (M=2.20, SD=0.73)	587	43%	Students occasionally use the IWB	18%	Teachers only use IWBs
					39%	Students frequently use the IWB
	The ability to use IWB and its tools in lessons (M=1.68, SD=0. 63)	587	51%	Competent	41%	Unable
					9%	Proficient
	Audiences	587	90%	Whole class teaching (M=0.90, SD=0.31)	20%	Small groups (M=0.20, SD=0.40)
					8%	With individuals (M=0.08, SD=0.27)
Difficulties	Difficulties and challenges in using IWBs	587	54%	Lack of training courses (M=0. 54, SD=0. 50)	34%	Lack of educational resources (M=0. 34, SD=0. 47)
					28%	Lack of time for designing educational resources (M=0. 28, SD=0. 45)
			52%	Technical problems when using IWBs (M=0. 52, SD=0. 50)	27%	Unavailability of IWBs (M=0. 27, SD=0. 44)
					19%	Students find difficulties with IWBs (M=0. 19, SD=0. 39)
			48%	Lack of assistance and support (M=0. 48, SD=0. 50)	18%	Location of IWBs (M=0. 18, SD=0. 39)
					18%	Difficulties in integrating IWBs in lessons (M=0. 18, SD=0. 38)

(Continued)

<u>Table 5.22(continued): A summary of the results of the four main dimensions of the questionnaire</u>

		N	The Majority of Teachers		The Rest of Teachers	
Teachers' Training	Training sources	587	41%	Self-trained (*M=0.41, SD=0.49*)	32%	By a colleague (*M=0.32, SD=0.47*)
					26%	By the education department (*M=0.26, SD=0.44*)
					15%	No training (*M=0.15, SD=0.36*)
					6%	By private organizations (*M=0.06, SD=0.23*)
	The received IWB training courses	587	60%	Had not received any training courses	39%	1-3 training courses
					1%	More than 5
	Reasons that prevent Saudi teachers from attending training courses	587	52%	Unavailability of IWB training courses	7%	Attending training courses are time-consuming
					6%	These courses are held in other cities
					4%	IWB training courses are not necessary
					3%	I have appropriate skills in using IWBs
					3%	IWB training courses do not improve my teaching
					1%	I dislike attending courses that relate to technology use
	Saudi teachers' satisfaction towards the level of training they have received	587	57%	Neutral	10%	Very satisfied
					22%	Satisfied
					11%	Dissatisfied
	Receiving assistance when using IWBs	587	49%	Sometimes	14%	Always
					24%	Seldom
					13%	Never
	The need for further training	587	55%	A lot of needs	40%	little need
					5%	No need
	Teachers' training needs	587	66%	Technical skills in the use of IWB (*M*=0.66, *SD*=0.47)	56%	Effective teaching techniques by using IWB (*M*=0.56, *SD*=0.50)
					47%	Designging educational resources (*M*=0.47, *SD*=0.50)
	Training methods preferences	587	71%	Attend training courses and workshops (*M*=0.71, *SD*=0.45)	53%	Observe lessons of skilled educators (*M*=0.53, *SD*=0.50)
					36%	Collaboration with colleagues (*M*=0.36, *SD*=0.48)
					25%	More time for self-training (*M*=0.25, *SD*=0.43)

b) A summary of the associations indicated between variables in this study

Table 5.23: A summary of the associations indicated between variables in this study

First variable	Second variable	Type of Association	Level of Significance
The frequent use of IWBs in lessons	Location in classrooms	Highly significant [$\chi2$ (3, N=587) =52.39; *p*<0.001]	0.001
	Location in resource rooms	Highly significant [$\chi2$ (3, N=587) =56.05; *p*<0.001]	0.001
	Location in laboratories	Non-significant [$\chi2$ (3, N=587) =3.40; *p*= 0.33].	0.05
	Location in other places (libraries in this study)	Significant [$\chi2$ =11.29; *p*= 0.003]	0.05
	Teachers' attitude towards using IWBs in teaching and learning	Significant [$\chi2$ (3, N=587) =11.63; *p*=0.01]	0.05
Teachers' experience in using IWBs	The frequency of use	Highly significant [$\chi2$ (6, N=587) =211.23; *p*<0.001]	0.001
	Using IWB features	Highly significant [$\chi2$ (4, N=587) =150.96; *p*<0.001]	0.001
	Teachers' competence	Significant [$\chi2$=12.18; *p*= 0.01]	0.05
	The needs for further training	Highly significant [$\chi2$=54.16; *p*<0.001]	0.001
	Teachers' attitude towards using IWBs in teaching and learning	Non-significant [$\chi2$=5.44; *p*=0.06]	0.05
Teachers who had not had any training	Teachers' competence	Highly significant [$\chi2$ (2, N=587) =43.85; *p*<0.001].	0.001
	The use of IWB features	Highly significant [$\chi2$ (2, N=587) =40. 38; *p*<0.001]	0.001
	Teachers' approaches in using IWBs in classrooms	Highly significant [$\chi2$ (2, N=587) =40.38; *p*<0.001].	0.001
The number of IWB training courses	Using IWB features	Highly significant [$\chi2$=52.62; *p*<0.001]	0.001
	Satisfaction with the level of training	Highly significant [$\chi2$=709.60; *p*<0.001]	0.001

Table 5.24: Associations between teachers' gender and some variables

First variable	Second variable		Male	Female	Type of Association	Level of Significance
Teachers' Gender	Attitude	Teachers' attitude towards using IWBs in teaching and learning	87%	91%	Non-significant [χ2 (1, N=587) =2.38; *p*=0.12]	0.05
	IWB Use	The frequency of use	13% Always Use 24% Seldom Use	23% Always Use 21% Seldom Use	Highly significant [χ2 (3, N=587) =21.82; *p*<0.001]	0.001
		Teachers' experience in using an IWB	10% >5 years 37%< 1 year	1% >5 years 48%< 1 year	Highly significant [χ2 (2, N=587) =25.32; *p*<0.001]	0.001
		The use of IWB features	48% Most Features 16% Few Features	30% Most Features 21% Few Features	Highly significant [χ2 (2, N=587) =18.60; *p*<0.001].	0.001
		Teachers' competence	12% Proficient 39% Unable	6% Proficient 42% Unable	Significant [χ2 (2, N=587) =7.89; *p*=0.02].	0.05
		Teachers' approaches in using IWBs in classrooms	48% Students frequently use the IWB	30% Students frequently use the IWB	Highly significant [χ2 (2, N=587) =18.60; *p*<0.001].	0.001

(Continued)

Table 5.24(continued): Associations between teachers' gender and some variables

First variable	Second variable		Male	Female	Type of Association	Level of Significance
Teachers' Gender	IWB Training	The number of the received of IWB training courses	35% 1-3 courses 1% > 5 courses	43% 1-3 courses 1% > 5 courses	Non-significant [$\chi 2$=4.23; p=0.13]	0.05
		The need for further training	48% A lot of needs	61% A lot of needs	Significant [$\chi 2$ (2, N=587) =10.36; p=0.01]	0.05
	Training needs	Technical skills in the use of IWB	63%	69%	Non-significant [$\chi 2$ (1, N=587) =2.22; p= 0.14].	0.05
		Effective teaching techniques by using IWBs	43%	57%	Significant [$\chi 2$ (1, N=587) =9.26; p=0.002]	0.05
		Designing educational resources compatible with IWBs	49%	51%	Non-significant [$\chi 2$ (1, N=587) =0.01; p= 0.93].	0.05
	Training methods preferences	Attend training courses and workshops	51%	49%	Non-significant [$\chi 2$ (1, N=587) =3.20; p= 0.07]	0.05
		Observe lessons of skilled educators	49%	51%	Non-significant [$\chi 2$ (1, N=587) =0.00; p= 0 .998]	0.05
		Collaboration with colleagues	47%	53%	Non-significant [$\chi 2$ (1, N=587) =0.44; p= 0.51]	0.05
		More time for self-training	39%	61%	Significant [$\chi 2$ (1, N=587) =6.74; p= 0.01]	0.05

6. THE RESULTS OF THE SECOND STAGE DATA COLLECTION

6.1. INTRODUCTION

In this chapter, general information about the twenty teachers who participated in the second stage of this research and their schools are presented first in Section 6.2. In Sections 6.3 and 6.4, the findings obtained from classroom observations and interviews are presented respectively. In Section 6.5, a summary of this chapter is followed.

6.2. BACKGROUND TO THE PARTICIPANTS IN THE SECOND STAGE

Table 6.1 displays general information regarding the twenty teachers who agreed to participate in the second stage of this research. Ten male and ten female teachers were interviewed including seven female teachers who were also observed in their lessons. All participants involved in seven *Tatweer* schools in Jeddah. In this study, these schools are numbered from one to seven for ethical consideration. Six of these schools (from 1 to 6) are for girls, whereas *Tatweer* School (7) is for boys. Fifteen teachers had more than one year of experience using IWBs, while only five were novice female teachers. The interviewees taught a variety of subjects, as shown in Table 6.1. Based on the answers of the participants, 15 teachers indicated that they had IWBs in their classrooms, and five teachers had IWBs in learning resource rooms. Moreover, three male teachers (M6, M9, and M10) reported that they had IWBs in both laboratories and classrooms. One female teacher (F6) and all the male teachers indicated that they taught 20-24 classes per week, whereas nine female teachers reported that they taught 10-19 classes per week.

In the *Tatweer* School (1), there are three resource rooms supported with IWBs. In the *Tatweer* schools 2, 3, 4, and 6, few classrooms were equipped with IWBs. However, the learning resource room was the only room equipped with an IWB in *Tatweer* School (5). In contrast, *Tatweer* School (7) was equipped with IWBs in all classrooms. Additionally, there was a learning resource room and different types of laboratories that were also supported with IWBs. There were no ordinary whiteboards in the *Tatweer* School (7), which indicates that the IWBs were the only boards in this school for teachers' use. However, all the other six female schools were equipped with ordinary whiteboards installed next to the IWBs, either in classrooms or in learning resource rooms. In all these schools, the IWBs were located in the middle of the front wall of each classroom or learning resource room and connected to a laptop and projector. In *Tatweer* School (5), there was a teacher of the resource room who had no classes to teach, and who was wholly responsible for the learning resources, organizing a schedule for teachers to use the IWB, and helping them to use it. In *Tatweer* School (1), there were four female experts in using technical devices who helped teachers when problems occurred. However, assistance was not provided in the other schools. According to the data obtained from both the managers of male and female *Tatweer* schools, the number of teachers in *Tatweer* primary schools in Jeddah ranged from 33 to 55 teachers in each school. The number of pupils in each school ranged from 556 to 977 students. As observed, all the buildings were modern and had the same design. The number of classrooms in these schools ranged from 17 to 22 in each school. These schools were supported by different kinds of technologies and training programmes. There was also a variety of laboratories in these schools, such as for science, maths, computing, arts, and social sciences. In these schools, teachers were classified based on subject and guided by the more expert teacher in the same field (a senior teacher). They met weekly on a regular schedule to discuss concerns and participate in training courses.

Table 6.1: Background to the participants in the second stage of the research

Teachers	Gender	*Tatweer* schools	Experience of using IWBs	Fields of teaching	The location of IWBs	Teachers' workload
F1	Female	*Tatweer* school (1)	7 years	Islamic Sciences	Learning resource room	18
F2	Female		4 years	Social Sciences	Learning resource room	19
F3	Female	*Tatweer* school (2)	4 years	Arabic language	Classroom	18
F4	Female	*Tatweer* school (3)	18 months	Special needs	Special needs' classroom	18
F5	Female	*Tatweer* school (4)	10 months	English language	Classroom	18
F6	Female	*Tatweer* school (5)	3 months	Mathematics	Learning resource room	20
F7	Female		One month	Mathematics	Learning resource room	15
F8	Female	*Tatweer* school (6)	2 years	Special needs	Special needs' classroom	18
F9	Female		9 months	Special needs	Special needs' classroom	18
F10	Female	*Tatweer* school (1)	8 months	Arabic language	Learning resource room	18
M1	Male	*Tatweer* school (7)	7 years	Arabic language	Classroom	20
M2	Male		2 years	Islamic sciences	Classroom	24
M3	Male		4 years	Arabic language	Classroom	23
M4	Male		4 years	English Language	Classroom	20
M5	Male		4 years	Mathematics	Classroom	22
M6	Male		5 years	Science	Classroom + Laboratory	20
M7	Male		6 years	Mathematics	Classroom	20
M8	Male		4 years	Social sciences	Classroom	20
M9	Male		2 years	Art	Classroom + Laboratory	24
M10	Male		5 years	Art		24

6.3. CLASSROOM OBSERVATIONS

In this study, the findings from classroom observations were mainly used to answer the second and third research sub-questions. Therefore, the researcher designed the *observation schedule,* used in all the observed lessons, to address the usage of IWBs in primary *Tatweer* schools in Jeddah. The *observation schedule* and the procedure for conducting the observation were described in detail in the methodology chapter in Section 4.5.2.1.

6.3.1. Description of the Seven Observed Lessons

In this section, each lesson is described and reviewed separately to clearly indicate the use of IWBs in these lessons and the strategies that teachers used for the use of IWBs. Therefore, the following descriptions will mainly focus on the board itself, the activities used through the stages of each lesson, and the users of IWBs in these activities.

6.3.1.1. The First Lesson

Teacher F1 presented an Islamic topic, which was the chapter of Al Sheba from the Holy Quran from verse 40-45, to students in fifth grade aged ten and eleven years. The teacher aimed to teach the students about the chapter of Al Sheba and the significant meaning it involves. There were twenty students divided into three groups. Two of these groups consisted of seven students, and the third one had six students. The type of IWB in this resources room was Promethean, and the program that was used is *ActivInspire.* In this school, teachers can use three resources rooms which were supported by IWBs.

Teacher F1 had seven years' experience in using IWBs and had undertaken many different training courses; some of these courses related to the use of IWBs. She started her lesson by presenting an unusual activity that was designed by the teacher and saved in a file in a Promethean format ("*flipchart*"). In this activity, a beautiful coloured treasure box appeared on the board and, inside it, were five brightly coloured cards. Each student collected a card by touching the treasure on the board. Each card had a general question relating to the topic such as "*What is the aim of reading the Holy Koran?"* and students had to answer all the questions orally. They were very active and happy during this activity (*five students involved in this activity*). Then, the teacher presented another activity that was saved in "*ActivInspire-Studio*" to introduce the content of the lesson (*the great teachings that are involved in the chapter of Al Sheba*). This activity consisted of an envelope that had to be pressed twice to become active and then a written phrase appeared. These phrases introduced new information such as the chapter of Al Sheba is

Makkiah (was revealed to the Prophet Mohammed, Peace Be upon Him, in the city of Makkah). It focuses on the Islamic belief, and concentrates on life after death (hereafter). The teacher clearly explained and discussed these phrases with students. During this activity, the teacher used different coloured pens (*five students involved in this activity*). As observed, most students were close listeners to what the teacher said, and they critically asked her for more information. Indeed, these ten year old students were very interested in learning more about the hereafter, and the teacher answered them in an attentive way. However, when they ask many questions, this can take a long time so she told them to postpone answering these issues until the next lesson. After that, she presented an audio recording of part of the chapter of Al Sheba from verse 40-45, to teach the students how to read them in an exact way. The students repeated these verses in groups.

In the third stage of the lesson, she presented two interesting and enjoyable activities that were designed by the teacher and mainly focused on confirming the information gained through the lesson. The first one was matching questions with their answers. There were two columns, A and B. Column A was for the questions and B was for the answers. Students needed to drag a response from column B and drop it to match any question from column A. If the answer was right this response would disappear with that question but if not it returned to its place (*eight students involved in this activity*). The second activity of this stage aimed to assess students' understanding relating to the new words they had learned through the lesson. There was a variety of words on the board that related to the topic. Students used the IWB feature "*Spotlight*" with the help of the teacher to identify the difficult concepts that they did not understand. Coloured pens were used to draw a circle on words that students knew. However, sometimes the teacher helped students when they used the coloured pens because pens need some strength to draw on the board. The teacher answered each student individually. Thus, the teacher, in using this way, ensured that all pupils had sufficient knowledge about the lesson they learned in the class (s*ix students involved in this activity*). During this stage of the lesson, the board stopped working, and the teacher asked for assistance from a professional female in technology who was working in the same school and responsible for maintenance. However, the teacher decided to shut down the board, and restored it before the arrival of the assistance.

At the end of this impressive lesson, Teacher F1 also used the board to review the lesson and evaluate students' understanding through two types of game. She designed a fishing game involving the content of this lesson. This game contained ten different coloured fishing ropes and twelve fish in a pond; these fish carried different answers labelled from one to twelve. Each student pulled up a fishing rope and caught a fish with a correct answer (*ten students involved in this game*). Then the teacher presented a puzzle on the board. She asked students to order the pieces that contained accurate information about the topic. The teacher chose a group of five pupils to participate in this activity. These five students collaborated in solving the puzzle (*five students participated in this game*). The teacher reviewed the lesson in the last two minutes by presenting a slide that summarized all the information learned in the lesson. She displayed each part separately and covered the other parts using the "*screen shade*" or the "*reveal"* feature to concentrate students' focus on this part only (*Whole class activity*).

Overall, Teacher F1 was an example of an expert teacher who used the IWB in all the stages of her lesson, and applied selected IWB features such as *spotlight*, *screen shade*, *colouring objects*, *games*, and *drag and drop*. She designed activities for whole class teaching, small groups, and individuals. During the interview, Teacher F1 said, "*I created all these activities by myself and stored them in the "ActivInspire-Studio" to use them with other classes*." She used the board less than her students. The students were very active, and they showed high thinking abilities during class discussion, which produced an attractive and enjoyable lesson. As seen above, Teacher F1 introduced many activities that involved all the students in the class. However, the lesson finished on time (forty-five minutes). The teacher F1 responded to this situation during the interview "*my students know how to deal with the class activities because I always use the IWB in my lessons, so they do not take a long time in these activities*."

6.3.1.2. The Second Lesson

Teacher F2, who teaches social sciences to students from grades four to six, presented the second lesson in the resources room. She was working with Teacher F1 in the same school. Therefore, the same type of IWBs and software were used. She introduced a topic named "*The kings of my country*" to twenty students in the sixth grade. These students were also seated in three groups with seven or six students. Teacher F2 started her lesson by reviewing some information about Saudi Arabia, by presenting a file in a Promethean format ("*flipchart*") that had been used and saved in the last lesson. She reviewed the last lesson gradually by using the "*screen shade*" or the "*reveal*" feature to manage the demonstration of the content (*Whole class activity*).

Then, she presented another file in a "*flipchart*" format that was designed by her specifically for this lesson. The first slide of this file showed a green flag, and she asked her students to use the IWB feature "*Spotlight*" to direct students' focus to a certain part of the flag, in which an image of one of the kings of Saudi Arabia appears. Then, she asked them to guess the name of each king (s*even students participated in this part of the activity).* During this activity, Teacher F2 used the "*magic pen"* (an IWB feature) to write some symbols and comments on this slide. Indeed, this feature is very helpful for teachers because they can write whatever they want on slides without having to erase what they have written because these words disappear after ten seconds. Additionally, the teacher can use the *"magic pen"* as a "*spotlight"* feature by drawing a circle on a particular part to increase students' focus on this part. Moreover, the *"magic pen"* can also be used as a "*zoom in"* feature by drawing a square on the selected part to make it bigger or smaller. Then, Teacher F2 asked her students to drag each image separately. When they pulled the pictures, some information was presented about each king, such as the date and place of birth, remarkable achievements, and the time of the death of each king. She supported this information by searching the internet and presenting pictures that indicated some governmental institutions such as the ministries of education, health, and agriculture (*seven students participated in the second part of the activity*). During this activity, Teacher F2 talked with her students continuously. She also wrote down their questions and ideas on a whiteboard, installed near the IWB, to answer these issues during the lesson. It appears that these students had a broad range of knowledge about the topic. Moreover, they asked some critical questions that were not involved in their curriculum, such as the reasons for choosing these kings, the method of election, and why all of them were males.

Then, Teacher F2 distributed a worksheet to each student in the three groups and asked them to solve these tasks collaboratively. They could think and discuss with other students in each group. This sheet contained an exercise related to the content of the lesson, which was a connection between the name of each king and his accomplishments (*all students involved in this activity in small groups*). Indeed, students at this stage were very pleased and active when they turned to their group to answer the exercise. Then, the teacher presented the solution to this exercise on the IWB and discussed it with the whole class. She highlighted some significant achievements for each king.

At the end of this lesson, Teacher F2 presented two interesting games designed by herself to evaluate students' understanding of the lesson. The first consisted of five phrases, and the students had to indicate whether each expression was right. When the student showed a correct answer, the sound of clapping appeared; for a wrong answer, there was a warning alarm (*see Figure 6.1*) (*Five students participated in solving this exercise*).

Figure 6.1: An activity presented by the teacher F2

During this game students were laughing and imitating sounds associated with their answers. The second game consisted of seven flowers. Each flower was designed with a picture of one Saudi King. Additionally, seven phrases had been written on the board concentrating on the achievements of the seven Saudi kings. The student had to drag the right phrase and drop it to one flower. This activity was cleverly designed, as each flower only blooms if the answer indicated by the student was right, providing automatic feedback (*Seven students participated in solving this exercise*).

To conclude, Teacher F2 was another example of an expert teacher who used the IWB and a variety of its features in all the stages of her lesson. She designed her slides using the IWB program "*ActivInspire*." She also presented and developed various types of activities that involved all her students. Students participated in these activities individually and in groups, and used the board extensively through all the activities except the collaborative activity, in which the teacher was the only user of the IWB. Although she used several activities, the time of this lesson was only forty-five minutes. She commented on this when she said,

> The use of IWBs led to increasing the pace of lessons because I usually present prepared slides; therefore, I did not need to write everything like I did before when using the ordinary whiteboard.

6.3.1.3. The Third Lesson

Teacher F3 was also an expert teacher of Arabic language to students in the third grade aged eight or nine years. A Smart Board was used in this classroom, and the program was the "*Smart Notebook"* software. The number of students in this class was thirty-six. They were seated in six groups named by different colours, which were "the pink group", "the purple group", "the blue group", "the green group", "the red group", and "the yellow group”. Each group consisted of six students, and each student had a number in her group from one to six. A small-decorated box “treasure” was put on the table in each group and used to encourage students. The teacher gave the whole group a pearl in the case of presenting a correct answer or worthy behaviour. At the end of the week, these pearls were collected and replaced with prizes. Moreover, there was an enhancement panel in the left corner near the IWB. She put the names of these six groups on the panel and rewarded each group at the end of the lesson with a coloured butterfly next to the group’s name (*see Figure 6.2*).

Figure 6.2: The enhancement panel designed by the teacher F3

Teacher F3 started her lesson by reminding her students of the class instructions, such as avoid making noise, keeping calm, and discussing with classmates. These guidelines were presented using PowerPoint and supported with attractive images and animations. Then, she revised the last lesson by presenting a file in a smart-board format (“*Notebook*”) that involved the main points (*The teacher only used the IWB at this stage*).

Then, she presented a new file in a smart-board format that was designed by her and saved to be used in this lesson. The first slide presented the title of the topic named “*Our summer residence*.” This topic was the third lesson in the second unit of the student textbook. She asked her students to open their books and then she asked all students with number four from each group to read two sentences. Each selected student read the phrases loudly to encourage them to read correctly (*Six students read the text in their books*).

Teacher F3 presented another slide on which was written “*summer residence*” and asked her students to think carefully and discuss the meaning of these word in groups. Then, she selected the student number one from each group to explain the meaning of this word. All the answers that were introduced were correct. Therefore, the teacher gave each group one pearl. Then the teacher presented four well-known cartoon characters sequentially, carrying four different meanings for the word of “*summer residence*”. Only one of these characters indicated the exact meaning of “*summer residence*,” as described in the students' textbook, which is a place that people live in during the summer (*see Figure 6.3*). The teacher asked her students to choose the right meaning collectively (*the teacher only used the IWB in this activity*).

Figure 6.3: An activity designed by the teacher F3

Then, she presented a short movie relating to the topic. This video was previously stored to be used during lessons. In this film, four children in animation style were talking about the famous tourist cities in Saudi Arabia. Each child introduced one city and talked about its attractions and agricultural products. The cities that were included in this movie were Al-Taif, Asseer, Al-Baha, and Abha. All the students in the classroom were silent and fascinated (*the teacher only used the IWB in presenting the movie*).

Then, she showed a slide that contained a map of Saudi Arabia. She asked her students to use pens and highlight the names of the tourist cities introduced in the movie and their famous agricultural products. During this activity, three students did not manage using the pen, and the teacher helped them (*ten students used the IWB in this activity*). After that, she distributed one worksheet to each group. This sheet consisted of an exercise about the same content that was presented in the movie. In this exercise, eight phrases described each tourist city included in the lesson and the students had to write the name of each city in the blank. During this activity, students discussed each phrase with the group, and one of them was nominated for writing down the answers. In this time, Teacher F3 moved between the groups to direct and remind them of the class instructions. Each team finished the task they awarded with pearls (*neither the teacher nor the students used the IWB in this activity*).

At the end of this enjoyable lesson, the teacher introduced a competition for her students by presenting a slide on the board with six phrases, indicating information about the four Saudi tourist cities. Students had to determine which of these phrases were right by putting a "✓" or "x." She raised a green flag with number two. Six students whose number was two in each group got up immediately and went to the board to start solving the task.

After finishing, the teacher presented another six phrases and asked for a correction. She raised a green flag with number three. Six students whose number was three also got up directly and went to the board to solve the task. During this competition, the teacher recorded the scores for each group while all other students were watching silently. All the groups had similar scores; therefore, the teacher used two coloured dices to determine the winner. Each dice had the same colours of the six groups (red, green, blue, pink, purple, and yellow). When the teacher threw the dices, two colours appeared, yellow and blue. As a result, the blue group and the yellow group had another competition, which was choosing the correct answer from two sentences. Again, the teacher raised a green flag with number six. Two students with number six from the blue and yellow groups solved this task; however, the student from the blue group chose the correct answer, and thus the teacher awarded the blue group three pearls (*fourteen students used the IWB in this activity*).

Finally, the teacher asked her students to search the internet at home with the help of their parents to get some pictures of figs as a "type of fruit". Indeed, this lesson was very enjoyable for both the students and the researcher. This expert teacher used the IWB in all the stages of her lesson and used some IWB features that were useful in her lesson. However, she did not use the internet in her class. Instead, she supported her lesson with stored pictures and movies because "*the IWB in her classroom was not connected to the internet"* as she said.

Moreover, she continuously allowed her students to use the board, except during the collaborative activity when the IWB was not used. Students used the board both in groups and individually. Students likely seemed to be very excited and active during the class activities. They indicated full compliance with the class instructions, probably because of the daily use of the IWB in this classroom, as Teacher F3 confirmed during an interview when she said, "*I use the interactive whiteboard every day because it is located in my classroom, so there is no reason not to use it*." Thus, it appears that the IWB was effectively integrated into this lesson.

6.3.1.4. The Fourth Lesson

Teacher F4 is another teacher from *Tatweer* schools who participated in this study. She only teaches students with learning difficulties individually or in small groups in a particular class that differs from other classrooms. Teacher F4 designed individual plans appropriate for each student. In other words, each student had to be tested based on specific measures to be involved in the learning difficulties programmes. Teacher F4 determined the educational and social skills that these students needed and, consequently, she designed specific individual plans for them. The design of this class was different from other classrooms, where there was a large u-shaped table with six chairs in the middle of the class (*see Figure 6.4*).

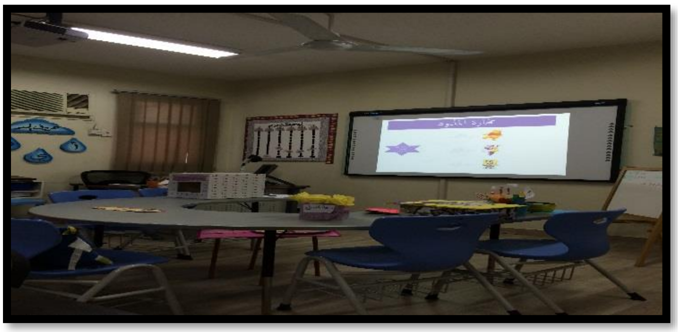

Figure 6.4: Special needs' classroom

At the back of the class, a television and additional computer were installed in the right corner for students' use. There was also a coloured carpet on the left side of the class for doing some activities and games on it. Moreover, there was a variety of educational equipment and storybooks. Similar to Teacher F3, there was an enhancement panel in the left corner near the IWB (*see Figure 6.5*). This panel consisted of six magnificent palaces at the top of the panel and six beautiful crowns at the bottom of the panel. Each palace and its parallel crown belonged to one student. There were ten stations along the track between each palace and the crown. When the student had made progress, the teacher moved her crown to the top. When the crown reached the palace, the student was rewarded.

Figure 6.5: The enhancement panel designed by the teacher F4

Teacher F4 presented this observed lesson, aiming to teach a student in grade two how to read vowel sounds in words with "*Mad al-alif*." To be clear, there are three long vowels in the Arabic language: "*alif" (ا)* (/a /)*, "waw" (و)* (/o/)*, "ya"* (ي) (/i :/). The "*Mad al-alif*" (ا) only comes in the middle and at the end of the word. It is essential that the "*fatha*"

(-) (which is a diagonal line placed above the letter) be positioned before "*Mad al-alif*" in the same word.

The duration of this lesson was also forty-five minutes. Teacher F4 started her lesson by presenting four cards indicating states of the face (sad, happy, sleepy, and tired) and asked the student to choose the face that reflected her physical and mental state. The student wanted the happy face, and the teacher was delighted about that. The teacher gave the student a small box with letters and asked her to select the letter that was studied in the previous lesson. The student picked up an Arabic alphabet that called "*faa*" and then the teacher gave her a sticker. Then, the teacher F4 presented a file in a smart-board format ("*Notebook*") that was designed to explain "*Mad al-alif"* for her students. The first slide shows words with "*Mad al-alif"* (آ) and the teacher taught the student how to pronounce these words. Then, the teacher presented another slide that indicated a story named "*The obedient girl*." In this story, the teacher represented the "*Mad al-alif*" (آ) with the mother, and she represented the "*Fatha*" (-) with the daughter. In this story, the mother described her daughter as a respectful little girl who did not depart from her mother (*see Figure 6.6*).

Figure 6.6: A story presented by the teacher F4

There was a small girl called "*Fatha*" who was a shy girl with a low voice. She was hardworking and always obeyed her mother's commands. One-day "*fatha*," asked her mother "*Mad al-alif*" to take her to the garden. The mother agreed, but she asked her daughter to always walk before her, and not to go far away because she might be unable to find her way in the garden and no one would hear her voice. The little girl "*Fatha*" accepted her mum's requests. She walked in front of her mother all the time, and enjoyed her time in the garden (*The teacher F4 was reading the story*).

While reading the story, the teacher used the IWB feature "*screen shade*" to present the story gradually to help the student focus on the main parts of the story. Indeed, this feature is considered one of the most important IWB features because this feature allows teachers to present the lessons in particular parts and hide other parts. This feature seems to be very useful for students, especially with those who have learning difficulties. This feature helps them to concentrate on one area; consequently, the possibility of distraction is decreased. The importance of this feature was also confirmed by teacher F4, who stated, "*I always use the feature "screen shade" during my lessons because it enables me to cover what I want and thus I can increase the focus of my students on smaller parts."*

After finishing the story, the teacher used another feature, "*Spotlight*", to cover the whole story, and only one word with "*Mad al-alif* "appeared. Then, she asked the student to read this word. This feature also led to improving the focus of the student, as teacher F4 explained during her interview when she said: "*with students who have learning difficulties I use spotlight most frequently to focus their attention on one word rather than the whole page*." Then, she covered the student's eyes, and she reread the story slowly. She asked the student to clap when she heard any word with "*Mad al-alif* "(ا**)**. Indeed, the student was very active and happy when she was clapping (*the teacher was the only user of the IWB in this activity*).

Then, the teacher presented a slide that consisted of an interesting exercise. There was a bear on the board, and there were three honey jars with different words. The teacher asked the student to help the bear to find out which of these three jars had "*Mad al-alif* "(ا**)**. The student picked up a pen and drew a circle on the right honey pot. The teacher asked the student about the reasons for not choosing the other two words to check her understanding. Therefore, the teacher rewarded her by moving her crown on the enhancement panel (*both the teacher and the student used the IWB in this activity*).

In another activity, Teacher F4 connected the "*Mad al-alif* "(ا**)** with three senses. First, she covered the student's eyes to listen to the sound of this vowel. Then, she asked the student to focus on the vowel in the middle and the end of words using her eyes. After that, she asked her to draw the vowel sound (ا**)** with her finger on the sand in a small box. At the end of this lesson, the teacher did not use the IWB; alternatively, she allowed her student to use it in an enjoyable activity aimed at improving the ability of her student. The teacher and the student sat on the carpet alongside a large box containing coloured cards with words. The teacher asked the student to collect three words with "*Mad al-alif* "(ا**)** and write them on the IWB. The student chose the right words and then wrote them on the IWB using a red pen.

Overall, Teacher F4 introduced an exciting lesson using the IWB and some of its amazing features to explain the vowel sound "*Mad al-alif* "(ا**)** for a student with learning difficulties. As observed, the student was very active and had a high motivation to participate in all activities during this lesson. She used the IWB to introduce the content of her lesson and the lesson's activities. However, the IWB was not utilized at the beginning of the lesson. Nevertheless, the audience in this lesson was a student with learning difficulties, and therefore, the teacher presented a variety of activities to improve the ability of this student, and this seemed to be achieved during this lesson.

6.3.1.5. The Fifth Lesson

Teacher F5, whose teaching subject was the English language for students in grades 4, 5, and 6, presented the fifth observed lesson. The title of this lesson was "*Family and friends*." This lesson aimed to teach students in grade four the names of family members in English. This lesson was the fourth lesson in the third unit of the students' book. In the Saudi educational system, students start to learn English in the fourth year of state primary school. However, students in private schools start learning English in the first year of primary education and nursery schools as well. In this observed classroom, thirty-five students were seated in five groups with seven students in each group. The IWB was only connected to a tower of a desktop, which had no monitor, located in the left corner of the classroom. In other words, Teacher F5 used the IWB as a large screen for the computer that was controlled using a mouse. Surprisingly, the IWB was not activated to work as an IWB but as a screen for a computer. During her interview, the teacher indicated, "*I use the IWB as a computer with a large screen, and I use the mouse to touch the board*." When asking her about the reason for using the board in this way, she said, with great sadness, "*I contacted the educational department many times over the last ten months to activate the IWB programme but all my tries failed, and nothing has changed."* Moreover, there was also a projector in the ceiling. However, the location of this projector was not appropriate and affected the image on the IWB. The teacher F5 commented on this situation: "*I need urgent assistance to activate the IWB in my classroom and fix the problems when using the IWB, but unfortunately, it has not been offered in my school*."

Teacher F5 started her lesson by presenting a short video titled "*Good morning*" to revise the last lesson, which was about greetings. This video was an animation movie with songs. All students were happy when repeating the song. She reminded her students about the class instructions, such as raising a hand to answer, raising the voice when answering a question, and only English is allowed in the class. Then, she presented slides using

PowerPoint. Each slide was about one of the family members (father, mother, brother, sister). Each word was indicated with an image and a written text. The teacher taught her students how to pronounce each word collectively and individually. Then, she presented an audio record (from the students' e-book) about a song of my family (*see Figure 6.7*). All students and the teacher repeated the song.

Figure 6.7: A slide from the students' e-book

After that, the teacher gave each group an alphabet set and asked them to form words about family members. Indeed, enthusiasm, discussion, participation, and enjoyment were detected in each group. The teacher thanked the three first winners groups. Then, the teacher distributed worksheets to each student to solve an exercise about the family in groups. This exercise was the connection between each picture (family members) and the right word. Most students in each group solved the task individually, but few of them discussed it in groups. This behaviour indicates that students were more likely to think independently, or may have understood the lesson because of repetition. At the end of this lesson, teacher F5 displayed an animation movie with a song "*Daddy finger*." All students stood up and moved towards the board. They were dancing when they were repeating the song. This was the first time the researcher had seen students repeat the songs as native speakers. The teacher confirmed this when she said, "*I was able to teach the students the correct pronunciation of words because of the help of movies and songs that I usually used in my lessons*." She added, "*my students love my classes, and they have become very confident in speaking English.*"

To sum up, this lesson was an interesting lesson. However, the board was used as a large computer screen, not as an IWB. Therefore, none of the IWB features was used in this lesson and the students in this classroom did not use the board. Indeed, the teacher made a great effort in teaching her students using various media, but she strongly wished to activate the IWB in her classroom as a real IWB.

6.3.1.6. The Sixth Lesson

A mathematics teacher (F6) presented this lesson in a learning resources room for thirty-six students in year four. These students were seated in six groups of six students. There was a library next to the resources room with a large glass window between them. This could have caused some disturbance for students in the resources room because they focused on the activities in the library more than their activities in the resources room.

In this lesson, teacher F6 revised the last lesson by looking into the file in a smart-board format ("*Notebook*") that had been saved previously. Then, she opened the "*Smart Notebook*" software and presented a new blank slide. Then, she wrote on it "*Steps for solving a task*" aiming to teach her students about the right steps to deal with issues. These steps were the understanding, planning, solving the issue, and checking the answer. The teacher used the red pen and wrote these four steps on it. Then, she changed the colour of the pen and its size. She used the blue pen to explain these four steps to her students. However, the students asked her to change the colour because it was not clear to them. Therefore, she changed it into the black one. She wrote next to the first step "understanding" with two arrows, one referring to determining the available information, and the other to the required result. She explained this to her students by indicating, "*you should first understand the issue by determining the available information and the required result*."

Teacher F6 wrote the word logic next to the second step "planning", and she said to her students "*you should use a logical plan to answer the issue*." After that, she guided her students to start solving the issue based on a reasonable plan. Finally, she wrote next to the fourth step, "checking the answer", the word review and she said, "*you have to evaluate the answer to ensure its correctness*." Then, she presented a new slide and asked her students to remind her of the four steps for solving an issue. She chose four students from four different groups to answer; however, she picked the red pen and wrote these steps by herself. She did not allow her students to use the IWB. When asking her after the lesson regarding her behaviour, she said, "*actually I never allow my students to use the IWB because I am suspicious that students might disrupt the board, and then the school administration will blame me.*" Then, she asked her students to open their textbooks, read the first exercise individually, and then discuss it in their groups. She reminded her students to use the four steps of solving a task. This first exercise in the student textbook was "*Nora gave her brother 2 riyals in the morning, and she still has 4 riyals in this afternoon. How much did Nora have yesterday?*"

During a group discussion for each team, the teacher wrote this exercise and its answer on a new slide. Then, she used the IWB feature "*screen shade*" to show the previously indicated exercise and hide the answer. After that, she asked each group to present the answer. Four of these groups showed the right answer "six riyals." Therefore, the teacher F6 chose one student from each of these four groups to explain how they reached the right answer. The four students explained how they solved this exercise using the four steps. However, the teacher asked them to use the whiteboard, not the IWB to write the answer.

After that, she showed the answer using the IWB feature "*screen shade*." At the end of this lesson, the teacher asked her students to copy the last slide on their notes and then she closed the file without saving the lesson. When asking her about saving the lesson she said, "*I do not need to save it because I only wrote on blank slides, so it is not worth saving.*" She added that *"Actually, I need a variety of educational resources specific for mathematics lessons to introduce more interesting lessons to my students."*

As noticed through this lesson, the teacher used a few of the interactive features such as colouring objects and "*screen shade*." She did not allow her students to use the IWB in her lessons, possibly because of her lack of skill in using the IWB effectively. She confirmed this when she said,

> I am a beginner teacher in using this technology, and I did not receive any formal training courses except some basic training from those responsible for learning resources. Moreover, I have a high workload so I have difficulty to have free time for asking my colleagues or self-training. (Teacher F6)

Therefore, she believes that she needs more practice and training for best use of the IWB. However, the IWB was located in the resources room, which could probably decrease her daily use of this technology, as she confirmed during the interview, "*I did not use the IWB in all my lessons because it is in the resources room, which is far away from my classroom.*"

6.3.1.7. The Seventh Lesson

Similarly, Teacher F7 was in the same school with Teacher F6 where the IWB was located in the learning resources room, which was supervised by the teacher of the resources room. Teacher F7 was also a mathematics teacher, and she presented a lesson called "*Division process*" to thirty-four students in year five, seated in six groups. This lesson was the sixth lesson from unit four in the student textbook.

At the beginning of this lesson, the students delayed for five minutes because of doctors had visited the school to educate students about obesity, on the same day as the classroom observation. However, students sat in their places quickly when they arrived. Teacher F7 chose three students and gave each of them a small box. Then, she put 46 small balls in a large box on the table and asked another student to distribute all the balls equally between these three boxes. The student distributed 15 balls in these three small boxes, and one ball remained with the student. Then, the teacher opened a new blank slide by touching the icon for "*Smart Notebook"* software and wrote on it the following phrase (46÷3=15 and the *remainder* is 1). Then, she explained to her students the main elements in this *division*, which are the *dividend (46)*, the *divisor* (3), the *quotient* (15), and the *remainder* (1). She taught her students how to solve it and gave them two minutes to write the answer in their notes.

After that, the teacher erased what she wrote on the slide, and she wrote a new phrase (38÷6=). She told her students how to solve this *division*, but she was the only writer and user of the IWB. She gave her students two minutes to write the answer in their notes. The teacher followed the same procedure with the other exercises. During her interview about using the same process in explaining the exercises, she said, "*I did not find any useful educational resources for this lesson, and I wish the education department would provide us with such resources*."

At the end of this lesson, the teacher presented a new slide and wrote (134÷8 =) on it. Then she asked her students if anyone knew how to solve it. One student raised her hand and asked the teacher to let her solve this task. This student went toward the IWB aiming to answer the division by using it. However, the teacher gave her a pen and asked her to use the whiteboard. It seems that this student was enthusiastic to use the smart board, but the teacher did not give her a chance to do so. When asking the teacher after the lesson to explain the situation, she answered, "*to be honest, this is the first time for me to employ the IWB in my lessons, so I feel that I am not a confident user*." She added,

> I am in a difficult stage because I am a beginner user, and I cannot allow my students to use the IWB because it is a highly sensitive board. Therefore, I'm afraid of being blamed if it is damaged or my students cause any problems (Teacher F7).

When the students were leaving, the teacher had difficulty closing the file. Then she went towards the laptop connected to the IWB and tried to close it but it did not respond. Then she looked for the teacher responsible for the resources room, who had left school early. The teacher said, shyly, "*she always helps me when problems occur, but unfortunately when she is absent for some reason I cannot find any help*."

To sum up, although Teacher F7 used different coloured pens and different fonts, she was the only user of the IWB. She did not allow any student to use the board, probably because of her lack of experience using them (only one month), as she indicated: "*I learnt how to use the IWB during the last month, and I need more time to practise*." Moreover, students in the resources room sat in groups but the teacher did not ask her students to discuss and solve the exercises in groups. She only focused on the whole class in this lesson. After the lesson, she explained this situation during the interview, by indicating, "*I only use this technology for teaching the class as a whole because I have not learned how to integrate IWBs in my teaching.*"

6.3.2. Comparison of the Seven Observed Lessons

In this section, the seven observed female teachers are compared regarding particular factors, such as the stages of their lessons, the frequency of using IWB features, the difficulties they faced during their observed lessons, and the audience and users during the lessons.

6.3.2.1. The Use of IWBs through the Lesson Stages

Table 6.2 presents the use of IWBs through the stages of the observed lessons. All seven observed teachers used the IWB both to introduce the content of their lessons, and for activities at the end of the lessons. Moreover, all teachers used the IWB at the start, except for teachers F4 and F7. Who started by presenting activities to students without using the board. Furthermore, Teacher F5 was the only teacher who did not employ the IWB during the collaborative activity presented in her lesson. In contrast, some teachers (F1, F2, F3, and F4) designed specific activities for use on the board, and teachers F6 and F7 used the IWB while solving mathematical tasks. Thus, the heaviest use of IWBs during the seven observed lessons was in the second and final stages of each lesson.

Table 6.2: The use of IWBs through the stages of the observed lessons

Stages of Lessons	Teachers						
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Introduction	√	√	√	–	√	√	–
Content	√	√	√	√	√	√	√
During Activities	√	√	√	√	–	√	√
End of Lessons	√	√	√	√	√	√	√

6.3.2.2. The Frequency of Using IWB Features

The frequency of using IWB features during the seven observed lessons is indicated in Table 6.3. “Colouring Objects” was the most frequently used (48 times), followed by “Drag and Drop” (22 times), and “Spotlight” (18 times). In contrast, teachers did not use the IWB features of Zoom, Snapshot, and Lesson Recording. Moreover, Teacher F2 was the most frequent user of the IWB features. She used a range of features to present her lesson. In contrast, Teacher F7 only employed one feature “colouring objects” in her lesson. Overall, teachers who had experience in using IWBs more than one year (F1, F2, F3, and F4) used more features of the IWB than teachers F5, F6, and F7, who had less than one year’s experience.

Table 6.3: The frequency of using specific IWB features

IWB features	The frequencies of using IWB features							Total
	F1	F2	F3	F4	F5	F6	F7	
Zoom	-	-	-	-	-	-	-	0
Snapshot	-	-	-	-	-	-	-	0
Lesson Recording	-	-	-	-	-	-	-	0
Using Websites	-	1	-	-	-	-	-	1
Movies	-	-	1	-	2	-	-	3
Magic Pen	-	4	-	-	-	-	-	4
Highlighting Pen	-	4	-	-	-	-	-	4
Screen shade (Reveal)	1	1	-	1	-	2	-	5
Games	2	2	1	1	-	-	-	6
Pictures	-	5	4	4	4	-	-	17
Spotlight	6	7	-	5	-	-	-	18
Drag and Drop	8	14	-	-	-	-	-	22
Colouring Objects	9	-	22	4	-	7	6	48
Total	26	38	28	15	6	9	6	128

6.3.2.3. The Identified Difficulties

Table 6.4 shows the difficulties which occurred during the seven observed lessons. The location of IWBs in the resources rooms and the lack of assistance and support were noted four times during classroom observations. This was followed by technical problems, insufficient skills, and difficulties in integrating IWBs in a lesson where each of them was ranked three times. Teacher F6, who had high workload (20 classes per week), was the only teacher who reported a lack of time as a difficulty that faced her. Moreover, the absence of educational resources was only reported by teachers F6 and F7. In this study, students found difficulties in managing the colouring pens in the two lessons of teachers F1 and F3.

Table 6.4: The identified difficulties in the seven observed lessons

Types of Difficulties	Teachers						
	F1	F2	F3	F4	F5	F6	F7
Location of IWBs	√	√	-	-	-	√	√
Difficulties related to students	√	-	√	-	-	-	-
Technical problems	√	-	-	-	√	-	√
Lack of educational resources	-	-	-	-	-	√	√
Lack of time	-	-	-	-	-	√	-
Lack of assistance and support	-	-	√	√	√	-	√
Lack of teachers' skills	-	-	-	-	√	√	√
Difficulties in integrating IWBs into lesson	-	-	-	-	√	√	√

6.3.2.4. The Audience

Table 6.5 clarifies the audience in the seven observed lessons when using IWBs. Teacher F1 used the IWB to present activities for both individuals and small groups (53%) more than the activities that were used for the whole class (47%). The rest of the teachers, except for Teacher F4, used the IWB for whole class teaching more than both small groups and individuals. Therefore, teachers F2, F3, F5, F6, and F7 supported the entire class teaching when using IWBs. Teacher F4 only used the IWB to teach one student in her lesson because she only teaches pupils with learning difficulties.

Overall, the majority of the time in the seven observed lessons, approximately 64%, was whole class teaching, followed by 29% for individuals. The lowest proportion of time (8%) was for small groups.

Table 6.5: The audience in the seven observed lessons

Teachers	The audiences in lessons while using IWBs			Total
	Whole class teaching	Small groups	Individuals	
F1	47%	4%	49%	100%
F2	58%	0%	42%	100%
F3	71%	18%	11%	100%
F4	0%	0%	100%	100%
F5	91%	9%	0%	100%
F6	78%	22%	0%	100%
F7	100%	0%	0%	100%
Average	63.57%	7.57%	28.86%	100%

6.3.2.5. The Users of IWBs

Table 6.6 shows the users of IWBs in the seven observed lessons. Teacher F1 was the only teacher who used the IWB in her lesson less than her students. She used the IWB around 47% of the lesson time while her students used the board approximately 53% of the lesson time. In contrast, teachers F2, F3, and F4 used the IWB technology more than their students did. The percentage of students' use of IWBs decreased gradually in the lessons of the teachers F2, F3, and F4 (42%, 29%, and 13%, respectively). However, teachers F5, F6, and F7 did not allow their students to use the board and, consequently, they were the only users of IWBs in their lessons.

To sum up, 80% of all the lesson time was for the teachers' use compared with students' use, which took up only 20% of the lesson time. In this study, therefore, the teachers were the primary users of IWBs.

Table 6.6: The users of IWBs in the seven observed lessons

Teachers	The use of IWBs in the seven observed lessons				Total
	The teacher only used the IWB	Teachers and students used the IWB		Only students used the IWB	
		The percentage of lesson time for teachers' use	The percentage of lesson time for students' use		
F1	-	47%	53%	-	100%
F2	-	58%	42%	-	100%
F3	-	71%	29%	-	100%
F4	-	87%	13%	-	100%
F5	100%	-	-	-	100%
F6	100%	-	-	-	100%
F7	100%	-	-	-	100%
Average	42.86%	37.57%	19.57%	-	100%

6.3.3. Summary of the Use of IWBs by the Seven Female Teachers

The IWB technology was most frequently used in the second and final stages of each observed lesson, as indicated in Table 6.2. All seven observed teachers used IWBs to present and review the content of their lessons, but they varied in applying IWBs during activities and at the start of their lessons. Additionally, the use of IWB features and allowing students to use the board were considered differently by the teachers observed, depending on their experience in using IWBs. The teachers who had more than one year experience in using IWBs (F1, F2, F3, and F4) used several interactive features and allowed their students to use the board more than the novice teachers (F5, F6, and F7) (see Tables 6.3 and 6.6).

Moreover, the teachers observed in this study generally preferred whole class teaching more than teaching to individuals or small groups when using IWBs (see Table 6.5); they were also the main users of IWBs in this study (see Table 6.6). Furthermore, the location of IWBs in the resources rooms and the lack of assistance and support were the most common difficulties faced by the seven teachers. This was followed by technical problems, lack of teachers' skills, and difficulties in integrating IWBs in lessons (see Table 6.4).

6.4. SEMI-STRUCTURED INTERVIEWS

The findings from the interviews were used to answer all five research sub-questions. Thus, these findings were used to clarify, explain, and, where applicable, support or challenge the findings that obtained from the questionnaire. The researcher designed a basic interview checklist that was used in all the interviews (*more details are given in Section 4.5.2.2*).

6.4.1. The Results of the Interviews

Analysis of teachers' responses presented four main themes based on the first four research sub-questions, as well as several sub-themes resulting from this analysis (see Table 6.7). Thus, in this section, teachers' replies for each main theme and sub-themes are presented with demonstrative quotations.

Table 6.7 : A summary of the interview analysis

The main themes	Sub-themes	The aim
Teachers' use of IWBs (n= 20)	The frequent use of IWBs in lessons (n= 20) The use of IWBs during the lessons' stages (n= 13) The use of interactive IWB features (n= 20) The audiences (n= 20) The users (n= 20) The ability to use IWBs (n= 20)	To understand how teachers use IWBs in their lessons
Difficulties in using IWBs (n= 20)	Technical problems when using IWBs (n= 8) Lack of training courses (n= 9) Lack of assistance and support (n= 7) Location of IWBs in the resources room (n= 2) Lack of time for designing educational resources (n= 1)	To identify the problems that face teachers when using IWBs
Teachers' training (n= 20)	Sources of training (n= 20) Number of IWB training courses (n= 20) Reasons for not attending IWB training courses (n= 20) Satisfaction with the level of training (n= 20) Availability of assistance (n= 20) The need for further training (n= 20) Training needs (n= 20) The preferred training methods (n= 20)	To determine how teachers were trained to use IWBs and what their training needs were
Teachers' attitudes towards using IWBs (n= 20)	In the teaching process (n= 11) In the student learning (n= 13)	To investigate teachers' attitudes towards using IWBs

6.4.1.1. Teachers' Use of IWBs

The responses of the interviewees to this main theme provide explanations and more detail about how these teachers used IWBs in their lessons. These responses were classified into six sub-themes, indicated in the following sections.

a) The frequent use of IWBs in lessons

In this study, most of the interviewees (14 teachers) reported that they always use the IWB technology in their lessons. Three of the fourteen teachers (F1, F2, and F10) had

IWBs in three resources rooms in their school (*Tatweer* School 1), whereas the rest (F3, F4, F5, and all the male teachers) had IWBs in their classrooms. For example,

- "*I always use the IWB technology in all my lessons because it helps me to design attractive lessons." (Teacher F1)*
- *"Although the IWB is located in the resources room, I like to use it in all my lessons because my students like to use it." (Teacher F2)*
- *"I am lucky because I have the IWB in my classroom so I use it every day in all my lessons." (Teacher F4)*
- *"I usually employ the IWB technology in all my lessons because it helps me to design enjoyable lessons for the children I teach." (Teacher M1)*
- *"I use the IWB in every lesson." (Teacher M5)*
- *"I used to present all my lessons via the IWB because I do not have an ordinary whiteboard in my classroom." (Teacher M3)*
- *"I use this technology daily because it helps me to teach students some basic skills in arts. Thus, through using the IWB, I can present movies for some famous artists in the world as well." (Teacher M10)*

Only six of the interviewees indicated that they sometimes employed IWBs in their lessons. Three of these teachers (F8, F9, and M2) had IWBs in their classrooms, while Teacher M6 had an IWB in both his classroom and science laboratory; two teachers (F6 and F7) had IWBs in the learning resources rooms. For example,

- *"I usually use the interactive whiteboard in some lessons because of two reasons: The first reason relates to students and that because they usually take a long time to leave the classroom to the resources room where the IWB was located. The second reason relates to the availability of the resources room where teachers have specific schedule to use the IWB. " (Teacher F7)*
- *"Actually, I feel that some lessons need to be explained by using a variety of pictures, videos, and searching the internet. However, I prefer not to use the IWB in the Quran lessons because I usually teach my students the correct pronunciation by reading the verses and then explain the meaning of these verses for them." (Teacher M2)*
- *"I sometimes use the IWB in my lessons, and that depends on the student who I teach. For example, it is better for some students with learning difficulties to learn sculptures in maths classes by touching concrete sculptures rather than watching them on the board". (Teacher F9)*

Teacher M6, who teaches science in *Tatweer* School (7), indicated,

- *"When I teach my students in the classroom, I always use the IWB technology. However, in some lessons, which are introduced in the laboratory I sometimes use this technology but not always." (Teacher M6)*

Overall, most interviewees indicated that they always used the IWBs in their lessons, compared to just six teachers who sometimes employed these technologies in their lessons.

b) The use of interactive IWB features

The results of the interviews show that the twenty interviewees used the IWB features differently. Most teachers (F1, F2, F3, F4, F8, M1, M2, M3, M4, M5, M6, M7, M8, M9, and M10) reported that they used most of the interactive IWB features. For instance,

- *"I use most of the features such as drag and drop, reveal, spotlight, and games that help me to introduce the content of my lesson in a new and attractive way." (Teacher F1)*
- *"I usually use most of the interactive IWB features that I need in my lessons. For example, I like using the magic pen, spotlight, reveal, and highlighting to increase student attention on the important information during lessons." (Teacher F2)*
- *"I use the interactive IWB features that I need in my lessons and that depends on the nature of these lessons but I try to employ most of these features such as colouring objects, pictures, movies, and games. However, there are some interactive tools that I have not used in my lessons such as snapshot, spotlight, screen shade, and lesson recording because I have not learned how to use them." (Teacher F3)*
- *"I use most of the IWB features in my lessons. For example, I use the zoom feature to maximize some words. Additionally, I usually present videos that clarify letters and geometric shapes. Moreover, I like to use maths games to facilitate students' understanding of difficult concepts." (Teacher F8)*
- *"I like to use most features that I know, especially, zoom, mouse functions, and all tools that help me to present geometric shapes to my students." (Teacher M5)*
- *"I always use most of the features of the digital board based on my lessons."(Teacher M8)*
- *"I like to use most of the IWB features. For example, I use the internet to present an image to my students then I use the appropriate tools to explain how to draw such a picture."(Teacher M9)*

However, five female teachers (F5, F6, F7, F9, and F10) revealed that they used few of the IWB features. For instance,

- *"Unfortunately, I never use the interactive IWB features because of inactivating the IWB programme. Therefore, in this situation, I found myself using the IWB as an alternative to the computer screen, as I can manage by using the mouse to present the prepared lessons either by using PowerPoint or ready prepared educational videos."(Teacher F5)*
- *"I have limited knowledge about using IWBs effectively; therefore, I only use a few of the interactive IWB features. For example, I can present my lesson by using the IWB programme, open new slides and write on these slides by using touch functions such as a pen, rubber, and colours. Sometimes I use the screen shade for hiding part of the content of my lessons."(Teacher F6)*

- *"I am a novice teacher in using the IWB; therefore, I always use few features such as touch functions, colours, draw tables, and pens." (Teacher F7)*
- *"I use some of the IWB features in my lessons because I have limited knowledge in using IWBs because of lack of training." (Teacher F9)*

In summary, the interviewees who had more than one year experience in using IWBs (15 teachers) reported that they used more interactive features than the five female teachers whose experience in using IWBs was less than one year.

c) The audience

The responses of the interviewees varied regarding the types of audience during activities when using IWBs. Three teachers (F1, F3, and M5) reported that they used the IWBs with the whole class, small groups, and individuals.

- *"I usually use the IWB with the entire class and individuals besides dividing my students into small groups and presenting some activities on the board then choosing a student from each group to be a volunteer for her group in solving the task after discussing it in the group." (Teacher F3)*

- *"I use the IWB to teach the whole class, small groups, and individuals and that depends on the lesson's activities as well as the needs of my students." (Teacher M5)*

Additionally, three teachers (F6, M4, and M10) reported that they consider using IWBs with the whole class students and small groups. For example,

- *"I always use the IWB to teach the whole class students then I present tasks on the board and ask students to solve them collaboratively in groups. While students work in groups, I usually help some students who need help." (Teacher F6)*

- *"In my lessons, I use the digital board to teach the whole class. However, sometimes, I divide the class into small groups and use the board to teach each group separately." (Teacher M10)*

In contrast, two teachers (F2 and F5) indicated that they usually used the IWB to teach the whole class and the individuals.

- *"I use the IWB when teaching the whole class as well as with students individually. However, I do not always use the board with groups. Instead, I distribute worksheets for small groups to solve collaboratively."(Teacher F2)*

- *"Although I am using the IWB as a large screen of the computer I usually teach the whole class and sometimes use the IWB with students individually." (Teacher F5)*

Moreover, five teachers (F7, M1, M3, M7, and M9) during the interview stated that they only used the IWBs to teach the whole class. For instance,

- *"In lessons that I do not use IWBs, I usually employ whole class teaching through effective teaching strategies and teach students in groups and individually through collaborative learning, as well as focusing on students who have learning difficulties. However, in lessons with IWBs, I only use this technology for teaching the class as a whole because I have not learned how to integrate IWBs into my teaching." (Teacher F7)*

- *"To be honest, I usually teach the whole class when using the IWB."(Teacher M9)*

Surprisingly, three teachers (F10, M6, and M8) indicated that they only used the board with students in small groups. For instance,

- *"In my lessons, I usually present images, videos, and activities using the IWB and ask my students to discuss and solve these activities in groups." (Teacher F10)*

- *"By using the digital board, I like to present activities that relate to the content of social science to my students in small groups."(Teacher M8)*

Four teachers (F4, F8, F9, and M2) reported that they use the IWBs to teach students individually. For example,

- "*I teach students with learning difficulties; therefore, I usually prepare specific lessons on some skills based on an individual plan for each student. Thus, I use the IWB with one student or rarely with a small group of two students." (Teacher F4)*

- *"In my lessons, I usually present activities using the IWB and these activities are solved by individuals." (Teacher M2)*

As seen above, whole class teaching was reported by the majority of teachers, followed by small groups and individuals, which were equally indicated by the interviewees.

d) The users of IWBs

The respondents (F1, F2, F3, F10, M5, and M10) stated that they frequently allowed their students to use the IWBs in their lessons. For example,

- *"I usually design my lessons to make most of the students sharing the board." (Teacher F1)*
- *"My students usually use the board in every lesson, and their number is based on the designed activities for this lesson. (Teacher F3)*

- *"I frequently allow my students to use the IWB in my lessons because I noticed that how they are excited to touch the board and motivated to participate in activities presented via this technology."(Teacher M5)*
- *"My students like to use the IWB in my lessons, and they sometimes remind me to use some features." (Teacher M10)*

The teachers (F4, F8, F9, M1, M2, M3, M4, M7, and M8) reported that they used the IWBs more than their students, and that only a few students occasionally used the board. For example,

- *"In my lessons, I present the skill to the student and then I introduce tasks around this skill on prepared slides to ensure her understanding. During these tasks, I make sure that she sometimes uses the board to encourage her to communicate and move from her seat to the board." (Teacher F4)*

- "*Sometimes, I allow my students to use the IWB to encourage them to move from their seats and touch the board." (Teacher M1)*

- *"I use the IWB more than my students. Students only use the board during activities."(Teacher M4)*

However, five teachers (F5, F6, F7, M6, and M9) reported that they only used the IWBs in their lessons. For instance,

- *"I never permit my students to use the board because I am not an expert in using this technology, and I am still learning. Therefore, I did not train my students to use it; alternatively, they use the ordinary whiteboard for solving exercises." (Teacher F6)*

- *"I am the only user of the IWB in the classroom."(Teacher F7)*

- *"I only use the IWB in my lessons because my students are too young to use the board." (Teacher M9)*

Overall, the majority of the interviewees (nine teachers) reported that they sometimes allowed their students to use the IWBs compared with six teachers, who indicated that they frequently allowed their students to use the board. Only five teachers reported that they were the only users of the IWBs in their lessons.

e) Teachers' ability to use the IWB technology with its tools

Most teachers (F3, F4, F8, F10, M3, M4, M6, M7, M8, and M9) indicated that they were competent users of IWBs. For instance,

- "*I can say that I became a competent user of IWBs because it is easy to use and teachers can train themselves by searching the internet." (Teacher F3)*

- *"I can classify myself as a competent user of IWBs, but I am not a proficient user of this technology because I still cannot fix some common technical problems, and I have not had any training courses." (Teacher F8)*

- *"I can use the IWB in my lessons well, but I am not a professional user. Certainly, I know that there are many advantages of this technology that I am not sure of." (Teacher M7)*

Conversely, six teachers (F5, F6, F7, F9, M2, and M10) reported that they are unable to use IWBs in their lessons. For example,

- *"It is true to say that I am unable to use this technology effectively." (Teacher F6)*
- *"I still use the IWB in my lessons as a novice user because I have not had any training courses; therefore, I need more training and practice."(Teacher M2)*

Four teachers (F1, F2, M1, and M5) stated that they considered themselves proficient users of IWBs.

- *"I consider myself an expert in using IWBs because I design my lessons myself and start from scratch." (Teacher F1)*
- *"I consider myself a skilful user of this technology because I already had an efficient training course that was arranged in my school. Then, self-training and daily practice dramatically improved my skills. Therefore, I do not find any difficulties in using IWBs and designing lessons with effective activities."(Teacher F2)*
- *"I have used the IWB in my lessons for seven years, and I have all the necessary skills to use IWBs, so I am an expert in using this technology." (Teacher M1)*
- *"I know very well how to use IWBs in my lessons because I have used them daily for four years." (Teacher M5)*

To sum up, the majority of the interviewees indicated that they are competent users of IWBs, followed by six teachers who reported that they were unable to use IWBs in their lessons. Then, a smaller number (four teachers) stated that they were proficient users of IWBs.

f) Stages of lessons

Regarding the use of IWBs during the lesson stages, only thirteen teachers (F1, F2, F3, F4, F5, F6, F7, F10, M1, M3, M5, M6, and M9) expressed their opinion towards this sub-theme. All these teachers indicated that they used the IWB in the second stages of lessons to present the content. For instance,

- "*Using the IWB helps me to design attractive activities that support the content of my lessons effectively*." *(Teacher F1)*
- "*Using the IWB helps me to introduce the content of my lesson more easily than using the normal whiteboard. It supports my lessons with pictures, maps, videos, and useful websites; therefore, I feel that I can present interesting lessons using this interactive technology." (Teacher F2)*
- "*I prefer using the IWB to present the content of my lessons because it enables me to use animation and movies with students. Additionally, I can save my lessons and use them in the future. Thus, students can learn the content visually through this technology rather than using their textbooks." (Teacher F3)*
- *"The IWB helps me to teach the content of maths lessons to my students using different tools, such as a calculator, ruler, clock, and geometric shapes. Thus, using these tools saves time and motivates students to learn math concepts. Moreover, I can use the educational games that help me to explain some of the basic operations in maths lessons, such as addition, subtraction, and multiplication. Therefore, the content of my lessons is enhanced using IWBs." (Teacher M5)*

- *"I found that the IWB is a very helpful technology in strengthening students' knowledge about the content of their lessons. By searching the internet, students can receive a large amount of information relating to the content of the lesson, and therefore they might learn better than using their textbook." (Teacher M9)*

Moreover, all thirteen teachers used the IWB at the end of their lessons to review the content, or for assessment. For instance,

- "*I usually review each lesson using the IWB to ensure students' understanding*." *(Teacher F1)*
- "*I like to design games that include the content of my lessons and use these games at the end of lessons to evaluate the understanding of my students." (Teacher F2)*
- *"Using the digital board at the end of my lessons is considered an important step for me because through using the IWB I can summarize the main points in my lesson and present them step by step to students to remind them and ensure their understanding." (Teacher M6)*

Regarding the use of IWBs at the start of lessons, eleven teachers reported that they considered the importance of using IWBs at this stage as attracting students to the lesson. For instance,

- "*I believe that IWBs inspire students at the start of the lesson by presenting enjoyable activities and that is what I usually do in my lessons." (Teacher F1)*
- *"I usually use the IWB at the start of my lessons by introducing a short movie relating to the content of each lesson." (Teacher M9)*

However, some teachers preferred not to start their lessons using the IWB, such as the observed teachers F4 and F7, who started their lessons with activities that required students' movement.

- "*Most of the lesson time, I use the IWB except during the start of the lesson. Actually, I prefer that my students do some physical activities that help them to be prepared for the lesson." (Teacher F4)*
- "*Usually I start my lessons by presenting a practical activity that helps to pave the way for understanding the topic of my lesson." (Teacher F7)*

Furthermore, twelve teachers reported that they use IWBs to present lesson activities. For example,

- "*The IWB technology enables me to design a variety of activities that can make Arabic lessons easier for students." (Teacher F10)*
- *"Actually, the digital whiteboard helps me to introduce a variety of interesting activities that might facilitate the understanding of students for some historical events." (Teacher M8)*

Conversely, Teacher F5 (who was observed) preferred to not employ the IWB during activities. She explained during interview that,

- *"In my activities, I usually focus on how students solve the task individually and in groups to ensure their understanding as well as to improve their ability to discuss." (Teacher F5)*

Thus, the majority of the interviewees indicated that they used the IWB technology at the beginning of lessons to attract students, in the second stages to present the content of their lessons, during lesson activities, and at the end to revise, or for assessment.

6.4.1.2. Difficulties in Using IWBs

The twenty interviewees reported five types of problems when using IWBs in their lessons. Therefore, their responses regarding these five problems are provided with quotations in this section.

a) Lack of training courses

Lack of training courses was reported by the teachers M2, M4, M5, M9, F3, F4, F7, F8, and F9. For example,

- *"For me, lack of training sessions is an essential problem that should be considered from the responsible of the Department of Education. I did not have any training courses in using IWBs. " (Teacher M2)*
- *"I did not have any training courses from the Department of Education; therefore, I think this is the biggest problem for me." (Teacher M9)*
- *"Unavailability of training courses organised by the Educational Department is one of the difficulties that face me." (Teacher F3)*
- *"The lack of training courses that clarify the use of IWBs in effective ways is the most major problems that faces me." (Teacher F4)*

b) Technical problems when using IWBs

This difficulty was indicated by the teachers F1, F2, F3, F7, F10, M1, M6, and M10. For instance,

- *"There are some faults in the programme itself; sometimes it cancels some of the features without any reason known to us." (Teacher F1)*
- *"Sometimes I face some technical problems such as it stops working, as any other technical device."(Teacher F2)*
- *"I find difficulties when technical problems happen such as power failure or computer malfunction." (Teacher M1)*
- *"There is no ordinary whiteboard in my classroom. I only have an IWB. However, when technical problems occur I feel very frustrated because these problems waste my time." (Teacher M6)*
- *"I also have some technical problems that affect my use of the IWB in my lessons, and some of these problems relate to the computer that is connected with the IWB." (Teacher F7)*

c) Lack of assistance and support

Seven interviewees (M3, M7, M8, F4, F5, F8, and F9) complained about the lack of assistance and support in their schools. For example,

- *"I think that the lack of assistance is the most important issue that should be offered in all schools with IWBs." (Teacher M3)*
- *"I believe that the maintenance of IWBs is neglected. Therefore, constant assistance should be provided for teachers in each school supported with IWBs." (Teacher M7)*
- *"The lack of assistance and support either inside my school or in the Education Department is also considered a problem for teachers; therefore, when I face any problem I usually search the Internet or call some private professionals, which is considered time-consuming." (Teacher F4)*
- *"The main and the biggest problem that challenges me is the ignorance of those responsible for maintenance in the Education Department, as they do not respond to my calls to fix the IWB or provide professionals to help me to solve this problem." (Teacher F5)*
- "*Absolutely, the major problem is the lack of assistance and support as you see the IWB in my school broke down three months ago, and it still isn't fixed." (Teacher F8)*

d) Location of IWBs

Teachers F6 and F7 reflected that the location of the IWB in the resources room was a significant problem affecting them, as they stated,

- *"The location of the IWB in the resources room is one of the problems that face me in using this technology." (Teacher F6)*
- "*The most common problem I encounter is the location of the IWB in the resources room, where all the teachers have a specific schedule for using it. Thus, I do not use this technology daily; I only use it in some lessons." (Teacher F7)*

e) Lack of time for designing educational resources

Only Teacher F6 indicated this difficulty, as she stated,

- *"The lack of time for designing educational resources is another problem that affects me when applying the IWB in my lessons." (Teacher F6)*

To sum up, the majority of the interviewees reported that the lack of training courses is the major problem that negatively affected their use of IWBs, followed by technical problems when using IWBs, and then the lack of assistance and support. The lack of time for designing educational resources and the location of IWBs were indicated by only one or two teachers.

6.4.1.3. Teachers' Training

a) Sources of training

Nine teachers reported that they had been trained to use IWBs by the Department of Education. These teachers were F1, F2, F10, M3, M5, M6, M7, M8, and M10. For example,

- *"I started to learn how to use the IWB from scratch in my school, guided by experts in using IWBs, and then I learned how to design activities and games through the school website that was designed by some professionals in technology. This involves a lot of activities and games." (Teacher F1)*
- *"I was trained to use IWBs through a training course that held inside my school."(Teacher F2)*
- *"I was taught to use the digital board through a two-hour training course that was the only course provided to us by the IWB supplier." (Teacher M5)*
- *"The Department of Education provided only one training course when the IWBs were first installed in our school." (Teacher M10)*

Additionally, self-training was reported by teachers F3, F4, F5, M1, M4, and M9. For instance,

- *"Self-training was the only method that I used to have training in using this technology." (Teacher F3)*
- *"I taught myself how to use the interactive features, and I wrote down what I learned using notes, then through daily use and practice I overcame some common problems and became able to use this technology." (Teacher F4)*
- *"I did not learn how to use all the interactive features because I did not have any training courses from the Educational Department. I trained myself to use the IWB through searching IWB websites."(Teacher M1)*

Moreover, both self-training and collaboration with colleagues were indicated by the teachers F6, F7, F8, F9, and M2. For example,

- *"I learned to use the IWB through the strategy of trial and error as well as watching lessons and tutorials on YouTube. Then, I focused on attending some lessons of my colleagues who are expert in using this technology." (Teacher F8)*
- *"My colleagues helped me to learn how to use IWBs, and then I relied on myself to improve my skills." (Teacher F9)*
- *"I am so grateful for my colleagues who trained me in using IWBs and, after gaining the basic skills, I practised what I learned in my lessons" (Teacher M2)*

In summary, self-training was reported by the majority of teachers (eleven teachers). Then, training by the Department of Education was indicated by nine teachers, whereas training through collaboration with colleagues was reported by only five teachers.

b) Number of IWB training courses

The majority of the participants (eleven teachers) reported that they had not had any training courses related to the use of IWBs. These teachers were F3, F4, F5, F6, F7, F8, F9, M1, M2, M4, and M9. For example,

- "*I did not receive any training courses related to the use of IWBs*." *(Teacher M1)*
- "*Unfortunately, training courses that consider the use of IWB technology were not provided to teachers despite the availability of this technology in our school. How should we use this technology effectively if we did not receive suitable training?" (Teacher F9)*

However, three teachers (F1, F10, and M8) reported that they had had two or three training courses. For instance,

- "*I had three training courses in my school when this technology was installed in the school."(Teacher F1)*
- *"I participated in three training courses relating to the use of IWBs."(Teacher M8)*
- *"I had two training courses in my school that only focused on how to use this technology and its tools." (Teacher F10)*

Moreover, the rest of the interviewees (F2, M3, M5, M6, M7, and M10) indicated that they had only had one training course in how to use the IWBs. For instance,

- "*I was trained to use the IWB through participating in one training course held in my school, as well as through the school website, which contains a lot of information relating to the use of IWBs."(Teacher F2)*
- *"I had only one short training course in using IWBs."(Teacher M6)*
- *"Only one training course was provided to teachers when IWBs were installed in my school."(Teacher M10)*

Overall, the majority of the interviewees participating in *Tatweer* schools in Jeddah reported that they had not received any IWB training courses, and nine had had between 1-3 courses.

c) Reasons for not attending IWB training courses

In this section, teachers' replies were classified based on their gender to know the specific reasons are preventing female teachers from attending IWB training courses, as well as the reasons that prevent male teachers from participating in these courses.

Female teachers

Seven female teachers (F3, F4, F5, F6, F7, F8, and F9) reported that they did not attend training courses because these courses were not available. For example,

- *"Unavailability of training courses relating to the use of IWBs is the only reason that could prevent me from attending any IWB training* sessions*." (Teacher F3)*
- *"The only reason that prevents me from attending training courses is the unavailability of these courses for teachers. In fact, the teacher who is responsible for the resources room only participated in a training programme regarding the use IWBs, and she trained teachers in our school about some core competencies." (Teacher F6)*
- *"These training courses are not available. If training courses are provided to teachers, I will be the first one in attending these courses because I need training in using IWBs." (Teacher F9)*

Teachers F4 and F8 indicated that they did not attend training courses because of the lack of availability of transport:

- *"The lack of transportation is also an important reason that could prevent me from attending training courses and in the case of providing these courses that are usually held in faraway centres." (Teacher F4)*
- *"Training courses are always held in external centres which are far away from our school. Therefore, as a Saudi woman prevented from driving, I often find difficulty reaching these centres." (Teacher F8)*

In contrast, teachers F1, F2, and F10 reported that they did not attend training courses relating to the use of IWBs because they had the appropriate skills in using these technologies.

- *"I know how to use IWBs effectively."(Teacher F1)*
- *"I have appropriate skills in using IWBs as well as everything I need is provided on the school website."(Teacher F2)*
- *"I have the necessary skills to use IWBs in my lessons, and I have no problems with attending training courses because these courses were provided in our school."(Teacher F10)*

Male teachers

Six male teachers indicated that they did not have any reason that could prevent them from attending training courses. However, only four teachers (M4, M6, and M7, and M10) agreed with the female teachers regarding the unavailability of IWB training courses. For instance,

- *"Training courses that concentrate on this technology specifically are usually not provided."(Teacher M4)*

- *"I think training courses are not always available for teachers. Therefore, this is the only reason could prevent me from attending training courses because I like to have continuous training in how to use this technology in new ways." (Teacher M6)*

Overall, most teachers interviewed (eleven teachers) reported that the reason that prevented them from attending IWB training courses was the unavailability of these courses. Female teachers reported two additional reasons, the unavailability of transport, identified by two teachers, and already having the appropriate skills in using IWBs, indicated by three teachers.

d) Satisfaction with the level of training

Eight teachers stated that they were satisfied with the level of training they had received (F1, F2, F10, M1, M3, M5, M6, and M8). For example,

- *"I am very delighted with the training that I have received."(Teacher F2)*
- *"Although I received only one training course in how to use the IWB, I think I am satisfied with my training because I can improve my skills by self-training."(Teacher M3)*

The majority of the interviewees (F3, F4, F5, F6, F7, F8, F9, M2, M4, M7, M9, and M10) expressed that they were dissatisfied with their level of training. For instance,

- *"I am not satisfied with my level of training because I did not have any training courses" (Teacher F4)*
- *"I am very frustrated and unsatisfied because I did not have any training courses and I did not use the IWB in my lessons as it should be." (Teacher F5)*
- *"I only had one training course in how to use the IWBs, so I sometimes feel uncomfortable with this technology." (Teacher M7)*
- *"Most teachers whom I know only had one or two training courses, so I think that is not enough for the best use of IWBs. Therefore, teachers need more training sessions to be more satisfied with modern technologies." (Teacher M10)*

Overall, the majority of the interviewees (twelve teachers) reported that they were dissatisfied with their level of training compared to only eight teachers who indicated that they were satisfied.

e) Availability of assistance

Only three teachers (F1, F2, and F10) reported that they always had assistance when they encountered difficulties with the use of IWBs. These three teachers were working in *Tatweer* School (1), which had four experts in using technical devices. For example,

- *"We have an IT experienced staff in my school." (Teacher F1)*

- *"When problems occur especially technical difficulties I usually find assistance from the four technical professionals who are working in my school." (Teacher F2)*

In contrast, Teacher F5 stated that she did not find any assistance regarding the IWB that was installed in her classroom as a large computer screen. She said,

- *"I did not find any help for solving the technical problems whether inside my school or in the Education Department who did not make active efforts for activating the board." (Teacher F5)*

However, two teachers (F6 and F7) reported that they sometimes received assistance from the teacher working in the resources room. This teacher usually had no assigned teaching, and was responsible for the resources room and organising the schedule for teachers to use the IWB.

- *"Sometimes I find assistance from the teacher who is in charge of the resources room, but when she is absent, I stop using the IWB when problems occur." (Teacher F6)*
- *"Personally, I find assistance from the teacher who does not have any teaching classes and is totally responsible for the resources room, organising the schedule for teachers to use the IWB, and training teachers in our school in using the IWB. Thus, she always helps me when problems occur, however, unfortunately when she is absent in some circumstances I do not find any help." (Teacher F7)*

Moreover, the rest of teachers (14 teachers) indicated that they sometimes found assistance when problems occurred. They tried to solve some of the problems either by searching the internet (such as teachers F3, F4, M6, and M7) or by their colleagues (such as teachers F8, F9, M1, M2, M3, M4, M5, M8, M9, and M10). For example,

- *"No one in my school has the experience to solve the problems relating to the IWBs, so I depend on searching the internet to fix some problems" (Teacher F3)*
- *"I rarely find support when the IWB stop working and some technical problems happen. Therefore, in this case, I usually contact a professional in using IWBs or search the IWB websites to learn how to use it."* (Teacher F4)
- *"I remember that I had some problems that prevented me from using the board, so I felt very frustrated because there is no constant assistance in my school. However, I fixed these problems by the help of my colleague who has the experience in using the board." (Teacher M1)*
- *"Unfortunately, constant assistance is not available in my school; therefore, when I found any problem I always ask some colleagues who are expert in using IWBs." (Teacher M3)*

Consequently, the majority of teachers (16 teachers) reported that they sometimes found assistance in their schools regarding the use of IWBs. Three teachers indicated that they always found assistance when they encountered any difficulties related to the use of IWBs.

f) The need for further training

Twelve teachers (F3, F4, F5, F6, F7, F8, F9, M2, M4, M5, M7, and M9) indicated that they needed much more training. For example,

- *"I need more training in using IWBs for a more efficient use because I still need to know how to use some interactive features that could be used in mathematics lessons." (Teacher F4)*
- *"Yes, of course, I need more training to use this amazing technology because I did not have any training courses. Therefore, I use only a few features, and I have limited knowledge about it" (Teacher F7)*
- *"Of course, I need a lot of continuous training in using this technology because technology is changing each hour and we need to be ready for such reform to improve the educational outcomes." (Teacher F8)*
- *"Absolutely, I need training because of my conviction that there are many advantages of IWBs that I did not know." (Teacher M5)*
- *"I need many training courses in using IWBs as long as these courses provide practical training in how to use the IWB. Indeed, theoretical training is a waste of time." (Teacher M2)*
- *"I still have limited knowledge in how to integrate this technology effectively into my lessons; therefore, I need more training regarding this technology."(Teacher M7)*

Five teachers reported that they needed some training (F2, F10, M3, M6, and M8). For instance,

- *"Although I had effective training in using this technology, I need some training for the best use of this technology because each teacher needs continuous training in order to increase the quality of teaching and remain updated about what helps improve the teaching and student learning." (Teacher F2)*
- *"I need some training relating to the use of IWBs because the three training courses that I had received did not provide us with the effective use of this technology in teaching." (Teacher M8)*

However, three teachers (F1, M1, and M10) showed their unwillingness to have more training. They explained:

- *"I had trained well to use IWBs in my school, so I do not need more training."(Teacher F1)*
- *"I did not need any training courses in the use of IWBs because I think that I can employ this technology in my lessons in a way that covers my needs."(Teacher M1)*
- *"I do not think that I need more training in using this technology because I know the basic tools that I need in teaching art to my students." (Teacher M10)*

To sum up, the majority of the teachers interviewed indicated that they needed much more training focused on the use of IWBs. Five teachers reported that they needed some training, and only three teachers showed their unwillingness to have more training.

g) Training needs

Eight teachers (F5, F9, M1, M2, M6, M7, M8, and M10) reported that they required training in technical skills in the use of IWBs. For instance,

- *"As you see, I used the IWB in the wrong way, as a computer with a large screen, because of inactivating its programme; therefore, logically I need a lot more training courses to equip me with technical skills of how to use this technology from scratch before moving to advanced courses." (Teacher F5)*
- *"I want to participate in training courses that cover the technical skills in using IWBs as well as the common problems that face teachers when using this technology." (Teacher M10)*
- *"I like to attend training courses that explain to me all the technical skills of using IWBs in a practical way to have the opportunity to use the board by myself in these courses." (Teacher F9)*

Five teachers (F2, F10, M3, M4, and M9) indicated that they needed training in effective teaching techniques using IWBs.

- "*I need new ideas and attractive methods in how to integrate IWBs into my lessons effectively." (Teacher F2)*
- *"I prefer to learn the effective teaching methods when using the smartboards to achieve the main goals of my lessons." (Teacher M9)*
- *"I need to learn the best teaching strategies for teaching the content of English language through using IWBs." (Teacher M4)*
- *"I like to attend continuous training courses that contain new ideas and effective strategies in integrating the IWB in my teaching." (Teacher F10)*
- *"Personally, I want to be trained in how to use this technology in my lessons to create more powerful and attractive lessons for primary school students."(Teacher M3)*

Three teachers (F1, F4, and M5) stated that they needed to be trained in how to design educational resources that could be used via IWBs.

- *"I only want to learn new methods in designing attractive lessons for my students."(Teacher F1)*
- *"I need to be trained in designing educational resources that fit with IWBs because I have a lack of this kind of training, and I feel it will facilitate my teaching and preparing lessons as well as it will improve student learning for more active learning." (Teacher F4)*
- "*I wish to be trained in how to design effective educational materials that could be used in my lessons." (Teacher M5)*

In contrast, four female teachers (F3, F6, F7, and F8) reported that they needed more than one type of training. For example,

- *"I need effective training in everything relating to the use of IWBs including technical skills, effective teaching strategies, and design educational resources that I need in my lessons. I think if I trained in all these courses I would not find troubles when using this technology." (Teacher F3)*
- *"I need training in how to use IWB features, integrate this technology into my lessons, fix the core problems, and design active lessons because I have difficulties to find educational resources on some topics in my content." (Teacher F7)*

Thus, according to Table 6.8, training in the technical skills of using IWBs was reported by the majority of the interviewees (n=12), followed by training in the effective teaching techniques using IWBs (n=8), and then training in designing educational resources compatible with IWBs (n=6).

Table 6.8: Summary of the types of training needs indicated by the interviewees

The types of training need	Female interviewees	Male interviewees
Technical skills	F3, F5, F6, F7, F8, and F9 (n=6)	M1, M2, M6, M7, M8, and M10 (n=6)
Effective teaching techniques	F2, F3, F6, F7, and F10 (n=5)	M3, M4, and M9 (n=3)
Design educational resources	F1, F3, F4, F7, and F8 (n=5)	M5 (n=1)

h) The preferred training methods

In this section, the interviewees reported their preferred training methods in using IWBs. Nine teachers indicated that they only preferred one type of training methods. The rest of the interviewees (eleven teachers) reflected that they wanted two types of training methods.

Two teachers (F1 and F2) stated that they only preferred self-training to improve their IWB skills.

- *"In fact, self-training is considered the most important method for learning, especially for using technologies because it reflects the teachers' self-desire for learning and shows to what extent the teacher wants to learn." (Teacher F1)*
- *"I have experience in using IWBs. Therefore, I need only self-training because I can evaluate my skills and, consequently, determine my needs." (Teacher F2)*

Teachers (F8, M4, M7, and M9) indicated that they only preferred to attend training courses that relate to the use of IWBs. For instance,

- *"I completely prefer to attend training courses." (Teacher F8)*
- *"I like to attend training courses. However, most training sessions were not related to the use of IWBs and, most importantly, the time of these courses was not suitable for me as a math teacher with a huge curriculum that I have a specific time to finish." (Teacher M7)*
- *"I think the effective training courses could be better in training teachers about the full potentials of IWBs in the teaching process." (Teacher M4)*

Three teachers (M1, M2, and M6) reported that they preferred collaboration with colleagues in improving their skills in using IWBs.

- *"I prefer to ask my colleagues because I think they are better than waste my time on these courses."(Teacher M2)*
- *"I feel very comfortable when asking my colleagues in the school about the use of these technologies." (Teacher M1)*
- *"I prefer collaboration with colleagues to improve my skills." (Teacher M6)*

Additionally, three teachers (F5, F6, and F10) reported that they preferred both attending training courses and self-training. For example,

- *"Personally, I love attending training courses, especially which relate to the use of technology in education, because I am willing to improve my skills, and I believe in the importance of technology in facilitating the process of teaching and learning. Moreover, I trained myself through online courses many long ago to use the computer until I became professional in using the software to design active educational lessons. Therefore, I prefer self-training too." (Teacher F5)*
- *"I like to attend training courses in which I can learn how to use IWBs from the beginning, and I can apply what I learnt in practice. Additionally, I wish I had free time for self-training." (Teacher F6)*

Only, one teacher M10 preferred both attending training courses and collaboration with colleagues to improve his skills in using IWBs.

- *"From my view, I think training courses and collaboration with colleagues could be enough for training teachers in using this technology effectively."(Teacher M10)*

Moreover, five teachers (F3, F4, F9, M3, and M5) indicated that they were in favour of both attending training courses and observing the lessons of skilled educators. For instance,

- *"I prefer to attend training courses to obtain the basic skills of using IWBs and how to integrate them into lessons. Moreover, I like to attend some lessons of expert teachers in using IWBs to know how they use them in classrooms in* *practice, how they face the technical problems, and how they integrate them into their teaching." (Teacher F4)*

- *"I like attending training courses and observing expert teachers when using IWBs to improve my use of this technology."(Teacher M3)*

- *"There is no doubt that training courses could be useful in training teachers for best use of IWBs; however, observing skilled teachers in using this technology is also considered an important way for training." (Teacher M5)*

Finally, two teachers (F7 and M8) preferred both a collaboration with colleagues and observing lessons of skilled educators in improving their IWB skills.

- *"I like to ask my colleagues about using this technology and visit expert teachers who use IWB in their lessons; indeed, by these two training methods, I do not need to leave the school for training and I can choose a time that fits my schedule." (Teacher F7)*

- "*I like observing lessons of a proficient teacher besides collaborating with my colleagues." (Teacher M8)*

Thus, according to Table 6.9, attending training courses relating to the use of IWBs was reported by the majority of interviewees (13 teachers). Observing the lessons of skilled educators was preferred by seven teachers, and collaboration with colleagues was indicated by six teachers. Finally, self-training was reported by five teachers.

Table 6.9: Summary of the training method preferences indicated by the interviewees

Training methods preferences	Female interviewees	Male interviewees
Attending training courses and workshops	F3, F4, F5, F6, F8, F9, and F10 (n=7)	M3, M4, M5, M7, M9, and M10 (n=6)
Observe skilled teachers	F3, F4, F7, and F9 (n=4)	M3, M5, and M8 (n=3)
Collaboration with colleagues	F7 (n=1)	M1, M2, M6, M8, and M10 (n=5)
Self-training	F1, F2, F5, F6, and F10 (n=5)	(n=0)

6.4.1.4. Teachers' Attitudes towards Using IWBs

All the interviewees responded to this main theme by indicating that they had positive attitudes towards using this technology in their lessons. In this section, some of these views in either the teaching process or the student learning are indicated with extracts.

In the teaching process

- *"It is a great help for teachers in all subjects, especially maths, science, and Islamic topics." (Teacher F1)*

- *"It is a fact to tell you that IWBs change the environment in classrooms from traditional and boring when using the ordinary whiteboard into modern and active classrooms." (Teacher F2)*

- *"From my experience, I found that the use of an IWB in my classroom helps me to prepare effective lessons that include images, songs, and videos. Indeed, this technology has transformed the traditional environment in my classroom into an active and enjoyable one. In fact, the only IWB is located in my classroom, so I feel that I am very lucky more than other teachers are in my school. Therefore, I cannot imagine myself teach without using this technology." (Teacher F3)*

- *"I strongly agree with the use of IWBs in my teaching because this technology helps me in preparing my lessons as well as it supports the teaching of English language content. Therefore, IWBs have the ability to support lessons with educational videos of native speakers. As a result, the pronunciation of students will be improved." (Teacher F5)*

- *"Although it was the first time to apply the use of the IWB in my lesson, I encourage all teachers to use this innovative technology in their teaching because of their ease and usefulness in preparing lessons as well as saving the lessons' time." (Teacher F7)*

- *"I can say that IWBs change the environment in classrooms from boring classrooms when using the ordinary whiteboards to more active classrooms when using the digital whiteboards. Indeed, this technology is considered an important tool in increasing students' participation and discussions in classrooms." (Teacher M3)*

- *"The use of IWBs helps me to be able to manage the lesson time and that because of preparing my lessons formerly at home." (Teacher M5)*

- *"I agree with the ability of IWBs in facilitating the teaching process, planning maths lessons, and saving time. Additionally, this technology enables me to use animations and movies that explain some concepts as well as it helps me to design enjoyable lessons and saving them to be used with other students." (Teacher M7)*

- *"I usually look for new activities related to the content of my lessons to add fun to these lessons; therefore, I found that using the interactive whiteboard helps me to design enjoyable lessons." (Teacher M8)*

In student learning

- *"I compared lessons using an IWB and some lessons in which I did not use this technology, and I found that my students when using the IWB were motivated to attend lessons, engaged in classroom activities, and participated in classroom discussion more than in lessons without using this innovative board. Thus, I'm very confident to say that IWBs improve student learning." (Teacher F3)*
- *"IWBs have an important role in improving student learning because they increase their attention and motivate them to communicate. In fact, when using educational videos that include animation and songs, my students started to love English lessons and their understanding of concepts was increased. I was really shocked when my students became more active in lessons and more fluent in pronouncing the English words." (Teacher F5)*
- *"Using IWBs in student learning is a positive factor that can motivate them to learn, increase their engagement in classroom activities, enhance their attention, and thus improve their success." (Teacher F6)*
- *"I strongly agree with the usefulness of using IWBs in improving students' learning for improving their motivation and interests. Additionally, they decrease boredom for students during lessons, especially with some complicated maths concepts and tasks." (Teacher F7)*
- *"Using IWBs in classrooms is considered a major step in improving students learning and increasing their scores." (Teacher F10)*
- *"In my lessons, I found that discussion was improved by using the IWB because it enables presentation of images and videos which allows my students to discuss them in groups. (Teacher M1)*
- *"The interactive whiteboard enables my students to learn concepts, letters, and grammar structures faster more than the ordinary boards. Students like learning English when using the digital board and they can remember these lessons very well." (Teacher M4)*
- *"I believe that IWBs have the ability to attract students to the maths lessons and increase their interaction in the classroom. For example, some of my students do not like to participate in classroom activities and solving tasks. However, when I presented these activities on the digital board I noticed that they became more focused and motivated to solve these tasks." (Teacher M7)*

Suggestions indicated by the interviewees

- *"I recommend increasing the number of IWBs in schools to cover all classrooms." (Teacher F3)*

- *"I suggest providing Arabic guidelines with each IWB that could aid teachers to understand how this technology works." (Teacher F4)*

- *"I wish to introduce IWBs in all classrooms, activate these devices, and provide professionals in each school to help teachers in the case of technical problems." (Teacher F5)*

- *"I hope to provide IWB training courses at each school to offer the opportunity for all teachers inside the school for training. Thus, there will not be any excuse* *for female teachers to not attend these courses because of the unavailability of transport, since women in Saudi Arabia are not allowed to drive." (Teacher F8)*

- *"I have 24 classes per week, and that could affect my ability to develop my IWB skills. Therefore, I suggest reducing the teachers' workload to provide more time for teachers to train." (Teacher M2)*
- *"I do not have enough time to train during the school day because I have 22 classes per week. I wish these classes could be reduced to have the time for training." (Teacher M5)*

6.4.2. Summary of the Interview Results

In this section, the findings from the interviews with twenty teachers (participating in *Tatweer* primary schools in Jeddah) are summarized and compared to the quantitative findings with 587 teachers in these schools. The majority of the findings from the interviews were similar to and supported the quantitative findings. These supportive findings are summarized first, before handling the dissimilarities between the results of using both methods (questionnaire and interviews).

The majority of the interviewees indicated that they used the IWB technology at the beginning of lessons to attract students, in presenting the content of their lessons, during the lessons' activities, and at the end of their lessons for revising or for assessment. Additionally, they reported that they employed whole class teaching when using IWBs. However, they sometimes allowed their students to use the IWBs. Moreover, most teachers revealed that they believed they were competent users of IWBs. Six teachers reported that they were unable to use IWBs in their lessons, and four stated that they were proficient users.

Furthermore, the lack of training courses was the major problem that negatively affected the IWB usage of most of the interviewees, followed by technical problems using IWBs, and then the lack of assistance and support. Importantly, most interviewees reported that they had not received any training courses regarding the use of IWBs from the Department of Education. Moreover, the majority of teachers both males and females indicated that the reason that prevented them from attending IWB training courses was their lack of availability. However, female teachers reported two additional reasons: the unavailability of transport, identified by two teachers, and having the appropriate skills in using IWBs, indicated by three teachers.

Concerning the availability of assistance in *Tatweer* schools, the majority of interviewees (16 teachers) reported that they sometimes found assistance in their schools regarding the use of IWBs. Only three teachers reported that they always found assistance. Therefore, the majority of the teachers showed that they needed much more training focused on the use of IWBs, while five teachers reported that they needed some training, and only three were unwilling to have more training. Thus, most teachers displayed the need for training in the technical skills of using IWBs, while training in effective teaching techniques for using IWBs, and then training in designing educational resources compatible with IWBs were also suggested. Moreover, most teachers (12 teachers) preferred attending training courses relating to the use of IWBs. Observing the lessons of skilled educators was favoured by eight teachers, and collaboration with colleagues was indicated by six. Finally, self-training was reported by five teachers. All the interviewees showed positive attitudes towards using IWBs in their lessons.

However, only four findings from the interviews differed from the results of the questionnaire. These findings relate to the frequent use of IWBs in lessons, sources of training, satisfaction with the level of training, and the use of interactive IWB features. The majority of the interviewees indicated that they always used the IWBs in their lessons compared to only six teachers who sometimes employed them in their lessons. Thus, this result varied from the quantitative results, which indicated that the majority of teachers in *Tatweer* primary schools sometimes used the board. Regarding the sources of training, self-training was reported by the most teachers (eleven teachers), and training by the Department of Education was indicated by nine teachers. Training through collaboration with colleagues was reported by only five teachers. Thus, the majority of the interviewees were self-trained, which is similar to the quantitative results, where most of the respondents to the questionnaire (41%) were also self-trained. However, the responses of the interviewees varied from the respondents of the questionnaire regarding the training through collaboration with colleagues and the Department of Education. In the quantitative findings, training through collaboration with colleagues (32%) was in the second stage of teachers' training sources, while training via the Department of Education (26%) was in the third stage of teachers' training sources.

Furthermore, the majority of the interviewees (twelve teachers) reported that they were dissatisfied with their level of training, and only eight teachers were satisfied. Thus, the responses of the interviewees were also different from the quantitative results, where 57% of the respondents of the questionnaire were neutral about their satisfaction towards the level of training they had received. However, 32% of respondents were satisfied, and a smaller percentage (11%) were dissatisfied. In addition, most interviewees reported that they used most of the interactive IWB features. This result differed from the quantitative findings, which showed that most teachers used few of them. However, it can be noticed that the interviewees with more than one year's experience in using IWBs (15 teachers) reported that they used more interactive features than the five female teachers with less than one year. This finding supported some of the associations that were indicated in the quantitative findings. These associations are between teachers' experience in using IWBs, and using their interactive features (see Section 5.7.2.2), as well as between teachers' gender and the use of IWB features (see Table 5.15).

6.5. CONCLUSION OF THE CHAPTER

In this chapter, the results of the analysis of the second stage data collection (classroom observations and semi-structured interviews) were presented and summarized. These findings were collected from twenty teachers in *Tatweer* primary schools in Jeddah. Classroom observations and the female interviews were carried out by the researcher, while the male interviews were conducted by a male researcher because of Saudi cultural restrictions (as discussed earlier in Section 4.5.2.2). The findings from the interviews with twenty male and female teachers were used to answer all the five research sub-questions. The findings from the classroom observations only focused on how the IWBs were used in practice by seven female teachers, and the difficulties they faced during this. Overall, the findings of the interviews and classroom observations were combined with the quantitative results to present a clear picture of the context of the study, and consequently, increase the research validity. The next chapter discusses the findings of this study (both the quantitative and qualitative results) within the context of the literature and compares these (where appropriate) to the TPACK model (Mishra and Koehler, 2006) and the CBAM *Levels of Use* (LoU) (Hall and Hord, 2006).

7. DISCUSSION

7.1. INTRODUCTION

The aim of this study was to investigate how teachers in *Tatweer* primary schools in Jeddah use IWBs in classrooms, and to determine their IWB training needs. The five research sub-questions were, therefore, examined in this study using mixed methods research including a questionnaire, classroom observations, and a semi-structured interview. The first four sub-questions concentrated on investigating teachers' attitudes towards using IWBs, evaluating their approaches to using this technology in classrooms, identifying the problems they encounter, and recognizing their training needs relating to the use of this technology. The fifth sub-question aimed to investigate gender differences regarding teachers' attitudes, their use of IWBs, the number of IWB training courses they had received, the types of training they need, and their training method preferences (see Table 7.1).

All the participants in this study were teachers from *Tatweer* primary schools in Jeddah, Saudi Arabia. 587 teachers (301 female and 286 male) completed a self-reporting questionnaire mainly designed for this study. Twenty teachers (10 female and ten male) were interviewed, and of these seven female teachers were also observed teaching in their classrooms or in learning resources rooms.

As the current study is a quantitative-dominant mixed method research study that mainly used a *sequential explanatory* strategy, the quantitative method was employed in the first stage of data collection, followed by the qualitative methods in the second stage. In this chapter, therefore, the findings of analyzing both quantitative and qualitative methods are combined, critically discussed, and linked to the previous studies in the field. These results are also compared (where appropriate) to the existing technology integration models, mainly the TPACK model (Mishra and Koehler, 2006) and the CBAM *Levels of Use* (LoU) (Hall and Hord, 2006). Consequently, in this chapter, the process that was used to answer each research sub-question started with using the quantitative findings, and then these findings were interpreted and explained either using the involved associations between variables or extracts of the observed teachers or interviewees. Overall, this chapter is structured according to the five research sub-questions. All five sub-questions are discussed and answered through using the findings of both the questionnaire and interviews. The findings from the classroom observations were also employed to answer the second and the third research sub-questions (see Table 7.1).

Table 7.1: Summary of the data collection methods used for each research question and their analysis

Research questions	Data collection methods	Data analysis
What are the views of teachers towards introducing IWBs in *Tatweer* primary schools?	Questionnaire Semi -structured interview	Quantitative Qualitative
How do teachers in *Tatweer* primary schools currently use IWBs?	Questionnaire Classroom observations Semi -structured interview	Quantitative Qualitative
What are the difficulties and challenges facing *Tatweer* primary school teachers in using IWBs?	Questionnaire Classroom observations Semi-structured interview	Quantitative Qualitative
How were teachers in *Tatweer* primary schools trained to use IWBs and what were their training needs?	Questionnaire, Semi -structured interview	Quantitative Qualitative
Are there differences between male and female teachers in *Tatweer* primary schools regarding their attitudes, their use of IWBs, their training, the types of training need, and their training method preferences?	Questionnaire, Semi -structured interview	Quantitative Qualitative

7.2. RESEARCH QUESTION 1

WHAT ARE THE VIEWS OF TEACHERS TOWARDS INTRODUCING IWBS IN TATWEER PRIMARY SCHOOLS?

In this study, although approximately 11% of the teachers within the sample (n=587) were more negative about the role of IWBs in improving the teaching and learning process, the majority, nearly 89%, had positive attitudes towards using IWBs in the teaching and learning process (see Table 5.22). These positive attitudes were also supported by all the twenty teachers who were interviewed. For example, Teacher F2 said,

> It is a fact to tell you that IWBs change the environment in classrooms from traditional and boring when using the ordinary whiteboard into modern and active classrooms. (Teacher F2)

Similarly, Teacher M8 revealed positive views towards using IWBs in his lessons. He stated,

> I usually look for new activities related to the content of my lessons to add fun to these lessons; therefore, I found that using the interactive whiteboard helps me to design enjoyable lessons. (Teacher M8)

Thus, these positive views are consistent with many studies in the IWB literature (Beauchamp, 2004; Glover *et al.*, 2007; Moss *et al.*, 2007; Hammond *et al.*, 2009; Saltan *et al.*, 2010; Winzenried *et al.*, 2010; Manny-Ikan *et al.*, 2011; Turel and Johnson, 2012; Muhanna and Nejem, 2013; Alghamdi, 2015; Gashan and Alshumaimeri, 2015; Oguz Akcay *et al.*, 2015).

Indeed, teachers in the current study showed positive attitudes towards all the IWB benefits provided in the questionnaire in both teaching and student learning processes. In the following sections, only the top four benefits which had the highest average score of teachers' selection, as well as the benefit which had the lowest mean score of teachers' selection, in both the teaching and learning processes are discussed.

With regards to the teaching process, the eighth element in this theme Q14 (*Using IWBs strengthens my content knowledge*) had the highest average score (*M*=2, *SD=0.95*), indicating the least positive views. Most teachers indicated an inclination towards this statement (see Table 5.2). Extracts from the interviewees confirmed this choice. For example, Teacher F1 (Islamic Science) supported the advantage of using IWBs in strengthening the content knowledge when she said, "*Using the IWB helps me to design attractive activities that support the content of my lessons effectively*." Similarly, Teacher F3 (Arabic Language) also indicated,

> From my experience, I found that the use of an IWB in my classroom helps me to prepare effective lessons that include images, songs, and videos. Indeed, this technology has transformed the traditional environment in my classroom into an active and enjoyable one. In fact, the only IWB is located in my classroom, so I feel that I am very lucky more than other teachers are in my school. Therefore, I cannot imagine myself teach without using this technology. (Teacher F3)

This advantage of IWBs is also supported by an extract from Teacher F5 (English Language) as she said,

> I strongly agree about the use of IWBs in my teaching because this technology helps me in preparing my lessons as well as it supports the teaching of English language content. Therefore, IWBs have the ability to support lessons with educational videos of native speakers. As a result, the pronunciation of students will be improved. (Teacher F5)

Moreover, Teacher M5 (Mathematics) agreed. He said,

> The IWB helps me to teach the content of maths lessons to my students using different tools such as a calculator, ruler, clock, and geometric shapes. Thus, using these tools saves time and motivates students to learn maths concepts. Moreover, I can use the educational games that help me to explain some of the basic operations in maths lessons such as addition, subtraction, and multiplication. Therefore, the content of my lessons is enhanced when using IWBs. (Teacher M5)

Similarly, Teacher M9 (Art) revealed that IWBs strengthen students' knowledge about the content of their lessons,

> I found that the IWB is a very helpful technology in strengthening students' knowledge about the content of their lessons. By searching the internet, students can receive a large amount of knowledge relating to the content of the lesson, and therefore, they might learn better than using their textbook. (Teacher M9)

Teachers in the earlier extracts described using different activities and multimedia to introduce the content more effectively and, consequently, improve student learning (Hall and Higgins, 2005). The finding regarding the ability of IWBs to strengthen the presentation of the content knowledge is consistent with a study conducted by Holmes (2009), which examines the lesson activities that were produced by thirteen student teachers in their final year of a secondary mathematics undergraduate programme. The outcomes of this study indicated that the participants had successfully integrated IWB features in teaching the content of their mathematical lessons, which led, consequently, to improvement in the TPACK framework. Moreover, those teachers used different visual demonstrations such as pictures, diagrams, animations, and links to websites, which result in understanding various mathematical concepts.

Then, Q9 in the teaching process theme which refers to (*Discussions in class will be facilitated when using IWBs*) (*M*=1.74, *SD*=0.82) (see Table 5.2) was ranked in the second place and chosen by the majority of the respondents to the questionnaire. Two potential reasons could explain their selection. Firstly, instructors, when using IWBs in their lessons, might perceive themselves as becoming more competent to concentrate on classroom discussions and answering questions (Ball, 2003). Secondly, the possibility of discussions and interactions in classrooms could be increased when using IWBs (Becta, 2003; De Vita *et al.*, 2014). Thus, students may be more motivated and engaged in classroom discussion and solving problems when using IWBs in classrooms (De Vita *et al.*, 2014). According to Levy (2002), when using IWBs, the communications between educators and their students improved because of enhanced discussion, analysis, and student participation in classrooms. As a result, the effectiveness of teaching will be developed by growing conversations in classrooms (ibid.). Consequently, IWBs have the ability to enhance interactivity (Levy, 2002; Koenraad *et al.*, 2015) Q8 *(M*=1.58, *SD*=0.77*)* (see Table 5.2). In the UK, it has been shown that lesson interactivity and teacher-student dialogues in lessons that used IWBs were greater than those not using IWBs (Smith *et al.*, 2006).

The usefulness of IWBs in facilitating discussions in classrooms was also supported by the interviewees. For instance, Teacher M1 stated,

> In my lessons, I found that discussion was improved by using the IWB because it enables presentation of images and videos which allows my students to discuss them in groups. (Teacher M1)

Similarly, Teacher M3 supported this advantage when he said,

> I can say that IWBs change the environment in classrooms from boring classrooms when using the ordinary whiteboards to more active classrooms when using the digital whiteboards. Indeed, this technology is considered an important tool in increasing students' participation and discussion in classrooms. (Teacher M3)

Q11(*Using IWBs helps me to prepare lessons*) (*M*=1.73, *SD*=0.87) (see Table 5.2) was ranked third in teachers' choices among the other IWB benefits in the teaching process. The ability of IWBs to facilitate preparing lessons was agreed by teachers because they could save notes in their lessons using IWBs (Cox *et al.*, 2004). Additionally, they might keep and save their lessons to change and improve them for further use (Glover *et al.*, 2007; Elaziz, 2008; Wood and Ashfield, 2008). Moreover, they were able to use animations in their lessons (Manny-Ikan *et al.*, 2011) and present multimedia to support their lessons by using IWBs (Elaziz, 2008; Slay *et al.*, 2008). Therefore, IWBs can help teachers to plan and prepare their lessons effectively. This is consistent with the views of the majority of teachers, in a study conducted by Latham (2002), who revealed that IWBs had an active role in planning and arranging their lessons. Although educators, in a study conducted by Manny-Ikan *et al.* (2011), consumed many hours in designing learning resources for their lessons, they indicated that the strategies used to prepare engaging lessons were improved when using IWBs.

This choice also appears to have been supported by some extracts from the interview with teachers M7 and F7 who said,

> I agree with the ability of IWBs in facilitating the teaching process, planning maths lessons, and saving time. Additionally, this technology enables me to use animations and movies that explain some concepts as well as it helps me to design enjoyable lessons and saving them to be used with other students (Teacher M7)
>
> Although it was the first time to apply the use of the IWB in my lesson, I encourage all teachers to use this innovative technology in their teaching because of their ease and usefulness in preparing lessons as well as saving lesson time. (Teacher F7)

The first element in the teaching process Q7 (*Class time will be managed successfully by using IWBs*) (*M*=1.73, *SD*=0.82) was also in the third place of teachers' choices (see Table 5.2). Teachers' positive view towards this benefit of IWBs may be because students were faster and better at completing their tasks (Lee and Boyle, 2003). Additionally, it can have a more rapid pace than those which do not employ IWBs, and that is partly because the gaps in IWB lessons can be reduced (Higgins *et al.*, 2005). Moreover, IWBs provide teachers with a chance of using multimedia and ready-made resources (Zevenbergen and Lerman, 2007). Therefore, educators' time is saved. It could be argued that teachers in ordinary classrooms which do not use IWBs would do similarly by presenting predefined resources. However, this process seems to be more easily facilitated when using IWBs. This finding was also confirmed by most of the interviewees, as seen in the previous extracts of teachers M7 (who used animations and movies that explain some maths concepts) and F7 (who agreed with the usefulness of IWBs in saving lesson time). Moreover, Teacher M5 explained the ability to use this technology in saving the time of his lessons, as he said, *"The use of IWBs helps me to manage the lesson time because of preparing my lessons at home."*

However, Q12, which refers to the ability of IWBs in visualizing course content, had the lowest mean score in the teaching process theme (*M*=1.48, *SD*=0.74), showing the most positive views (see Table 5.2). The majority of participants selected this benefit of IWBs, possibly because IWBs can produce visual materials that are regarded interesting and attractive for both teachers and learners (Kennewell and Beauchamp, 2007). Through employing IWBs, the content of the curriculum course can be more visual and, therefore, educators may become more flexible when dealing with resources and materials through IWBs. For instance, educators can add some changes to their resources and save their lessons (Glover *et al.*, 2007; Elaziz, 2008; Wood and Ashfield, 2008), they can highlight specific parts and change the size of texts and pictures (Turel and Demirli, 2010), and they can apply various kinds of multimedia when presenting their lessons (Elaziz, 2008; Slay *et al.*, 2008). This advantage of IWBs was also confirmed in an extract of Teacher F3 when she said,

> I prefer using the IWB to present the content of my lessons because it enables me to use animation and movies with students. Additionally, I can save my lessons and use them in the future. Thus, students can learn the content visually through this technology rather than using their textbooks. (Teacher F3)

Moreover, IWBs can be attractive tools for learners as well. For example, high school students in a study carried out by Schut (2007) in biology classes stated that an IWB was an attractive tool for them because of the ability to write notes and present visual media. They added that IWBs aid them to learn concepts, especially for visual learners. Thus, it seems that IWBs helped those students because their concentration and memory might be enhanced when presenting pictures, animations, and videos on IWBs. Holmes (2009) declared the importance of visual demonstration when introducing mathematics concepts using IWBs. However, teachers should be aware of the over employment of visual displays with IWBs in their lessons because this could lead to an excessive display of information and, consequently, cause confusion for students. Moreover, as indicated before, this could discourage higher-order thinking and cognitive processes among learners (Reedy, 2008) and limit cognitive participation in classroom activities (Schmid, 2008). Hence, teachers should choose the appropriate visual aids that support the lesson goals and time.

Moving on to the advantages of IWBs in the student learning theme, the second component in the student learning in the questionnaire (*collaborative learning will be facilitated by using IWBs*), had the highest mean score (*M*=1.80, *SD*=0.83), indicating the least positive views (see Table 5.3). During the interviews, teachers also supported this advantage of using IWBs. For example, Teacher F10 stated, *"In my lessons, I usually present images, videos, and activities by using the IWB and ask my students to discuss and solve these activities in groups."* In the same vein, Teacher M8 indicated, *"By using the digital board, I like to present activities that relate to the content of social science to my students in small groups."* Similarly, Teacher F6 said,

> I always use the IWB to teach the whole class students then I present tasks on the board, and I ask students to solve them collaboratively in groups. While students work in groups, I usually take care of some students who need help. (Teacher F6)

The respondents might have agreed with the advantage of using IWBs to facilitate collaborative learning because IWBs have the ability to present texts and visual resources to a group of students in classrooms at a particular time (Reedy, 2008). Moreover, students could use computer software and the internet through IWBs in front of other students who are observing their presentation (Wood and Ashfield, 2008). Furthermore, students can have the chance to use and deal with the interactive features of IWBs in a collaborative style (Cox *et al.*, 2004). Hence, IWBs can produce an active, cooperative and attractive environment for learners who will become more involved in lessons. Thus, IWBs could be used to enhance group work. From a theoretical perspective, this is consistent with Bandura (1986) who states that individuals may have a chance to learn better when they communicate with others, and the majority of their performance could be gained through their interaction and observation of other individuals. Consequently, students can learn how to use technology through their classmates. Similarly, Vygotsky (1978) concentrated on the importance of social communications in achieving the learning goals. Therefore, Vygotsky encouraged educators to design classroom activities that allow students to be more dynamic learners. The findings revealed that, based on evidence from the participating educators' viewpoints, student communication is improved when using IWBs in their classrooms. Therefore, collaborative learning could be enhanced by using these technologies. However, Smith *et al.* (2006, p. 454) stated, "IWB lessons contained more a whole class teaching and less group work." Consequently, greater collaboration is not automatic when using IWBs but it may be determined by how teachers employ this technology and how they design the activities during their lessons.

The seventh element in the student learning theme Q24 (*using IWBs helps students to understand difficult concepts*) had the second highest mean score (M=1.79, SD=0.89) and the majority of these teachers showed their agreement with this benefit (see Table 5.3). This advantage was also supported in extracts from two teachers (M4 and F7).

> The interactive whiteboard enables my students to learn concepts, letters, and grammar structures faster more than the ordinary boards. Students like learning English when using the digital board and they can remember these lessons very well. (Teacher M4)

> I strongly agree with the usefulness of using IWBs in improving students' learning for improving their motivation and interests. Additionally, they decrease boredom for students during lessons, especially with some complicated maths concepts and tasks. (Teacher F7)

This outcome is consistent with the study conducted by Higgins *et al.* (2005) which revealed that using IWBs caused improvements in some aspects of students' abilities, which were recall, understanding, and knowledgeable skills. This benefit of IWBs could be clarified because IWBs seem to have the ability to offer a variety of selections and opportunities for teachers that leads them to recognize what their students require (Cox *et al.*, 2004). Moreover, IWBs seem to have the ability to simplify student learning and enhance memory by allowing the presentation of visual media (Turel and Demirli, 2010; Aktas and Aydin, 2016). Therefore, students can learn better and faster using IWBs.

Thus, IWBs seem to have an important role in stimulating students to be active learners and, consequently, increase their interaction in classrooms (Q22) (M=1.74, SD=0.85). The majority of teachers also agreed with this advantage of using IWBs (see Table 5.3). For instance, teachers F3 and M7 stated that:

> I compared lessons using an IWB and some lessons in which I did not use this technology, and I found that my students when using the IWB were motivated to attend lessons, engaged in classroom activities, and participated in classroom discussion more than in lessons without using this innovative board. Thus, I am very confident to say that IWBs improve student learning. (Teacher F3)

> I believe that IWBs have the ability to attract students to the maths lessons and increase their interaction in the classroom. For example, some of my students do not like to participate in classroom activities and solving tasks. However,

> when I presented these activities on the digital board, I noticed that they became more focused and motivated to solve these tasks. (Teacher M7)

The evidence from literature indicated that students' interaction could be increased in classrooms when using IWBs (Hall and Higgins, 2005; Higgins *et al.*, 2007; Reedy, 2008; Lan and Hsiao, 2011; Aktas and Aydin, 2016). One explanation may be that students can discuss different topics in groups when text, videos or images are presented on IWBs, and therefore this may increase the interaction between students in relation to what is displayed (Reedy, 2008). This is also consistent with Vygotsky (1978), who concentrated on the importance of social communications between learners and clarified the role of tools in facilitating individuals' interactions. However, Higgins *et al.* (2005) state that employing IWBs in classrooms leads to a faster pace for lessons and, consequently, less time for the interaction between students in groups. This could be explained by Maor (2003), who stated that educators in classrooms using IWBs are likely to stand in front of their students, and this supports the interaction between teachers and their students. Nevertheless, this kind of interaction seems to be challenged by Latane (2002), who recommends that teachers should improve the interaction between students in classrooms. Therefore, indeed, this kind of learning may be more challenging when using IWBs and it depends on how teachers use this technology. Hence, improving the quality of interaction in classrooms and effective teaching depends more on teachers' effectiveness than using IWBs (Higgins *et al.*, 2007; Kyriakou and Higgins, 2016).

Q23 (*students may have chances to use IWBs in the classroom by themselves*) (M=1.72, SD=0.84) (see Table 5.3) was ranked fourth in teachers' choices, and most teachers' responses showed their agreement with this benefit of using IWBs. Indeed, identifying the learning advantages of the IWB depends on direct student interaction with this technology, instead of only watching their educators when using IWBs (Chuang *et al.*, 2008). During classroom observations, teachers F1, F2, F3, and F4 allowed their students to use IWBs, and they designed activities that were solved by students. For example, Teacher F1 stated, "*I usually design my lessons to make the most of the students share in using the board."* Similarly, Teacher F3 said, *"My students usually use the board in every lesson, and their number is based on the designed activities for this lesson."* Moreover, Schmid (2006) asserts students desire to participate in activities that require moving between their places and IWBs in the classroom. This is confirmed by an extract from the report of Teacher M10 who said, *"My students like to use the IWB in my lessons, and they sometimes remind me about some features."*

Nevertheless, educators frequently design the classroom IWB activities using group work with students and avoid interaction between students and IWBs (Schmid, 2006). Indeed, this situation occurred with teachers F5, F6, and F7, who were observed in their lessons, and teachers M6 and M9, who were interviewed. For instance, Teacher M9 said, *"I only use the IWB in my lessons because my students are too young to use the board."*

The lack of students' use of IWBs in classrooms was also informed by a study carried out by Higgins *et al.* (2005), which indicated that students in this study stated that they had limited chances to use IWBs. Consequently, teachers can attract students to use IWBs in their lessons and design dynamic activities that encourage them to use the board. Educators should develop new strategies and techniques to create autonomous learners and achieve the full potential of IWBs and how to employ them in their classrooms (Glover and Miller, 2002). Thus, teachers can create active learners who become more able to employ critical thinking in their learning when they use IWBs (Hennessy *et al.*, 2007). However, to improve using higher-order thinking skills in lessons, teachers have to acquire sufficient abilities in presenting the learning material, introducing explanations and visual presentation to facilitate difficult concepts, and encouraging student participation in lessons, by giving them more time to improve their learning (Smith *et al.*, 2005; Kennewell *et al.*, 2007).

The lowest mean score between the elements in the student learning theme was for the third component Q20 (*using IWBs enhances students' attention in class*) (M=1.63, SD=0.82), showing the most positive views (see Table 5.3). The majority of teachers believed that IWBs help students to be more focused in lessons, demonstrating positive impacts of these technologies on student attention. This finding was also supported by teachers F5 and F6, who reported that,

> IWBs have an important role in improving student learning because they increase their attention and motivate them to communicate. In fact, when using educational videos that include animation and songs, my students start love English lessons and their understanding of concepts was increased. I was really shocked when my students became more active in lessons and more fluent in pronouncing the English words. (Teacher F5)

> Using IWBs in student learning is a positive factor that can motivate them to learn, increase their engagement in classroom activities, enhance their attention, and thus, improve their success. (Teacher F6)

These teachers seemed sure that this technology has the ability to increase student focus during lessons. This finding is consistent with Solvie (2004), who indicated that there was an apparent improvement in student attention in the literacy lessons when using IWBs in primary schools. Similarly, Tataroglu and Erduran (2010) found that IWBs increased the attention of mathematics students and, consequently, enhanced their learning.

Student attention and engagement may be improved in classrooms that use IWBs to present visual resources (Christophy and Wattson, 2007), internet websites, and computer software (Wall *et al.*, 2005). The role of IWBs in increasing student focus in classrooms was explained by Beeland (2002), who stated that IWBs may have an essential effect on increasing student focus in classrooms, due to IWBs having the ability to inspire students to be more concentrated on their tasks, improve their interest, and increase their engagement in lessons. Similarly, Tozcu (2008) stated that IWBs seem to guide student concentration on their activities and enhance their interest. Thus, children's focus could be controlled effectively when teachers use IWBs, and this benefit may be less possible when using other resources (Smith *et al.*, 2005).

To sum up, teachers in *Tatweer* primary schools indicated a high level of positive attitude towards using IWBs in their classrooms and they highly appreciated their benefits in both the teaching and learning processes. These benefits could be classified according to the TPACK model as outlined next.

Teachers had positive attitudes towards TCK statements (*course content will become more visual when using IWBs; using IWBs makes content teaching easier to students; using IWBs strengthens my content knowledge, and using IWBs helps students to understand difficult concepts*). Thus, teachers in the sample acknowledged that IWBs have positive effects on strengthening and facilitating the delivery of their content. Moreover, teachers showed positive attitudes towards TPK statements (*class time will be managed successfully by using IWBs; the lessons will be more active when using IWBs; discussions in class will be facilitated when using IWBs; using IWBs makes teaching more enjoyable; using IWBs helps me to prepare lessons; students' learning will be improved by using IWBs; collaborative learning will be facilitated by using IWBs; using IWBs enhances students' attention in the class; using IWBs makes students more motivated in the class; using IWBs increases students' interaction in the class, and students may have chances to use IWBs in the classroom by themselves*). Consequently, teachers believe that IWBs have a strong impact on their teaching. Similarly, teachers indicated positive attitudes towards the TPACK statements *(using IWBs helps me to design content-based activities in classrooms; using IWBs improves my teaching methods to develop students' learning, and I can use IWBs with appropriate teaching style to teach* *the content).* Thus, the TPACK of Saudi teachers within the sample was rated high based on their responses to the questionnaire.

7.3. RESEARCH QUESTION 2

HOW DO TEACHERS IN TATWEER PRIMARY SCHOOLS CURRENTLY USE IWBS?

To provide a clear picture about the teachers' use of IWBs, the current study considers evaluating the actual use of IWBs by focusing on several important factors. These factors are their experience in using IWBs; the frequency of use of IWBs in lessons; their use of interactive IWB features; the dominant approaches when using IWBs (teacher-centred or student-centred); teachers' capacities; and the audience during using IWBs. Therefore, to answer this question, the findings from using the questionnaire, classroom observations, and interviews were integrated to provide a deeper understanding of how teachers in *Tatweer* schools use IWBs in their lessons with more explanation and details.

7.3.1. The Experience of Teachers in Using IWBs

The quantitative outcomes of this study indicated that more than half of the participants in *Tatweer* primary schools in Jeddah (51.6%) had employed IWBs in their lessons for 1-5 years. Additionally, 42.6% had used this technology for less than one year, whereas only 5.8% had more than five years' experience (see Table 5.22). Therefore, approximately 57% of the participants had had fairly extensive practice with using IWBs for more than one year.

7.3.2. The Frequency of Using IWBs in Lessons

According to Table 5.22, the majority of respondents (31%) indicated that they sometimes used IWBs in their lessons, followed by 29 percent who often used them. However, around 23% of the respondents rarely used IWBs. A smaller proportion (18%) indicated that they had daily use of IWBs in their lessons. This is inconsistent with the findings of a study conducted by Jwaifell and Gasaymeh (2013) to investigate English female teachers' use of IWBs in Jordan. All the teachers in this study used IWBs daily, and this helped them to shift their teaching methods from traditional to more interactive methods, using conversations, group work, and open educational resources. However, the participants were only four teachers compared to the large sample (n=587) in the current study.

For more effective use of IWBs, teachers should have daily use of these technologies in classrooms (Armstrong *et al.*, 2005) to become confident and fluent in their use.

Consequently, this will lead to the development of their skills (Glover and Miller, 2001). Indeed, when teachers use IWBs regularly, they tend to become more capable because they will be more experienced and familiar with these technologies and their features. Thus, the majority of teachers in *Tatweer* schools appeared not to use IWBs as effectively because of the irregular use of these technologies. The variability of teachers' answers relating to the frequency of IWB use in the current study can be explained in three ways, relating to the location of IWBs, teachers' experience, and their attitudes towards using IWBs.

Regarding the location of IWBs, it appears that for those teachers who had regular and daily use of IWBs in their lessons, these technologies were placed in their classroom or learning resources rooms in schools that have more than one learning resources room. This suggestion was statistically confirmed by a highly significant association between the frequent use of IWBs and their location in classrooms and learning resources rooms [$\chi2$ (3, N=587) =52.39; $p<0.001$] and [$\chi2$ (3, N=587) =56.05; $p<0.001$], respectively (see Table 5.23). When IWBs are placed in each classroom, teachers seem to be encouraged to use them daily. Similarly, when they are also placed in the learning resources rooms, teachers (who are working there) or teachers (in schools that had more than one resources room such as *Tatweer* School 1 tend to employ them in their lessons constantly.

In the current study, teachers who had IWBs in their classrooms indicated that they used these technologies daily in each lesson, such as the observed teachers F3, F4, and F5. For instance, Teacher F4 said, *"I am lucky because I have the IWB in my classroom, so I use it every day in all my lessons."* Similarly, Teacher F3 confirmed that when she said, *"I use the interactive whiteboard every day because it is located in my classroom, so there is no reason not to use it."*

In the same vein, all the male teachers interviewed (excluding M2) indicated that they always use IWBs, which were installed in all classrooms in *Tatweer* School 7. For example, Teacher M5 revealed, *"I use the IWB in every lesson."* Similarly, Teacher M10 stated,

> I use this technology daily because it helps me to teach students some basic skills in arts. Thus, through using the IWB, I can present movies for some famous artists in the world as well. (Teacher M10)

All the male teachers were from *Tatweer* School 7, which had no ordinary whiteboards, indicating that the IWBs were the only boards in the school that male teachers could use. This was confirmed by an extract from Teacher M3, who said, *"I used to present all my* *lessons via the IWB because I do not have an ordinary whiteboard in my classroom."* Thus, this system seems to force teachers in this school to use IWBs in classrooms because there was no choice for them. In contrast, the other six female *Tatweer* schools were equipped with ordinary whiteboards installed next to the IWBs, either in classrooms or learning resources rooms. Therefore, this could be evidence that female teachers' use of IWBs completely depended on their personal motivation and skills and was less related to the school system. Indeed, providing traditional boards in classrooms that have IWBs may also be important in case of technical problems, as well as to write some important concepts or ideas which can remain visible throughout the lesson period (DiGregorio and Sobel-Lojeski, 2010). This was supported by the observed teacher F2 when she wrote down some questions and ideas indicated by her students on the traditional whiteboard for them to refer to during the lesson.

Similarly, teachers F1, F2, and F10, who were from *Tatweer* School 1, which had three learning resources rooms, indicated that they used IWBs daily, as stated by Teacher F1, "*I always use the IWB technology in all my lessons because it helps me to design attractive lessons"* and Teacher F2, "*Although the IWB is located in the resources room, I like to use it in all my lessons because my students like to use it."*

However, teachers F6 and F7 indicated that they sometimes used the IWB in their lessons because of the location of this technology in the learning resources room. They had only one learning resources room in their school with one IWB. This explanation was confirmed by their extracts as Teacher F6 said, "*I did not use the IWB in all my lessons because it is in the resources room which was far away from my classroom."* Similarly, Teacher F7 stated,

> I usually use the interactive whiteboard in some lessons because of two reasons: The first reason relates to students and that because they usually take a long time to leave the classroom to the resources room where the IWB was located. The second reason relates to the availability of the resources room where teachers have specific schedule to use the IWB. (Teacher F7)

Therefore, daily interaction and consistent use of IWBs may not be achieved when IWBs are not located in classrooms, for instance, in schools that only have one learning resources room. Indeed, this is the case with most schools in Saudi Arabia, where the majority have an installed IWB in the learning resources rooms, and there is usually only one of these (Alghamdi, 2013; Alghamdi, 2015).

Moreover, when IWBs are located in libraries, their use seems to be daily and often, leading to the suggestion that the importance of IWBs in libraries is to enhance the daily use of these technologies, where the teachers or librarians need to visit websites and databases, as well as to organize their work using IWB applications. In other words, if IWBs are located in libraries they will probably be used frequently. This explanation was also statistically supported by a significant association between the frequent use of IWBs and their location in libraries [$\chi 2$ =11.29; p= 0.003] (see Table 5.23).

In contrast, those teachers who sometimes and seldom used IWBs seem to have IWBs in laboratories. When IWBs are placed in laboratories, their use was not as consistent in each lesson, because of teachers in laboratories, such as science teachers (17%) in the sample (see Table 5.1), possibly prefer to focus on practical experiences during lessons more than showing these lessons on the board. According to Table 5.23, our explanation was statistically supported in that there was no significant association between the frequent use of IWBs in lessons and their location in laboratories [$\chi 2$ (3, N=587) =3.40; p= 0.33]. Additionally, Interviewee M6, who teaches science in *Tatweer* school 7, confirmed this association when he said,

> When I teach my students in the classroom, I always use the IWB technology. However, in some lessons, which are introduced in the laboratory I sometimes use this technology but not always. (Teacher M6)

Similarly, teachers' frequent use of IWBs and the location of these technologies were also closely associated in an earlier study (Alghamdi, 2013) conducted by the researcher of the current study to investigate the use and attitudes of Saudi primary teachers towards IWBs in Yanbu city in Saudi Arabia. Therefore, IWBs should not be fitted in a computer room but inside classrooms to be used as a tool for simplifying curriculum learning and to encourage teachers to use them fully (Hunt *et al.*, 2006).

The second explanation for the frequent use of IWBs could be related to educators' experiences. Those teachers who indicated that they often and always use IWBs in their lessons could be expert teachers, whereas those teachers who reported that they sometimes and rarely used IWBs were likely to be beginner teachers. Indeed, to increase the teaching effectiveness when using IWBs, educators should consider two essential elements: the experience and the frequency of using IWBs (Hodge and Anderson, 2007). This explanation is confirmed statistically in Table 5.23, which shows a highly significant association between the experience of teachers in using IWBs and their frequency of use [$\chi 2$ (6, N=587) =211.23; p<0.001]. Consequently, this association suggests that the more experience in using IWBs, the most frequent use of these technologies. Teachers' interviews also confirmed this explanation. Fifteen interviewees had more than one-year experience in using IWBs while only five were novice female teachers. The majority of the applicants reported that they always used the IWB technology in their lessons. For example, Teacher M1, who had seven years' experience in using IWBs stated, *"I usually employ the IWB technology in all my lessons because it helps me to design enjoyable lessons for the children I teach."*

All the novice interviewees were females. These teachers were F5, F6, F7, F9, and F10. Three of the beginner female teachers F6, F7, and F9 stated that they sometimes used IWBs in their lessons. For instance, Teacher F9, who teaches students with learning difficulties, who had used the IWB for only nine months, said,

> I sometimes use the IWB in my lessons, and that depends on the student who I teach. For example, it is better for some students with learning difficulties to learn sculptures in maths classes by touching concrete sculptures rather than watching them on the board. (Teacher F9)

In contrast, the two novice teachers F5 and F10 indicated that they always used the IWB technology in their lessons because of the location of IWBs in the classroom and the three learning resources rooms in *Tatweer* School 1, as indicated before. Therefore, the availability of this technology in the same classroom helped Teacher F5 to use it frequently. Similarly, the availability of three learning resources rooms supported with IWBs helped Teacher F10 to use it daily.

Surprisingly, all the male interviewees had more than one year's experience in using IWBs, and all of them reported that they always used IWBs, except for two male teachers M6 (who teaches science) as indicated before and M2 (who teaches Islamic sciences). Teacher M2 reported that,

> Actually, I feel that some lessons need to be explained by using a variety of pictures, videos, and searching the internet. However, I prefer not to use the IWB in the Quran lessons because I usually teach my students the correct pronunciation by reading the verses and then explain the meaning of these verses for them. (Teacher M2)

Teacher M2 indicated that he used this technology sometimes to teach the Quran lessons. He indicated that he preferred to present a uniform reading by himself to his students and then explain its meaning. This is inconsistent with the observed female Teacher F1, who introduced a Quran lesson using the IWB. During her lesson, she presented an audio recording to teach her students how to read the verses in an exact way and then the students repeated these verses in groups. She revealed that she used the IWB every day even when teaching Quran lessons.

As seen above, the four teachers F1, F9, M2, and M6 used IWBs differently based on the nature of the topic introduced to their students. Indeed, it appears that these teachers knew what was beneficial for students' learning, leading to the decision of whether to use the IWB or not in their lessons. To promote effective learning, according to the TPACK theory, educators should have a coherent understanding of how to combine the utilization of technology with knowledge of both the content and teaching approaches. This theory identifies that to incorporate technology in classrooms effectively, teachers should recognize how the three fields of knowledge regarding technology, pedagogy, and content can be combined to introduce effective content-based teaching with technology (Shin *et al.*, 2009).

The third explanation for the frequent use of IWBs is that teachers who reported more frequent use of IWBs in their lessons seemed to have a more positive attitude towards the use of this technology compared with those teachers who seldom used IWBs. This suggestion was proved by a significant association between the teachers' attitude towards using IWBs and the frequency of using them [$\chi 2$ (3, N=587) =11.63; p= 0.01] (see Table 5.23). Similarly, a significant association between teachers' attitudes towards the use of IWBs and their frequent use was indicated in numerous studies (Beauchamp, 2004; Turel and Johnson, 2012).

Thus, in the current study, this significant relationship suggests that Saudi teachers with positive attitudes towards using IWBs (89%) tended to report that they use IWBs more frequently than those teachers with less positive views (11%). However, all the interviewees in this study, whether expert or beginner, reported positive views towards using IWBs in their lessons, as indicated in Section 6.4.1.4. These findings are not consistent with the results of a study carried out by Glover and Miller (2001), in which expert educators were distrustful of using IWBs and novice teachers reflected that using IWBs was a valued influence in improving their teaching.

7.3.3. The Use of Interactive Features

The quantitative results indicated that a high number of respondents (43%) used IWBs with a few interactive features. This was followed by 39% of teachers who employed most of the interactive features in their lessons. However, the lowest percentage of respondents (18%) used the IWB as an ordinary white/blackboard (see Table 5.22). Similarly, the findings of a study conducted by Manny-Ikan *et al.* (2011) indicated that the majority of teachers used a few features, such as using the Internet, giving presentations, and engaging students in lessons. Thus, it likely seems that those teachers in the current study used IWBs in a basic way, and they still need to improve their technical skills of using IWBs.

To explain the findings regarding the use of IWB features, two potential connections are associated with the more efficient use of IWB features in classrooms. These two possibilities could relate to teacher training and their experience of using this technology. The first possibility seems to be confirmed, according to Table 5.22, where the majority of respondents to the questionnaire (60%) in this study had not received any training courses specifically in how to use the interactive features. Therefore, most of the teachers reported that they used a few interactive features of IWBs. Indeed, training teachers in the effective use of IWBs is an important factor in improving their use of these technologies and their interactive features. This result is not surprising given that a large body of research has focused on the importance of having suitable mechanical and pedagogical abilities for teachers to improve their teaching quality when using IWBs (Beauchamp and Parkinson, 2005; Higgins *et al.*, 2007; Moss *et al.*, 2007; Turel and Demirli, 2010; Manny-Ikan *et al.*, 2011).

Additionally, this first possibility is statistically reinforced by Table 5.23, which showed that there was an extremely significant association between teachers who had not had training and their use of IWB features in lessons [$\chi 2$ (2, N=587) =40. 38; p<0.001]. Thus, this leads to the suggestion that teachers in the sample who had not had training rarely used IWB features in their lessons or only used a few of these functions. In contrast, teachers who usually use most of the interactive IWB features in their lessons usually reported that they had had enough training. The first possibility is also statistically supported by Table 5.23, indicating that there is a highly significant association between the number of IWB training courses and using IWB features [$\chi 2$=52.62; p<0.001]. Based on this finding, the more IWB training courses are provided, the more IWB features can be used.

Furthermore, this possibility was also confirmed by the interviewees' reports. For instance, Teacher F9 reported that she used few interactive features because she had not had any training courses. She said, *"I use some of the IWB features in my lessons because I have limited knowledge in using IWBs because of a lack of training*." She added that,

> Unfortunately, training courses that consider the use of IWB technology were not provided to teachers despite the availability of this technology in our

> school. How should we use this technology effectively if we did not receive suitable training? (Teacher F9)

In contrast, Teacher M8 reported, *"I always use most of the features of the digital board based on my lessons"* because *"I participated in three training courses relating to the use of IWBs."*

Indeed, this first possibility is also confirmed by the TPACK theory, indicating that the lack of using IWB features shows the lack of teachers' technological knowledge. According to Mishra and Koehler (2006), technological knowledge is one of the main fields of knowledge that should be improved; therefore, training teachers should be emphasised to improve teachers' technical knowledge.

Moreover, the suggestion regarding the second possibility (teachers' experience), is also statistically supported by Table 5.23. Similarly, there was a highly significant association [$\chi 2$ (4, N=587) =150.96; p<0.001] between the experience in using IWBs and the use of IWB features. Thus, there was a significant difference between expert and novice teachers in applying IWB features in this study, confirming that teachers with more experience in using IWBs tend to be more active users of the interactive IWB features in their lessons. This result is consistent with Beauchamp (2004), who found that advanced teachers were more effective in using IWBs than novice teachers. This is because progressive teachers usually use high-scale features of IWBs and take interactive approaches to present their lessons when communicating with IWBs. In contrast, beginner teachers use IWBs as an ordinary whiteboard.

Although the majority of interviewees reported that they use most of the interactive IWB features, this differed from the quantitative findings. However, it can be seen that the interviewees with more than one year's experience in using IWBs (15 teachers) reported more use of the interactive features than the five novice female teachers. As discussed before, this finding supported the association between teachers' experience in using IWBs and using their interactive features (see Table 5.23). For example, Teacher F1 who had seven years' experience in using IWBs, stated, *"I use most of the features such as drag and drop, reveal, spotlight, and games that help me to introduce the content of my lesson in a new and attractive way."* Additionally, Teacher M5, who had used this technology for four years, said, *"I like to use most features that I know especially, zoom, mouse functions, and all tools that help me to present geometric shapes to my students*."

Moreover, Teacher F2 who also had four years' experience in using IWBs, indicated,

> I usually use most of the interactive IWB features that I need in my lessons. For example, I like using the magic pen, spotlight, reveal, and highlighting to increase student attention on the important information during lessons. (Teacher F2)

Similarly, Teacher F8, who had two years' experience in using IWBs, said,

> I use most of the IWB features in my lessons. For example, I use the zoom feature to maximize some words. Additionally, I usually present videos that clarify letters and geometric shapes. Moreover, I like to use maths games to facilitate students' understanding of difficult concepts. (Teacher F8)

In contrast, the five novice teachers (F5, F6, F7, F9, and F10) revealed that they used few of the IWB features. For instance, Teacher F7 (only one-month experience in using IWBs) stated, *"I am a novice teacher in using the IWB; therefore, I always use few features such as touch functions, colours, draw tables, and pens."*

Similarly, Teacher F6 (only three-months experience in using IWBs) stated,

> I have limited knowledge about using IWBs effectively; therefore, I only use a few of the interactive IWB features. For example, I can present my lesson by using the IWB programme, open new slides and write on these slides using touch functions such as a pen, rubber, and colours. Sometimes I use screen shade for hiding part of the content of my lessons. (Teacher F6)

Thus, the novice teachers with less experience in using IWBs appeared to have limited technical knowledge, leading to a decreased effective use of IWBs in classrooms. As indicated previously, technological knowledge is one of the main fields of knowledge that could be improved (Mishra and Koehler, 2006). However, to understand technical knowledge, it should not be investigated in isolation; alternatively, it has been argued that knowledge in all areas of technology, pedagogy, and content have to be explored in combination to recognize the process of acquiring knowledge for use (Blanchard *et al.*, 2010).

7.3.4. The Audience

The quantitative findings of this study showed that the majority of teachers (90%) indicated that they use IWBs for whole class teaching followed by 20% of teachers who employed these technologies in small groups. In contrast, 8% of respondents revealed that they use IWBs with individuals (see Table 5.22). This result is in line with other research studies indicating that the IWB lessons are more regularly controlled by whole-class instruction (Higgins *et al.*, 2005; Zevenbergen and Lerman, 2007; Kneen, 2014).

Moreover, through classroom observations in the current study (see Table 6.5), the majority of the time in the seven observed lessons approximately (63.57%) was spent on whole class teaching, followed by 28.86% of the lesson time for individuals. A smaller proportion of the lesson time, about 7.57%, was for small groups. Similarly, this outcome is consistent with a study conducted by Kneen (2014), which focused on examining how English skills and content can be supported using IWBs in secondary classrooms in the UK. The whole class was the main audience for most of the observations (88%), and a smaller percentage, approximately 2%, was for using IWBs with a group of students. In contrast, in 10% of the observations, the teacher was the audience in one lesson where students presented to their teacher alone. However, a study conducted by Blau (2011), which investigated to what extent teachers in primary schools in the North of Israel employ an IWB professional development programme in their instructional practices, reported that the majority of the time in all the lessons for whole class teaching was only 50%. This was followed by individual learning (28%), and then small group activities (22%). In Blau's study, whole class teaching only took half of all lesson time.

Indeed, the smaller proportion for small groups when using IWBs in classrooms is not a surprising result, as indicated by numerous studies (Higgins *et al.*, 2005; Blau, 2011; Turel and Johnson, 2012). For example, most teachers did not choose to involve students in active and cooperative activities using IWBs in a study conducted by Turel and Johnson (2012). Thus, the observed teachers in the current study preferred whole class teaching to teaching either individuals or small groups when using IWBs (see Table 6.5). Consequently, the observed teachers (F2, F3, F5, F6, and F7) in this study confirmed what was indicated by Hall and Higgins (2005), who stated that IWBs mostly support whole class teaching. IWBs are usually used to support the traditional teaching style (Cuban *et al.*, 2001; Cogill, 2002; Knight *et al.*, 2004; Windschitl and Sahl, 2005; Wood and Ashfield, 2008) because educators can be inspired by the technical possibilities of IWBs more than pedagogical affordances (Higgins *et al.*, 2005).

However, the capability and experience of educators are the main factors that lead to pedagogical change (Rogers and Finlayson, 2004) and increased lesson quality (Wood and Ashfield, 2008). Indeed, this seems to be confirmed in the current study, where the seven observed female teachers presented different experiences and capabilities. According to Table 6.5, only Teacher F1 used the IWB to present activities for both individuals and small groups (53% more than the activities that were used for the whole class (47%). However, the rest of the teachers (except Teacher F4) used the IWB for whole class teaching more often than for both small groups and individuals. Therefore, teachers F2, F3, F5, F6, and F7 supported whole class teaching when using IWBs.

Teacher F4 only used the IWB for teaching one student in her lesson because she only teaches pupils with learning difficulties.

Thus, it seems that Teacher F1 successfully changed her pedagogy to involve more students in her lesson. When students interact with IWBs, this can create an environment where students are the centre of the learning process, whereas teachers, in this case, are classified in more progressive phases of using IWBs (Beauchamp, 2004). Indeed, this teacher was an expert in using IWBs (seven years' experience in using IWBs). She used this technology daily despite its location in the learning resources room. Additionally, Teacher F1 had also had three training courses in her school, as she indicated in her interview, "*I had three training courses in my school when this technology was installed in the school.*"

Therefore, Teacher F1 combined two important factors that helped her to transform her pedagogy, sufficient experience and training. Indeed, progressive change can be achieved by using technology in classrooms in addition to providing teachers with effective professional development programmes (Glover and Miller, 2009). Similarly, Hennessy *et al.* (2005) stated that IWBs have the ability to change teachers' pedagogy, but this requires the introduction of effective professional development programmes. Consequently, teachers need more time for practice and consistent training to change their pedagogies. Indeed, changing teachers' pedagogy is essential to achieve the goals of using interactive technology devices (Shenton and Pagett, 2007; Slay *et al.*, 2008). However, the findings of a study conducted by Cogill (2002) indicated that the use of IWBs differs between educators based on their knowledge, goals, and competencies. Therefore, it seems that it is important to investigate teachers' knowledge regarding IWB technology, in order to enable pedagogical change, as recommended by Holmes (2009).

In the current study, the majority of the teachers used IWBs for whole class teaching, probably because of their lack of IWB pedagogical knowledge. Teachers need to change their pedagogy to support student-based learning, and this can only be achieved by providing the appropriate training as indicated earlier. Therefore, teachers also need effective training to improve their IWB pedagogical knowledge. Thus, the current study reinforced the statement of the TPACK theory that is concentrating on educators' technical knowledge alone is insufficient to the effective integration of technology (Mishra and Koehler, 2006).

7.3.5. The Users of IWBs

The results obtained from using the questionnaire indicated that most teachers within the sample (43%) revealed that students occasionally used the IWB in their lessons, while 39% of the teachers indicated that students had frequent use of the IWB. However, 18% of the respondents acknowledged the fact that they were the only users of this technology in their classrooms (see Table 5.22). Surprisingly, the option "*Students always use IWBs in the classroom"* was not selected by the respondents to the questionnaire (587 teachers), indicating evidence of a lack of teachers' pedagogical knowledge. This is possibly because these teachers concentrated on the basic use of IWBs that relate to technical skills only. This is inconsistent with the TPACK theory, which stated that instructors need effective technological pedagogical and content knowledge instead of only concentrating on technical knowledge (Mishra and Koehler, 2006). Therefore, obtaining technological knowledge only is not enough for integrating technology effectively. It should be combined with knowledge of both content and pedagogy (ibid.).

Thus, the quantitative findings of the current study indicated that 82% of respondents to the questionnaire reported that they allowed students to use IWBs in their lessons compared to only 18% of teachers who did not. However, this self-report questionnaire was completed by teachers who might report misleading estimates of their real actions. Nevertheless, seven teachers were observed in this study to ensure the validity of the quantitative results. In these lessons, four teachers allowed their students to use IWBs while three teachers prevented their students from using the board. Thus, these findings from classroom observations could be more expressive about the true picture, regarding the statement of allowing students to use IWBs in *Tatweer* schools. In other words, a large number of teachers participating in *Tatweer* schools did not allow their students to use the board.

Moreover, 80% of the lesson time in all seven observed lessons in this study was for teachers' use, compared with students' use, which was only 20% (see Table 6.6). As a result, teachers were the main users of IWBs in this study. This finding is similar to the results of a study conducted by Kneen (2014), indicating that teachers' use of IWBs (80%) in the majority of the observations was remarkably more than students' use (19%) of the total use of this technology. This was followed by the use of both the teacher and student (0.5%) and then the group of students (0.3%). Indeed, IWBs generally stimulate a teacher-centred instructional style where students have a low-level of dynamic contribution (Way *et al.*, 2009).

However, this finding is inconsistent with a study conducted by Blau (2011), in which the role of the teachers in most of the lesson time supports student-centred learning (57.3%) where teachers guide their students and scaffold their learning. In contrast, teacher-centred education (42.7%) lesson time was reduced in this study. In other words, although the teachers in this study employed pedagogical approaches, they widely used constructivist activities in their lessons. However, students did not have a chance to use IWBs by themselves in other studies (Higgins *et al.*, 2005; Zevenbergen and Lerman, 2007). Indeed, students are usually willing to use IWBs by themselves (Wall *et al.*, 2005; Schmid, 2006). Consequently, preventing students from using IWBs may lead to a decrease in their motivation and achieving a more student-centred approach.

Allowing students to use IWBs could be connected to two important factors, teachers' experience in using IWBs, and the availability of training. This could be confirmed through the seven observed teachers in this study, who had more than one year's experience in using IWBs (F1, F2, F3, and F4) and who allowed their students to use the board. Conversely, the novice teachers (F5, F6, and F7) were the only users of this technology in their lessons. For example, the novice teachers F6 and F7 reported that only they used the IWBs in their lessons. Teacher F7 said, *"I am the only user of the IWB in the classroom."* Similarly, Teacher F6 stated,

> I never permit my students to use the board because I am not an expert in using this technology, and I am still learning. Therefore, I did not train my students to use it; alternatively, they use the ordinary whiteboard to solve exercises. (Teacher F6)

In contrast, the expert teachers tended to allow their students to use IWBs. For example, a report was revealed by Teacher M5, who said,

> I frequently allow my students to use the IWB in my lessons because I noticed that how they are excited to touch the board and motivated to participate in activities presented via this technology. (Teacher M5)

This finding agrees with Jang and Tsai (2012) who stated that expert teachers should have better knowledge to demonstrate the subject content by using effective pedagogical teaching approaches more than novice teachers. According to Hennessy *et al.* (2007), expert educators can encourage their students to be active learners in classrooms that use IWBs, as students can progress ideas and assumptions, and become more able to employ critical thinking in their learning. Consequently, students' self-efficacy and autonomy can be increased (Walker, 2003; Somekh *et al.*, 2007). By doing this, IWBs can transform teaching approaches from teacher-centred to student-centred, improve collaborative learning, enrich autonomous learning, and improve the use of higher-order thinking skills in lessons. Indeed, the effectiveness of using IWBs is limited by the ability of educators to choose the suitable pedagogical methods more than just *technical interactivity* (Webb, 2005; Hennessy *et al.*, 2007). According to Higgins *et al.* (2007), effective *pedagogical interactivity* necessitates that teachers are able to plan effective and organized lessons focused on cognitive development and pace in activities, aiming to achieve teaching and learning objectives. Therefore, educators can integrate instructional technologies into their lessons by designing tasks and activities rather than using them as teaching assistance tools (Cox *et al.*, 2004). Thus, improving the quality of interactions in classrooms, and consequently increasing the probabilities of effective teaching, depends on teachers' skills and how they incorporate IWBs in their pedagogy (Higgins *et al.*, 2007; Kyriakou and Higgins, 2016).

According to Table 6.6, surprisingly, Teacher F1 was the only teacher who used the IWB in her lesson less than her students. She used the IWB approximately 47% of the lesson time, while her students used the board nearly 53% of the lesson time. However, the percentage of students' use of IWBs decreased gradually in the lessons of teachers F2, F3, and F4 (42%, 29%, and 13% respectively). Thus, teachers with more experience in using IWBs tended to allow their students to use the board more. This can be explained by the fact that when teachers have sufficient time to practise using IWBs, they become more confident users of these technologies (Becker and Ravitz, 2001; Cogill, 2002; Beauchamp, 2004). According to Beauchamp (2004), teachers will allow students to participate more in their lessons when their confidence improves; consequently, students will become more confident in using IWBs by themselves. By doing this, students became the centre of the learning process (ibid.).

Moreover, those teachers who were the only users of IWBs, or their students had infrequent use of the IWB in classrooms, seem to be more likely to have had a lack of training. This explanation is supported in Table 5.23, which indicates a highly significant association between teachers who had not had any training and their approaches to using IWBs in classrooms [$\chi 2$ (2, N=587) =40.38; p<0.001]. Consequently, teachers who had not had any training tended to report more use of IWBs in classrooms than their students. For instance, Teacher F1, who had had three training courses regarding the use of IWBs, used the board in her lesson less than her students did, as indicated previously. Thus, she concentrated on designing activities that allowed most of her students to use the board.

In contrast, the observed teachers F5, F6, and F7, who had not had any training courses related to the use of IWBs, did not allow their students to use the board. This association was confirmed during the interviews, for instance, by extracts from teachers F6 and F7. Teacher F6 said,

> Actually, I never allow my students to use the IWB because I am suspicious that students might disrupt the board, and then the school administration will blame me. (Teacher F6)

Then, she explained this during the interview when she stated, *"I am a beginner teacher in using this technology, and I have not received any formal training courses."* Similarly, Teacher F7 stated, "*to be honest, this is the first time for me to employ the IWB in my lessons, so I feel that I am not a confident user."* Then she added,

> I am in a difficult stage because I am a beginner user, and I cannot allow my students to use the IWB because it is a high sensitive board. Therefore, I am afraid of blaming me when it is damaged or when my students cause any problems. (Teacher F7)

Thus, the lack of training perhaps led to a lack of confidence in using IWBs and consequently, limited students' experience of these technologies in classrooms. This is in line with the TPACK theory as it suggested that when the educators' technical knowledge improves, they will be more comfortable permitting their students to use the board without fear of damaging it (Harris *et al.*, 2009). Therefore, these teachers need effective training to increase their confidence in their technical knowledge, because this is the basis for confidence in the other three kinds of knowledge that connect to this part in the TPACK theory (Graham *et al.*, 2009).

7.3.6. The Ability of Teachers to Use IWBs

In this study, for Q30 in the questionnaire, which refers to the capacity of teachers to use IWB with its tools in their lessons, most of the respondents (51%) classified themselves as competent users of IWBs, while nearly 41% of the teachers were unable to use IWBs in their lessons. Conversely, only about (9%) of the respondents considered themselves expert users of IWBs (see Table 5.22). However, these classifications were based on how teachers evaluate their abilities (self-reported skills), leading to the probability of adding an element of unreliability. Nevertheless, the questionnaire was triangulated using classroom observations and interviews, which indicated similar results. In this study, the majority of the interviewees (ten teachers) indicated that they were competent users of IWBs. This was followed by six teachers who reported that they were unable to use IWBs in their lessons. Then, a smaller number (four teachers) stated that they were proficient users of IWBs. These findings are similar to the results of a previous study (Alghamdi, 2013) conducted by the researcher. Where most teachers (57%) considered themselves competent users of IWBs, 38% of teachers viewed themselves as unable to use IWBs, and only 5% of teachers felt that they were proficient users.

There are two possibilities that could explain how teachers classified themselves in terms of the ability of using IWBs. The first possibility may relate to teachers' experience. This is statistically confirmed in Table 5.23, which indicates that there is a significant association between teachers' experience in using IWBs and their competence [$\chi 2=12.18$; $p=0.01$]. Teachers who viewed themselves either as competent users (51%) or skilled users (9%) may have had more experience in using IWBs, whereas those who viewed themselves as unable to use the device (41%) may have been novice teachers. Thus, skilled educators were possibly more active users of IWBs while novice teachers were less competent.

Moreover, this explanation could also be confirmed by teachers' interviews. The four expert teachers F1, F2, M1, and M5 (who had long experience in using IWBs of seven or four years) viewed themselves as proficient users of IWBs. For example, Teacher M1 said, *"I have used the IWB in my lessons for seven years, and I have all the necessary skills to use IWBs, so I am an expert in using this technology."* Similarly, Teacher M5 stated, *"I know very well how to use IWBs in my lessons because I have used them daily for four years."* In the same vein, the observed Teacher F1 indicated, *"I consider myself an expert in using IWBs because I design my lessons myself and start from scratch."*

In contrast, Teacher F3, who had four years' experience in using IWBs, classified her ability of using IWBs as a competent user when she said, "*I can say that I became a competent user of IWBs because it is easy to use and teachers can train themselves by searching the internet."* Similarly, Teacher F8, who had two years' experience in using IWBs, considered herself a competent user of IWBs, as she said,

> I can classify myself as a competent user of IWBs, but I am not a proficient user of this technology because I still cannot fix some common technical problems, and I have not had any training courses. (Teacher F8)

However, the novice teachers F5, F6, F7, and F9 reported that they were unable to use IWBs in their lessons. For example, Teacher F6 indicated, *"It is true to say that I am unable to use this technology effectively."*

The second explanation could be interpreted as that teachers' competence in using IWBs is strongly associated with their training. This is also statistically confirmed in Table 5.23, which presents a highly significant association between teachers who had not had any training and their ability to use IWBs [$\chi 2$ (2, N=587) =43.85; $p<0.001$]. Thus, it could be stated that teachers who had not had any training in the use of IWBs reported they were less able to use these technologies effectively. This justification is also confirmed by teachers' extracts during interviews. For example, Teacher F2 had had a training course in using IWBs introduced in her school, and her training was extended by the school website for more training, as she stated,

> I was trained to use the IWB through participating in one training course held in my school, as well as through the school website, which contains a lot of information relating to the use of IWBs. (Teacher F2)

Therefore, Teacher F2 considered herself an expert user of IWBs, as she confirmed in her interview when she said,

> I consider myself a skilful user of this technology because I already had an efficient training course that was arranged in my school. Then, self-training and daily practice dramatically improved my skills. Therefore, I do not find any difficulties in using IWBs and designing lessons with effective activities. (Teacher F2)

Mishra and Koehler (2006) emphasised that teachers have the capacity to learn and employ new technology in their pedagogical approaches and content demonstrations for teaching particular subjects aiming to improve students' learning. However, teachers' competence in using IWBs could be successfully enhanced through providing teachers with effective training, and allowing enough time to practise (Hall and Higgins, 2005; Wall *et al.*, 2005). Importantly, training teachers should involve all types of knowledge regarding technology, content, and pedagogy (Mishra and Koehler, 2006).

7.3.7. Stages of Lessons

Based on the findings of classroom observations and interviews in the current study, the majority of the teachers use IWBs in all four stages of their lessons. However, three teachers (F4, F5, and F7) did not use this technology during the first or the third stage.

Regarding the use of IWBs at the beginning of lessons, eleven interviewees reported that they considered the importance of using IWBs at this stage in order to attract students to the lesson by revising the last homework or introducing a short movie. For instance, the observed Teacher F1 said, "*I believe that IWBs inspire students at the start of the lesson by presenting enjoyable activities and that is what I usually do in my lessons.*" Moreover, Teacher M9 stated, *"I usually use the IWB at the start of my lessons by introducing a short movie relating to the content of each lesson."*

However, some teachers preferred not to start their lessons using the IWB; for example, the observed teachers F4 and F7 started their lessons with activities that required students to move. Teacher F4 indicated,

> Most of the lesson time, I use the IWB except during the start of the lesson. Actually, I prefer that my students do some physical activities that help them to be prepared for the lesson. (Teacher F4)

Similarly, the observed Teacher F7 said, "*Usually I start my lessons by presenting a practical activity that helps to pave the way for understanding the topic of my lesson."*

Moreover, all thirteen interviewees indicated that they used the IWB technology in the second stage of lessons to present the content of their lessons. Teachers can present the content by designing activities, as the observed Teacher F1 did in her lesson. Additionally, they presented the content by using pictures, maps, videos, and useful websites as the observed Teacher F2 did. She stated,

> Using the IWB helps me to introduce the content of my lesson more easily than using the normal whiteboard. It supports my lessons with pictures, maps, videos, and useful websites; therefore, I feel that I can present interesting lessons using this interactive technology. (Teacher F2)

However, Teacher F3 used animation and movies during her lesson, as indicated earlier, and therefore the content of student textbooks was transformed to a visual content that allowed her to become more flexible to add some changes and save lessons. Similarly, the interviewed Teacher M5 supported the use of IWB technology and its tools to present the content of maths lessons, as indicated previously.

Regarding the use of IWBs during the third stage, twelve teachers reported that they used the IWBs to present the lessons' activities. For example, Teacher F10 stated, "*The IWB technology enables me to design variety of activities that can make Arabic lessons easier for students."* In the same vein, Teacher M8 stated,

> Actually, the digital whiteboard helps me to introduce a variety of interesting activities that might facilitate the understanding of students for some historical events. (Teacher M8)

Nevertheless, the observed Teacher F5 used a collaborative activity for students without using the IWB and preferred not to employ the IWB during the activities of her lessons. She explained this during her interview,

> In my activities, I usually focus on how students solve the task individually and in groups to ensure their understanding as well as to improve their ability to discuss. (Teacher F5)

Thus, Teacher F5 believes that IWBs do not support collaborative learning and she did not choose to involve students in active and cooperative activities by using IWBs (Turel and Johnson, 2012).

Moreover, all thirteen interviewees reported that they used the IWB at the end of their lessons to review the content or for assessment. For instance, the observed Teacher F1 reviewed the lesson by presenting a slide that summarized all the information of her lesson. During the interview, she stated, "*I usually review each lesson using the IWB to ensure students' understanding*."

However, Teacher F2 presented two interesting games that were designed by herself to evaluate her students. These two games were very helpful to assess and ensure the understanding of her students because they offered useful immediate feedback for students. During these, students can know if their answers are right or wrong immediately because of the sound or blooming of a flower. She commented on her use of games, as she said, "*I like to design games that include the content of my lessons and use these games at the end of lessons to evaluate the understanding of my students."* Indeed, direct feedback could be useful because it inspires students to keep trying until they reach the correct answer (Cheng and Chen, 2007). Moreover, it stimulates independent learning and allows students to observe their improvement immediately while undertaking assessment activities (Irons, 2008). Therefore, students like the immediate feedback because it keeps the activities and their outcomes closely associated, expressive and up-to-date (Denton *et al.*, 2008).

Likewise, all thirteen teachers interviewed supported the use of IWBs at the end of their lessons because they help them to summarize the main points and to ensure students' understanding. Teacher M6, for example, confirmed this when he said,

> Using the digital board at the end of my lessons is considered an important step for me, because through using the IWB I can summarize the main points in my lesson and present them step by step to students to remind them and ensure their understanding. (Teacher M6)

Overall, the majority of the interviewees were positive about the use of IWBs to start lessons, present the content during activities, and to revise or assess their lessons. Thus, the findings of the current study support the framework indicated by Kennewell and Beauchamp (2007). The authors outlined the structure of IWB lessons in their study in four stages, as indicated before in Section 3.4.1. However, the majority of the interviewees in the current study used IWBs during activities in the third stage of the lesson, in contrast to the lesson plans in Kennewell and Beauchamp's (2007) framework. Indeed, this depends on teachers' knowledge regarding technology, pedagogy, and content (TPACK), where teachers know how to present activities to their students by choosing the effective method. Therefore, teachers' TPACK should be improved to create effective lessons using IWBs.

In this study, the seven observed Saudi female teachers used IWBs differently in their lessons, presented different abilities, and also had a different level of training. Therefore, teachers' knowledge should be investigated in all the fields of knowledge (technology, pedagogy, and content) to provide a more accurate assessment of their level of use and, consequently, a more productive training. According to Angeli and Valanides (2005), TPACK is considered a different set of knowledge created by integrating educators' knowledge relating to technology, pedagogy, and the content in their teaching. Therefore, the combination of these kinds of knowledge in the TPACK framework is essential for the effective use of technology in classrooms (Koehler *et al.*, 2007). Consequently, the findings of the current study support the TPACK theory, which suggests that the deeper consideration of the interrelationship of a TPACK for teachers may lead to the more efficient use of new technologies in classrooms (Koehler and Mishra, 2005; Mishra and Koehler, 2006).

Moreover, some teachers in the current study presented clear examples that reflect how they successfully integrated their knowledge of technology, content, and pedagogy to improve students' learning. For instance, Teacher F1 designed an activity consisting of an envelope to present the topic of her lesson. She clearly explained and discussed the information in this activity with her students, who critically asked her for more details, mainly about the hereafter. Moreover, she designed an enjoyable activity about matching questions with their answers in two columns, and students used drag and drop in this activity. If the answer was right, the selected response would disappear with the question; if not, it returned to its place. Indeed, this activity also led to enhancing discussion amongst young students about the correctness of answers and the possibility of disappearing.

Furthermore, Teacher F1 designed a fishing game involving the content of her lesson. This game contained ten different coloured fishing ropes. Additionally, there were twelve fish in the pond; these fish carried different answers labelled from one to twelve. The number of answers was more than the questions on fishing ropes, leading to the need for deep thinking. Additionally, she designed a puzzle and asked students to solve it in a group of five. This was an example of improving collaborative learning and discussion among students during their use of the board by themselves. Teacher F1 designed all these activities by herself, and she transformed the verbal concepts of the Quranic verses into clear and invisible concepts that fit with young students. Indeed, there is no specific way for teaching Quran lessons, and this only depends on teachers' capacities and effectiveness.

Similarly, Teacher F2 designed an activity to present her topic "*The kings of my country*" as indicated before; students asked critical questions about the topic. Additionally, she designed two interesting games where the correctness of answers was connected with sounds (clapping and a warning alarm) and movement (flowering). Hence, these expert teachers F1 and F2 appeared to be successful in improving students' learning, involving interaction, discussion, and higher thinking skills (Hennessy *et al.*, 2007).

Indeed, the indicated examples highlighted the role of educators in designing their lessons as "*curriculum designers*" as described by Koehler and Mishra (2008, p. 21). Teachers F1 and F2 designed educational activities to present their content using their knowledge regarding pedagogy, content, and technology. Thus, the findings of the current study support the claim outlined in the literature, which indicated that the mere availability of new technologies in classrooms does not ensure that teachers will use them effectively (Koehler and Mishra, 2005). Indeed, the teacher is the main factor in determining the effective use of IWBs in classrooms. This finding is consistent with a large body of research (Cogill, 2002; Cox *et al.*, 2004; Webb, 2005; Hennessy *et al.*, 2007; Higgins *et al.*, 2007; Moss *et al.*, 2007; Shenton and Pagett, 2007; Holmes, 2009; Kneen, 2014; Kyriakou and Higgins, 2016). Therefore, the effective use of technology in classrooms necessitates that teachers should have appropriate pedagogical content knowledge (PCK) as well as technical knowledge (TK) to improve the effectiveness of teaching (Koehler and Mishra, 2005; Mishra and Koehler, 2006).

7.3.8. Classification of Teachers based on the CBAM Levels of Use (LoU)

Further analysis of the second research question is based on the CBAM *Levels of Use* (LoU) (Hall and Hord, 2006). As indicated before in Chapter Three, Section 3.6.3.2, this model concentrates on the general behaviour of teachers when implementing innovations in classrooms. Eight levels define the *LoU* framework: *Non-User*, *Orientation*, *Preparation*, *Mechanical*, *Routine*, *Refinement*, *Integration*, and *Renewal*.

In this study, the quantitative findings showed that the majority of teachers who completed the questionnaire (31%) indicated that they sometimes used IWBs in their lessons and only (43%) used a few interactive features. Consequently, these findings can be used to place teachers in the *Mechanical* stage in the CBAM model, where teachers have started using IWBs in classrooms and are learning new teaching and technical skills. For these teachers, traditional teaching was the dominant approach (Anderson, 1997) because they focused on learning technical skills and, consequently, did not take opportunities for pedagogical development, such as by developing interactive student use of the technology. Thus, at this level, teachers need to acquire new teaching skills besides learning technical skills (ibid.). Indeed, teachers may find difficulties at this level because they work hard to make the innovation adaptable to their needs and easy to use. However, most participants also did not use IWBs daily in their lessons; therefore, they did not fully reach the *Routine* stage where teachers have regular use of IWBs. In this study, only 18% of the respondents to the questionnaire indicated that they had daily use of IWBs in their lessons, which places them in the *Routine* stage.

Moreover, the majority of participants (90%) reported that they used IWBs for whole class teaching, confirming that these teachers were in the *Mechanical* stage of LOU because they maintained a teacher-centred approach. Furthermore, those teachers who allowed students to use the board either occasionally (43%) or frequently (39%) could perhaps be placed in the *Refinement* stage of LOU in the CBAM model as this suggests they were exploring the potential of the technology. As they appeared to make some changes to their pedagogy and their use of IWBs, this might support a more positive impact on their students, and consequently, a more student-centred approach is apparent regarding the changes in using innovations (Anderson, 1997). For those teachers (18%) who did not allow their students to engage with using IWBs, they were perhaps still in the *Mechanical* stage, where a more teacher-centred approach seems to be more apparent.

Regarding the seven observed teachers, teachers F1, F2, F3, and F4 used IWBs daily with an acceptable range of the interactive features, and allowed their students to use the board. Therefore, there is some indication that they extended the *Routine* stage to be at the higher levels of the CBAM *Levels of Use* (LoU). Those teachers were likely to be in the *Refinement* Level because they presented a more active contribution to evaluating the effects of using the innovation on their students. Therefore, they have engaged with some changes relating to the IWBs and their teaching approaches and may be considered to be around the *Refinement* Level.

Surprisingly, the expert Teacher F1 used the IWB daily in all the four stages of her lesson, and she applied most of the IWB features that were needed in her lesson. She effectively designed activities and games for whole class teaching, small groups, and individuals. Moreover, Teacher F1 used the board less than her students in the lessons, though she organized and orchestrated their interaction. Students were very active, and they showed higher order thinking capabilities during class discussion, which produced an engaging and enjoyable lesson. As observed, Teacher F1 introduced many activities that involved all the students in the class. Furthermore, she was also looking for significant improvements in the use of IWBs to improve student learning as she confirmed during the interview, *"I only want to learn new methods in designing attractive lessons for my students."* Therefore, she appeared to be working at the *Renewal* Level, which is the highest level of the CBAM *Levels of Use* (LoU). Indeed, this teacher appeared to have skipped the *Integration* Level because she was trained first in her school and so she relied on herself to improve her use of IWBs. During the interviews, there was no indication for collaboration with colleagues to improve her skills. Thus, this could suggest that the *Integration* Level of LoU is not an essential stage that teachers must pass through.

However, Teacher F5 was still working at the *Routine* level because, although she used the IWB daily, she did not allow her students to use the board and did not make any changes regarding her pedagogy. However, the two observed teachers F6 and F7 appeared to be in the *Mechanical* level of this model. These two teachers did not use the IWB every day in their lessons, as discussed before, because of the location of this technology, which was in a learning resources room. These two teachers reported that they trained through collaboration with the teacher who was responsible for the learning resources room, which is usually found in a high level (the *Integration* Level). However, inconsistent use of this technology suggests they are best placed at the *Mechanical* level.

Moving to the interviewees, similar to the observed teachers F6 and F7, interviewees M2, M6, F8, and F9 appeared to be in the *Mechanical* level because they reported that they sometimes use IWBs in their lessons. In contrast, teachers F10, M1, M3, M4, M5, M7, M8, and M10 used the IWBs in their lessons daily. Therefore, these teachers were more likely to be in the *Routine* stage. Moreover, teachers F10, M5, and M10 stated that they frequently planned for their students to use the IWBs in their lessons, while teachers M1, M3, M4, M7, and M8 reported that they allowed their students to use the board occasionally. Thus, those teachers indicated that they might be working at the *Refinement* Level, on the basis of a more varied and student-centred approach. Teacher M9 reported that he used the IWB in his lessons daily, but he only used the IWB in his lessons without expecting his students to use the board. Therefore, this teacher appeared to be in the *Routine* level of the LoU.

Furthermore, the male interviewees M1, M8, and M10 reported that they preferred to collaborate with their colleagues to improve their skills. As a result, these teachers could be placed at a higher level of the LoU. They moved to the *Integration* Level because they tended to collaborate with their colleagues to improve their use of an innovation to achieve student success (Anderson, 1997). Teachers at this level tend to reach a more expansive stage in which they think about how to improve the learning process.

Indeed, progress in the CBAM model is determined by teachers' decisions and conforming behaviours in applying innovations in classrooms (Anderson, 1997). Therefore, classifying teachers in this study according to this model depends on the regularity of IWB use, allowing students to use the board, collaborating with colleagues, and significant improvements in the use of the innovation. Therefore, the teachers within this sample (n=20) were not involved in the lower three levels of the CBAM model. However, the majority of teachers (twelve teachers) were in the higher three levels of this framework (*Refinement, Integration, and Renewal).* The rest of teachers (eight teachers) were placed in the *Mechanical* and *Routine* levels (see Figure 7.1). Indeed, these eight teachers did not have the opportunity to benefit from in-service training. They had not had any training courses related to the use of IWBs, and only one teacher (M6) had had a short training course, as indicated during the interviews. In contrast, all the teachers in the higher three levels of the CBAM model had been trained to use IWBs by the Department of Education, except for teachers F3, F4, M1, and M4 who were self-trained. However, these four teachers seemed to be highly motivated to employ IWBs in their lessons and their personal commitment motivated them to train themselves. Overall, this suggests that teachers should be provided with regular and long-term in-service training to improve their adoption of technology in terms of the CBAM levels. Moreover, more male teachers were in the higher levels of the CBAM model than females. In contrast, the number of female teachers in the *Mechanical* and *Routine* levels was higher than males (see Figure 7.1).

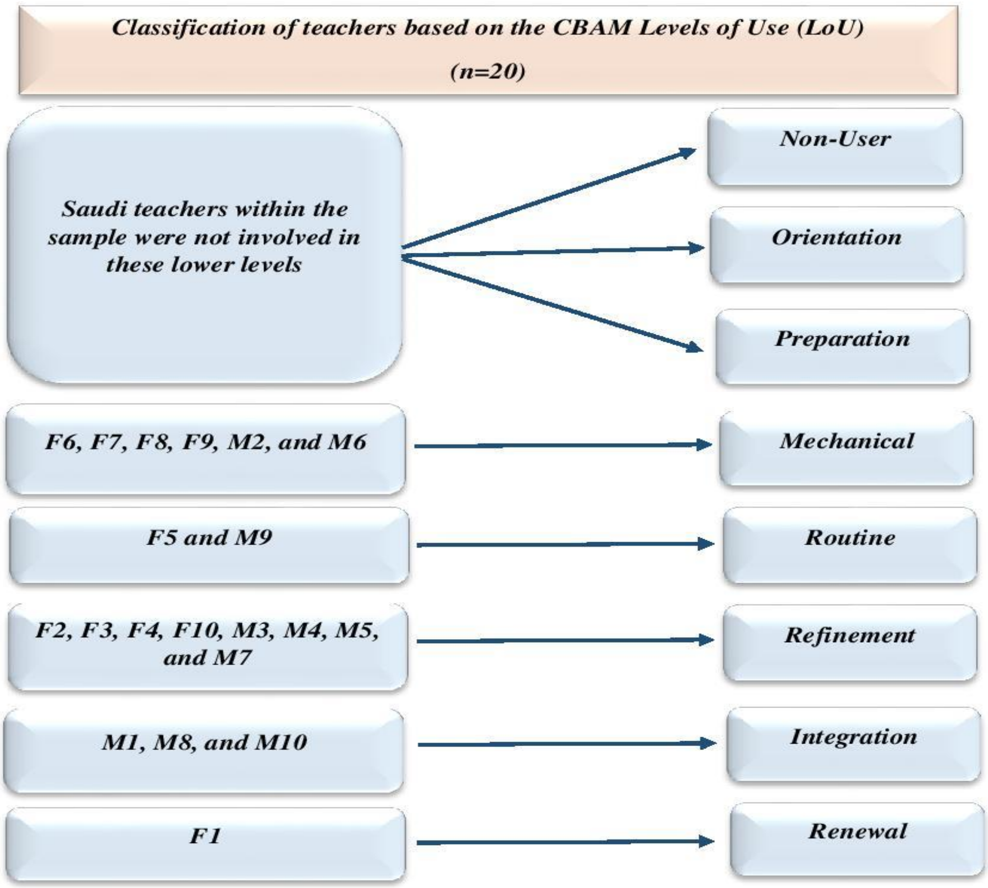

Figure 7.1: Classification based on the CBAM Levels of Use (LoU)

7.3.9. A proposed Integrated Model of Technology Adoption (IMTA)

Comparing the CBAM *levels of Use* (LoU) (Hall and Hord, 2006) and Beauchamp model (2004) in the section (3.6.4) indicates that both models consisted of several levels that teachers go through when using technologies and therefore, both are used to classify teachers' levels when using digital technology. However, when linking the eight levels that define the LoU framework with the five stages of Beauchamp model (2004) (see Figure 3.3); the difference between the two models appeared through five levels. These five levels are; *non-user*, *orientation*, *preparation*, *routine*, and *integration*. All these levels are explicitly found in the CBAM *levels of Use* (LoU) as categorical levels compared with Beauchamp model (2004).

The CBAM model contains three levels (*non-user*, *orientation*, and *preparation)*, which teachers go through before using IWBs. Whereas, Beauchamp model (2004) focused more on teachers who use this technology. Thus, the CBAM model may be more useful for evaluating teachers' levels of use in developing countries, which have recently started to use IWB technology in their classrooms.

The *routine* level was indicated in the CBAM model as a higher level than the *Mechanical* level. Indeed, teachers should use technology regularly and consider the daily use as a habit for more effective use of IWBs. Teachers should be encouraged to daily and continuously using technology in their lessons to increase their confidence in using technology (Armstrong *et al.,* 2005). Consequently, this will lead to developing their skills (Glover and Miller, 2001). However, some teachers could not use technologies daily because of their location and lack of access to technology or the nature of the content of lessons. Some expert teachers do not have IWBs in their usual classrooms but in places like a learning resources room. The location of this technology prevents those teachers from daily use, especially in the case of schools with only one learning resources room for all classes. In this case, classification of teachers' levels based on the CBAM model places those skilled teachers in the lower level (*Mechanical* level). However, some of those teachers might have sufficient technical and pedagogical skills of using IWBs, where they should be in the higher levels of the CBAM model.

Moreover, according to the findings of the current study, the three teachers F9, M2, and M6 used IWBs differently based on the nature of the topic introduced to their students. Indeed, it appears that these teachers knew what was beneficial for students' learning, leading to the decision of whether to use the IWB or not in their lessons. Teacher M2, who teaches Islamic sciences, indicated that he used this technology sometimes to teach the Quran lessons. He stated that he preferred to present a consistent reading by himself to his students and then explain its meaning. Similarly, Teacher F9, who teaches students with learning difficulties, indicated that her use of the IWB depends on the nature of the topic introduced to her students. Moreover, When IWBs are placed in laboratories, their use was not consistent in each lesson. Science teachers (17% of the sample) sometimes prefer to focus on practical experiences during lessons more than demonstrating ideas or concepts on the board. This was confirmed in the current study during the interview as the Teacher M6, who teaches science in *Tatweer* school 7, reported that he sometimes used the IWB in the laboratory.

Thus, I am consistent with Beauchamp model in that I have not separated the *routine* level as a distinct level because the daily use of technology could be during any stage whether in the lower or higher levels. Therefore, the *routine* level might be better indicated implicitly in the model but not as a discrete level that used to classify teachers' levels of use.

Regarding the *integration* level, based on the findings of the current study, it should be better not located in the higher levels of the LOU framework but it should be between *mechanical* and *routine* levels because some teachers may collaborate with their colleagues at the beginning of using technologies as the two observed teachers F6 and F7 did. These two teachers did not use the IWB every day in their lessons because of the location of this technology in a learning resources room. These two teachers reported that they trained through collaboration with the teacher who was responsible for the learning resources room, which is usually found at a high level (the *Integration* Level). However, inconsistent use of this technology suggests they are best placed at the *Mechanical* level.

Moreover, some teachers do not collaborate with colleagues during training instead; they relied on different ways to improve their skills such as the expert Teacher F1 as indicated in Section 7.3.8. This teacher appeared to be working at the *Renewal* Level, which is the highest level of the CBAM *Levels of Use* (LoU). She seemed to have skipped the *Integration* Level because she was trained first in her school and so she relied on herself to improve her use of IWBs. During the interviews, there was no indication for collaboration with colleagues to develop her skills. Thus, this could suggest that the *Integration* Level of LoU is not an essential stage that teachers must pass through.

Thus, the *Integration* Level of LoU seems to be better moved to be between *mechanical* and *routine* levels of LoU as in the case of the two teachers F6 and F7or to be not considered as an essential stage as in the case of the teacher F1. However, some expert teachers could also collaborate to discuss using new methods or strategies regarding using IWBs. As a result, the *Integration* Level could be better placed implicitly during any stage of teachers' levels of use but not as a certain stage similar to Beauchamp model (2004).

Therefore, the CBAM *levels of Use* (LoU) (Hall and Hord, 2006) was adapted to provide a new model based on the findings of the current study and was also inspired by Beauchamp model (2004), suggests four potential levels of innovative technology integration: These levels are: *non-user, mechanical*, *refinement*, and *renewal.* This new model can be called the Integrated Model of Technology Adoption (IMTA) (see Figure 7.2).

In this model, the three levels (*non-user, orientation, and preparation*), which were categorised as *non-users* in the CBAM *levels of Use* (LoU), were combined as one category level that indicates the situation of teachers who do not using the technology, including having little or enough information about the innovation as well as deciding to use or not to use the technology. The *mechanical*, *refinement*, and *renewal* levels remained as indicated in the CBAM *levels of Use* (LoU). The *mechanical* level, where teachers start using IWBs in classrooms as a presentation tool. The *Refinement* LoU, where a more student-centred approach appears, and teachers focus on both the technical and pedagogical skills of using IWBs. The highest level of this model is the *renewal* level in which teachers tend to discover new methods to improve their use of IWBs. However, the two levels the *routine*, and *integration* were found to be suitably indicated implicitly in the IMTA model similar to the Beauchamp model (2004). The *integration* may appear at any level starting from the *non-users* level, where teachers might discuss some information related to the use of technologies with their colleagues. Whereas, the *routine* can only appear in the *mechanical, refinement,* and *renewal* levels. Thus, IMTA model can be used to classify the levels of teachers when using educational technologies in classrooms based on four levels: *non-user*, *mechanical*, *refinement*, and *renewal*.

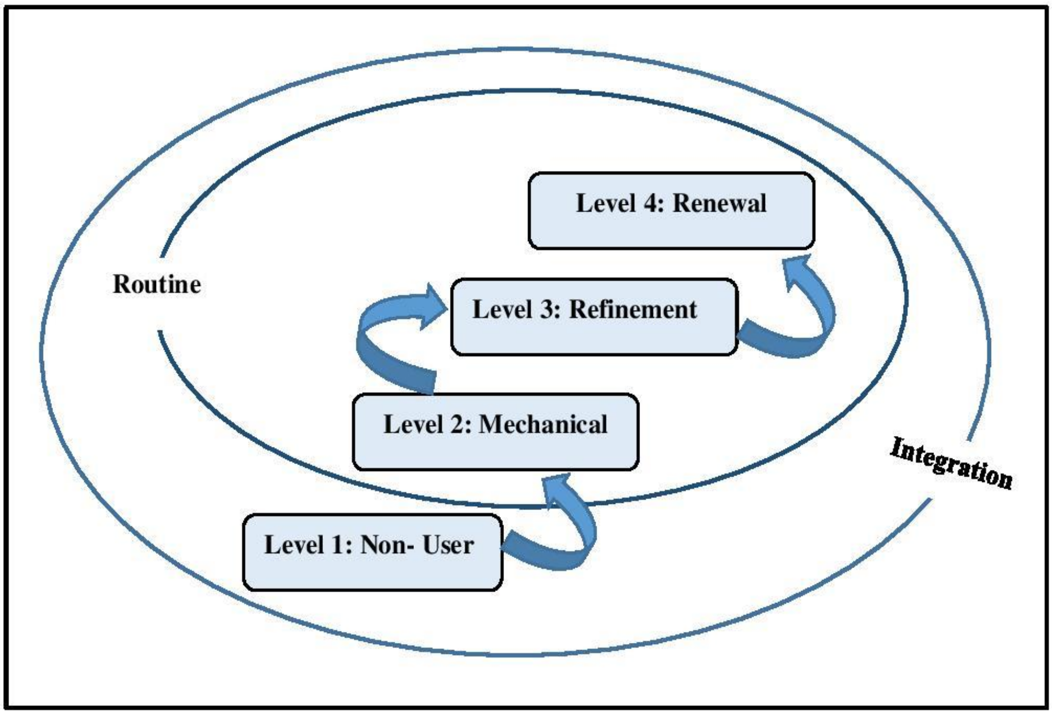

Figure 7.2: Alghamdi's Integrated Model of Technology Adoption

7.4. RESEARCH QUESTION 3

WHAT ARE THE DIFFICULTIES AND CHALLENGES FACING TATWEER PRIMARY SCHOOL TEACHERS IN USING IWBS?

According to the quantitative findings of this study (see Table 5.22), the top three difficulties faced by teachers in *Tatweer* primary schools when using IWBs were "*Lack of training courses*" selected by most educators (54%), then "*Technical problems when* *using IWBs*", chosen by 52% of the teachers, and "*Lack of assistance and support*", selected by 48% of teachers.

These three difficulties were also reported by the interviewees as their major problems when using IWBs. The majority of the respondents (nine teachers) indicated that the lack of training was the major issue that affected their use of IWBs negatively. For example, Teacher M9 said, *"I did not have any training courses from the Department of Education; therefore, I think this is the biggest problem for me."* Similarly, Teacher F4 indicated, *"The lack of training courses that clarify the use of IWBs in effective ways is the most major problems that faces me."* In the same vein, Teacher M2 reported,

> For me, lack of training sessions is an essential problem that should be considered from the responsible of the Department of Education. I did not have any training courses in using IWBs. (Teacher M2)

Technical difficulties when using IWBs were also mentioned by eight teachers. For instance, Teacher F1 said, *"There are some faults in the programme itself; sometimes it cancels some of the features without any reason known to us."* Similarly, Teacher M1 said, *"I find difficulties when technical problems happen, such as power failure or computer malfunction."* In the same vein, Teacher F7 indicated,

> I also have some technical problems that affect my use of the IWB in my lessons, and some of these problems relate to the computer that is connected with the IWB. (Teacher F7)

The lack of assistance and support was reported by seven teachers, as Teacher M3 said, *"I think that the lack of assistance is the most important issue that should be offered in all schools with IWBs."* Similarly, Teacher M7 said,

> I believe that the maintenance of IWBs is neglected. Therefore, constant assistance should be provided for teachers in each school supported with IWBs. (Teacher M7)

Teachers F4 and F5, moreover, reflected that they suffered from a lack of assistance and support in their schools as they reported,

> The lack of assistance and support either inside my school or in the Education Department is also considered a problem for teachers; therefore, when I face any problem I usually search the Internet or call some private professionals, which is considered time-consuming. (Teacher F4)

> The main and the biggest problem that challenges me is the ignorance of those responsible for maintenance in the Education Department, as they do not respond to my calls to fix the IWB or provide professionals to help me to solve this problem. (Teacher F5)

Moreover, the lack of assistance and support was recorded in the lessons of teachers F3, F4, F5, and F7, while technical problems were noted in the lessons of teachers F1, F5, and F7 (see Table 6.4).

Indeed, these major problems have also been identified in several research studies. For example, a study was conducted by Al-Faki and Khamis (2014) to investigate the difficulties that face English teachers during their use of IWBs in Jeddah. The lack of training courses, technical problems, and lack of assistance and support were reported by teachers in this study. Approximately half of the teachers faced difficulties in managing IWBs. Moreover, all teachers indicated that they had a lack of knowledge about fixing IWB problems. Similarly, technical problems, lack of technical support, and lack of knowledge and training were also huge obstacles faced by teachers in Slovenia in a study conducted by Šumak *et al.* (2016). The teachers in a study carried out by Glover and Miller (2002), to investigate the use of IWBs by 35 primary teachers and their views about benefits and limitations of this technology, criticized the lack of a technical consultant to provide them with immediate instructions when technical difficulties occur.

Moreover, the lack of sufficient training in using IWBs was also reported in several Saudi studies (Bakadam *et al.*, 2012; Isman *et al.*, 2012; Alghamdi, 2013; Gashan and Alshumaimeri, 2015). For instance, the lack of training courses was one of the major difficulties facing Saudi female educators, who teach English in secondary schools in the city of Riyadh, when using IWBs in a recent study carried out by Gashan and Alshumaimeri (2015). Similarly, the lack of suitable professional development and training courses in using computers in teaching was an important difficulty reported by 79% of teachers in a study conducted by Al-Qurashi (2008). It identified the difficulties of using a computer and the internet by mathematics teachers in the intermediate boys' schools in Al-Taif city in Saudi Arabia. Furthermore, lack of training and technical support were also indicated by the teachers in a study conducted by Oyaid (2009), to investigate the use of ICTs in Saudi secondary schools, in Riyadh, Saudi Arabia.

Indeed, teachers who chose "*Lack of training courses*" and "*Technical problems when using IWBs*" as their two main difficulties appeared to lack technology knowledge. In other words, they had limited knowledge regarding the basic technical skills of using IWBs, inconsistent with TPACK theory. This theory concentrates on the importance of improving teachers' technical knowledge as it is an essential component in this model (Mishra and Koehler, 2006; Graham *et al.*, 2009).

According to the quantitative findings in the current study, 34% of teachers chose the option of "*Lack of educational resources*" as a difficulty (see Table 5.22). Similarly, this finding was confirmed by extracts of the interviews indicated by the two observed teachers F6 and F7. Teacher F6 said, *"Actually, I need a variety of educational resources specific for mathematics lessons to introduce more interesting lessons to my students*." In the same vein, Teacher F7 indicated, *"I have not found useful educational resources for this lesson, and I wish the educational department would provide us with such resources."* This difficulty was also identified by Saudi male teachers, in a study carried out by Al-Faki and Khamis (2014), who revealed that the interactive learning materials provided by schools administrations were inadequate. Similarly, the responses of Saudi female teachers in a study conducted by Gashan and Alshumaimeri (2015) indicated that the lack of the applicable curriculum content was one of the obstacles encountered by them when using IWBs. Similarly, the shortage of digital learning resources, as well as the invested time in organizing lessons, were the main problems indicated by teachers in a pilot project conducted by Manny-Ikan *et al.* (2011). Moreover, the lack of digital educational resources was also a significant finding reported by teachers in a case study conducted by Somyurek *et al.* (2009) to examine the new inclination of IWB's investment in primary and secondary schools in Turkey. Gursul and Tozmaz (2010) state that teachers' concerns usually focus on the deficiency of instructive software, and therefore they need such resources.

Digital educational resources can contain text, still and dynamic pictures, animations, presentations, sounds, videos, and websites, as described by Hall and Higgins (2005), as some of the main benefits of using IWBs in teaching and learning processes. Therefore, the lack of suitable digital educational resources may cause failure regarding introducing the content (Wall *et al.*, 2005) and resistance from educators who use technology (Glover and Miller, 2002). Consequently, these resources are crucial for the effective use of IWBs in classrooms (Beauchamp, 2004; Koenraad *et al.*, 2015). In the current study, teachers who chose "*Lack of educational resources*" as a difficulty when using IWBs seemed to have limited knowledge regarding using IWBs to introduce their content. Therefore, they need to improve their skills relating to IWB content knowledge for the effective use of this technology (Holmes, 2009).

Furthermore, 28% of the respondents to the questionnaire in this study revealed that they did not have enough time to design educational resources (see Table 5.22), possibly because of their high workload of more than 20 classes per week. This quantitative finding was also qualitatively supported by the interviews and classroom observations. The lack of time for designing educational resources was reported by the observed teacher F6 (who teaches Mathematics) as a problem that faced her when using the IWB. She said, *"The lack of time for designing educational resources is another problem that affects me when applying the IWB in my lessons."* Similarly, Teacher M7 (who also teaches Mathematics) criticized the training courses provided by the Education Department, indicating that he had an overlong curriculum to cover in a specific time. As he said in the following extract,

> I like to attend training courses. However, most training sessions were not related to the use of IWBs and, most importantly, the time of these courses was not suitable for me as a maths teacher with a huge curriculum that I have a specific time to finish. (Teacher M7)

Similarly, teachers M2 (who teaches Islamic sciences) and M5 (who teaches Mathematics) reported that they had long teaching schedules that limited their chances to train, and they suggested reducing their classes per week as they stated,

> I have 24 classes per week, and that could affect my ability to develop my IWB skills. Therefore, I suggest reducing the teachers' workload to provide more time for teachers to train. (Teacher M2)

> I do not have enough time to train during the school day because I have 22 classes per week. I wish these classes could be reduced to have the time for training. (Teacher M5)

The lack of time for designing pedagogical lessons using IWBs was also reported in several studies and reviews (Glover and Miller, 2002; Higgins *et al.*, 2007; Šumak *et al.*, 2016). Indeed, class time and the content of the curriculum are examples of obstacles that prevent educators from using technology regularly. In a study conducted by Karasavvidis (2009), teachers reported that time and syllabuses are the greatest difficulties that keep them from using technology daily. Similarly, the lack of time was also reported in several studies as one of the main restrictions to integrate technologies into the teaching and learning processes (Afshari *et al.*, 2009; Ihmeideh, 2009; Khan *et al.*, 2012).

Moreover, the lack of time and teachers' long schedules were also confirmed by several Saudi research studies (Al-Alwani, 2005; Oyaid, 2009; Al-Maini, 2011; Al Mulhim, 2013; Al-Faki and Khamis, 2014). In the same vein, according to Koehler and Mishra (2009, p. 62), "*acquiring a new knowledge base and skill set can be challenging, particularly if it is a time-intensive activity that must fit into a busy schedule*."

Therefore, time issues indicated by teachers in the current study should be considered in the policies of the Ministry of Education to create a better environment for teachers to gain training. Teachers' workloads and the length of the curriculum should be reduced as suggested by the participants. Indeed, educators usually have different ways and speeds in improving their skills; therefore, they need a comfortable and helpful environment (Beauchamp, 2004). Thus, providing sufficient time for teachers to upgrade their abilities in using IWBs is an essential issue as recommended by Becker and Ravitz (2001), who stated that advanced courses should be progressively delivered during the year by educational leaders, who also offer equipment and time for teachers to practise with these technologies. When using IWBs, instructors in their early training stages need adequate time to practise alongside their training to explore their affordances and the effective methods to incorporate them into their lessons (Cogill, 2002).

According to the quantitative findings of this study, more than a quarter of respondents to the questionnaire (27%) indicated that they did not have IWBs in their classrooms (see Table 5.22). This was confirmed in the qualitative findings, as 15 teachers from the twenty interviewees indicated that they had IWBs in their classrooms, while a quarter of the respondents (five female teachers) reported that they had IWBs in learning resources rooms. The unavailability of installed IWBs in all classrooms has also been reported in several studies (Slay *et al.*, 2008; Manny-Ikan *et al.*, 2011; Alwazzan, 2012; Alghamdi, 2013; Šumak *et al.*, 2016). Indeed, the unavailability of technologies in Saudi schools is one of the major obstacles and challenges that hinder teachers to integrate educational technology into their teaching (Al-Alwani, 2005; Oyaid, 2009; Al Mulhim, 2013).

Moreover, the quantitative findings of the current study showed that the bottom three barriers faced by teachers in the sample in using IWBs were "*students find difficulties with IWBs*","*location of IWBs*", and "*difficulties in integrating IWBs in my teaching lessons*" (see Table 5.22). These findings were also confirmed through either classroom observations or interviews.

While observing the seven female teachers in this study, students found difficulties in managing the coloured pens in the two lessons of teachers F1 and F3, whereas students did not use the board in the lessons of teachers F5, F6, and F7. However, the previous studies have reported several problems that have a negative impact on students such as the inability to see because of the small size of these technologies (Hammond *et al.*, 2009), especially for students at the back of the classroom (Hall and Higgins, 2005), the difficulty of reaching high-level icons on the top of the board (Beauchamp, 2004; Smith *et al.*, 2005), the technical problems, and teachers' limited skills (Hall and Higgins, 2005).

In the current study, the location of IWBs in the learning resources room was observed in four lessons introduced by teachers F1, F2, F6, and F7. However, teachers F1 and F2 did not consider this a major problem that prevented them from daily use, because they had three learning resources rooms in their schools and each was provided with an IWB. In contrast to teachers, F6, and F7, who had only one learning resources room in their school with one IWB, therefore, the location of this technology in the learning resources room was considered a significant problem for them. Teacher F6 confirmed this when she said, *"The location of the IWB in the resources room is one of the problems that face me in using this technology."* Similarly, Teacher F7 stated,

> The most common problem I encounter is the location of the IWB in the resources room, and all the teachers have a specific schedule for using it. Thus, I do not use this technology daily; I only use it in some lessons. (Teacher F7)

As discussed before in Section 7.3.2, this difficulty was also reported in a study conducted by the researcher of the current study (Alghamdi, 2013), where the frequent use of IWBs in classrooms was extremely connected with IWB location, whether in classrooms or the learning resources rooms. Indeed, installing resources in the appropriate place is considered an essential factor for successful use. Therefore, IWBs should be fitted inside classrooms (Hunt *et al.*, 2006) and, moreover, they should be located in an appropriate place in the classroom to enable viewing for the whole class (Glover and Miller, 2002).

Moreover, in the current study, the three observed teachers F5, F6, and F7 appeared to have difficulty integrating IWBs in their lessons and showed a lack of skills in using IWBs. This was confirmed during the interviews, as Teacher F7 stated,

> I need training in how to use IWB features, integrate this technology into my lessons, fix the core problems, and design active lessons because I have difficulties to find educational resources on some topics in my content. (Teacher F7)

Similarly, Interviewee M7 said,

> I still have limited knowledge in how to integrate this technology effectively in my lessons; therefore, I need more training regarding this technology. (Teacher M7)

These findings relating to the lack of teachers' skills and the difficulty of integrating IWBs in the teaching were also found in several Saudi studies (Bakadam *et al.*, 2012; Isman *et al.*, 2012; Alghamdi, 2013; Hakami, 2013; Gashan and Alshumaimeri, 2015). Similarly, teachers encountered difficulties in integrating IWBs in their current teaching methods in a study conducted by Schmid (2008). Indeed, teachers who selected the difficulty of integrating IWBs in their lessons appeared to have limited knowledge regarding the effective way of integrating IWBs in their teaching methods (TPK);

therefore, they need effective training to improve their competence in using IWBs successfully (Hall and Higgins, 2005; Wall *et al.*, 2005).

To sum up, identifying the fundamental obstacles encountered by Saudi primary teachers in *Tatweer* schools in integrating IWBs into classrooms is considered the first step towards finding solutions to these problems. Schmid (2006) reported that introducing innovative technologies in schools could create conflict and challenges, and consequently instructors and learners could be affected. Moreover, when technical difficulties occur, teachers become more likely to use traditional methods to introduce their content (Cuban *et al.*, 2001; Bauer and Kenton, 2005). Therefore, providing educators with appropriate skills and approaches to face technology obstacles is essential for more effective use of technology (Kopcha, 2010).

7.5. RESEARCH QUESTION 4

HOW WERE TEACHERS IN TATWEER PRIMARY SCHOOLS TRAINED TO USE IWBS AND WHAT WERE THEIR TRAINING NEEDS?

Investigating teachers' sources of training to use IWBs, the number of training courses they had received, their satisfaction, the need for further training, the types of training needs, and their preferred training methods are critical issues that should be considered to improve teachers' professional programmes relating to the use of IWBs. Therefore, to answer this question, the findings from both the questionnaire and interviews were combined and linked to the literature.

This part of the research was published by developing a conference paper by Alghamdi and Higgins (2015), entitled "*Investigating how teachers in primary schools in Saudi Arabia were trained to use Interactive Whiteboards and what their training needs were*". This paper was developed from the quantitative results of the current research and an examination of the literature related to the IWB technology (see Appendix 15).

7.5.1. Sources of Training

According to Table 5.22, the quantitative findings of this study indicated that the majority of teachers had had two kinds of training, self-training (41%) and then via their colleagues (32%).Teachers who had been trained by the education department (26%) were in the third place. Additionally, 15% of the respondents revealed that they had had no training. The lowest percentage of teachers had been trained by private organizations (6 %). These findings concur with a study carried out by Shenton and Pagett (2007), to explore the use of IWBs in the UK, indicating self-training and collaborating with colleagues were the most appropriate teacher training sources, which might be more efficient factors in improving teachers' skills for the best use of IWBs. However, these findings are inconsistent with those of Turel and Johnson (2012), which indicated that most educators (67%) had been trained by the educational institution or the provider of IWBs, and a lower percentage (26%) of educators were self-trained. Nevertheless, 81% of the teachers in a study conducted by Higgins *et al.* (2005), to evaluate the pilot project (*Embedding ICT in the Literacy and Numeracy Strategies*), had trained via their colleagues and by their local IWB consultants.

In this study, moreover, most interviewees (eleven teachers) also reported self-training as their source of training. For example, Teacher F3 said, *"Self-training was the only method that I used to have training in using this technology."* Then, nine interviewees reported being trained by the Department of Education, as indicated by, for instance, Teacher F2, *"I was trained to use IWBs through a training course that held inside my school."*

However, training through collaboration with colleagues was reported by only five teachers during the interviews. For example, Teacher F9 reported, *"My colleagues helped me to learn how to use IWBs, and then I relied on myself to improve my skills."* Similarly, Teacher M2 stated, *"I am so grateful for my colleagues who trained me in using IWBs and after having the basic skills, I practised what I learned in my lessons."*

Thus, the majority of the interviewees were self-trained, and this is similar to the quantitative results, where most of the respondents to the questionnaire (41%) were self-trained too. However, training through collaboration with colleagues and the Department of Education were also reported by the interviewees but in a different order. Therefore, the findings from interviews are more likely to be supportive of the quantitative findings. Moreover, none of the interviewees had been trained by a private organization. However, this was only indicated by a small percentage (6%) of the respondents to the questionnaire. One justification for this small proportion could be because of the lack of the effectiveness of these private centres, which led to the lack of confidence in their programmes. Another possibility for this small percentage could be related to the deficiency of providing IWB training courses in private institutions.

7.5.2. Quantity and Quality of IWB Training Courses

The majority of the teachers who completed the questionnaire, nearly 60%, had not received any training sessions either from the education department or private organizations, while around 39% of teachers had had 1-3 courses. However, only eight teachers (about 1%) had received more than five training courses relating to the use of IWBs (see Table 5.22). This finding is inconsistent with the results of Higgins et al. (2005), where training courses were found to be the most common IWB training sources for the majority of teachers (86%). Moreover, this finding is also inconsistent with a study carried out by Turel and Johnson (2012) which revealed that most educators (67%) had had training courses from the educational institution or provider of IWBs.

Indeed, this quantitative finding was also confirmed through the interviews where the majority of the participants (eleven teachers) reported that they had not had any training courses related to the use of IWBs. For example, Teacher M1 said, "*I did not receive any training courses relate to the use of IWBs*." Similarly, Teacher F9 said,

> These training courses are not available. If training courses are provided to teachers, I will be the first one in attending these courses because I need training in using IWBs. (Teacher F9)

However, only three teachers (F1, F10, and M8) reported that they had had two or three training courses as indicated in Section 6.4.1.3. Moreover, six interviewees (F2, M3, M5, M6, M7, and M10) indicated that they had only had one training course in how to use the IWBs. For instance, Teacher M6 said, *"I had only one short training course in using IWBs."* In the same vein, Teacher M10 stated, *"Only one training course was provided to teachers when IWBs were installed in my school."*

Consequently, the majority of teachers (60%) participating in *Tatweer* primary schools in Jeddah had not received any IWB training courses from the Department of Education, which indicates a serious problem that should be considered for the best use of IWBs. Obviously, this finding clarifies the lack of teachers' knowledge relating to the use of IWBs and, accordingly, the narrow range of using IWBs. This is inconsistent with the TPACK theory, which suggests that educators need to improve their knowledge of the technology, pedagogy, and content as well (Mishra and Koehler, 2006). Indeed, training courses are crucial to improving the capabilities of teachers when using IWBs (Hall and Higgins, 2005; Wall *et al.*, 2005), and, consequently, the quality of their teaching (Compeau and Higgins, 1995; Turel and Demirli, 2010).

Moreover, some teachers (39%) in the current study had been provided with a few training courses (between 1-3 courses). However, these courses would be inadequate for efficient use of IWBs. These training courses should be gradual and continuous during a teacher's professional career to help teachers be productive and operative when using IWBs in their lessons. Regular training in using the full potential of IWBs could help to increase educators' capabilities (Hall and Higgins, 2005), especially for new users of IWBs (Beauchamp, 2004; Adams, 2005; Holmes, 2009; Lai, 2010).

The importance of regular training when using IWBs was also confirmed by an extract of Teacher M7, who said, *"I only had one training course in how to use the IWBs, so I sometimes feel uncomfortable with this technology."* Similarly, Teacher M10 stated,

> Most teachers I know only had one or two training courses, so I think that is not enough for the best use of IWBs. Therefore, teachers need more training sessions to be more satisfied with modern technologies. (Teacher M10)

Therefore, teachers should be provided with effective ongoing professional development programmes relating to the use of IWBs, as suggested by Teacher F10, *"I like to attend continuous training courses that contain new ideas and effective strategies in integrating the IWB in my teaching."*

In the same vein, the teachers F8 and F2 stated,

> Of course, I need a lot of continuous training in using this technology because technology is changing each hour and we need to be ready for such reform to improve the educational outcomes. (Teacher F8)
>
> Although I had effective training in using this technology, I need some training for the best use of this technology because each teacher needs continuous training in order to increase the quality of teaching and remain updated about what helps improve teaching and learning. (Teacher F2)

Moreover, these training courses taken by 39% of the participants appeared to be more concentrated on the core technical skills of IWBs, ignoring skills relating to the pedagogic and content. This suggestion was confirmed by some extracts of the interviews. For instance, Teacher M5 indicated, "*I was taught to use the digital board through a two-hour training course that was the only course provided to us by the IWB supplier*". Similarly, Teacher M8 stated, "*I need some training relating to the use of IWBs because the three training courses that I received did not provide us with the effective use of this technology in teaching."* Indeed, this finding is inconsistent with the TPACK theory, where it recommends that educators need technological pedagogical and content knowledge rather than merely technical proficiency (Mishra and Koehler, 2006).

Furthermore, these few training courses provided to teachers in *Tatweer* schools also appeared to exclude training teachers how to teach their content using IWBs, as confirmed by Teacher M4, who indicated, "*I need to learn the best teaching strategies for teaching the content of English language through using IWBs."* Similarly, Teacher F4 said, *"I need more training in using IWBs for a more efficient use because I still need to know how to* *use some interactive features that could be used in mathematics lessons."* This finding is in the same line with Glover and Miller (2001), who stated that there are limited training programmes for teachers in particular subjects because the focus of IWB suppliers is usually on improving teachers' technical abilities in using the equipment and software. However, the TPACK theory advises that instructors necessitate technological pedagogical and content knowledge rather than just technical capabilities (Mishra and Koehler, 2006).

Despite the importance of educators' technology skills in determining the efficiency of using IWBs in their lessons, Holmes (2009) asserts that information about technology or the effectiveness of pedagogy are insufficient for educators if they do not know how to use technology effectively regarding content knowledge. Therefore, teachers' professional development should consider training teachers in specific subject content. Indeed, training courses that only focus on the technical skills of IWBs are more likely to limit teachers' instructional understanding to apply their IWB knowledge to their teaching appropriately. Thus, teachers need effective training that not only focuses on the technical skills of technology, but also include training in pedagogical and content knowledge to provide teachers with all types of knowledge, as suggested by the TPACK theory (Mishra and Koehler, 2006).

Accordingly, these training courses provided to Saudi teachers in the sample appeared to ignore the current skills of teachers and their real needs for a more efficient use of IWBs. This finding was also confirmed in several research studies evaluating teachers' training programmes in Saudi Arabia (Alhajeri, 2004; Meemar, 2007; Colbert *et al.*, 2008; Al-Jadidi, 2012; Sywelem and Witte, 2013). Thus, these training courses provided to the teachers in this study had a lack of connection with classroom practice because teachers had not participated in their design (Colbert *et al.*, 2008), and their opinions regarding the content of these activities were not considered (Sywelem and Witte, 2013).

This finding is aligned with Koehler and Mishra (2009, p. 62), who stated,

> Many approaches to teachers' professional development offer a one-size-fits-all approach to technology integration when, in fact, teachers operate in diverse contexts of teaching and learning.

Thus, the necessity for continual, cooperative training is not only required for basic use but is also needed to develop the full potential of IWBs and should concentrate on improving teachers' effectiveness (Hall and Higgins, 2005). Importantly, teachers' professional development programmes should focus on investigating the current skills of teachers in practice and their real needs. Therefore, teachers should have the chance to participate in designing these programmes. Moreover, these training courses are provided to teachers as theoretical courses (not practical workshops), as stated by teachers F9 and M2, who said,

> I like to attend training courses that explain to me all the technical skills of using IWBs in a practical way to have the opportunity to use the board by myself in these courses. (Teacher F9)

> I need many training courses in using IWBs as long as these courses provide practical training in how to use the IWB. Indeed, theoretical training is a waste of time. (Teacher M2)

These teachers stated that they need training courses which consider educating them how to integrate IWBs in their teaching effectively rather than just theoretically. This finding was also confirmed in other Saudi research studies (Alhajeri, 2004; Meemar, 2007; Al-Jadidi, 2012), indicating that teachers' training programmes in Saudi Arabia focused more on the theoretical delivery of information than training teachers in practice. Indeed, teachers need more than the provision of technical knowledge in using IWBs in a lecture way by the trainers. They need practical training such as workshops to give them a chance to interact and test their abilities during training. However, unfortunately, lectures and discussions are used by most of the trainers in teachers' training programmes in Saudi Arabia (Alhindi, 2009). Thus, practical courses should be considered in the plans of the Ministry of Education for teachers for more effective training. However, as discussed formerly, the training courses provided for teachers in the current study concentrated on the basic technical skills of IWBs and ignored skills relating to the pedagogy and content. It appears that this is inconsistent with the TPACK theory, which asserts that educators need to expand their technological pedagogical and content knowledge, not just technical skills (Mishra and Koehler, 2006).

Overall, the findings of the current study indicated that the quantity and quality of training courses that were provided to teachers in *Tatweer* schools in Jeddah were insufficient for the better use of this technology. Therefore, as discussed in the second research question, Saudi teachers in the current study, showed a narrow range of the effective use of IWBs in their classrooms because they demonstrated a low level of both technical and pedagogical knowledge. Thus, the quantity and quality of training courses that were provided to teachers within the sample seemed to have a direct impact on their level of TPACK knowledge.

7.5.3. Reasons for not Attending IWB Training Courses

Surprisingly, the most common reason that prevented teachers within the sample from attending IWB training sessions was the lack of availability of these courses, which was chosen by most teachers (52%), while the other reasons had very low percentages (see Table 5.22). Indeed, educators frequently note the lack of training courses from providers and these courses only focus on the core competencies of IWBs (Glover and Miller, 2001; Smith *et al.*, 2005).

Teachers' reports also confirmed this finding during the interviews. The majority of the interviewees (both males and females) indicated that the reason that prevented them from attending IWB training courses was the unavailability of these courses. For example, Teacher F3 said, *"The unavailability of training courses relating to the use of IWBs is the only reason that could prevent me from attending any IWB training sessions."* In the same vein, Teacher M6 stated,

> I think training courses are not always available for teachers. Therefore, this is the only reason could prevent me from attending training courses because I like to have continuous training in how to use this technology in new ways. (Teacher M6)

However, female teachers reported two additional reasons that are considered necessary for them. The first reason was the unavailability of transport, identified by the two teachers F4 and F8. These two teachers indicated that they had not attended training courses because they had difficulty finding transportation, as they reported,

> The lack of transportation is also an important reason that could prevent me from attending training courses and in the case of providing these courses that are usually held in faraway centres. (Teacher F4)

> Training courses are always held in external centres, which are far away from our school. Therefore, as a Saudi woman prevented from driving, I often find difficulty reaching these centres. (Teacher F8)

Indeed, this reason was identified by these two teachers and could be considered one of the major issues in Saudi Arabia because of Saudi culture. Female teachers suffer from the unavailability of transport, so they have difficulty attending training courses outside their schools. Therefore, the best solution appears to be to provide training courses inside schools, which would be more suitable for teachers' circumstances. This was confirmed by an extract indicated of Teacher F8, as she said,

> I hope to provide IWB training courses at each school to offer the opportunity for all teachers inside the school for training. Thus, there will not be any excuse for female teachers to not attend these courses because of the unavailability of transport, since women in Saudi Arabia are not allowed to drive. (Teacher F8)

The second reason was identified by teachers F1, F2, and F10. They reported that they did not attend training courses relating to the use of IWBs because they had the appropriate skills in using these technologies. For example, Teacher F2 stated, *"I have appropriate skills in using IWBs and everything I need is provided on the school website."* Similarly, Teacher F10 reported, *"I have the necessary skills to use IWBs in my lessons and I have no problems with attending training courses because these courses were provided in our school."*

However, all three teachers were from *Tatweer* School 1, suggesting that the administrators of this school were more likely to provide their teachers with the necessary skills of using IWBs by continuous training courses and constant assistance. Therefore, they considered that teacher development is vital to the effective use of IWBs, and the importance of consistent support through and after introducing training courses (Lai, 2010). Moreover, they recognized that their teachers lacked consistent support after training and tend to be less efficient at employing student-centred instruction when using technology (Zhao and Bryant, 2006).

7.5.4. Satisfaction with the Level of Training

Although a large portion of teachers (who responded to the questionnaire) (57%) were neutral about showing their satisfaction towards their level of training, 22% of them were satisfied. A further 10% were very pleased. However, 11% of the respondents were dissatisfied towards the level of training they had received (see Table 5.22). This could be clarified by the lack of training courses provided for these frustrated teachers. In contrast, 84% of teachers who had obtained IWB training in a study carried out by Higgins *et al.* (2005) showed their satisfaction with the training they had received.

There is no doubt about the usefulness of training courses in enhancing teacher satisfaction (Parkes and Stevens, 2000), increasing their confidence, skills, and pleasure (Darling-Hammond and Baratz-Snowden, 2005), because training courses act as a moderator that aids educators to be autonomous and self-guided learners (Merriam *et al.*, 2007). This explanation is shown in Table 5.23, which indicated a highly significant association between the number of IWB training courses obtained by teachers and their satisfaction with their level of training [$\chi2$=709.60; p<0.001]. Consequently, this could suggest that teachers with a greater number of IWB training courses tend to be more satisfied with their level of training.

This explanation is also confirmed by extracts from the interviews. For instance, Teacher F2, who had a training course in her school, expressed her satisfaction with her level of training as she stated, *"I am very delighted with the training that I have received."* Similarly, Teacher M3, who had also had a training course, said, *"Although I received only one training course in how to use the IWB, I think I am satisfied with my training because I can improve my skills by self-training."* However, the majority of the interviewees (F3, F4, F5, F6, F7, F8, F9, M2, M4, M7, M9, and M10) expressed that they were unsatisfied with their level of training because of the lack of training. For example, Teacher F4 stated, *"I am not satisfied with my level of training because I did not have any training courses"* Similarly, Teacher F5 said, *"I am very frustrated and unsatisfied because I have not had any training courses and I did not use the IWB in my lessons as it should be."* Thus, the findings of this study showed that teachers who had adequate training tend to be more satisfied with their level of training.

7.5.5. Availability of Assistance

Nearly half of the teachers (49%) in the sample (n=587) were sometimes provided with assistance, only 14% of them always had help when problems occurred, 13% were never provided with any assistance, and 24% rarely found assistance (see Table 5.22). Similarly, the majority of the interviewees reported that they sometimes had assistance in their schools regarding the use of IWBs. For instance, Teacher M1 said,

> I remember that I had some problems that prevented me from using the board, so I felt very frustrated because there is no constant assistance in my school. However, I fixed these problems with the help of my colleague who has the experience in using the board. (Teacher M1)

Only three teachers (F1, F2, and F10) indicated that they always had assistance when they encountered any difficulties related to the use of IWBs. These three teachers were working in *Tatweer* School 1, which had four experts in using technical devices. As indicated by Teacher F2:

> When problems occur, especially technical difficulties, I usually find assistance from the four technical professionals who are working in my school. (Teacher F2)

Thus, both the quantitative and qualitative findings in the current study indicated that the lack of assistance and technical support was reported by the majority of teachers in *Tatweer* Schools in Jeddah. Similarly, the findings of a study conducted by Oyaid (2009) indicated that the lack of assistance and technical support was a significant issue identified by teachers, and this affected their use of technologies in their lessons. Indeed, teachers need more than just the installation of IWBs in their classrooms; they need effective training and support (Armstrong *et al.*, 2005) to increase the efficiency of using these technologies in schools. Moreover, educators need adequate technical support to help them overcome problems when they use technologies.

However, the lack of provision of technical support in schools could lead to a decrease in teachers' use of technologies in their lessons (Hew and Brush, 2007). Moreover, according to Glover and Miller (2003), if instructors do not have the appropriate support they may not consider interactivity with their students when using IWBs and, as a result of this, a more teacher-centred instruction might develop. Thus, educational administrators should provide technical support and maintenance in schools to guarantee the quality of technology devices and, consequently, to increase the usefulness of technologies in education (Balanskat *et al.*, 2006).

To sum up, according to the results of the current study, technical support seems to be ineffective in *Tatweer* primary schools, where only 14% of teachers always find assistance. Therefore, technical support should be considered in all schools with technologies, including IWBs. Indeed, teachers with limited technological knowledge are more likely to request assistance. Therefore, teachers' knowledge relating to educational technologies in classrooms should be improved (Harris *et al.*, 2009).

7.5.6. The Need for Further Training

According to the quantitative findings (see Table 5.22), most teachers in the sample (95%) reported that they need further training related to the use of IWBs. Nevertheless, only a small percentage (5%) of the teachers did not need any more training, indicating that those teachers were probably proficient in using this technology. These quantitative findings are inconsistent with numerous studies (Glover and Miller, 2001; Higgins *et al.*, 2005; Somyurek *et al.*, 2009; Turel and Johnson, 2012), where the majority of educators in these studies revealed that they did not require more training relating to the use of IWBs, because these teachers were qualified and skilled users of IWBs.

Similarly, the findings from the interviews (n=20) in this study supported the quantitative results. The majority of the teachers (12 teachers) reported that they need more training focused on the use of IWBs. Five teachers indicated that they need some training, and only three teachers showed their unwillingness to have more training.

Our previous suggestion regarding skilled teachers in using IWBs and the need for training is confirmed by Table 5.23, demonstrating a highly significant association between teachers' experience in using IWBs and their need for further training [$\chi2=54.16$; $p<0.001$]. Consequently, this indicates that beginner teachers in the sample often require more training in using IWBs, while skilled teachers were less keen to acquire more training. For example, the novice Teacher F7 reported,

> Yes, of course, I need more training to use this amazing technology because I did not have any training courses; therefore, I use only a few features, and I have limited knowledge about it. (Teacher F7)

In contrast, the expert teachers F1 and M1 (who had seven years' experience in using IWBs) did not want more training, as Teacher F1 stated, *"I had trained well to use IWBs in my school, so I do not need more training."* Similarly, Teacher M1 said, *"I did not need any training courses in the use of IWBs because I think that I can employ this technology in my lessons in a way that covers my needs."* Thus, their unwillingness to receive more training could be explained by the fact that two teachers have extensive technological and pedagogical knowledge. These teachers, according to Mishra and Koehler (2006), were capable of designing activities regarding their content, and had independent abilities to adapt their technological approaches. Indeed, those teachers with a deeper technical foundation will benefit less from attending training courses; therefore, they did not need more training courses. In contrast, novice teachers had limited technical skills which could improve, such as teachers F6 and F7.

7.5.7. The Types of Training Need

According to the quantitative findings, the option of technical competences in the use of IWBs was chosen by the majority of educators (66%). This was followed by effective teaching techniques using IWBs (selected by 56%), and finally designing educational resources compatible with IWBs (preferred by 47%) (see Table 5.22). Thus, teachers in *Tatweer* primary schools have a high need for training in these three suggested types of training. However, there was a slight difference regarding their needs.

In contrast, the majority of teachers (53%) in a previous study conducted by Alghamdi (2013) preferred to be trained in effective teaching techniques using IWBs. This was followed by 28% of teachers, who desired to have training in the technical skills of using IWBs, while a smaller percentage of teachers (19%) chose training on designing educational resources compatible with IWBs. This suggests that those teachers in the Alghamdi (2013) study had knowledge of using the technical skills of IWBs, but they did not have sufficient knowledge of how to integrate these technologies into their teaching. Nevertheless, teachers' ratings for these three IWB training topics, in a study carried out by Turel and Johnson (2012), revealed that only 33% of them needed training in each of these three types of training; however, the majority of teachers did not need any more training relating to these three areas.

The quantitative findings of the current study were also supported by the findings from the interviews. The majority of the interviewees (eight teachers) reported that they required training in technical skills in the use of IWBs. For instance, Teacher M10 stated,

> I want to participate in training courses that cover the technical skills in using IWBs as well as the common problems that face teachers when using this technology. (Teacher M10)

Additionally, five teachers indicated that they need training in effective teaching techniques using IWBs. For example, Teacher M9 stated, *"I prefer to learn the effective teaching methods when using the smartboards to achieve the main goals of my lessons."* Only three teachers (F1, F4, and M5) indicated that they need to be trained in how to design educational resources that could be used via IWBs. For example, Teacher F4 indicated,

> I need to be trained in designing educational resources that fit with IWBs because I have a lack of this kind of training, and I feel it will facilitate my teaching and lesson preparation, and it will make student learning more active. (Teacher F4)

Thus, in both the quantitative and qualitative findings, training in the technical skills of using IWBs was reported by the majority of the teachers, followed by training in effective teaching techniques using IWBs and, then training in designing educational resources compatible with IWBs. Indeed, this order in teachers' choice of training needs confirms that, as indicated before, the majority of teachers (60%) had not received any training courses. Therefore, they need to establish strong training in the use of IWBs starting with technical skills, then effective teaching techniques, and finally designing educational resources. This finding is in line with Graham *et al.* (2009), who stated that increasing teachers' confidence in TK is an essential step because it is the basis for confidence in the three other kinds of knowledge that connect to this part in the TPACK theory. Therefore, all educators firstly need effective training that presents the basic knowledge about integrating advanced technologies into their lessons, before moving to advanced training.

In the current study, teachers' choices regarding the types of training could be explained by suggesting that those teachers who selected training in the technical skills in the use of IWBs were novice users of IWBs, while teachers who chose training in effective teaching techniques and designing educational resources compatible with IWBs were expert users of IWBs. This explanation may have been confirmed by the novice teachers

F5 and F9, who had less than one year experience in using IWBs. Teacher F5 reported that,

> As you see, I used the IWB in the wrong way, as a computer with a large screen, because inactivating its programme; therefore, logically I need a lot more training courses to equip me with technical skills of how to use this technology from scratch before moving to advanced courses. (Teacher F5)

Similarly, Teacher F9 confirmed in an interview that she needed training courses that focus on the technical skills of using IWBs. These novice teachers supported the TPACK theory, which indicates that teachers who need more technical training had a lack of a basic technology knowledge (Harris, 2008). In contrast, the expert Teacher F2 (four years' experience in using IWBs) indicated that she needed training in effective teaching techniques, as she said, "*I need new ideas and attractive methods in how to integrate IWBs in my lessons effectively."* Similarly, the same choice was indicated by the expert Teacher M3, as he stated*, "Personally, I want to be trained in how to use this technology in my lessons to create more powerful and attractive lessons for primary school students."* Moreover, some expert teachers such as F1, F4, and M5 chose to train in designing educational resources compatible with IWBs. For example, Teacher M5 (four years' experience in using IWBs) said, "*I wish to be trained in how to design effective educational materials that could be used in my lessons."*

Indeed, our suggestion is consistent with the results of a study carried out by Sweeney (2010) to examine the impact of using IWBs on educators' pedagogy in one primary school, which revealed that beginner teachers focused on IWB technical skills, whereas expert teachers concentrated on teaching and IWB cooperative skills. However, teachers with various levels of experience in using IWBs still generally have deficient technical and pedagogical IWB skills preventing them from using IWBs effectively (Elaziz, 2008; Somyurek *et al.*, 2009). Therefore, teachers in *Tatweer* primary schools need effective training in all these types of training starting with technical skills of IWBs. This suggestion was confirmed by an extract of the expert Teacher F3 (four years' experience in using IWBs) who stated,

> I need effective training in everything relating to the use of IWBs including technical skills, effective teaching strategies, and design educational resources that I need in my lessons. I think if I trained in all these courses, I would not find troubles when using this technology. (Teacher F3)

When teachers can successfully gain IWB technical skills, they are stimulated to amend their teaching methods (Sweeney, 2010). Saudi teachers should be highly trained to use IWBs effectively to be active users of these technologies (Hall and Higgins, 2005).

Therefore, in order to improve teachers' TPACK, they need effective training relating to technology knowledge (TK) (*Technical skills in the use of IWBs*), technology content knowledge (TCK) (*Designing educational resources companionable with IWBs*), and technology pedagogy knowledge (TPK) (*Effective teaching techniques by using IWBs*). Overall, they need effective training to improve their TPACK, which consists of all these types of training together. This is consistent with Mishra and Koehler (2006), who assert that teachers' knowledge relating to the technology, pedagogy and content should be improved rather than merely concentrating on technical skills for best use of technology.

7.5.8. The Preferred Training Methods

According to the quantitative findings of the current study, the training method most favoured by the teachers to improve their skills was attending training courses and workshops, these were, remarkably, preferred by 71% of these teachers. Observing lessons of skilled educators was ranked next highest and was nominated by 53% of teachers. This was followed by collaborating with colleagues, which was desired by 36% of educators. Finally, more time for self-training received the lowest ranking from teachers and was favoured by 25% (See Table 5.22).

Similarly, the findings from interviews supported the quantitative results as they indicated that attending training courses relating to the use of IWBs was reported by the majority of the interviewees (13 teachers). For instance, Teacher M4 said, *"I think the effective training courses could be better in training teachers about the full potentials of IWBs in the teaching process."*

This was followed by observing the lessons of skilled educators, which was preferred by seven teachers. For instance,

> I prefer to attend training courses to obtain the basic skills of using IWBs and how to integrate them into lessons. Moreover, I like to attend some lessons of expert teachers in using IWBs to know how they use them in classrooms in practice, how they face the technical problems, and how they integrate them into their teaching. (Teacher F4)

> There is no doubt that training courses could be useful in training teachers for best use of IWBs; however, observing skilled teachers in using this technology is also considered an important way for training. (Teacher M5)

Then, collaboration with colleagues was indicated by six teachers; for example, Teacher M1 said, *"I feel very comfortable when asking my colleagues in the school about the use of these technologies".* Finally, self-training was reported by five teachers. For instance, teachers F1 and F2 explained their selection of this type of training when they said,

> In fact, self-training is considered the most important method for learning, especially for using technologies, because it reflects the teachers' self-desire for learning and shows to what extent the teacher wants to learn. (Teacher F1)

> I have experience in using IWBs. Therefore, I need only self-training because I can evaluate my skills and, consequently, determine my needs. (Teacher F2)

The most useful sources of information in using IWBs indicated by teachers in a study conducted by Higgins *et al.* (2005) were: IWB consultants, selected by approximately 40% of teachers; training sessions, supported by 36% of teachers; collaboration with other teachers, indicated by 33% of the participants; and, the IWB website, chosen by 13% of teachers. Moreover, the findings of a recent study by Al Mulhim (2013) focused on the use of ICTs by novice female teachers in primary schools in Saudi Arabia. It indicated that female teachers' responses to the questionnaire showed the need for training in both technical and pedagogical skills of using technology. Additionally, they preferred both face-to-face and online training courses. Moreover, they favoured collaborative training in small groups more than individual support or observing peers.

As seen above, attending training sessions and workshops was the most favoured training method in the current study. However, training programmes for teachers should not only concentrate on improving teachers' technical skills, but should also involve improving teachers' pedagogy and content knowledge (Koehler and Mishra, 2009). Therefore, training courses seem to be an effective factor in the success of integrating technology in classrooms.

In the current study, nine interviewees indicated that they only preferred one type of training method, whereas the majority of the respondents (eleven teachers) reflected that they wanted two types of training method. For instance, Teacher M3 preferred training courses as well as observing skilled teachers, as he stated, *"I like attending training courses and observing expert teachers when using IWBs to improve my use of this technology."* Moreover, Teacher M10 believed that training sessions and collaboration with colleagues are enough to improve his skills, as he said, *"From my view, I think training courses and collaboration with colleagues could be enough for training teachers in using this technology effectively."* In contrast, Teacher F5 chose training courses and self-training for training in the use of IWBs as she reported,

> Personally, I love attending training courses, especially those which relate to the use of technology in education, because I am willing to improve my skills, and I believe in the importance of technology in facilitating the process of teaching and learning. Moreover, I trained myself through online courses long years ago to use the computer until I became professional in using the software

> to design active educational lessons. Therefore, I prefer self-training too. (Teacher F5)

However, Teacher F7 preferred two kinds of training method, which were a collaboration with colleagues and observing expert teachers. She explained her choices in the following extract:

> I like to ask my colleagues about using this technology, and visit expert teachers who use IWB in their lessons; indeed, by these two training methods, I do not need to leave the school for training and I can choose a time that fits my schedule. (Teacher F7)

Therefore, based on teachers' suggestions in the current study, providing teachers with different types of training method could be more efficient in improving their skills in using IWBs than only using one kind of training. Moreover, teachers' preferences regarding the type of training method should be considered in designing training courses. Thus, other types of training methods should be provided beside training courses, to introduce a suitable environment for teachers to be engaged in active lifelong training in their schools. For example, observing the lessons of skilled educators should also be focused on in teachers' professional development, as well as providing formal training courses because it creates the chance for teachers to receive direct training that clarifies the use of IWBs in lessons introduced by expert teachers, in using these technologies in a specific subject. This is consistent with social cognitive theory (Bandura, 1986) as individuals learn through observing the behaviour of their colleagues when they are cooperating with them. Indeed, observation-based learning is an essential instrument to improve the efficiency of educators (Lortie, 2002).

Moreover, collaboration with colleagues should also be considered in improving teachers' skills in using IWBs because, for example, Lewin *et al.* (2009), in a study conducted in the UK, found that educators improved both technical and teaching skills in using IWBs during conversations and contact with colleagues. Similarly, Winzenried *et al.* (2010) suggested that dialogue between teachers on the appropriate use of IWBs to enhance student participation in the learning environment was more valued than official external experts. Indeed, sharing ideas and collaboration among teachers should be encouraged in schools, and school administrators should provide support for teachers during their professional development programmes (Boling and Beatty, 2012).

Furthermore, self-training is also a vital method in improving teachers' abilities, because it depends on teachers' inner desire to learn. In fact, the teachers can determine their current skills and their limitations when using IWBs, as previously noted by the two teachers F1 and F2. Indeed, these two teachers had high confidence in using IWBs; therefore, they were more able to improve their own skills by themselves after having basic training in these technologies (Levy, 2002). However, teachers who had less confidence and experience in using IWBs, such as teachers F6 and F7, appeared to be less competent only to adopt a self-training method. Therefore, besides formal training courses, these two teachers need continuous and individually-designed training, where more experienced users of IWBs elaborate together with beginner teachers (Glover and Miller, 2001). This was confirmed in the previous extract, as indicated by Teacher F7, who preferred two types of training method based on the interaction between humans, which were a collaboration with colleagues and observing expert teachers to improve her skills.

There are two kinds of stimulating approaches that help teachers to improve their abilities individually, such as using "*trial and error*" (Buckenmeyer, 2010, p. 33) and "*exploration and discovery"*(Sergiovanni and Starratt, 2006, p. 276). In this study, learning through trial and error was identified by Teacher F8, who said, *"I learned to use the IWB through the strategy of trial and error as well as watching lessons and tutorials on the YouTube."* Moreover, the two teachers M1 and F4 indicated the exploration and discovery approach when they stated,

> I did not learn how to use all the interactive features because I did not have any training courses from the Educational Department. I trained myself to use the IWB through searching IWB websites. (Teacher M1)
>
> I taught myself how to use the interactive features, and I wrote down what I learned by using notes then through the daily use and practice I overcame some common problems and became able to use this technology. (Teacher F4)

Searching websites and videos for information is consistent with Wlodkowski (2008), who indicated that educators usually following a practical method when they are learning about employing new technology in their lessons. These teachers had not had formal training regarding the use of IWBs; therefore, they searched for the interactive features that they wanted to use during their lessons.

Overall, the findings of the current study revealed that the majority of teachers preferred attending training courses and workshops as the most effective training method. This was followed by observing the lessons of skilled educators, and then collaborating with colleagues, and finally, more time for self-training.

7.6. RESEARCH QUESTION 5

ARE THERE DIFFERENCES BETWEEN MALE AND FEMALE TEACHERS IN TATWEER PRIMARY SCHOOLS REGARDING THEIR ATTITUDES, THEIR USE OF IWBS, THEIR TRAINING, THE TYPES OF TRAINING NEED, AND THEIR TRAINING METHOD PREFERENCES?

In the current study, the respondents of the questionnaire were 587 teachers, while the interviewees were only 20 teachers. To examine the effect of gender on teachers' attitudes, their use of IWBs, and their training, it seems better to operationalize this sub-question as:

7.6.1. Are there statistically significant differences between the questionnaire responses of male and female teachers (n=587) regarding their attitudes, their use of IWBs, their training, the types of training they need, and their training method preferences?

7.6.2. How does the qualitative data from interviews with 20 teachers confirm, contradict or extend understanding of the differences between male and female teachers regarding their attitudes, their use of IWBs, their training, the types of training they need, and their training method preferences?

7.6.1. Are there statistically significant differences between the questionnaire responses of male and female teachers (n=587) regarding their attitudes, their use of IWBs, their training, the types of training need, and their training method preferences?

In the current study, most male and female teachers indicated positive attitudes towards using IWBs in both the teaching and learning processes. According to Table 5.24, the association between educators' gender and their attitudes towards using IWBs was not significant [$\chi 2$ (1, N=587) =2.38, and p=0.12]. 87% of male teachers had positive views about the usefulness of using IWBs in teaching and learning, compared with 91% of female teachers who indicated no difference in this case relating to gender. Consequently, this suggests that there was no difference between male and female teachers regarding their attitudes towards using IWBs. This outcome is consistent with the findings of a study carried out by Muhanna and Nejem (2013), which showed that there was no statistically significant difference between males and females regarding their attitudes towards using IWBs in teaching mathematics. Similarly, the same finding was also confirmed by a case study conducted by Yusuf and Balogun (2011), who examined the gender influence on student teachers' skills and attitudes towards ICTs in teacher education programmes in a Nigerian university. However, there were significant differences between male teachers and females in their attitudes towards using IWBs in a study conducted by Oguz Akcay *et al.* (2015) in secondary schools in Turkey. Male teachers presented more positive attitudes toward employing these technologies in their classrooms than females.

Moving on to teachers' use of IWBs, according to Table 5.24, a highly significant association between teachers' gender and their frequent use of IWBs in lessons was found [$\chi2$ (3, N=587) =21.82, and p<0.001]. The percentage of female teachers (23%) who always used IWBs was more than male teachers (13%), indicating that female teachers were the more frequent users of IWBs than male teachers. However, male teachers reported more experience in using IWBs [$\chi2$ (2, N=587) =25.32, and p<0.001]. The proportion of male teachers (10%) who had more than five years of experience was greater than females (1%). Additionally, male teachers (48%) reported more use of the most of the IWB interactive features [$\chi2$ (2, N=587) =18.60, with p<0.001] than female teachers (30%). Moreover, male teachers reported more competence of using IWBs than females [$\chi2$ (2, N=587) =7.89, and p=0.02]. The percentage of male teachers (12%) who described their use of IWBs as proficient was greater than female teachers (6%). Furthermore, a highly significant association was indicated between teachers' gender and their approaches in using IWBs in classrooms [$\chi2$ (2, N=587) =18.60, and p<0.001]. Male teachers (48%) reported that they allowed their students to use the board more frequently than females (30%). Overall, the responses of male teachers in this study showed that they were more experienced in using IWBs, reported more use of the interactive features, had more competence in using these technologies, and more frequently allowed their students to use the board than females. However, the answers of female teachers gave the impression that they more frequently used IWBs than males.

These findings are not consistent with the outcomes of the study carried out by Yusuf and Balogun (2011) in a Nigerian university. There were no significant differences between female educators and males relating to their attitudes and competencies. However, low skills were presented by all student teachers in this study, which raised a great concern for the need to develop the quality of teacher education programmes in this Nigerian university. Similarly, no significant differences between male and female teachers regarding their use of ICTs were found in a study conducted by Alharbi (2014) to investigate the use of ICTs in the classrooms in secondary schools in the State of Kuwait, from the view of students, educators, and administrators. Conversely, there was a significant difference in teachers' perception of both their confidence and the impact of ICT use in the classroom, which was in favour of male teachers.

Turning to teachers' training, according to Table 5.24, there was a non-significant association between teachers' gender and the number of IWB training courses received [$\chi2$=4.23; p=0.13]. Thus, no difference was found relating to the number of IWB training courses provided to both genders. However, male teachers in the sample were less demanding of further training programmes than females [$\chi 2$ (2, N=587) =10.36, and p=0.01], and female teachers (61%) reported a greater need for further training than males (48%).

With regards to the types of training need, according to Table 5.24, no significant difference appeared between male and female teachers in their requirements for training courses that focus on technical skills in the use of IWBs [$\chi 2$ (1, N=587) =2.22, and p= 0.14]. Most teachers of both genders (63% of males and 69% of females) strongly expressed their desire to obtain training in IWB technical skills. Similarly, there was no significant difference between male teachers (49%) and females (51%) relating to their needs for training courses focused on designing educational resources compatible with IWBs [$\chi 2$ (1, N=587) =0.01, and p= 0.93]. Nevertheless, there was a significant difference between males and females regarding their reported need for training courses about effective teaching techniques using IWBs [$\chi 2$ (1, N=587) =9.26, and p=0.002]. Female teachers (57%) reported a greater need for improving their skills in this type of training course than males (43%).

Regarding the training method preferences, according to Table 5.24, there was no difference between males (51%) and females (49%) with respect to their preference for attending training courses and workshops to improve their IWB skills [$\chi 2$ (1, N=587) =3.20, and p= 0.07]. Additionally, nearly half of males (49%) and females (51%) preferred to observe skilled teachers during their lessons, suggesting that there were no significant differences between them with regards to observing the lessons of skilled educators [$\chi 2$ (1, N=587) =0.00, and p= 0 .998]. Moreover, there was no difference between males (47%) and females (53%) on their preference for cooperating with their colleagues to develop their abilities to use IWBs [$\chi 2$ (1, N=587) =0.44, and p= 0.51]. However, there was a difference between male teachers and females regarding their preference for self-training to improve their IWB skills [$\chi 2$ (1, N=587) =6.74, and p=0.01]. Female teachers (61%) numbered considerably more than males (39%) in preferring self-training to develop their abilities to use IWBs.

Hence, in this study, there was no statistically significant difference between male and female teachers regarding the number of IWB training courses they had received, or the types of training courses they need, which focus on IWB technical skills and designing educational resources compatible with IWBs. Nevertheless, female teachers' responses showed more need for further training than males, particularly in effective teaching techniques using IWBs. Moreover, the self-training method was more desired by female teachers to improve their IWB skills than males. However, other training methods (attending training courses, observing the lessons of skilled educators, cooperating with colleagues) were favoured by both genders with no significant differences. So far, there are no studies that have investigated teachers' gender differences, regarding the use of IWBs, the number of training courses they had received, the need for further training, the types of training need, and the training method preferences. Thus, the current study contributes to filling this gap in the literature.

7.6.2. How does the qualitative data from interviews with 20 teachers confirm, contradict or extend understanding of the differences between male and female teachers regarding their attitudes, their use of IWBs, their training, the types of training need, and their training method preferences?

According to Section 6.4.1.4 in Chapter Six, the findings from the interviews showed no differences between male and female educators regarding their attitudes towards using IWBs. All the interviewees showed positive attitudes towards using this technology in their lessons. Hence, the qualitative interviews confirmed the quantitative findings that relate to teachers' attitudes.

Regarding educators' use of IWBs, according to Table 6.1, male teachers had more experience in using IWBs than females. Half of the female interviewees were novice teachers with less than one-year experience in using IWBs, whereas all the male interviewees had experience in using IWBs between (2-7) years. Thus, male teachers were more experienced in using IWBs in this study. Additionally, according to Section 6.4.1.1 in Chapter Six, most of the interviewees (eight male teachers and six females) reported that they always used the IWB technology in their lessons. Only six of the respondents (M2, M6, F6, F7, F8, and F9) indicated that they sometimes employ IWBs in their teachings. Thus, there was a slight difference between males and females regarding the frequent use of IWBs, which was in favour of male teachers. Thus, this finding challenged the quantitative findings, which indicated that female teachers reported more frequent use of IWBs than men. Moreover, the results of the interviews reinforced the quantitative findings regarding the use of the IWB interactive features. All male interviewees reported that they used most of the interactive IWB features, whereas five female teachers (F5, F6, F7, F9, and F10) revealed that they used few of the IWB features (see Chapter Six, Section 6.4.1.1).Thus, male interviewees reported more use of the IWB interactive features than females. Furthermore, the interviews confirmed the quantitative finding regarding the greater competence of male teachers in using IWBs. The outcomes of the interviews indicated that the number of male teachers who stated that they were competent users of IWBs was more than females. However, the number of male teachers who reported that they were unable to use IWBs in their lessons was less than females (see Chapter Six, Section 6.4.1.1). In addition, the quantitative findings indicated that male teachers reported allowing their students to use the board more frequently than females. This statement was also supported by the results of the interviews. Eight male teachers and seven female teachers reported that they allowed their students to use IWBs in their lessons. However, five teachers (F5, F6, F7, M6, and M9) reported that only they used the IWBs in their lessons. Thus, the male interviewees reported slightly more student use of IWBs than females (see Chapter Six, Section 6.4.1.1). Overall, the responses of male interviewees in this study show that they were more experienced in using IWBs, used IWBs more frequently, made more use of the interactive features, had more competence in using these technologies, and allowed their students to use the board more frequently than females.

Turning to training, according to Section 6.4.1.3 in Chapter Six, the majority of the participants (seven female teacher and four males) reported that they had not had any training courses related to the use of IWBs. These teachers are F3, F4, F5, F6, F7, F8, F9, M1, M2, M4, and M9. However, three female teachers and six males (F1, F2, F10, M3, M5, M6, M7, M8 and M10) reported that they had had between 1-3 courses. Thus, the number of males who had had training courses was double the number of females. This finding contradicts the quantitative findings, which indicated that no difference was found regarding the number of IWB training courses provided to both genders. Additionally, seventeen interviewees (nine females and eight males) reported that they need further training in using IWBs. However, three teachers (F1, M1, and M10) showed their unwillingness to have more training (see Section 6.4.1.3 in Chapter Six). Thus, this finding supports the quantitative findings, which indicate that female teachers reported more need for further training than males.

Moving on to the types of training need, according to Table 6.8, the qualitative findings confirmed the quantitative findings, which indicated that there was no significant difference between male and female teachers in their need for training courses that focus on technical skills in the use of IWB. Similarly, the interviewees confirmed the quantitative findings that showed that female teachers reported a greater need than males for improving their competence in effective teaching techniques using IWBs. However, these results were inconsistent with the quantitative finding regarding the third type of training need. The qualitative findings presented that female teachers reported a significant need for training courses focused on designing educational resources compatible with IWBs.

With regards to the training methods preferences, according to Table 6.9, no significant difference was shown between males and females with respect to their preference for attending training courses and workshops and observing the lessons of skilled educators to improve their IWB skills. However, there was a significant difference between males and females in their preference for cooperating with their colleagues and self-training. Thus, the qualitative findings confirmed the quantitative findings regarding teachers' preference for attending training courses, observing the lessons of skilled educators, and self-training. However, the male interviewees reported more inclination to collaborate with their colleagues as a training method than females. Therefore, this finding differs from the quantitative findings.

To sum up, the qualitative data from interviews with 20 teachers confirmed the quantitative findings as follows:

- No significant differences were indicated between female and male teachers in their attitudes, their need for training courses that focus on technical skills in the use of IWB, their preference for attending training courses and workshops, and observation of the lessons of skilled educators to improve their IWB skills.
- Male teachers were more experienced in using IWBs, and reported more use of the IWB interactive features, more competence of using these technologies, and allowed their students to use the board more frequently than females.
- Female teachers reported more need for further training than males, more need for improving their skills in effective teaching techniques using IWBs, and a stronger preference for self-training.

However, the qualitative data from the interviews contradicted the quantitative findings regarding:

- The frequent use of IWBs, the number of IWB training courses, the training needs that focused on designing educational resources compatible with IWBs, and the training method preference for collaboration with colleagues.

7.7. CONCLUSION OF THE CHAPTER

In this chapter, the findings of analyzing both the quantitative and qualitative methods were combined, critically discussed, and linked to the previous studies in the field to answer the five research sub-questions. These findings were also compared (where appropriate) to the TPACK model (Mishra and Koehler, 2006) as well as the CBAM *Levels of Use* (LoU) (Hall and Hord, 2006), which was only used to classify teachers' level of use. The key findings for each research sub-question are provided in the final chapter with appropriate recommendations.

8. CONCLUSIONS AND IMPLICATIONS

8.1.INTRODUCTION

In this chapter, a summary of the key results from both quantitative and qualitative methods for the five research sub-questions is presented. This is followed by recommendations based on the research findings for improving the effective use of IWBs in *Tatweer* primary schools. A Proposed Training Model for Teachers (PTMT) in *Tatweer* Schools based on the findings of this study is also suggested. The characteristics of the current study that make a theoretical and practical contribution to the use of IWBs in Saudi literature specifically, and in the international literature more broadly, are then emphasized. The limitations of this study as well as some suggestions for future research are elaborated. Finally, reflective comments on this study are presented.

8.2. RESEARCH QUESTION 1

WHAT ARE THE VIEWS OF TEACHERS TOWARDS INTRODUCING IWBS IN TATWEER PRIMARY SCHOOLS?

In this study, the majority of the teachers within the sample (n=587; nearly 89%) had positive attitudes towards using IWBs in the teaching and learning processes. Only 11% of the teachers disagreed. This positive attitude indicated by teachers towards using IWBs in their lessons was also supported by all twenty teachers interviewed. Hence, the teachers in *Tatweer* primary schools indicated a strong positive attitude towards using IWBs in their classrooms, and they highly appreciated their benefits in the teaching and learning processes.

8.3. RESEARCH QUESTION 2

HOW DO TEACHERS IN TATWEER PRIMARY SCHOOLS CURRENTLY USE IWBS?

In the current study, the majority of teachers in *Tatweer* primary schools (57%) had had extensive practice with using IWBs of more than one year, and 43% had used this technology for less than one year. Additionally, most teachers within the sample reported that they used IWBs infrequently and only employed a few interactive features, indicating that their choices were limited by their current technical capability. Only 18% of teachers reported that they had daily use of IWBs in their lessons. However, teachers' frequent use of IWB in the current study differed based on the location of IWBs, teachers' experience, and their attitudes towards using IWBs. Moreover, the majority of teachers presented only a basic knowledge of pedagogy because they used IWBs for whole class teaching and only occasionally varied this, such as when their students used the board. Similarly, most teachers in the classroom observations were the main users of IWBs in their lessons, and they preferred whole class teaching over teaching either individuals or small groups. Consequently, most teachers within the sample showed a narrow range of using IWBs in their classrooms and that because their choices were limited by their current technical capability and pedagogical knowledge.

However, in this study, teachers' experience in using IWBs and the opportunity to receive training were the two important factors determining teachers' effectiveness in using IWBs. The teachers with more experience in using IWBs tended to use them more frequently, employ the interactive features, allow their students to use the board, and be more competent teachers. Similarly, the teachers who had more training were the most efficient users of IWB features, were more confident teachers, allowed students to use the board more often, and were more capable teachers.

The majority of the respondents to the questionnaire (50.6%) viewed themselves as competent users, and 40.5% of teachers classified themselves as limited users, whereas only 8.9% of teachers reported that they were skilled users. Additionally, based on the findings of classroom observations and interviews in the current study, the majority of the teachers supported the use of IWBs: at the beginning of lessons to engage students; in the second stages of lessons to present the content of their lessons; during lesson activities; and at the end of their lessons for revision or assessment. However, some teachers varied regarding using IWBs during the first and the third stage.

8.4. RESEARCH QUESTION 3

WHAT ARE THE DIFFICULTIES AND CHALLENGES FACING TATWEER PRIMARY SCHOOL TEACHERS IN USING IWBS?

The findings of this study (both quantitative and qualitative) indicated that the top three difficulties that face teachers in *Tatweer* primary schools when using IWBs are the lack of training courses, technical problems, and the lack of assistance and support. The bottom three barriers facing teachers in the sample in using IWBs were difficulties relating to student use of IWBs, the location of IWBs in the learning resources rooms, and challenges in integrating IWBs in teachers' lessons.

Moreover, 34% of teachers chose the lack of educational resources as a difficulty which faces them, which was also confirmed during the interviews. Furthermore, 28% of the respondents to the questionnaire in this study revealed that they did not have enough time to design educational resources, possibly because of the high workload of more than 20 classes per week. Teachers' workloads and the length of the curriculum are examples of obstacles that prevent educators from using technology regularly. Therefore, they should be reduced as suggested by the participants, and should be considered in the policies of the Ministry of Education to create a better environment for teachers to gain training. The unavailability of IWBs in classrooms was indicated by more than a quarter of the respondents to the questionnaire (27%) and was confirmed by the findings of interviews. Other difficulties were observed in this study during classroom observations, such as managing the colouring pens, the location of IWBs in the learning resources rooms, difficulty in integrating IWBs in lessons, and the lack of teachers' skills when using IWBs.

Thus, identifying these fundamental obstacles encountered by primary teachers in *Tatweer* schools is considered the first step towards finding solutions to these problems. Therefore, educators should be provided with opportunities to upgrade their skills and knowledge by introducing effective training to tackle these obstacles and reduce their effects.

8.5. RESEARCH QUESTION 4

HOW WERE TEACHERS IN TATWEER PRIMARY SCHOOLS TRAINED TO USE IWBS AND WHAT WERE THEIR TRAINING NEEDS?

The majority of teachers (73%) in *Tatweer* primary schools in Jeddah were trained via self-training and collaboration with their colleagues. Only 26% of teachers were trained by the Department of Education. However, 15% of the teachers had not received any training. The lowest percentage of teachers (6%) were trained by private organizations, probably because of the unavailability of these private centres or the lack of their effectiveness, which led to a lack of confidence in their programmes.

The majority of teachers (60%) had not received any IWB training courses either from the education department or private organizations. Obviously, this finding clarifies the lack of teachers' knowledge relating to the use of IWBs and, accordingly, their narrow range of IWB use. Only eight teachers among the 587 teachers participating in this study of *Tatweer* primary schools in Jeddah had received more than five training courses relating to the use of IWBs, and only 39% of teachers had been provided with between 1-3 courses. However, this limited number of training courses provided to teachers in *Tatweer* schools was irregular and appeared to be inadequate for efficient use of IWBs, as explained by the interviewees in the current study. These training courses were more concentrated on the core technical skills of IWBs ignoring skills relating to pedagogy and content. Moreover, they excluded training teachers in how to teach their content using IWBs. Therefore, these training sessions were unsatisfactory regarding training teachers in specific subject content when using IWBs. Furthermore, these training courses were usually delivered as a lecture by the trainers and appeared to ignore teachers' current skills and their real needs. Consequently, teachers need practical training such as workshops to give them a chance to interact and try things out during training, and they should participate in designing their training courses. Overall, the findings of the current study indicate that the quantity and quality of training courses provided to teachers in *Tatweer* schools in Jeddah were insufficient for the efficient use of this technology. Therefore, teachers in the current study showed a narrow range of using IWBs in their classrooms. Thus, the quantity and quality of training courses provided to teachers within the sample seemed to have a direct impact on their level of knowledge as evaluated using the TPACK model.

The most common reason that prevented both male and female teachers from attending IWB training courses was the lack of availability of these courses, which was identified by most teachers (52%), with other reasons having very low percentages. Female teachers reported two important reasons: the unavailability of transport, and having the necessary skills to use IWBs, which meant they did not wish to attend further training. Moreover, although a large portion of teachers (57%) in the sample were neutral about showing their satisfaction towards their level of training, 32% of them were satisfied with their level of training. However, 11% of the respondents were dissatisfied towards the level of training they had received. This could be clarified by the lack of training courses provided for these frustrated teachers, which was confirmed by the majority of the interviewees. It was evident in this study that teachers with a greater number of IWB training courses were more satisfied with their level of training. With regards to the availability of assistance, only 14% of the teachers in this study always found help when problems occurred. However, most teachers (49%) were sometimes assisted, 13% of teachers were never provided with any assistance, and 24% rarely found assistance. Consequently, technical support seems to be ineffective in *Tatweer* primary schools in Jeddah.

Most teachers in the sample (95%) reported that they needed further training related to the use of IWBs. Only a small percentage (5%) of teachers indicated their unwillingness to have more training, and these teachers were probably skilled teachers or at least believed they were expert users of IWBs. The findings of the current study demonstrated a highly significant association between teachers' experience in using IWBs and their need for further training. Consequently, this indicates that beginner teachers in the sample often require more training in using IWBs, while skilled teachers were less keen to acquire more training. Moreover, teachers in this study had a high need for training in all three suggested types of training. However, there was a slight difference regarding their needs. They require effective training regarding technical skills in using IWBs (selected by 66% of teachers), effective teaching techniques using IWBs (56% of teachers), and designing educational resources compatible with IWBs (preferred by 47%). Indeed, this order in teachers' choice of training need occurred because the majority of teachers (60%) in this study had not received any training courses. Therefore, they need to establish a strong training in the use of IWBs. In this study, it was confirmed that teachers' choices regarding the type of training need were based on their experience in using IWBs. Novice teachers in this study selected training in the technical skills of using IWBs, while expert teachers chose training in effective teaching techniques and designing educational resources compatible with this technology.

The most popular training method favoured by the teachers within the sample was attending training courses and workshops, which were, remarkably, preferred by 71% of these teachers. Observing the lessons of skilled educators was ranked next highest and was nominated by 53% of teachers. This was followed by collaborating with colleagues, which was desired by 36% of teachers. Finally, more time for self-training received a low ranking from teachers and was favoured by only 25%.

8.6. RESEARCH QUESTION 5

ARE THERE DIFFERENCES BETWEEN MALE AND FEMALE TEACHERS IN TATWEER PRIMARY SCHOOLS REGARDING THEIR ATTITUDES, THEIR USE OF IWBs, THEIR TRAINING, THE TYPES OF TRAINING NEED, AND THEIR TRAINING METHOD PREFERENCES?

In the current study, both the quantitative and qualitative findings indicated that no significant differences were indicated between male and female teachers regarding their attitudes, their need for training courses focusing on technical skills in the use of IWB, their preference for attending training courses and workshops, and observing the lessons of skilled educators to improve their IWB skills. However, male teachers were more experienced in using IWBs, used more of the IWB interactive features, had more competence in using these technologies, and allowed their students to use the board more frequently than females. In contrast, female teachers reported more need for further training than males, more need for improving their skills in effective teaching techniques using IWBs, and more preference for self-training.

However, the qualitative data from interviews contradicted the quantitative findings regarding the frequent use of IWBs, the number of IWB training courses, the training needs that focused on designing educational resources compatible with IWBs, and the training method preference for collaboration with colleagues.

8.7. CONCLUSION

The conclusions drawn from this study provide evidence about the range of teachers' technical and pedagogical skills of using IWBs. Therefore, educators should learn how to use IWBs effectively as well as how to combine them with the content, which needs constant technical and pedagogical training to achieve these aims. Hence, pedagogical change seems to be crucial for the efficient use of IWBs. However, students' use of the board in classrooms is not enough for the effective use of this technology; what is more important is how teachers organize their use of the board. Indeed, the effectiveness of using IWBs is limited by the ability of educators to choose suitable pedagogical methods more than just technical interactivity (Webb, 2005; Hennessy *et al.*, 2007). In other words, the teacher should plan activities to enable a wider range of pedagogical uses for students to allow them to use the board effectively. Consequently, teachers should develop their pedagogy to support more student-based learning, and this can be only achieved by providing them with appropriate training.

Moreover, the findings of this study confirm the lack of sufficient and effective training courses provided by the education department, as well as the lack of assistance and support, has had an important effect on teachers' IWB skills and their satisfaction with their level of training. Therefore, they depend on themselves or their colleagues to improve their abilities. Thus, training in both technical and pedagogical skills as well as providing support for the school administration are essential for effective integration of IWBs in classrooms. Moreover, surprisingly, attending training courses and workshops was the most popular training method favoured by teachers in this study for training. However, the lack of availability of these courses was identified by most teachers as the most important reason that prevented them from attending IWB training courses. Therefore, based on these findings the views of teachers towards their current skills and their real needs should be closely considered in designing successful training courses relating to the use of IWBs in the future.

For this study, both the TPACK and the CBAM *Levels of Use* (LoU) models were used as conceptual lenses and not as practical methodologies, to understand the research findings from logical justifications and enhance the internal validity of this research when comparing the research results with challenging models (Yin, 2003). According to the TPACK model, the three types of knowledge (technology, pedagogy, and content knowledge) overlap (Mishra and Koehler, 2006); therefore, this provides a chance to understand how teachers in *Tatweer* primary schools teach their content using suitable pedagogical approaches and technologies. Based on the findings of this study, the quantity and quality of training courses provided to these teachers seemed to have a direct impact on their level of TPACK knowledge. Therefore, the majority of teachers showed a narrow range of using IWBs in their classrooms. Similarly, the CBAM *Levels of Use* (LoU) appeared to be useful to understand the change in teachers' behaviour when implementing IWBs in classrooms, and, consequently, this model helps to classify teachers' levels regarding their use of IWBs. Thus, these two models were found useful to aid understanding and add strength to the findings of this study. Importantly, the outcomes of this study fit the main hypothesises of the two models, which concentrate on the importance of providing effective training, sufficient time, and support, for teachers to improve their TPACK knowledge and their CBAM *Levels of Use* (LoU).

8.8. RECOMMENDATIONS FOR IMPROVEMENT

Based on the findings of the current study, several recommendations should be considered in the plans of the Ministry of Education to improve teachers' professional development programmes relating to the use of IWBs, which are as follows:

- ❖ The top-down professional development programmes that are usually used in Saudi Arabia because of the centralized Saudi educational system produce a negative impression of these programmes (Robson, 2006) among Saudi educators. Therefore, teachers should be involved in the decision-making process (Cordingley *et al.*, 2005) as they are the critical factor in determining the effective use of IWBs in classrooms. Hence, teachers should participate in designing their training courses, recommend themes, and help to drive the content of their training programmes (Colbert *et al.*, 2008). Teachers who use IWBs should have the chance to reflect on their current skills, future needs, and their preferred training methods to discover the common useful techniques for their learning and teaching.
- ❖ Although teachers have responsibility for evaluating their needs and, consequently determine the type of the required training, effective training courses in the basic skills of using IWBs should be compulsory for all teachers (Alhajeri, 2004; Altrjmi, 2010).

- ❖ In the first stage of using IWBs, it is important to train large numbers of educators in the basic technical skills of IWBs and provide them with enough time to integrate the new skills into their lessons and develop confidence in the effective use of IWB features, as suggested by Beauchamp (2004). Then, advanced training courses should be offered to teachers who have achieved the basic IWB skills.
- ❖ Teachers' teaching schedules and the length of the curriculum should be reduced, as suggested by the participants in this study, to have enough time for training. Therefore, providing sufficient time for teachers should be considered in the policies of the Ministry of Education.
- ❖ Moreover, digital educational resources should be made available to teachers to ensure the efficient use of IWBs (Beauchamp, 2004; Hall and Higgins, 2005) and protect teachers from failure when introducing content (Wall *et al.*, 2005).
- ❖ Furthermore, teachers' professional development programmes should be a continuous and lifelong process for all teachers during their career (Robertson, 2008). Therefore, teachers should have regular and updated training courses relating to the use of IWBs in both technical and pedagogical IWB skills (Beauchamp, 2004; Adams, 2005; Hall and Higgins, 2005; Holmes, 2009; Lai, 2010; Manny-Ikan *et al.*, 2011).
- ❖ Thus, these training courses should be provided for all teachers by increasing their number and improving their quality, because there is a direct association between educators' level of knowledge and the quality and quantity of the training courses that are provided to them (Balanskat *et al.*, 2006). These training courses should not only focus on the technical skills of IWB technology, but should also include training in pedagogical and content knowledge to provide teachers with all types of knowledge (Becta, 2004; Mishra and Koehler, 2006).
- ❖ These training courses should be based on teachers' needs and practice in reality (Alhindi, 2009; Lai, 2010) such as in the form of workshops instead of the current theoretical courses to provide teachers with a chance to interact and practise using IWBs during training.
- ❖ The basic training courses should be provided inside each school to be more suitable for teachers' circumstances, including teaching schedules, a solid curriculum, and the unavailability of transport for female Saudi teachers. Moreover, teachers' preferences regarding the type of training method should be considered.

- Therefore, collaborative professional development CPD, which involves at least two fellow educators and considers cooperation between educators during their training (Cordingley *et al.*, 2005) should be employed in the policies of the Saudi Ministry of Education. They should share teachers' opinions in designing and implementing training courses, facilitate teacher support, and provide teachers with the opportunity to choose more efficient methods (Colbert *et al.*, 2008).
- It is greatly recommended that policymakers and school leaders produce a policy that allows teachers to benefit from support follow-up activities in their schools such as peer mentoring, where highly skilled teachers in using IWBs are integrated with beginners (Feiman-Nemser, 2006). Therefore, formal mentoring programmes or coaching should be considered in the Saudi education system (Sywelem and Witte, 2013) and, consequently, should be crucial to encouraging educators in the best use of IWBs.
- Thus, to introduce a suitable environment for teachers to be engaged in an active lifelong training in their schools, teachers should be provided with different types of training instead of depending on training courses only. Therefore, observing the lessons of skilled educators, collaborating with colleagues, and self-training should also be considered.
- Assistance and adequate technical support should be provided in each school to help teachers face problems when using technologies.
- Overall, it is important to connect teachers' professional development programmes with school objectives, the student syllabus, effective teaching strategies, and teachers' real needs to improve CPD programmes in Saudi schools.

Consequently, based on these recommendations, a proposed training model, which was derived from the findings of the current study, is suggested to help the transition to new technologies (including IWBs) into *Tatweer* schools.

8.8.1. A Proposed Training Model for Teachers (PTMT) in Tatweer Schools

The Proposed Training Model in the current study was developed based on investigating teachers' perceptions regarding:

- Their current use of IWBs, which demonstrated their current technical capability and pedagogical skills.
- The received training, their training needs, and their preferred training methods.
- The difficulties that encountered them regarding both the use of IWBs and training.

- This model also considers the global trends in teachers' professional development regarding the use of IWBs and training (see Figure 8.1).

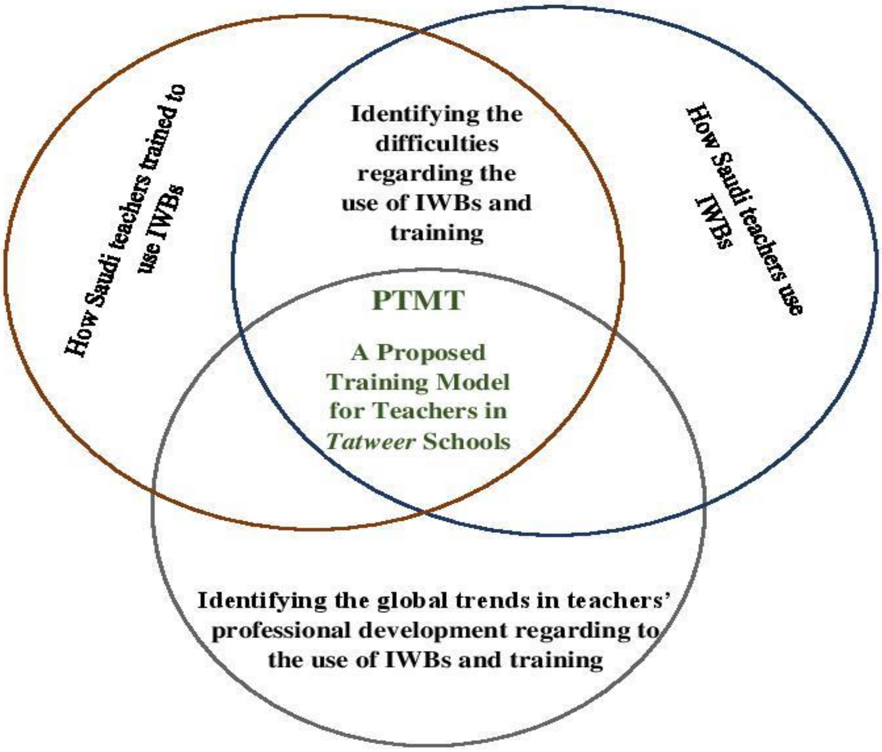

Figure 8.1: Process used to produce the Proposed Training Model

Consequently, according to Figure 8.2, this Proposed Training Model (PTMT) is described as follows:

1) The first step, it is important to train all teachers in *Tatweer* primary schools regarding the fundamental technical skills of IWBs within their schools and provide them with enough time to improve their abilities.
2) Then, in each *Tatweer* school, teachers' levels should be classified regarding the use of IWBs based on the Integrated Model of Technology Adoption (IMTA) as indicated in Section 7.3.9 (see Figure 7.2). A certified trainer from the Department of Education can make this classification via observing and interviewing teachers regarding their use of IWBs.
3) Teachers in each school are categorised based on subject matter. Then, from each discipline, a teacher who has an acceptable level of the Integrated Model of Technology Adoption (IMTA) (at the *refinement* or *renewal* levels) could be involved in a volunteer team of teachers inside each *Tatweer* school, working as IWB technology guiders in their schools.

4) Then, the training needs of teachers in each team (IWB technology guiders) are analysed, and training courses are designed based on their requirements.
5) The volunteer teams from all *Tatweer* schools should have regular advanced training in educational training centres by certified trainers based on their needs and especially regarding technology, pedagogy and content (TPACK) model. Through the discussions and dynamic interactions between teachers in technology guider teams, their TPACK can be improved (Koehler *et al.*, 2007).
6) The technology guider teams have the responsibility to train other teachers in their schools based on specific subject and strategies taking into account employing collaborating with colleagues, including peer mentoring and providing teachers with different types of training methods, such as observing the lessons of skilled educators and self-training. Moreover, there is a need for the provision of online training in each school as employed in *Tatweer* School (1), where information, programmes, lessons, and activities regarding the use of IWBs are provided on the school website for teachers use.
7) Importantly, technical support should be provided in each school to face any difficulties relating to the use of IWBs. Additionally, all teachers should be provided with enough time to receive training, especially in the first stage of using IWBs.

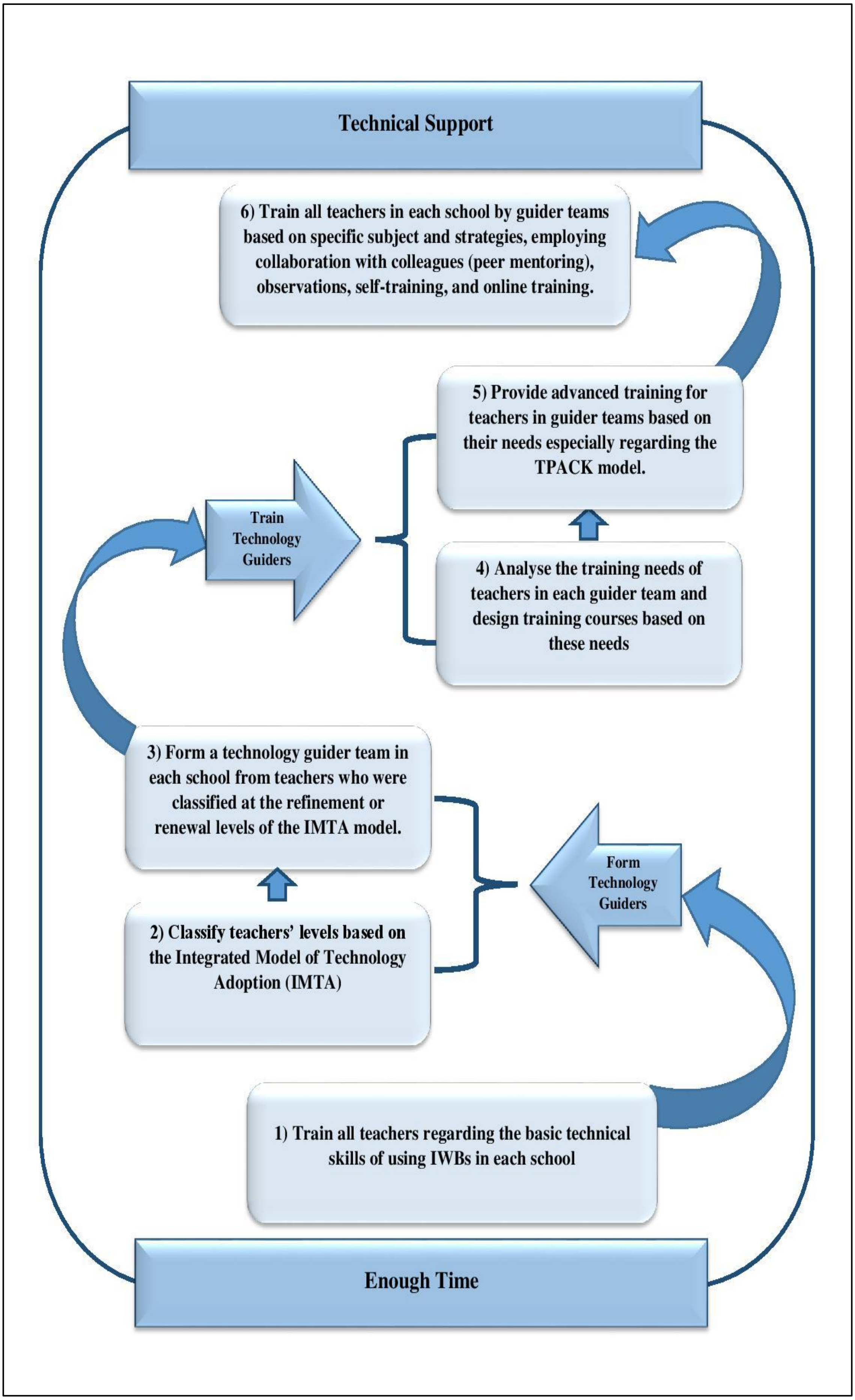

Figure 8.2: The Proposed Training Model for Teachers (PTMT) in Tatweer Schools

8.9. IMPLICATIONS OF THE RESEARCH FINDINGS

8.9.1. Theoretical Implications

1) The current study is the first study that investigated how teachers in Saudi Arabia were trained to use IWBs, specifically, what are their sources of training, their satisfaction with their training, their IWB training needs, and their training preference methods; therefore, the current study contributed to this field by adding new knowledge in this area.
2) Several educational studies relating to IWB technology have investigated students' gender differences, and only a few studies have examined teachers' gender differences with respect to their attitudes towards using IWBs. However, so far, no studies have investigated teachers' gender differences relating to the use of IWBs and training. Especially, the current study was conducted in the context of Saudi Arabia where the educational system is only based on single-sex schools where male and female (teachers and students) communicate separately; coeducational schools do not exist in this country. Thus, this study contributes to filling this gap in Saudi literature specifically and in the international literature more broadly.
3) This study compared the CBAM *Levels of Use* (LoU) and Beauchamp (2004) models, leading to provide a new model called the Integrated Model of Technology Adoption (IMTA) based on the findings of the current study and was also inspired by Beauchamp model (2004).
4) This study employed a mixed methods approach, using three methods (questionnaire, classroom observations, and semi-structured interviews). Thus it is the first study in which female teachers were observed regarding their use of IWBs in Saudi primary schools participating in the *Tatweer* project.
5) This study is the first study that investigated teachers' use of IWBs and their training needs for both genders in Saudi schools in general and in *Tatweer* schools especially.
6) The questionnaire used in this study was completed by a large number of primary teachers (n=587). Accordingly, the importance of this study appears from its contribution to produce useful information and knowledge that could be used to support future improvement in the use of IWBs in Saudi Arabia by providing new information about the primary school teachers in how they use this technology, their attitudes, their obstacles in using IWBs, and their training needs.

7) The MoE in Saudi Arabia will benefit from the outcomes of this study through the new information that concentrates on teachers' issues and difficulties when using IWBs in classrooms. This can lead to improving future Saudi educational policies, especially in the use of innovative technology.
8) The current study provided useful results about the quantity and quality of training courses delivered for teachers in *Tatweer* primary schools based on their views. Consequently, these findings could contribute to improving teachers' professional development programmes in Saudi Arabia.
9) This study may provide support for other researchers to investigate the adoption of other digital technologies in Saudi Arabia and extend current theories and models of teachers' professional development and learning in relation to the findings from this study.

8.9.2. Practical Implications

1) The main practical contribution of the current study is to suggest a Proposed Training Model for Teachers (PTMT) based on the research findings, which is appropriate for all teachers in all *Tatweer* schools both in Jeddah and other Saudi cities. This model could help the administrators of the *Tatweer* schools to improve teachers' professional development programmes regarding the use of IWBs by providing a practical model to employ on all *Tatweer* schools in Saudi Arabia. Moreover, this model could also be used to assist in the improvement of professional development programmes relating to the use of technology within similar contexts found in other developing countries.

2) Moreover, in this study, the CBAM *levels of Use* (LoU) (Hall and Hord, 2006) was adapted to provide a new model called the Integrated Model of Technology Adoption (IMTA) based on the findings of the current study and was also inspired by Beauchamp model (2004), suggests four potential levels of innovative technology integration: These levels are: *non-user, mechanical*, *refinement*, and *renewal*. Thus, IMTA model can be used to classify the levels of teachers when using educational technologies in classrooms.

3) The present study added new knowledge about using IWBs in Saudi Arabia, which was related to theories of technology adoption, mainly the TPACK and the CBAM *Levels of Use* (LoU) models. Thus, this study examined the robustness of these theories in a different cultural and educational context.

8.10. LIMITATIONS OF THE CURRENT STUDY

In this study, 587 teachers (301 female and 286 male) completed the questionnaire. Twenty teachers (10 males and ten females) were interviewed, and of these seven female teachers were also observed teaching in their classrooms or the learning resources rooms. Because of Saudi cultural restrictions, this study did not consider observing male teachers in their lessons. Moreover, the researcher, who is female, only observed and interviewed female teachers, while the male interviews were conducted with the help of a male relative of the researcher. The male researcher was the best available solution to contact and interview male teachers. However, the researcher created long conversations with the interviewees both males and females using WhatsApp, as explained in the methodology chapter, Section 4.6.2.2.

Moreover, this study employed a self-report questionnaire to collect quantitative data, where teachers' responses about their current skills and use of IWBs may be overvalued compared to their actual use of this technology. However, both quantitative and qualitative methods were employed in this study to achieve triangulation, aiming to increase the confidence in the research findings and ensure the research validity and reliability. Furthermore, the mix of using web-based and paper-based questionnaires might be criticized because of the possibility of focusing the choice on teachers who were more comfortable to use technology. However, I tried to reach as many teachers as possible with a paper version, but this was not practical in many schools due to some reasons relating to head teachers, Saudi culture, and the structure of the school system.

Finally, as a sole researcher, I might be influenced by my own perceptions when conducting this research, but I tried to be as transparent as possible and described what I have done in detail so other researchers can draw their conclusions.

However, despite these limitations, it is hoped that this study contributes to knowledge, addressing gaps that occur in the literature, with the purpose of gaining a better understanding of teachers' use of IWBs and their training needs in *Tatweer* primary schools in Saudi Arabia.

8.11. SUGGESTIONS FOR FUTURE RESEARCH

- The findings of the current study relied on a representative sample drawn from teachers in *Tatweer* primary schools, in one city in Saudi Arabia. Thus, similar research needs to be conducted in other *Tatweer* primary schools across wider regions of this country.

- This study only observed female teachers in their lessons because of cultural restrictions; thus, a similar study may be conducted that observes male teachers who are participating in *Tatweer* primary schools and compares the findings of both studies. Alternatively, the use of IWBs in *Tatweer* schools could be investigated effectively using a mixed gender team.
- In this study, the training needs of teachers who participated in *Tatweer* primary schools were only based on their perceptions; therefore, it is suggested that a similar study be conducted to explore teachers' training needs based on the views of school administrations in *Tatweer* schools and educational supervisors.
- A further study needs to be carried out to explore the effect of school culture and technical support in *Tatweer* schools on teachers' use of IWBs and their professional development programmes.
- It is suggested that the Proposed Training Model for Teachers (PTMT) be employed in all *Tatweer* schools and then examine its effect on the effective use of IWBs in classrooms.
- Another study needs to be conducted to consider the need for a 'Train the Trainers' programme based on a professional training standard to improve professional development programs for teachers in the use of technology.

8.12. REFLECTIVE COMMENTS

In conclusion, having completed this chapter, I believe that all the research questions have been fully answered, and the findings of this study contribute to filling current gaps in the literature, and, consequently, this could improve professional development programmes in Saudi Arabia. Moreover, this study provides useful recommendations and suggestions for further research.

Through conducting this study, I have personally learned the importance of using a mixed methods approach to investigate the use of IWBs in classrooms. Indeed, using the questionnaire to collect quantitative data provided me with a general background about the utilisation of this technology among teachers in all *Tatweer* schools in Jeddah. However, using classroom observations and semi-structured interviews added more fun and enjoyment, as the picture that I gained from using the questionnaire turned out to be like a movie film showing how teachers use this technology in more detail. To be honest, before conducting this study I was aware that teachers do not like to use IWBs in their lessons or they only used these technologies for PowerPoint presentations. However, during the exciting journey for collecting data, my views were positively changed to see the huge effort being made by the teachers. Indeed, some of the lessons observed were effective because of teachers' confidence in using IWBs, using different interactive features, the deep knowledge of the content, and the ability to plan effective lessons and activities using different teaching strategies based on the needs of their students. During these lessons, I was surprised by the students' participation and their enthusiasm to use IWBs. They showed a significant interaction during lessons, and they asked many questions which show how they think critically. Thus, these lessons could be used as examples of the successful integration of IWBs into lessons.

Despite the many difficulties that faced me during conducting this study (see the methodology chapter Section 4.10), I enjoyed observing teachers, and I appreciate all their efforts and strategies they used during their lessons. Indeed, the teachers observed appeared to be high motivated to use IWBs in their classrooms, and they tried hard to improve their skills. However, they need more consistent training, time, and technical support, which must be provided in each school as a continuous school culture (see PTMT Section 8.8.1). With this school culture, educators will gain the knowledge they need for introducing effective lessons to improve student learning. Finally, although all the difficulties facing primary teachers in using IWBs that were indicated in this study, there is a general feeling that IWBs have a future not only in *Tatweer* schools but also in all schools in Saudi Arabia. However, these obstacles should be overcome to improve the implementation of IWBs in Saudi Arabia.

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10. CONFERENCES AND PUBLISHING

During my Ph.D. study, I have participated in the following academic conferences by presenting posters or oral presentations:

- The iARC (Institute of Advanced Research Computing) #DHDurham – Making Connections 2014' Durham Digital Humanities at Durham University, 15th October 2014, Durham, UK.
- The 8th Saudi Students' Conference, 31st Jan - 1st Feb 2015, London, UK.
- The International Journal of Arts & Sciences (IJAS), 13-16 April 2015, Paris, France.
- The 4th International Conference on Teaching, Education, and Learning (ICTEL), 16-17 August 2015, Istanbul, Turkey.
- The 9th Saudi Students' Conference, 13 - 14 Feb 2016, Birmingham, UK.
- The 18th International Conference on Internet Information Systems and Technologies (ICIIST 2016), 17-18 October 2016, London, UK.

Moreover, I have published the following journal articles:

Alghamdi, A. (2015) 'An Investigation of Saudi Teachers' Attitudes towards IWBs and their Use for Teaching and Learning in Yanbu Primary Schools in Saudi Arabia', *International Journal of Arts & Sciences,* 8(6), pp. 539–554.

Alghamdi, A. and Higgins, S. (2015) 'Investigating how teachers in primary schools in Saudi Arabia were trained to use Interactive Whiteboards and what their training needs were', *International Journal of Technical Research and Applications*, Special Issue 30, pp. 1-10.

11. APPENDICES

Appendix 1: A summary of Saudi Studies Regarding the Use of IWBs

The Study	Focus	Sample	Stage	Research Methods	Findings
Al-wazzan (2012)	To investigate if using the IWBs aids the collaborative learning	Female teachers (n=2) and female students	One primary school, in Al-Qaseem in Saudi Arabia	1)Observations 2)Interviews	1) The lack of availability of IWBs in Saudi classrooms. 2) Limited Saudi teachers who practiced the collaborative learning in their classrooms.
Isman et al.(2012)	To investigate teachers' attitudes towards using IWBs	Male teachers (n=100) and male students	Secondary schools in Riyadh city in Saudi Arabia	1) IWBs'Attitude Survey 2) Questionnaire 3) Student's interviews	1) Positive attitudes. 2) The lack of teachers' skills. 3) The need for training programs.
Bakadam et al.(2012)	To investigate teachers' attitudes towards using IWBs	Male teachers (n=50)	One intermediate school in the city of Jeddah	1)Questionnaire 2)Interviews	1) The positive role of IWBs in delivering the information to the students and increasing their communication. 2)The limited use of IWBs' features 3) The need for teachers' training as well as reducing the number of students in classrooms.
Hakami (2013)	To investigate the use of ICTs in teaching and learning	Male teachers (n= 20) and male students	One secondary school participating in the *Tatweer* project in the city of Jeddah	Case Study Approach 1) Questionnaire 2)Classroom observations 3) Interviews	1)Limited ICT skills for both teachers and students 2)The lack of teachers' IWB skills 3)The lack of IWBs' resources 4) Limited student' use of IWBs.

The Study	Focus	Sample	Stage	Research Methods	Findings
Alghamdi (2013)	1) Investigate teachers' attitudes towards using IWBs. 2) Investigate teachers' use of IWBs in the teaching and learning.	Male and female teachers (n=100)	Primary schools in Yanbu city in Saudi Arabia	1)Questionnaire 2)Semi-structured interviews	1) Positive attitudes towards the use of IWBs in the teaching and learning processes. 2) The lack of teachers' skills in using IWBs. 3) Un regularly uses of IWBs in Saudi classrooms. 4) The lack of teachers' training in using IWBs caused the limited use of IWBs' features. 5) Self-training and collaboration with colleagues were the common training resources of the majority of teachers.
Al-Faki and Khamis (2014)	Investigate the difficulties that face English teachers during their use of IWBs in teaching English language classes	Male teachers (n=45)	Primary, intermediate, and secondary male schools in the city of Jeddah	1)Questionnaire 2)Classroom observations	English language teachers in the city of Jeddah had several problems, relating to teachers, students, technical support, and school administrations during their use of IWBs in their lessons.
Gashan and Alshumaimeri (2015)	1) Explore the attitudes of Saudi female teachers towards using IWBs in teaching English as a foreign language. 2) Investigate the difficulties that face them.	Female teachers (n=43)	Secondary female schools in the city of Riyadh	1) Questionnaire	1) English language female teachers in the city of Riyadh had positive attitudes toward using IWBs in their classrooms. 2) They found some obstacles such as lack of sufficient training, difficulty in managing their students, the lack of the appropriate curriculum content, the lack of class time, and the lack of financial support.

Appendix 2: The English Version of the Questionnaire

Dear Teacher,

This questionnaire is prepared for a doctoral study in the field of Educational Technology in the Faculty of Education at the Durham University, United Kingdom. It will not take more than 15 minutes. This study focuses on primary schools that participating in *Tatweer* project. My research aims to: 1) Evaluate the Saudi teachers' approaches in using Interactive Whiteboards (IWBs) in primary schools, 2) Investigate their attitudes towards using this technology, 3)Identify the problems they encounter, and 4) Recognise their IWB training needs. Therefore, this study may contribute to improving the use of IWBs in Saudi schools by evaluating the present teachers' methods and skills as well as identifying the required skills. The information in this questionnaire will be only used for research purpose and will be kept safely and anonymously. Moreover, your participation in completing this questionnaire is voluntary, and you have the right to withdraw at any stage. However, your participation in this study will be highly appreciated. If you have further inquiries about this questionnaire, please do not hesitate to contact me at the following address: azzah.alghamdi@durham.ac.uk

Azzah Alghamdi

Part I: (General Information) (*Please only choose one option*)

1) **Do you have IWBs in your school?** a) Yes b) No

2) **Gender** a) Male b) Female

3) **Experience** a) Less than one year b) 1-5 years c) 6- 10 years d) More than 10 years

4) **Fields of teaching** a) Mathematics b) Science c) Social Sciences
d) Computer Science e) Foreign Language (English)
F) Islamic Sciences g) Arabic Language and Literature
h) Special Needs I) Other: (please identify)……

5) **Teachers' workload**
a) Less than 10 b) 10-19
c) 20-24 d) More than 24

6) **Where is the IWB located?** (*You could choose more than one option)*
a) In your classroom b) In resource rooms
c) In laboratories d) Other

Part II: (Teachers' attitudes towards the use of IWBs)

What do you think about all of the following statements?

(*Please put* (✖) *in only one box of each item*).

	Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The Teaching Process	7) Class time will be managed successfully by using IWBs.					
	8) The lessons will be more active when using IWBs.					
	9) Discussions in class will be facilitated when using IWBs.					
	10) Using IWBs makes teaching more enjoyable.					
	11) Using IWBs helps me to prepare lessons.					
	12) Course content will become more visual when using IWBs.					
	13) Using IWBs makes content teaching easier to students.					
	14) Using IWBs strengthens my content knowledge.					
	15) Using IWBs helps me to design content-based activities in classrooms.					
	16) Using IWBs improves my teaching methods to develop student learning.					
	17) I can use IWBs with appropriate teaching style to teach the content.					
Student Learning	18) Student learning will be improved by using IWBs.					
	19) Collaborative learning will be facilitated by using IWBs.					
	20) Using IWBs enhances student attention in class.					
	21) Using IWBs makes students more motivated in class.					
	22) Using IWBs increases student interaction in class.					
	23) Students may have chances to use IWBs in the classroom by themselves.					
	24) Using IWBs helps students to understand difficult concepts.					

Part III: (Teachers' Use of IWBs)

25) How many years have you used an IWB? (*Please only choose one option*)

a) Less than one-year b)1-5 years c)More than five years

26) How frequently do you use the IWB in your lessons? (*Please only choose one option*)

a) Seldom b) Sometimes (For specific subjects) c) Often (Most lessons)
d) Always (Every lesson).

27) How usually do you use interactive IWB features (zoom, snapshot, spotlight, touch functions, lesson recording, highlighting, using the internet to search websites, import pictures and movies, games…………)?
(*Please only choose one option*)

a) I use the IWB as an ordinary white/ blackboard.
b) I use the IWB with a few interactive features that I like or am familiar with.
c) I use the IWB with most of the interactive features it provides as needed for my lessons.

28) In what ways do you use IWBs? (*You could choose more than one option)*

a) Whole class teaching.
b) Small groups.
c) With individuals.

29) Which of the following approaches describe the use of IWBs in your classroom?

(*Please only choose one option*)

a) You, as a teacher, only use the IWB.
b) Students occasionally use the IWB (once every few weeks).
c) Students frequently use the IWB (several times a week).
d) Students always use the IWB in the classroom (every day).

30) How would you classify yourself regarding the ability to use the IWB with its tools in your lessons? (*Please only choose one option*)

a) Unable.
b) Competent.
c) Proficient.

Part IV: Difficulties and Challenges in Using IWBs

(*You could choose more than one option)*

31) What difficulties and problems that encounter you when using IWBs?
a) Unavailability of IWBs.
b) Location of IWBs.
c) Students find difficulties with IWBs, for example, they cannot see or cannot reach the top of the IWB.
d) Technical problems when using IWBs.
e) Lack of educational resources.
f) Lack of time for designing educational resources that companionable with IWBs.
g) Lack of training courses in how to use IWBs effectively.
h) Lack of assistance and support. (for example, unavailability of a technical consultant in the school)
i) Difficulties in integrating IWBs in my teaching lessons.

Part V: (Teachers' Training)

32) How were you trained to use IWBs? (*You could choose more than one option)*

a) By the education department.
b) By private organizations.
c) By a colleague.
d) Self-trained.
e) No training.

33) How many IWB training courses did you receive? (*Please only choose one option*)

a) None b) 1-3 c) 4-5 d) More than 5

34) In the case of you did not participate in any IWB training courses could you please identify the reasons for not attending these courses.

(*You could choose more than one option)*

a) I think IWB training courses are not necessary.
b) I think IWB training courses do not improve my teaching.
c) These courses are held in other cities.
d) I think I have appropriate skills in using IWBs.
e) I feel that attending training courses are time-consuming.
f) I dislike attending courses that relate to technology use.
g) Unavailability of IWB training courses.
h) If you have other reasons (please identify).
……….……………………………………..
……………………………………………………………………………….…………

35) How satisfied are you with the level of training you have received?

(*Please only choose one option*)

a) Very satisfied b) Satisfied c) Neutral d) Dissatisfied

36) Do you find assistance when you encounter any difficulties related to the use of IWBs?

(*Please only choose one option)*

a) Always b) Sometimes c) Seldom d) Never

37) Do you need further training in using IWBs?

(*Please only choose one option*)

a) A lot of need b) Little need c) No need

38) Which training do you think you need to be an effective user of IWBs?

(*You could choose more than one option)*

a) Technical skills in the use of IWB.
b) Effective teaching techniques using IWB.
c) Designing educational resources compatible with IWBs.
Why?…………………………………………………………………………
…………………………………………………………………………………

39) Which of these methods do you think are more valuable in improving your IWBs' skills?

(*You could choose more than one option)*

a) Attending training courses and workshops.
b) Observe lessons of skilled educators.
c) Collaboration with colleagues (e.g. peer mentoring where beginner teachers are accompanied by highly qualified teachers in using IWBs).
d) More time for self-training.

Part VI: General Comments and Suggestions

40) Are there any commentaries or recommendations you would like to add?

....
....
....
....

Thank you very much for answering this questionnaire

Female teachers only

If you wish to participate in the classroom observations and interviews, please indicate your contact details:

Name: …………………………………..	Email: …………………………………

Telephone Number: …………………….	School: ……………………………….

Appendix 3: The Arabic Version of the Questionnaire

عزيزي المعلم \ عزيزتي المعلمة

هذا الإستبيان معد من أجل اكمال متطلبات درجة الدكتوراة في تخصص تكنولوجيا التعليم في جامعة درم في المملكة المتحدة. هذه الدراسة تستهدف المدارس التي تطبق مشروع الملك عبدالله بن عبدالعزيز لتطويرالتعليم وتهدف إلى:

1) معرفة الطرق التدريسية للمعلمين والمعلمات عند استخدام السبورة التفاعلية

2) تقصي ميولهم تجاه استخدام هذه التكنولوجيا

3) التعرف على المشاكل التي تواجههم

4) تحديد احتياجاتهم التدريبية.

وبالتالي هذه الدراسة سوف تساهم في تطوير استخدام السبورة التفاعلية قي المدارس السعودية عن طريق تقييم الطرق التدريسية والمهارات الحالية للمعلمين والمعلمات وكذلك تحديد المهارات المطلوبة. جميع المعلومات سوف تستخدم لأهداف البحث فقط وسوف تعامل بسرية تامة.

نود إحاطتك بأن مشاركتك في تعبئة هذا الإستبيان تطوعية بحتة و لك الحق في الانسحاب في أي وقت. هذا الإستبيان لن يأخذ من وقتك أكثر من 15 دقيقة. نشكر لك مشاركتك في اكمال هذا الإستبيان و الذي سيكون له أبلغ الأثر في اكمال هذه الدراسة مما سيسهم بدوره في تطوير العملية التعليمية في المملكة العربية السعودية . اذا كان لديك أي استفسارات بخصوص هذا الإستبيان رجاء لاتتردد\ي في الاتصال بي على البريد الإلكتروني التالي:

azzah.alghamdi@durham.ac.uk عـزة الغـامدي

الجزء الأول:(معلومات عامة)

(الرجاء اختيارإجابة واحدة فقط لكل سؤال ممايلي)

1) **هل توجد سبورة تفاعلية في المدرسة التي تدرس\ي فيها؟**

أ) نعم ب) لا

2) **الجنس:** أ) ذكر ب) انثى

3) **الخبرة في التدريس:** أ) أقل من سنة ب) 1- 5 سنوات ج) 6 - 10 سنوات د) أكثر من 10 سنوات

4) **مادة التدريس:** أ) رياضيات ب) علوم ج) علوم اجتماعية د) حاسب آلي

هـ) لغة انجليزية و) قرآن و دراسات اسلامية ك) لغة عربية

ل) تربية خاصة م) أخرى (أرجو التحديد..............................)

5) عدد الحصص الأسبوعية (النصاب التدريسي):

أ) أقل من 10 حصص ب) من 10- 19 حصة

ب) 20- 24 حصة ج) أكثر من 24 حصة اسبوعية

6) موقع السبورة التفاعلية: ***(يمكنك اختيار أكثر من إجابة)***

أ) في غرفة الصف الدراسي ب) في غرفة المصادر

ج) في المعامل المدرسية د) أماكن أخرى (اذكرها\ اذكريها) :..............

الجزء الثاني: (وجهة نظر المعلمين \ المعلمات حول استخدام السبورة التفاعلية)

ماهي وجهة نظرك تجاه كل عبارة من العبارات التالية؟

الرجاء وضع علامة (✖) في مربع واحد فقط امام كل عبارة من العبارات التالية

		موافق بشدة	موافق	محـايد	غير موافق	غير موافق بشدة
من ناحية التدريس	7) السبورة التفاعلية تساعد على ادارة وقت الحصة الدراسية.					
	8)يصبح الدرس أكثر فعالية عند استخدام السبورة التفاعلية.					
	9)السبورة التفاعلية تخلق فرص أكثر للمناقشة داخل الصف.					
	10)يصبح التدريس أكثر متعة باستخدام السبورة التفاعلية.					
	11)تساعدني السبورة التفاعلية على تحضير دروسي بشكل أفضل.					
	12)يصبح محتوى المادة مرئي أكثر باستخدام السبورة التفاعلية.					
	13)استخدام السبورة التفاعلية يسهل تدريس محتوى المنهج الدراسي.					
	14)استخدام السبورة التفاعلية يقوي معلوماتي المتعلقة بمحتوى المادة التي أدرسها.					
	15)استخدام السبورة التفاعلية يشجع على تصميم أنشطة تخدم المحتوى الدراسي.					
	16)استخدام السبورة التفاعلية يطور طرق التدريس من أجل تحسين عملية تعلم الطلاب \ الطالبات.					
	17)أستطيع أستخدام السبورة التفاعلية مع أساليب تدريس مناسبة للمحتوى الدراسي.					
من ناحية تعلم الطلاب\الطالبات	18)السبورة التفاعلية تحسن عملية التعلم لدى الطلاب\ الطالبات.					
	19)السبورة التفاعلية تسهل عملية التعلم التعاوني.					
	20)السبورة التفاعلية تحسن انتباه الطلاب\ الطالبات خلال الحصة الدراسية.					
	21)السبورة التفاعلية عامل مساعد لتحفيز الطلاب\ الطالبات.					
	22)السبورة التفاعلية تزيد من مشاركة الطلاب\ الطالبات.					
	23) يمكن إستخدام السبورة التفاعلية من قبل الطلاب\ الطالبات أثناء الدرس.					
	24)استخدام السبورة التفاعلية يساعد الطلاب على فهم بعض المصطلحات المعقدة.					

الجزء الثالث: (استخدام المعلم\ة للسبورة التفاعلية)

25) منذ متى وأنت تستخدم\ي السبورة التفاعلية؟ *(الرجاء اختيارإجابة واحدة فقط)*

أ) أقل من سنة ب) 1 – 5 سنوات ج) أكثر من 5 سنوات

26) ماهو معدل استخدامك للسبورة التفاعلية في حصصك اليومية؟ *(الرجاء اختيارإجابة واحدة فقط)*

أ) نادراً ب) بعض الأوقات(لمواضيع محددة فقط) ج) غالباً (معظم الدروس) د) دائماً (في كل درس)

27) كيف تستخدم\ي ميزات السبورة التفاعلية عادة في حصتك (الميزات مثل خاصية التقريب والتبعيد, خاصية أخذ اللقطات الثابتة, وظائف الفارة , وظيفة تسجيل الدروس, وظيفة تحديد النص, استخدام الإنترنت, الألعاب,...........)

(الرجاء اختيارإجابة واحدة فقط)

أ) استخدمها كسبورة عادية.
ب) استخدم فقط القليل من الميزات التي أعرفها.
ج) استخدم معظم الميزات المتوفرة في السبورة التفاعلية والتي احتاجها في دروسي.

28) بأي الطرق تستخدم\ي السبورة التفاعلية *(يمكنك اختيار أكثر من إجابة)*

أ) تدريس الفصل بأكمله. ب) مجموعات صغيرة. ج) التدريس الفردي.

29) أي الطرق التالية يصف استخدامك للسبورة التفاعلية: *(الرجاء اختيارإجابة واحدة فقط)*

أ) أنت فقط تستخدم السبورة التفاعلية.
ب) أحيانا يستخدم الطلاب\ تستخدم الطالبات السبورة التفاعلية (مرة واحدة كل عدة أسابيع).
ج) غالبا يستخدم الطلاب\ تستخدم الطالبات السبورة التفاعلية (عدة مرات في الأسبوع).
د) دائما يستخدم الطلاب\ تستخدم الطالبات السبورة التفاعلية (كل يوم).

30) كيف تصنف\ي نفسك من خلال مقدرتك على استخدام السبورة التفاعلية في حصصك؟

(الرجاء اختيارإجابة واحدة فقط)

أ) ليس لدي المعرفة الدقيقة باستخدامها. ب) مستخدم\ة جيد\ة للسبورة التفاعلية. ج) مستخدم\ة محترف\ة لها.

الجزء الرابع: (المصاعب والتحديات عند استخدام السبورة التفاعلية)

(يمكنك اختيار أكثر من إجابة)

31) ماهي المصاعب والمشاكل التي تواجهك عند استخدامك السبورة التفاعلية؟

أ)عدم توفر السبورة التفاعلية.
ب) الموقع والمكان الذي توضع فيه.
ج) الطلاب \الطالبات يجدوا مشاكل عند استخدام السبورة التفاعلية مثلا عدم الرؤية اوامكانية لمس أعلى اللوح.
د) مشاكل تقنية عند استخدام السبورة التفاعلية.
هـ) نقص المصادر التعليمية.
و) عدم توفر الوقت من أجل تصميم المصادر التعليمية التي تكون متوافقة مع السبورة التفاعلية.
ك) نقص البرامج التدريبية التي توضح كيفية استخدام السبورة التفاعلية بشكل فعال.
ل) نقص المساعدة والدعم (مثلا عدم وجود مستشار تقني في المدرسة أو عدم تعاون ادارة المدرسة).
م) أجد صعوبة في دمج السبورة التفاعلية في دروسي.

الجزء الخامس: (التدريب)

32) كيف تدربت على استخدام السبورة التفاعلية؟ ***(يمكنك اختيار أكثر من إجابة)***

أ) عن طريق ادارة التعليم/ المؤسسة التعليمية
ب) عن طريق معهد أو مركز خاص
ج) عن طريق أحد الزملاء أو إحدى الزميلات
د) بمجهود ذاتي
هـ) لم أحصل على أي نوع من التدريب

33) كم عدد الدورات التدريبية المتعلقة باستخدام السبورة التفاعلية التي حصلت عليها؟ ***(الرجاء اختيار إجابة واحدة فقط)***

أ) لم احصل على أي دورة تدريبية ب) 1-3 ج) 4-5 د) أكثر من خمس دورات تدريبية

34) في حالة عدم حصولك على أي دورة تدريبية أرجوا تحديد الأسباب التي منعتك من ذلك ***(يمكنك اختيار أكثر من سبب)***

أ) لأني اعتقد أن الدورات التدريبية في استخدام السبورة التفاعلية ليست ضرورية.
ب) لأني اعتقد أن الدورات التدريبية في استخدام السبورة التفاعلية لاتطور طرق تدريسي.
ج) الدورات التدريبية في استخدام السبورة التفاعلية تعقد في مدن أخرى.
د) عندي المهارات اللازمة في استخدام السبورة التفاعلية.
هـ) لأني اعتقد أن حضور الدورات التدريبية تستهلك وقتا كبيرا.
و) لا أحب حضور الدورات التدريبية المتعلقة باستخدام التكنولوجيا.
ك) بسبب عدم توفر دورات تدريبية متخصصة في استخدام السبورة التفاعلية.
ل) أذا توجد أسباب أخرى (أرجوا التحديد)

....

35) ما مدى الرضا الذي تشعر\ي به تجاه مستوى التدريب الذي حصلت عليه في حالة الالتحاق بدورات تدريبية ؟

(الرجاء اختيار إجابة واحدة فقط)

أ) راضي\ة جدا ب) راضي\ة ج) غير راضي \ة

36) هل تجد\ي مساعدة عندما تواجهك أي مشكلة تتعلق باستخدام السبورة التفاعلية؟ ***(الرجاء اختيار إجابة واحدة فقط)***

أ) دائما ب) أحيانا ج) نادرا د) أبدا

37) هل تحتاج\ي الى تدريب أكثر عن كيفية استخدام السبورة التفاعلية؟ ***(الرجاء اختيار إجابة واحدة فقط)***

أ) احتياج كبير ب) احتياج بسيط ج) لايوجد احتياج

38) أي نوع من التدريب تحتاج\ي لتصبح\ي مستخدم\ة فعال\ة للسبورة التفاعلية؟ ***(يمكنك اختيار أكثر من إجابة)***

أ) المهارات التقنية في استخدام السبورة التفاعلية.
ب) طرق التدريس الفعال باستخدام السبورة التفاعلية.
ج) تصميم مصادر تعليمية متوافقة مع السبورة التفاعلية.

لماذا؟...

39) أي الطرق التالية تفضل \ي من أجل تطوير مهاراتك في استخدام السبورة التفاعلية؟

(يمكنك اختيار أكثر من إجابة)

أ) حضور الدورات التدريبية وورش العمل .
ب) حضور دروس للمتمرسين من المعلمين\ المعلمات في استخدام السبورة التفاعلية .
ج) التعاون مع الزملاء\الزميلات (مثلا: عندما يتم التعاون بين المعلم\ة المبتدئ \ة و المعلم\ة الخبير\ة في استخدام السبورة التفاعلية).
د) توفير مزيد من الوقت من أجل التدريب الذاتي.

الجزء السادس: (اقتراحات عامة)

40) هل هناك أي إضافات, تعليقات, أو توصيات تود\ي إضافتها؟

....
....

....
....

شكراً لك على جهدك ووقتك الثمين وعلى مشاركتك في اكمال هذا الإستبيان

للمعلمات فقط

أذا أردتي المشاركة في الجزء الثاني من هذه الدراسة(زيارة صفية ومقابلة شخصية) فأرجوا وضع عنوان للتواصل:

الاسم: .... **الهاتف\الجوال:**..

البريد الإلكتروني:.. **المدرسة:**..

Appendix 4: The English Version of the Observation Schedule

General information	
Name of the teacher	
School	
Date of observation	
Grade Level	
Subject	
The duration of observation	
Teacher's experience in using IWBs	
Number of pupils in classroom	

The location of IWBs in school	In the observed classroom	In resource rooms	In laboratories	Other
The physical environment **The location of the IWB in the observed classroom.** **Notes**				

The audience in the observed lesson while using the IWB	Whole class teaching	Small groups	Individuals

The user of the IWB in the observed lesson	The teacher only use the IWB	Teachers and students used the IWB		Only Students use the IWB
		The percentage of lesson time for teachers' use	The percentage of lesson time for students' use	

The Interactive Features	The tool	How many times						How	Why
		1	2	3	4	5			
	Zoom								
	Snapshot								
	Spotlight								
	Highlighting								
	Colouring Objects								
	Drag and Drop								
	Lesson Recording								
	Using Websites								
	Pictures								
	Movies								
	Games								

Difficulties that faced the teacher when using the IWB	Comments	
Location of IWBs		
Difficulties related to students		
Technical problems		
Lack of educational resources		
Lack of time		
Lack of assistance and support		
Lack of teacher’ skills		
Difficulties in integrating IWBs in lesson		

Details about the observed lesson

Introduction:

The content:

Activities:

Teacher	Students

The end of Lesson:

Appendix 5: The Arabic Version of the Observation Schedule

معلومات عامة	
اسم المعلمة	
اسم المدرسة	
تاريخ الملاحظة	
الصف الدراسي	
الموضوع	
مدة الملاحظة	
خبرة المعلمة في استخدام السبورة التفاعلية	
عدد الطالبات في الفصل	

موقع السبورة التفاعلية في المدرسة	في غرفة الصف الدراسي	في غرف المصادر	في المعامل المدرسية	أماكن أخرى
البيئة الصفية موقع السبورة التفاعلية في غرفة الصف الدراسي ملاحظات				

الفئة المستهدفة اثناء استخدام السبورة التفاعلية	تدريس الفصل بأكمله	مجموعات صغيرة	التدريس الفردي

مستخدم السبورة التفاعلية	المعلمة فقط تستخدم السبورة التفاعلية	المعلمة و الطالبات يستخدمن السبورة التفاعلية		الطالبات فقط يستخدمن السبورة التفاعلية
		وقت استخدام المعلمة للسبورة التفاعلية	وقت استخدام الطالبات للسبورة التفاعلية	

	الخاصية أو الاداة	عدد المرات						كيف	لماذا
		1	2	3	4	5			
مميزات السبورة التفاعلية المستخدمة	التقريب والتبعيد								
	اللقطات الثابتة								
	تسليط الضوء على جزء محدد								
	تحديد النص								
	أدوات التلوين								
	السحب والاسقاط								
	تسجيل الدرس								
	استخدام المواقع الالكترونية								
	استخدام الصور								
	استخدام الافلام								
	استخدام الالعاب								

المصاعب والمشاكل التي واجهت المعلمة عند استخدام السبورة التفاعلية	ملاحظات	
موقع السبورة التفاعلية .		
مشاكل متعلقة بالطالبات.		
مشاكل تقنية عند استخدام السبورة التفاعلية.		
نقص المصادر التعليمية.		
عدم توفر الوقت.		
نقص المساعدة والدعم.		
نقص في مهارات المعلمة.		
صعوبة في دمج السبورة التفاعلية في الدرس.		

ملاحظات تفصيلية أثناء الدرس

المقدمة:

المحتوى:

الانشطة:

الطالبات	المعلمة

نهاية الدرس:

Appendix 6: The English Version of the Interview Questions

General information

School: ………………………… Name of the teacher: …………………………………….
Classroom: ……………………… Subject: …………………………………………………
Teaching experience: …………… Teacher's experience in using IWBs: ………………….
Teachers' workload: …………………………………….

Teachers' use of IWBs

1) How many years have you used an IWB?
2) Where about is the IWB you use located?
3) How frequently do you use IWB in your lessons?
4) How usually do you use interactive IWB features? Can you give me an example?
5) In what ways do you use IWBs? Regarding (whole class, groups, and individuals)?
6) Which approaches do you think to describe the use of IWB in your classroom? (e. g. You as a teacher only use IWB or students can use it?
7) Do students use IWBs in your lessons? How often do they use it?
8) How would you classify yourself in terms of the ability to use the IWB with its tools in your lessons? What makes you say that?
9) What difficulties and problems that encounter you when using IWBs?

Teachers' training

10) How were you trained to use IWBs?
11) How many IWB training courses did you receive?
12) Are there any reasons could prevent you from attending any IWB training courses?
13) How satisfied are you with the level of training you have received?
14) How do you find assistance when you encounter any difficulties relating to the use of IWBs?
15) Do you feel you need further training in using IWBs?
16) Which training do you think you need to be an effective user of IWBs?
17) Are there any suggestions do you think might be more valuable in improving your IWBs' skills?

Teachers' attitudes towards using IWBs

18) What are your attitudes towards the use of IWBs in the teaching process?
19) What are your attitudes towards the use of IWBs in student learning?

Appendix 7: The Arabic Version of the Interview Questions

معلومات عامة

الاسم:... **المدرسة:**...
الصف الدراسي:...................................... **مادة التدريس:**..
الخبرة في التدريس:.................................. **الخبرة في استخدام السبورة التفاعلية:**.........................
عدد الحصص الأسبوعية (النصاب التدريسي):..

1) منذ متى وأنت تستخدم\ي السبورة التفاعلية؟ (كم المدة الزمنية)

2) أين وضعت السبورة التفاعلية؟ في الفصل الدراسي\ غرفة المصادر\ المعامل المدرسية؟

3) ماهو معدل استخدامك للسبورة التفاعلية في حصصك اليومية؟

4) ماهو معدل استخدامك لمميزات وأدوات السبورة التفاعلية؟ هل تستطيع\ي التوضيح بمثال؟

5) بأي الطرق تستخدم\ي السبورة التفاعلية من ناحية (التدريس الجماعي و المجموعات الصغيرة و التدريس الفردي)؟

6) كيف تصف \ي استخدامك للسبورة التفاعلية (انت كمعلم/ ة فقط تستخدم/ ي السبورة التفاعلية او يمكن استخدامها من قبل الطلاب /الطالبات)؟

7) ماهو معدل استخدام الطلاب /الطالبات للسبورة التفاعلية ؟

8) كيف تصنف/ ي نفسك من خلال مقدرتك على استخدام السبورة التفاعلية ومميزاتها في حصصك؟ مالذي جعلك تقول/ ي ذلك؟

9) ماهي المصاعب والمشاكل التي تواجهك عند استخدامك السبورة التفاعلية؟

10) كيف تدربت/ ي على استخدام السبورة التفاعلية؟

11) كم عدد الدورات التدريبية في استخدام السبورة التفاعلية التي حصلت/ ي عليها؟

12) هل يوجد أي أسباب تمنعك من حضور الدورات التدريبية التي تتعلق باستخدام السبورة التفاعلية؟

13) ما مدى الرضا الذي تشعر/ي به تجاه مستوى التدريب الذي حصلت/ ي عليه ؟

14) كيف تجد/ي مساعدة عندما تواجهك أي مشكلة تتعلق باستخدام السبورة التفاعلية؟

15) هل تحتاج/ ي الى تدريب أكثر عن استخدام السبورة التفاعلية؟

16) أي نوع من التدريب تحتاج/ ي لتصبح/ ي مستخدم/ ة فعال/ ة للسبورة التفاعلية؟

17) هل يوجد أية اقتراحات لتطوير مهاراتك في استخدام السبورة التفاعلية؟

18) ماهو ميلك تجاه استخدام السبورة التفاعلية في عملية التدريس؟

19) ماهو ميلك تجاه استخدام السبورة التفاعلية في عملية تعلم الطلاب /الطالبات ؟

Appendix 8: Ethical Approval

Durham University

School of Education

Shaped by the past, creating the future

18 November 2014

Azzah Alghamdi
PhD student
School of Education

Azzah.alghamdi@durham.ac.uk

Dear Azzah

I am pleased to inform you that your application for ethical approval in respect of 'In-service Saudi teachers and interactive white boards: Current use and training needs' has been approved by the School of Education Ethics Committee.

May we take this opportunity to wish you good luck with your research.

Dr. J. Beckmann
Chair of School of Education Ethics Committee

Leazes Road
Durham, DH1 1TA
Telephone +44 (0)191 334 2000 Fax +44 (0)191 334 8311
www.durham.ac.uk/education

Appendix 9: Consent Letter to Teachers

(Classroom Observations and Interviews)

Dear Teacher,

I am conducting a doctoral study in Technology Enhanced Learning (TEL) in the Faculty of Education at the Durham University, United Kingdom. My research aims to identify the Saudi teachers' approaches in using Interactive Whiteboards (IWBs) in primary schools, investigate their attitudes towards using this technology, and recognise their problems and IWB training needs. Therefore, this study may contribute to improve the use of IWBs in Saudi schools by evaluating the present teachers' methods and skills as well as identifying the required skills. As part of the research, it will involve classroom observations and interviews. I believe the results of this study will be of great benefit in general. The information will be only used for research purposes and will be kept safely and anonymously. Moreover, your participation is voluntary and you have the right to withdraw at any stage. However, your participation in this study will be highly appreciated. If you have further inquiries about your participation please do not hesitate to contact me on the following address: Azzah.Alghamdi@durham.ac.uk.

I would be appreciative if you could complete the following consent form.

Thanking you in advance.

Azzah Alghamdi

Do you wish to take part in this study?

Yes No

Do you agree to record your lessons by using audio recording? (Female teachers)

Yes No

Do you agree to record your interview by using audio recording?

Yes No

Signed: _______________ Date: _____________

The Arabic Version of the Consent Letter to Teachers

موافقة على الاشتراك في البحث

عزيزي المعلم \ عزيزتي المعلمة

أنا طالبة دكتوراة في جامعة درم في بريطانيا . موضوع بحثي يتمركز حول استخدام المعلمين والمعلمات للسبورة التفاعلية (السبورة الذكية) في المدارس المطبقة لمشروع الملك عبدالله بن عبدالعزيز (مشروع تطوير).

الغرض من هذه الدراسة هو:

1) التعرف على الطرق التدريسية للمعلمين والمعلمات عند استخدام السبورة التفاعلية
2) تقصي اتجاهات المعلمين والمعلمات وميولهم نحو استخدام السبورة التفاعلية
3) التعرف على المشاكل التي تواجههم
4) تحديد الاحتياجات التدريبية لهم

وبالتالي فإن هذه الدراسة تهدف الى: الارتقاء بالعملية التعليمية في المملكة العربية السعودية وسوف تساهم في تطوير استخدام السبورة التفاعلية في المدارس السعودية عن طريق تقييم الطرق التدريسية والمهارات الحالية للمعلمين والمعلمات وكذلك تحديد المهارات المطلوبة علما بأن جميع المعلومات سوف تستخدم لأهداف البحث فقط وسوف تعامل بسرية تامة.

هذا البحث يتطلب زيارة صفية لعدد من المعلمات في مدارس البنات المطبقة لمشروع تطوير في مدينة جدة بالاضافة مقابلة شخصية مع المعلمين\ات في مدارس التطوير في مدينة جدة. جميع المعلومات ستعامل بسرية تامة وسوف تحفظ في مكان امن . أن مشاركتك في هذا البحث تطوعية ولك الحق في الانسحاب من الدراسة.

شكرا جزيلا

عزة الغامدي

ارجو اكمال التالي:

هل ترغب\ي في المشاركة في هذه الدراسة؟

نعم لا

هل توافقي على تسجيل دروسك باستخدام التسجيل الصوتي؟ (للمعلمات)

نعم لا

هل توافق\ي على تسجيل المقابلة الشخصية باستخدام التسجيل الصوتي؟

نعم لا

امضاء المشارك\ة:.. التاريخ :..................................

امضاء الشاهد\ة :.. التاريخ :..................................

Appendix 10: Letter Regarding Conducting the Field Study

Durham University

School of Education

24th April, 2015

Saudi Arabian Cultural Bureau
630 Chiswick High Road
London
W4 5RY

Dear Sir/Madam

Re Azzah Hamed Alghamdi

I am the supervisor for Azzah Hamed Alghamdi for her PhD studies on "How Saudi Primary Teachers Use Interactive White Boards And What Are Their Training Needs?" in the School of Education at Durham University.

She intends to travel to Saudi Arabia from 1/10/2015 to 1/1/2016 to undertake her research, this will be completed in accordance with her research design and the ethical permissions she has been granted by the School of Education's Ethics Committee.

I would ask you to please give whatever support you can to facilitate her research.

Yours sincerely

S. C. Higgins

Professor Steven Higgins
School of Education, Durham University
Leazes Road, Durham, DH1 1TA, UK
Tel: 0191 334 8359
s.e.higgins@durham.ac.uk

Appendix 11: Letter from Saudi Arabian Cultural Bureau

بسم الله الرحمن الرحيم

ROYAL EMBASSY OF SAUDI ARABIA
CULTURAL BUREAU
LONDON

سفارة المملكة العربية السعودية
الملحقية الثقافية
لندن

2015/01/06

إفـــــادة

تفيد الملحقية الثقافية بسفارة المملكة العربية السعودية في لندن بأن الطالبة / عزة حامد داحش الغامدي مبتعثة من قبل وزارة التعليم العالي لدراسة الدكتوراه في تخصص التربية في جامعة Durham اعتباراً من 2014/1/2 إلى تاريخ 2016/12/31.

وبناءً على توصية المشرف الدراسي على بحث الدكتوراه ستتقدم المبتعثة بطلب القيام برحلة علمية إلى المملكة العربية السعودية لإكمال إجراءات بحثها:

"In-service Saudi teachers and interactive whiteboards: Current use and training needs "

ونظراً لضرورة إرفاق موافقة من الجهة المستضيفة في المملكة لاستكمال طلب الموافقة على الرحلة العلمية تم منحها هذا الخطاب بناء على طلبها وذلك لتقديمه إلى إدارة التعليم في جدة.

وتقبلوا خالص التحية والتقدير،،،

الملحق الثقافي

بسفارة المملكة العربية السعودية في لندن

فيصل بن محمد المهنا أباالخيل

ROYAL EMBASSY OF SAUDI ARABIA-LONDON CULTURAL BUREAU

الرقم : .... التاريخ : .... الموافق : .... المرفقات : ....

630 Chiswick High Road, London W4 5RY Tel: +44 (0) 20 3249 7000 Fax: +44 (0) 20 3249 7001 E-mail: sacbuk@uksacb.org
www.uksacb.org

Appendix 12: Letter from the Education Department in Jeddah

المملكة العربية السعودية
وزارة التربية والتعليم
(٢٨٠)
الإدارة العامة للتربية والتعليم بمحافظة جدة
إدارة التخطيط والتطوير

وزارة التربية والتعليم
Ministry of Education

الرقم: ٣٦٧٩٦٣٢٢
التاريخ: ١٩/٤/١٤٣٦هـ
المرفقات: —

إلى : سعادة الملحق الثقافي بسفارة المملكة العربية السعودية بلندن المحترم

من : مدير عام التربية والتعليم بمحافظة جدة .

بشأن : تسهيل مهمة الباحثة / عزة حامد داحش الغامدي

السلام عليكم ورحمة الله وبركاته ، وبعد

بناء على الإفادة الصادرة من الملحقية الثقافية بلندن رقم **JU50/2** بتاريخ ٢٠١٥/١/٦ (المرفق) حول إفادتكم عن عزة حامد داحش الغامدي المبتعثة للدراسة للحصول على درجة الدكتوراه في تكنلوجيا التعليم بجامعة درم (DURHAM)، ووفق ما تتطلبه الاجراءات من الملحقية الثقافية ، واستكمالا لتسهيل مهمتها في بحثها الذي بعنوان " **استخدام المعلمين والمعلمات للسبورة التفاعلية (السبورة الذكية) في المدارس المطبقة لمشروع الملك عبد الله بن عبد العزيز (مشروع تطوير)** " والذي ترغب تطبيقه على معلمين و معلمات في مدارس تطوير بتعليم محافظة جدة .

نفيدكم أنه لا مانع لدينا من إجراء دراستها وتطبيق أدوات بحثها في تعليم محافظة جدة ، مع تمنياتنا لها بالتوفيق .

السلام عليكم ورحمة الله وبركاته

عبد الله بن أحمد الثقفي

ص/ لإدارة التخطيط والتطوير .

هاتف ٦٤٤٤٣٠٥ - فاكس ٦٤٣٤٠٤٠ - الرمز البريدي : ٢١١٥٨

Appendix 13: Descriptive Statistics

13.1. GENERAL INFORMATION

Table 1: Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	286	48.7	48.7	48.7
Female	301	51.3	51.3	100.0
Total	587	100.0	100.0	

Table 2: Experience in teaching

	Frequency	Percent	Valid Percent	Cumulative Percent
less than one year	8	1.4	1.4	1.4
1-5 years	86	14.7	14.7	16.0
6-10	69	11.8	11.8	27.8
More than 10 years	424	72.2	72.2	100.0
Total	587	100.0	100.0	

Table 3: Fields of teaching

	Frequency	Percent	Valid Percent	Cumulative Percent
Mathematics	110	18.7	18.7	18.7
Science	100	17.0	17.0	35.8
Social Sciences	54	9.2	9.2	45.0
Computer Sciences	16	2.7	2.7	47.7
Foreign Language (English)	74	12.6	12.6	60.3
Islamic Sciences	94	16.0	16.0	76.3
Arabic Language and Literature	99	16.9	16.9	93.2
Special needs	11	1.9	1.9	95.1
other	29	4.9	4.9	100.0
Total	587	100.0	100.0	

Table 4: Teachers' workload

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 10	103	17.5	17.5	17.5
10-19	257	43.8	43.8	61.3
20-24	223	38.0	38.0	99.3
More than 24	4	.7	.7	100.0
Total	587	100.0	100.0	

Table 5: IWB locations in Tatweer primary schools

IWB Location	Frequency			Percent		Cumulative Percent
	yes	no	Total	yes	no	Total
Classroom	323	264	587	55.0	45.0	100.0
Resource Rooms	292	295	587	49.7	50.3	100.0
Laboratories	59	528	587	10.1	89.9	100.0
Other	12	575	587	2.0	98.0	100.0

13.2. TEACHERS' ATTITUDES TOWARDS USING IWBS IN THE TEACHING PROCESS

Table 6: Class time will be managed successfully by using IWBs

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	256	43.6	43.6	43.6
Agree	269	45.8	45.8	89.4
Neutral	36	6.1	6.1	95.6
Disagree	18	3.1	3.1	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 7: IWBs create more active lessons

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	315	53.7	53.7	53.7
Agree	226	38.5	38.5	92.2
Neutral	30	5.1	5.1	97.3
Disagree	8	1.4	1.4	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 8: IWBs facilitate discussions in classrooms

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	249	42.4	42.4	42.4
Agree	274	46.7	46.7	89.1
Neutral	38	6.5	6.5	95.6
Disagree	18	3.1	3.1	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 9: IWBs make teaching more enjoyable

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	338	57.6	57.6	57.6
Agree	220	37.5	37.5	95.1
Neutral	11	1.9	1.9	96.9
Disagree	10	1.7	1.7	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 10: IWBs help teachers to prepare lessons

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	269	45.8	45.8	45.8
Agree	242	41.2	41.2	87.1
Neutral	54	9.2	9.2	96.3
Disagree	8	1.4	1.4	97.6
Strongly disagree	14	2.4	2.4	100.0
Total	587	100.0	100.0	

Table 11: IWBs help in visualising course content

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	358	61.0	61.0	61.0
Agree	198	33.7	33.7	94.7
Neutral	15	2.6	2.6	97.3
Disagree	8	1.4	1.4	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 12: IWBs help in facilitating content teaching

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	315	53.7	53.7	53.7
Agree	216	36.8	36.8	90.5
Neutral	42	7.2	7.2	97.6
Disagree	6	1.0	1.0	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 13: IWBs help in strengthening the content knowledge

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	194	33.0	33.0	33.0
Agree	246	41.9	41.9	75.0
Neutral	113	19.3	19.3	94.2
Disagree	16	2.7	2.7	96.9
Strongly disagree	18	3.1	3.1	100.0
Total	587	100.0	100.0	

Table 14: IWBs help in designing content-based activities in classrooms

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	286	48.7	48.7	48.7
Agree	240	40.9	40.9	89.6
Neutral	35	6.0	6.0	95.6
Disagree	8	1.4	1.4	96.9
Strongly disagree	18	3.1	3.1	100.0
Total	587	100.0	100.0	

Table 15: IWBs help in improving the teaching methods to develop students' learning

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	287	48.9	48.9	48.9
Agree	248	42.2	42.2	91.1
Neutral	34	5.8	5.8	96.9
Disagree	10	1.7	1.7	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 16: IWBs help teachers in teaching the content with appropriate teaching style

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	269	45.8	45.8	45.8
Agree	262	44.6	44.6	90.5
Neutral	34	5.8	5.8	96.3
Disagree	14	2.4	2.4	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

13.3. TEACHERS' ATTITUDES TOWARDS USING IWBS IN STUDENT LEARNING

Table 17: IWBs help in improving students' learning

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	284	48.4	48.4	48.4
Agree	240	40.9	40.9	89.3
Neutral	43	7.3	7.3	96.6
Disagree	8	1.4	1.4	98.0
Strongly disagree	12	2.0	2.0	100.0
Total	587	100.0	100.0	

Table 18: IWBs help in facilitating collaborative learning

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	237	40.4	40.4	40.4
Agree	256	43.6	43.6	84.0
Neutral	74	12.6	12.6	96.6
Disagree	12	2.0	2.0	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 19: IWBs help in enhancing students' attention in the class

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	304	51.8	51.8	51.8
Agree	229	39.0	39.0	90.8
Neutral	34	5.8	5.8	96.6
Disagree	8	1.4	1.4	98.0
Strongly disagree	12	2.0	2.0	100.0
Total	587	100.0	100.0	

Table 20: IWBs help in increasing students' motivation in the class

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	305	52.0	52.0	52.0
Agree	210	35.8	35.8	87.7
Neutral	51	8.7	8.7	96.4
Disagree	13	2.2	2.2	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 21: IWBs help in increasing students' interaction in the class

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	267	45.5	45.5	45.5
Agree	240	40.9	40.9	86.4
Neutral	55	9.4	9.4	95.7
Disagree	17	2.9	2.9	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 22: IWBs enable students to use them in the classroom

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	272	46.3	46.3	46.3
Agree	239	40.7	40.7	87.1
Neutral	58	9.9	9.9	96.9
Disagree	6	1.0	1.0	98.0
Strongly disagree	12	2.0	2.0	100.0
Total	587	100.0	100.0	

Table 23: IWBs help students to understand difficult concepts

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	262	44.6	44.6	44.6
Agree	224	38.2	38.2	82.8
Neutral	72	12.3	12.3	95.1
Disagree	21	3.6	3.6	98.6
Strongly disagree	8	1.4	1.4	100.0
Total	587	100.0	100.0	

13.4. THE USE OF IWBS

Table 24: The experience of using IWBs

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 1 year	250	42.6	42.6	42.6
1-5 years	303	51.6	51.6	94.2
More than 5 years	34	5.8	5.8	100.0
Total	587	100.0	100.0	

Table 25: The frequency of use of IWBs in lessons

	Frequency	Percent	Valid Percent	Cumulative Percent
Seldom	133	22.7	22.7	22.7
Sometimes(for specific subjects)	180	30.7	30.7	53.3
Often(most lessons)	168	28.6	28.6	81.9
Always(every lesson)	106	18.1	18.1	100.0
Total	587	100.0	100.0	

Table 26: Using IWB features

	Frequency	Percent	Valid Percent	Cumulative Percent
I use the IWB as an ordinary white/ blackboard.	108	18.4	18.4	18.4
I use the IWB with a few interactive features	252	42.9	42.9	61.3
I use the IWB with most of the interactive features	227	38.7	38.7	100.0
Total	587	100.0	100.0	

Table 27: Teachers' approaches to using IWBs in classroom

	Frequency	Percent	Valid Percent	Cumulative Percent
You, as a teacher, only use IWB	108	18.4	18.4	18.4
Students occasionally use the IWB (once every few weeks)	252	42.9	42.9	61.3
Students frequently use the IWB (several times a week)	227	38.7	38.7	100.0
Total	587	100.0	100.0	

Table 28: Teachers' ability to use IWBs and their tools in lessons

	Frequency	Percent	Valid Percent	Cumulative Percent
Unable	238	40.5	40.5	40.5
Competent	297	50.6	50.6	91.1
Proficient	52	8.9	8.9	100.0
Total	587	100.0	100.0	

Table 29: Descriptive statistics (The audience)

	Mean	Std. Deviation
Whole class teaching	0.90	0.31
Small groups	0.20	0.40
With individuals	0.08	0.27

Table 30: The audiences in classrooms when using IWBs

	Frequency			Percent		
	yes	**no**	**Total**	**yes**	**no**	**Total**
Whole class teaching	526	61	587	89.6	10.4	100.0
Small groups	119	468	587	20.3	79.7	100.0
With individuals	46	541	587	7.8	92.2	100.0

13.5. DIFFICULTIES AND CHALLENGES IN USING IWBS

Table 31: Descriptive statistics (Difficulties and challenges)

	Mean	**Std. Deviation**
Lack of training courses	0.54	0.50
Technical problems when using IWBs	0.52	0.50
Lack of assistance and support	0.48	0.50
Lack of educational resources	0.34	0.47
Lack of time for designing educational resources	0.28	0.45
Unavailability of IWBs	0.27	0.44
Students find difficulties with IWBs	0.19	0.39
Location of IWBs	0.18	0.39
Difficulties in integrating IWBs in my teaching lessons	0.18	0.38

Table 32: Difficulties that faced teachers in Tatweer primary schools when using IWBs

	Frequency			Percent		
	yes	**no**	**Total**	**yes**	**no**	**Total**
Lack of training courses	318	269	587	54.2	45.8	100.0
Technical problems when using IWBs	304	283	587	51.8	48.2	100.0
Lack of assistance and support	283	304	587	48.2	51.8	100.0
Lack of educational resources	200	387	587	34.1	65.9	100.0
Lack of time for designing educational resources	167	420	587	28.4	71.6	100.0
Unavailability of IWBs	156	431	587	26.6	73.4	100.0
Students find difficulties with IWBs	113	474	587	19.3	80.7	100.0
Location of IWBs	107	480	587	18.2	81.8	100.0
Difficulties in integrating IWBs in my teaching lessons	105	482	587	17.9	82.1	100.0

13.6. TEACHERS' TRAINING

Table 33: Descriptive statistics (Training sources)

	Mean	Std. Deviation
Self-trained	0.41	0.49
By a colleague	0.32	0.47
By the education department	0.26	0.44
No training	0.15	0.36
By private organizations	0.06	0.23

Table 34: Teachers' training Sources

	Frequency			Percent		
	yes	no	Total	yes	no	Total
Self-trained	241	346	587	41.1	58.9	100.0
By a colleague	189	398	587	32.2	67.8	100.0
By the education department	152	435	587	25.9	74.1	100.0
No training	88	499	587	15.0	85.0	100.0
By private organizations	34	553	587	5.8	94.2	100.0

Table 35: The number of IWB training courses

	Frequency	Percent	Valid Percent	Cumulative Percent
None	349	59.5	59.5	59.5
1-3	230	39.2	39.2	98.6
More than 5	8	1.4	1.4	100.0
Total	587	100.0	100.0	

Table 36: Reasons that prevent teachers from attending training courses

	Frequency			Percent		
	yes	no	Total	yes	no	Total
Unavailability of IWB training courses	304	283	587	51.8	48.2	100.0
Attending training courses are time consuming	39	548	587	6.6	93.4	100.0
These courses are held in other cities	36	551	587	6.1	93.9	100.0
IWB training courses are not necessary	23	564	587	3.9	96.1	100.0
I have appropriate skills in using IWBs	20	567	587	3.4	96.6	100.0
IWB training courses do not improve my teaching	16	571	587	2.7	97.3	100.0
I dislike attending courses that relate to technology use	8	579	587	1.4	98.6	100.0

Table 37: Teachers' satisfaction towards the training they have received

	Frequency	Percent	Valid Percent	Cumulative Percent
Very satisfied	58	9.9	9.9	9.9
Satisfied	130	22.1	22.1	32
Neutral	332	56.6	56.6	88.6
Dissatisfied	67	11.4	11.4	100.0
Total	587	100.0	100.0	

Table 38: Teachers' answers regarding receiving assistance when using IWBs

	Frequency	Percent	Valid Percent	Cumulative Percent
Always	82	14.0	14.0	14.0
Sometimes	288	49.1	49.1	63.0
Seldom	143	24.4	24.4	87.4
Never	74	12.6	12.6	100.0
Total	587	100.0	100.0	

Table 39: Teachers' answers regarding the need for further training

	Frequency	Percent	Valid Percent	Cumulative Percent
A lot of need	323	55.0	55.0	55.0
little need	236	40.2	40.2	95.2
No need	28	4.8	4.8	100.0
Total	587	100.0	100.0	

Table 40: Descriptive statistics (Training needs)

	Mean	Std. Deviation
Technical Skills in the use of IWBs	0.66	0.47
Effective Teaching Techniques by using IWBs	0.56	0.50
Designing Educational Resources compatible with IWBs	0.47	0.50

Table 41: Teachers' training needs

	Frequency			Percent		
	yes	no	Total	yes	no	Total
Technical skills in the use of IWB	389	198	587	66.3	33.7	100.0
Effective teaching techniques by using IWB	331	256	587	56.4	43.6	100.0
Designing educational resources compatible with IWBs	274	313	587	46.7	53.3	100.0

Table 42: Descriptive statistics (Training method preferences)

	Mean	Std. Deviation
Attend training courses and workshops	0.71	0.45
Observe lessons of skilled educators	0.53	0.50
Collaboration with colleagues	0.36	0.48
More time for self-training	0.25	0.43

Table 43: Teachers' training methods preferences

	Frequency			Percent		
	yes	no	Total	yes	no	Total
Attend training courses and workshops	417	170	587	71.0	29.0	100.0
Observe lessons of skilled educators	312	275	587	53.2	46.8	100.0
Collaboration with colleagues	209	378	587	35.6	64.4	100.0
More time for self-training	147	440	587	25.0	75.0	100.0

Appendix 14: Chi-Square and Fisher's Exact Tests

14.1. THE LOCATION OF IWBS

Table 11: The frequent use of IWBs in lessons and their location in classrooms

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	52.390 a	3	.000	.000		
Likelihood Ratio	55.153	3	.000	.000		
Linear-by-Linear Association	43.766b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 47.67.

b. The standardized statistic is 6.616.

Table 2: The frequent use of IWBs in lessons and their location in resource rooms

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	56.050 a	3	.000	.000		
Likelihood Ratio	58.151	3	.000	.000		
Linear-by-Linear Association	43.095b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 52.73.

b. The standardized statistic is -6.565.

Table 3: The frequent use of IWBs in lessons and their location in laboratories

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.398 a	3	.334	.340		
Likelihood Ratio	3.309	3	.346	.360		
Linear-by-Linear Association	.260b	1	.610	.641	.329	.047
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.65.

b. The standardized statistic is -.510.

Table 4: The frequent use of IWBs in lessons and their location in other places (libraries)

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	11.513 a	3	.009	.007		
Likelihood Ratio	15.750	3	.001	.002		
Fisher's Exact Test	11.285			.003		
Linear-by-Linear Association	6.573b	1	.010	.010	.006	.004
N of Valid Cases	587					

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 2.17.

b. The standardized statistic is -2.564.

14.2. THE EXPERIENCE IN USING IWBS

Table 5: The experience in using IWBs and their frequent use

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	211.230 a	6	.000	.b		
Likelihood Ratio	236.626	6	.000	.b		
Linear-by-Linear Association	177.031c	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.14.
b. Cannot be computed because there is insufficient memory.
c. The standardized statistic is 13.305.

Table 6: Teachers' experience in using IWBs and using their features

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	150.959 a	4	.000	.000		
Likelihood Ratio	168.761	4	.000	.000		
Linear-by-Linear Association	136.708b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.26.
b. The standardized statistic is 11.692.

Table 7: Teachers' experience in using IWBs and their competence

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	12.090 a	4	.017	.017		
Likelihood Ratio	14.892	4	.005	.006		
Fisher's Exact Test	12.177			.014		
Linear-by-Linear Association	.533b	1	.465	.470	.250	.034
N of Valid Cases	587					

a. 1 cells (11.1%) have expected count less than 5. The minimum expected count is 3.01.
b. The standardized statistic is .730.

Table 8: Teachers' experience in using IWBs and their needs for further training

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	53.119 a	4	.000	.000		
Likelihood Ratio	54.017	4	.000	.000		
Fisher's Exact Test	54.161			.000		
Linear-by-Linear Association	46.641b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 1 cells (11.1%) have expected count less than 5. The minimum expected count is 1.62.
b. The standardized statistic is 6.829.

14.3. TEACHERS' ATTITUDE TOWARDS USING IWBS

Table 9: The frequency of using IWBs and teachers' attitudes towards using them

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	11.627 a	3	.009	.008		
Likelihood Ratio	11.647	3	.009	.009		
Linear-by-Linear Association	5.320b	1	.021	.024	.012	.004
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.56.

b. The standardized statistic is -2.306.

Table 10: Teachers' experience in using IWBs and their attitudes towards these technologies

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4.697 a	2	.096	.085		
Likelihood Ratio	8.369	2	.015	.023		
Fisher's Exact Test	5.435			.062		
Linear-by-Linear Association	.598 b	1	.439	.501	.255	.067
N of Valid Cases	587					

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.71.
b. The standardized statistic is -.773.

14.4. TEACHERS' TRAINING

Table 11: The capacity of using IWBs and not having training

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	43.851a	2	.000	.000		
Likelihood Ratio	49.419	2	.000	.000		
Linear-by-Linear Association	41.805b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.80.

Table 12: Untrained Teachers and their use of IWB features

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	40. 376 a	2	.000	.000		
Likelihood Ratio	40.543	2	.000	.000		
Linear-by-Linear Association	39. 995 b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.19.
b. The standardized statistic is -6.324.

Table 13: Untrained Teachers and their approaches to using IWBs in classrooms

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	40.376 a	2	.000	.000		
Likelihood Ratio	40.543	2	.000	.000		
Linear-by-Linear Association	39.995 b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.19.

b. The standardized statistic is -6.324.

Table 14: The number of IWB training courses and the use of feature

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	50.772 a	4	.000	.000		
Likelihood Ratio	57.561	4	.000	.000		
Fisher's Exact Test	52.616			.000		
Linear-by-Linear Association	37.124b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 3 cells (33.3%) have expected count less than 5. The minimum expected count is 1.47.

b. The standardized statistic is 6.093.

Table 15: The number of IWB training courses and satisfaction with the level of training

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	602. 842 a	6	.000	.000		
Likelihood Ratio	728.274	6	.000	.000		
Fisher's Exact Test	709.604			.000		
Linear-by-Linear Association	356. 322 b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 4 cells (33.3%) have expected count less than 5. The minimum expected count is .79.

14.5. TEACHERS' GENDER

Table 16: Teachers' gender and their attitudes towards using IWBs

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.376 a	1	.123	.145	.079	
Continuity Correction b	1.985	1	.159			
Likelihood Ratio	2.381	1	.123	.145	.079	
Linear-by-Linear Association	2.372c	1	.124	.145	.079	.032
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 31.18.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.540.

Table 17: Teachers' gender and the frequent use of IWBs

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	21.819 a	3	.000	.000		
Likelihood Ratio	22.070	3	.000	.000		
Fisher's Exact Test	21.911			.000		
Linear-by-Linear Association	1.719b	1	.190	.199	.102	.014
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 51.65.

b. The standardized statistic is 1.311.

Table 18: Teachers' gender and their experience in using IWBs

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	25.321 a	2	.000	.000		
Likelihood Ratio	27.948	2	.000	.000		
Linear-by-Linear Association	16.704 b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.57.
b. The standardized statistic is -4.087.

Table 19: Teachers' gender and their use of IWB features

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	18.602 a	2	.000	.000		
Likelihood Ratio	18.698	2	.000	.000		
Fisher's Exact Test	18.615			.000		
Linear-by-Linear Association	13.179b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 52.62.

b. The standardized statistic is -3.630.

Table 20: Teachers' gender and their ability to use IWBs

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	7.892 a	2	.019	.019		
Likelihood Ratio	8.019	2	.018	.019		
Fisher's Exact Test	7.900			.019		
Linear-by-Linear Association	3.210b	1	.073	.076	.042	.011
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 25.34.

b. The standardized statistic is -1.792.

Table 21: Teachers' gender and their approaches in using IWBs in classrooms

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	18.602a	2	.000	.000		
Likelihood Ratio	18.698	2	.000	.000		
Linear-by-Linear Association	13.179b	1	.000	.000	.000	.000
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 52.62.

b. The standardized statistic is -3.630.

Table 22: Teachers' gender and the number of the received IWB training courses

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4.177 a	2	.124	.138		
Likelihood Ratio	4.186	2	.123	.138		
Fisher's Exact Test	4.234			.125		
Linear-by-Linear Association	2.874 b	1	.090	.097	.052	.014
N of Valid Cases	587					

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 3.90.

b. The standardized statistic is 1.695.

Table 23: Teachers' gender and the need for further training

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	10.356 a	2	.006	.005		
Likelihood Ratio	10.383	2	.006	.006		
Linear-by-Linear Association	9.307 b	1	.002	.002	.001	.001
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.64.

b. The standardized statistic is -3.051.

Table 24: Teachers' gender and their choice of technical skills in the use of IWBs

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.219 a	1	.136	.139	.080	
Continuity Correction b	1.967	1	.161			
Likelihood Ratio	2.220	1	.136	.139	.080	
Linear-by-Linear Association	2.216 c	1	.137	.139	.080	.023
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 96.47.
b. Computed only for a 2x2 table
c. The standardized statistic is 1.489.

Table 25: Teachers' gender and their choice of effective teaching techniques by using IWBs

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	9.256 a	1	.002	.003	.002	
Continuity Correction b	8.757	1	.003			
Likelihood Ratio	9.277	1	.002	.003	.002	
Linear-by-Linear Association	9.240 c	1	.002	.003	.002	.001
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 124.73.
b. Computed only for a 2x2 table
c. The standardized statistic is 3.040.

Table 26: Teachers' gender and their choice of designing educational resources

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.007 a	1	.934	1.000	.500	
Continuity Correction b	.000	1	1.000			
Likelihood Ratio	.007	1	.934	1.000	.500	
Linear-by-Linear Association	.007 c	1	.934	1.000	.500	.066
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 133.50.
b. Computed only for a 2x2 table
c. The standardized statistic is .083.

Table 27: Teachers' gender and their preference for attending training courses and workshops

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.201 a	1	.074	.084	.045	
Continuity Correction b	2.884	1	.089			
Likelihood Ratio	3.210	1	.073	.084	.045	
Linear-by-Linear Association	3.196 c	1	.074	.084	.045	.015
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 82.83.
b. Computed only for a 2x2 table
c. The standardized statistic is -1.788.

Table 28: Teachers' gender and their preference for observing lessons of skilled educators

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.000 a	1	.998	1.000	.532	
Continuity Correction b	.000	1	1.000			
Likelihood Ratio	.000	1	.998	1.000	.532	
Linear-by-Linear Association	.000 c	1	.998	1.000	.532	.066
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 133.99.
b. Computed only for a 2x2 table
c. The standardized statistic is .002.

Table 29: Teachers' gender and their preference for collaboration with colleagues

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.436 a	1	.509	.546	.283	
Continuity Correction b	.330	1	.566			
Likelihood Ratio	.436	1	.509	.546	.283	
Linear-by-Linear Association	.435 c	1	.509	.546	.283	.055
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 101.83.
b. Computed only for a 2x2 table
c. The standardized statistic is .660.

Table 30: Teachers' gender and their preference for self-training

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.740 a	1	.009	.010	.006	
Continuity Correction b	6.255	1	.012			
Likelihood Ratio	6.785	1	.009	.010	.006	
Linear-by-Linear Association	6.729 c	1	.009	.010	.006	.003
N of Valid Cases	587					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 71.62.
b. Computed only for a 2x2 table
c. The standardized statistic is 2.594.

Appendix 15: A Published Conference Paper Alghamdi and Higgins (2015)

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INVESTIGATING HOW TEACHERS IN PRIMARY SCHOOLS IN SAUDI ARABIA WERE TRAINED TO USE INTERACTIVE WHITEBOARDS AND WHAT THEIR TRAINING NEEDS WERE

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***Abstract*— The aim of this paper is to present some of the quantitative findings from a PhD study related to teachers' training in using IWBs in primary schools which participated in *Tatweer* project in the city of Jeddah, in Saudi Arabia. Therefore, this paper concentrates on investigating how Saudi teachers in primary schools were trained to use IWBs and examines gender differences, extent of training, the types of training they need, and their training preferences. The sample of this study consisted of 587 teachers (286 males and 301 females) from primary *Tatweer* schools in the city of Jeddah during the academic year 2014-2015. The quantitative findings of this study indicated that the lack of providing training courses to Saudi teachers had an important effect on their IWB skills and satisfaction about their level of training, leading them to depend on themselves or their colleagues to improve their capabilities. Moreover, training in both technical and pedagogical skills as well as providing support from the school administration is essential for effective integrating of IWBs in classrooms. Female teachers' responses in this study indicated greater need for training in effective teaching techniques using IWBs and greater preference for self-training methods than males.**

***Keywords*— Interactive Whiteboards; Saudi teachers; Teachers' training; *Tatweer* project.**

I. INTRODUCTION

The presence of Interactive whiteboards (IWBs) in schools has encouraged many researchers to examine their effects on instruction and learning processes [1]. Therefore, there are many studies that have examined the usage of IWBs in the classroom and their effects on education [2]. IWBs have a number of advantages agreed in the literature for both educators and learners. According to Glover, Miller, Averis, and Door [3], although teachers may take longer to arrange their lessons by using IWBs, the positive effects of using IWBs in teaching and learning process are valuable. IWBs increa students' motivation and focus, introduce different learnii methods whether visual or audio, enable importing vario resources, offer greater lesson planning, and present learnii resources obviously [3]. The effective use of IWBs requir educators to understand the methods of interactive teaching l using technology to have remarkable effects on stude learning. However, this needs more appropriate trainii courses for teachers that focus on changing their pedagogy [: Nevertheless, if there were no provision of these courses, tl outcome could be very unsatisfactory [2]. Moreover, previo studies have indicated that instructive innovations failed wh educators have not been supported with suitable skills to u them effectively [4]. Therefore, teachers need continuii professional development (CPD) to ensure their growth ai improvement. Importantly, it is important to conne professional development programs with students' syllabu effective teaching strategies, teachers' real needs, and scho objectives to improve CPD programs in Saudi schoo However, according to Alharbi [5], "professional developme programs in Saudi Arabia are designed nationally ai delivered through Local Education Authorities (LEAs) with ; absence of the voice of others."(p. 53).

Thus, the views of teachers in Saudi schools towards the current skills and their real needs should be investigated support the design of successful training courses relating to tl use of IWBs. There are only a few studies that ha investigated IWBs in Saudi Arabia [6; 7; 8; 9; 10; 11]. A these studies agree about the limited skills of Saudi teachers using this technology. However, no single study h investigated how Saudi teachers have been trained to u IWBs, what are their sources of training, their satisfactic about their training, their training methods preferences, ai

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their IWB training needs, therefore, this calls for a study that aims to contribute to this field by adding new knowledge in this area and fill the gap in Saudi literature specifically and the international literature more broadly.

Moreover, several educational studies relating to IWB technology [12;13;14] investigated students' gender differences and other studies [15;16] examined teachers' gender differences regarding their attitudes towards using IWBs. However, there are a lack of studies that investigate teachers' gender differences, in relation to the number of training courses, the types of training they need, and their training methods preferences. Thus, this study contributes to filling this gap in the literature. Especially, the educational system in Saudi Arabia is only based on single-sex schools and therefore, there are separate and different training courses for male and female teachers with different coaches.

In 2007, a large-scale project called the King Abdullah Project for General Education Development (*Tatweer* project) was launched aiming to improve education in public schools in Saudi Arabia. This project aims to train teachers in Saudi schools through improving continuing professional development programs. However, teachers' training can either meet the real needs of teachers or fail to reach these needs and consequently, increase their dissatisfaction and prevent them from improving their skills effectively [17]. Therefore, the views of teachers in Saudi schools towards their current training and their real needs should be accurately investigated for designing successful training courses relating to the use of IWBs.

II. The Importance of Training Teachers to Use Interactive Whiteboards

The professional development of teachers is an important factor to ensure the production of active lessons [18]. Professional development programs enhance teachers' satisfaction and consequently increase their desire for teaching [19]. They are also considered an important factor that help schools in improving the quality of teaching and learning [20] and that because they increase teachers' confidence, skills, and enjoyment [21]. Many opportunities can be offered to teachers when new technologies introduced in classrooms, and this can lead to enhancing their teaching abilities as well as improving their creativity [22]. However, incorporating new kinds of technology into classrooms is regarded as a vital issue for all teachers in the twenty-first century [23]. Therefore, it is essential to examine precisely the professional development of teachers and how this relates to technology [24]. Indeed, training courses act as a moderator that aids educators to be autonomous and self-guided learners, so developing their IWB skills and gaining in confidence with this technology [25].

There is no doubt that introducing innovative technologies in schools could create conflict and problems, and consequently instructors and learners could be affected [26]. Therefore, providing educators with appropriate skills and approaches to face technology obstacles is essential for more effective use of technology [27]. Teacher training should be considered when using IWBs to improve the quality of thei teaching [28].

Educators should have suitable technical and pedagogica skills in using IWBs in classrooms to enhance thei performance [29]. Therefore, they need more than installin IWBs in their classrooms; they need adequate training an support [30]. When educators have suitable training, they ca integrate IWBs into their lessons to improve the value o interactions in classrooms [30]. Moreover, communa preparation time with colleagues could be essential in th effective use of the technology [31]. Shenton and Pagett [32 conducted a study that aimed to explore the use of IWBs in th UK. The results of this study indicated that self-training an collaborating with colleagues were the most appropriat teacher training sources, and they could be more efficien factors in improving teachers' skills for best use of IWBs. I contrast, a study carried out by Turel and Johnson [33 revealed that most educators (67%) gained their training by th educational institution or by the provider of IWBs. The lowe percentage (26%) of teachers were self-trained. Howeve Higgins, Falzon, Hall, Moseley, Smith, Smith, and Wall [12 conducted a study to evaluate the UK's pilot projec (*Embedding ICT in the Literacy and Numeracy Strategies* where IWBs installed in more than 80 primary schools i England. This study showed that 81% of the instructors ha trained via their colleagues and by their local IWB consultant Furthermore, training courses were the most common IW training sources for the majority of teachers (86%) in thi project (ibid.).

To sum up, the necessity for continual, cooperative trainin is not only required for basic use, but is also needed to develo the full potential of IWBs, as well as it should concentrate o improving teachers' effectiveness [34]. However, educator lack technical and instructional abilities for more active use o IWBs, despite their constant training [35]. Additionall educators frequently lack training courses from providers an these courses only focus on the basic skills of IWBs [36].

III. The King Abdullah Project for General Education Development (*Tatweer* Project)

In 2007, the Saudi Council of Ministries launched a large scale project called the King Abdullah Project for Genera Education Development (*Tatweer* project). The budget of thi project was approximately SR 9 billion [37] which i equivalent to \$ 2.4 billion and £1.5 billion. The planne duration of this project was six years from 2007 to 2013 [37 Interestingly, in 2014 King Abdullah supported this projec with SR 80 billion (which is equivalent to approximately £13. billion) to improve Saudi public schools in the next five year [38].

This massive project aimed to improve the quality o education at all levels of public schools in all cities in Saud Arabia to meet the requirement of the 21st century. It focuse on five critical areas which are: 1) training Saudi educator through improving the regular professional developmen programs in order to successfully accomplish their tasks i

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classrooms; 2) developing educational curricula to be more suitable for social, mental, psychological, and the needs of students; 3) improving learning environment in all Saudi schools to motivate students and achieve high scores; 4) employing ICTs for increasing the quality of learning and teaching processes; and 5) supporting students' extracurricular activities aiming to improve their creativity, self-confidence, and social skills. The environment in classrooms has been enhanced by introducing modern technologies such as IWBs, demonstrating technologies, communications systems, and web services [39]. With regard to educator training, *Tatweer* project has several goals which are: introducing suitable training courses for all teachers, arranging for providing computer knowledge learning for educators as well as training them in integrating technology effectively in teaching, and preparing high skilled trainers [37].

Fifty Saudi secondary schools (25 male schools and 25 female schools), were selected to be involved in this project in the first stage, from different educational regions in the Kingdom of Saudi Arabia [40]. The number of schools participated in *Tatweer* project are significantly increased around the country. For example, the number of *Tatweer* schools in the city of Jeddah, in Saudi Arabia, until 2014 was 30 schools (ten primary schools, ten intermediate schools, and ten secondary schools). Then, in 2015 this number has doubled to be 60 *Tatweer* schools (twenty primary schools, twenty middle schools, and twenty secondary schools) [41].

IV. Purpose of the Study

This study aims to investigate how Saudi teachers in primary schools were trained to use IWBs. It aims also to examine teachers' gender differences, according to the number of training courses, the types of training they need, and the training methods preferences.

V. Questions of the Study

1) How Saudi teachers in primary schools were trained to use IWBs?
2) Are there any statistically significant differences between male and female Saudi teachers in terms of the number of IWB training courses they had received?
3) Are there any statistically significant differences between male and female Saudi teachers in terms of the types of training they need?
4) Are there any statistically significant differences between male and female Saudi teachers in terms of their training methods preferences?

VI. Methodology

The sample

The sample of this study consisted of 587 teachers (286 males and 301 females) from primary schools participated in *Tatweer* project in the city of Jeddah, in Saudi Arabia. This work conducted during the academic year 2014/2015 (*more details about the participants indicated in Table 1*).

Table 1: Number/percentage of the participants

		N	Percent
Gender	Male	286	49
	Female	301	51
Fields of teaching	Mathematics	110	19
	Science	100	17
	Social Sciences	54	9
	Computer Sciences	16	3
	Foreign Language (English)	74	13
	Islamic Sciences	94	16
	Arabic Language and Literature	99	17
	Special needs	11	2
	other	29	5
Teachers' workload	Less than 10	103	18
	10-19	257	44
	20-24	223	38
	More than 24	4	1
Experience of using IWBs	Less than one year	250	43
	1-5 years	303	52
	More than five years	34	6

Data collection

The mixed methods approach employed in this study. Data were collected by using a questionnaire, classroom observations, and semi-structured interviews. However, the findings from the utilization of the questionnaire will be only presented in this paper. The questionnaire consisted of two sections. The first part involves general information about the participants such as availability of IWBs, gender, teachers' experience, fields of teaching, teachers' workload, and the location of IWBs in schools. The second section consisted of eight multiple-choices questions to address teachers training regarding IWBs. Some of these questions adapted from two studies [33;42].

Validity and Reliability of the Instrument

The questionnaire was piloted with 15 Ph.D. students, in the UK, in the field of educational technology for both *face-validity* and *content-validity*. Therefore, some changes were done to produce the final version of the questionnaire. Additionally, Cronbach's alpha (α= 0.876) was calculated to ensure the *internal reliability* of the questionnaire.

Data analysis

The quantitative data was analyzed by using the Statistical Package for Social Sciences (SPSS v 21). Descriptive statistics

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were used in this study as well as Chi-Square test to identify any significant differences relating to gender.

VII. Findings

1) How Saudi teachers in primary schools were trained to use IWBs?

a) Training Sources

Table 2 indicates the training sources of Saudi teachers in *Tatweer* primary schools in Jeddah. Self-trained teachers had the highest mean score (M=0.41, SD=0.49), followed by training by colleagues (M=0.32, SD=0.47). Whereas, training from the education department (M=0.26, SD=0.44) was in the third place. The option of "no training" (M=0.15, SD=0.36) was in the fourth place, and the lowest mean scores were in favor of training by private organizations (M=0.06, SD=0.23).

Table 2: Descriptive statistics

	Mean	Std. Deviation
Self-trained	0.41	0.49
By a colleague	0.32	0.47
By the education department	0.26	0.44
No training	0.15	0.36
By private organizations	0.06	0.23

b) The number of IWB training courses

Table 3: The number of IWB training courses

	N	Percent
None	349	60
1-3	230	39
More than 5	8	1
Total	587	100

Table 3 present the number of IWB training courses that obtained by Saudi teachers in primary schools participated in *Tatweer* project. Fascinatingly, the majority of these teachers (60 %) did not receive any training courses, neither by the education department nor by private organizations. While 39% of teachers had training courses between 1-3 courses. However, only eight teachers (1%) who received more than five training courses relating to the use of IWBs.

c) Reasons that prevent Saudi teachers from attendin training courses

Table 4 clarifies the reasons that prevent Saudi teachers, i *Tatweer* schools in the city of Jeddah, from attending trainin courses regarding the use of IWBs in classrooms. Remarkably unavailability of IWB training courses was chosen by mos teachers (52%) while the rest of the reasons had a very lo percentage. The lowest percentage (1%) was in favor of (*dislike attending courses that relate to technology use*) whic was only selected by eight teachers.

Table 4: Reasons that prevent teachers from attending training courses

	N	Percent
Unavailability of IWB training courses	304	52
Attending training courses are time-consuming	39	7
These courses held in other cities	36	6
IWB training courses are not necessary	23	4
I have appropriate skills in using IWBs	20	3
IWB training courses do not improve my teaching	16	3
I dislike attending courses that relate to technology use	8	1

d) Saudi teachers' satisfaction towards their level of training

Table 5: Teachers' satisfaction towards their level of training

	N	Percent
Very satisfied	58	10
Satisfied	130	22
Neutral	332	57
Dissatisfied	67	11
Total	587	100.0

Table 5 shows teachers' satisfaction towards the level o training they had received. Interestingly, a large portion o Saudi teachers (57%) in the sample were neutral about showin their satisfaction towards their level of training while 22% o them were satisfied. A further 10 % were very satisfied However, 11% of the respondents were dissatisfied.

e) Saudi teachers' answers regarding receiving assistance when they encounter any difficulties relate to the use of IWBs?

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Table 6 presents Saudi teachers' replies to the availability of assistance in the event of problems regarding the use of IWBs. The majority of respondents 49 % indicated that they sometimes were provided by assistance, while, 24% of teachers revealed that they rarely find support. Only 14% of teachers who always find help. In contrast, 13% of Saudi teachers had never provided with any assistance when problems occur.

Table 6: Teachers' answers regarding receiving assistance when using IWBs

	N	Percent
Always	82	14
Sometimes	288	49
Seldom	143	24
Never	74	13
Total	587	100.0

f) Saudi teachers' answers regarding the need for further training in using IWBs?

Table 7: Teachers' answers regarding the need for further training

	N	Percent
A lot of needs	323	55
little need	236	40
No need	28	5
Total	587	100.0

Table 7 shows the responses of teachers regarding their needs for further training. Most teachers in the sample (55%) responded that they comprehensively need further training relate to the use of IWBs followed by 40% of teachers with little need for training. Nevertheless, a few percentage (5%) of teachers revealed that they did not need any more training, indicated that those teachers were proficient teachers in using this technology.

g) Saudi teachers' answers relating to the types of training they thought they needed to be effective users of IWBs?

Table 8 clarifies the type of training that chosen by Saudi teachers in primary schools for best and more efficient use of IWBs in classrooms. The option of "*Technical skills in the use of IWB*" (*M*=0.66, *SD*=0.47) had the highest mean scores. Then "*Effective teaching techniques by using IWB*" (*M*=0.56, *SD*=0.50) option, and finally "*designing educational resources compatible with IWBs*" (*M*=0.47, *SD*=0.50) option.

Table 8: Descriptive statistics

	Mean	Std. Deviation
Technical Skills in the use of IWB	0.66	0.47
Effective Teaching Techniques by using IWB	0.56	0.50
Designing Educational Resources compatible with IWBs	0.47	0.50

h) Teachers' training methods preferences

Table 9: Descriptive statistics

	Mean	Std. Deviation
Attend training courses and workshops	0.71	0.45
Observe lessons of skilled educators	0.53	0.50
Collaboration with colleagues	0.36	0.48
More time for self-training	0.25	0.43

Table 9 presents the most training methods favored by Saudi teacher in *Tatweer* primary schools. Remarkably, "*attend training courses and workshops"* (*M*=0.71, *SD*=0.45) had the highest mean scores. Followed by "*observe lessons of skilled educators"* (*M*=0.53, *SD*=0.50), while "*collaboration with colleagues*" option (*M*=0.36, *SD*=0.48) was in a third place. Finally, "*self-training"* (*M*=0.25, *SD*=0.43) had the lowest mean scores.

2) Are there any statistically significant differences between male and female Saudi teachers in terms of the number of IWB training courses they had received?

Table 10 presents the results of a cross tabulation between teachers' gender and the number of the received IWB training courses. Chi-square [$\chi 2$ (2, N=587) =4.177 and p=0.124],

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indicated that there was not a significant association at the 0.05 level in this case.

Table 10: Chi-Square test between teachers' gender and the number of IWB training courses

Gender	Number		Degree Of Freedom	Value Of (Chi-Square)	Statistical Significance
Male	286	587	2	4.177	0.124
Female	301				

3) Are there any statistically significant differences between male and female Saudi teachers in terms of the types of training they need?

a) The technical skills in the use of IWBs

Table 11: Chi-Square test between teachers' gender and their choice of technical skills in the use of IWBs

Gender	Number		Degree Of Freedom	Value Of (Chi-Square)	Statistical Significance
Male	286	587	1	2.219	0.136
Female	301				

Table 11 shows that a cross tabulation between teachers' gender and their choice of technical skills in the use of IWBs. Chi-square [$\chi2$ (1, N=587) =2.219, and p= 0.136] indicating a no significant association at the 0.05 level for this type of training.

b) The effective teaching techniques by using IWBs

In Table 12, Chi-square was $\chi2$ (1, N=587) =9.256, and p<0.05 indicating there was a significant association between teachers' gender and their reported need for effective teaching techniques using IWBs. As indicated in Table 13, 331 Saudi teachers from both gender selected training in effective teaching techniques by using IWBs. Thus, female teachers (57%) reported a greater need for improving their skills in this type of training courses than males (43%).

Table 12: Chi-Square test between teachers' gender and their choice of effective teaching techniques by using IWB

Gender	Number		Degree Of Freedom	Value Of (Chi-Square)	Statistical Significance
Male	286	587	1	9.256	0.002
Female	301				

Table 13: Teachers' gender and their choice of effective teaching techniques by using IWBs

		Effective teaching techniques by using IWB		Total
		No	*Yes*	
Gender	male	143	143	286
	female	113	188	301
Total		256	331	587

c) The designing educational resources compatible with IWBs

Table 14: Chi-Square test between teachers' gender and their choice of designing educational resources

Gender	Number		Degree Of Freedom	Value Of (Chi-Square)	Statistical Significance
Male	286	587	1	0.007	0.934
Female	301				

In Table 14, Chi-square was $\chi2$ (1, N=587) =0.007, and p= 0.934. Therefore, this association was not significant at the 0.05 level in terms of male and female teachers relating to their needs for training courses focused on designing educational resources compatible with IWBs.

4) Are there any statistically significant differences between male and female Saudi teachers in terms of their training methods preferences?

a) Attend training courses and workshops

Table 15 indicates the results of Chi-square [$\chi2$ (1, N=587) =3.201, and p= 0.074] through a cross tabulation between teachers' gender and their preference for attending training courses and workshops. Therefore, there was not a significant association in this case (at the 0.05 level).

Table 15: Chi-Square test between teachers' gender and their preference for attending training courses and workshops

Gender	Number		Degree Of Freedom	Value Of (Chi-Square)	Statistical Significance
Male	286	587	1	3.201	0.074
Female	301				

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b) *Observe lessons of skilled educators*

Table 16: Chi-Square test between teachers' gender and their preference for observing lessons of skilled educators

Gender	Number		Degree Of Freedom	Value Of (Chi-Square)	Statistical Significance
Male	286	587	1	0.000	0.998
Female	301				

p= 0.998 indicating that there was not a significant association between these two elements at the 0.05 level.

c) *Collaboration with colleagues*

Table 17 indicates that Chi-square was $\chi2$ (1, N=587) =0.436, and p= 0.509. Therefore, no significant difference was found between teachers' gender and their preference for collaboration with colleagues at the level of 0.05.

Table 17: Chi-Square test between teachers' gender and their preference for collaboration with colleagues

Gender	Number		Degree Of Freedom	Value Of (Chi-Square)	Statistical Significance
Male	286	587	1	0.436	0.509
Female	301				

d) *More time for self-training*

Table 18: Chi-Square test between teachers' gender and their preference for self-training

Gender	Number		Degree Of Freedom	Value Of (Chi-Square)	Statistical Significance
Male	286	587	1	6.740	0.009
Female	301				

Table 19: Teachers' gender and their preference for self-training

		More time for self-training		Total
		No	*Yes*	
Gender	male	228	58	286
	female	212	89	301
Total		440	147	587

Chi-square between teachers' gender and their preferenc(for self-training was indicated in table 18, [$\chi2$ (1, N=587) =6.740, and p<0.05]. Therefore, a significant association wa: shown in this case at the level of 0.05. According to Table 19 147 Saudi teachers from both genders revealed that they wer(in line with self-training for improving their competence whe1 using IWBs. As a result, female teachers approximately (61% were considerably more than males (39%) in preferring self training to develop their abilities to use IWBs.

VIII. Conclusions and Discussion

This paper has described the quantitative findings of ε study carried out in primary schools participated in *Tatwee* project in the city of Jeddah in Saudi Arabia. It aims t(investigate how teachers were trained to use IWBs an(identify their training needs. The findings of this stud) indicated that the majority of Saudi teachers had been traine(through two kinds of training (self-training (*M*=0.41 *SD*=0.49) and via their colleagues (*M*=0.32 *SD*=0.47)).Teachers who had trained from the educatio1 department (*M*=0.26, *SD*=0.44) was in the third place. Th(lowest percentage of teachers had trained by privat(organizations (*M*=0.06, *SD*=0.23).

Surprisingly, the reason that prevented most Saud teachers within the sample from attending IWB trainin(courses was lack of availability of these courses, which wa: chosen by most teachers (52%). Whereas, the rest of th(reasons had very small percentages. Although a large portio1 of Saudi teachers (57%) in the sample were neutral abou showing their satisfaction towards their level of training, 22% of them were satisfied with their level of training. A further 1(% were very satisfied. However, 11% of the respondents wer(dissatisfied about the level of training they had received an(that because of the lack of training courses provided for thos(frustrated teachers. There is no doubt about the usefulness o training courses in enhancing teachers' satisfaction an(increasing their confidence, skills, and pleasure.

Most teachers in the sample (55%) reported that the) need further training relate to the use of IWBs. Nevertheless only a few percentage 5% of teachers did not need any mor(training, indicating that these teachers were probabl) proficient teachers in using this technology. In addition, mos teachers in the sample (49 %) sometimes found assistance only 14% of them always finds help when problems occurred 13% never got any assistance, and 24% rarely found support Indeed, teachers need adequate training and support t(increase the efficiency of using these technologies in schools.

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With regards to the types of training they need, technical skills in the use of IWBs (*M*=0.66, *SD*=0.47) was ranked with the highest mean scores. Followed by effective teaching techniques by using IWBs (*M*=0.56, *SD*=0.50), and finally designing educational resources compatible with IWBs (*M*=0.47, *SD*=0.50). Thus, Saudi teachers have a high training need in all these three types of training; thought there was a slight difference regarding their needs. When teachers can successfully gain IWB technical skills, they are stimulated to improve their teaching methods [43]. Therefore, Saudi teachers should be highly trained to use IWBs effectively in order to be dynamic users of these technologies.

The most favoured training method indicated by teachers was attending training courses and workshops (*M*=0.71, *SD*=0.45). Observing lessons of skilled educators (*M*=0.53, *SD*=0.50) ranked next highest. Then, followed by collaborating with colleagues (*M*=0.36, *SD*=0.48). Finally, more time for self-training (*M*=0.25, *SD*=0.43) has received a low ranking from teachers. In this study, there was no difference between female and male teachers in terms of the number of IWB training courses and the types of training (*IWB technical skills* and *designing educational resources compatible with IWBs)*. Nevertheless, female teachers' responses indicated that they saw themselves as more need of further training than males in the effective teaching techniques by using IWBs. Although female teachers more desired self-training method than men, other training methods (attending training courses, observing lessons of skilled educators, cooperating with colleagues) were equally favored by both genders.

The conclusions drawn from this study provide evidence about the lack training courses from the education department. As indicated by the majority of Saudi teachers within the sample (60 %) who reported that they did not receive any training courses, neither by the education department nor by private organizations. Consequently, this has had an important effect on Saudi teachers' IWB skills and their satisfaction about their level of training, leading them to depend on themselves or their colleagues to improve their abilities.

Therefore, training Saudi teachers in both technical and pedagogical skills as well as providing support from the school administration are essential for effective integrating of IWBs in classrooms. In this study, attending training courses and workshops was the most training method favored by teachers for training. However, the lack of availability of these courses was identified by most teachers as the most important reason that prevented them from attending IWB training courses.

No significant differences were found between male teachers and females relating to the following variables (*the number of IWB training courses*, *IWB technical skills*, *designing educational resources compatible with IWBs*, *attending training sessions*, *observing lessons of skilled educators*, *cooperating with colleagues*). However, significant differences were indicated relating to the two variables (*effective teaching techniques by using IWBs* and *self-trainin method*) which were more favored by female teachers.

To sum up, based on these findings the views of teacher in Saudi schools towards their current training and their rea needs should be highly considered in designing successfu training courses relating to the use of IWBs in the future.

IX. Suggestions for Future Research

In this study, the training needs of teachers in school participated in *Tatweer* project were based on thei perceptions. Therefore, it is suggested that conducting simila study targeting to explore teachers' training needs based o the views of school administrations and educationa supervisors. Moreover, further research needs to be carried ou to investigate the effect of school culture and technical suppor on teachers' use of IWBs in *Tatweer* schools and thei professional development programs. Furthermore, th effectiveness of an IWB training course designed using th findings of this study could be used to explore effects on th teachers' use of IWBs in classrooms.

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