THE UNIVERSITY OF HULL

What is the best practice that can be incorporated to assist the effective use
of Interactive Whiteboard in primary classroom in Brunei Darussalam?

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By

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DEDICATIONS

This thesis is dedicated to my husband,

Haji Khairol 'Azhani Bin Haji Sahidi

and to my beloved parents,

Haji Jamain Bin Haji Taib and Hajah Noralam Binti Abd. Momin

for their constant prayers, love, sacrifices and continuous support.

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ABSTRACT

A step taken towards the use of technology in education in Brunei Darussalam has been by providing primary schools with technologies that can help support teaching in the classroom. This includes providing the interactive whiteboard (IWB). At the present time, almost all primary schools in Brunei Darussalam are provided with at least one IWB with the hope that it will be integrated effectively in all subject areas. This study investigates the perceptions of primary school teachers on the use of IWB to be able to assist the effective use of the IWB in Brunei Darussalam. A total of seven government primary schools located in Brunei Muara district were involved in this study. The study is based on data collected from both quantitative and qualitative approaches, which are questionnaire, lesson observations and interviews. The questionnaire sample consists of 75 primary school teachers, which categorised respondents into regular IWB user, low IWB user and no longer using the IWB. Lesson observations were conducted with seven regular IWB users and sixteen teachers participated in the interview. Interviews were conducted with regular and low IWB users as well as teachers who no longer use the IWB. The findings showed the different issues raised by participants relating to the implementation of IWB in primary schools in Brunei Darussalam. These includes accessibility; factors that influence or cause barriers to usage; teachers' perceived benefits of IWB; challenges teachers faced in using IWB; and IWB resources. It was also revealed that primary school teachers in Brunei Darussalam generally have a positive attitude towards the implementation of the IWB in the classroom. However, they lack the skills and knowledge in integrating use of the IWB effectively into their classroom practice and are still at the early stage of IWB implementation. Additionally, findings suggest that primary school teachers in Brunei Darussalam lack professional development and support when implementing the IWB in the classroom. Furthermore, the significance of the findings of this study was the importance of change management to successfully integrate the use of the IWB in the primary classroom.

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CHAPTER ONE: INTRODUCTION TO THE THESIS

1.1 Background of Study

This study is concerned with the integration of technology in primary schools in Brunei Darussalam. The formal definition of technology, according to Salisbury (1996) is the systematic application of scientific or other organised data into practical or sensible tasks. In other words, technology is when a new innovation is produced or developed and the disciplines, practices, procedures, tools and techniques are gathered to make up the new innovation. According to Imison and Tylor (2001), information technology (IT) is defined as technologies that have been invented as a means to enhance our abilities to think, to learn, to use our brains creatively and logically and to transfer information. IT does not only refer to the hardware used to transfer information, it also refers to the software that is used to store, retrieve and manipulate information. Salisbury (1996) states that technologies may or may not involve machines, but there are always applications of science that aim to solve human problems.

According to Selwyn et al. (2010), Information Communication Technology (ICT) became significant towards the mid-1990s as the importance of the internet was recognised and communication was emphasised thus the term ICT became an acceptable term in most countries for the use of computerised information technology in education. The increase of availability of ICT has brought about changes not only in society but also in education and this includes in Brunei Darussalam. According to Picciano (2006), the use of technology in education can be divided into two major categories, which are administrative and instructional.

According to Abbott (2001), any vision of the future of education has to recognise new methods available, including the use of ICT, as it has the potential to bring changes in teaching and learning in the classroom. Tinio (2003) states that the use of technology in education especially in developing countries has the potential to improve the relevance and quality of education. He also states that if used effectively, technology can be a powerful tool in the classroom. Therefore, the government of Brunei Darussalam, as a developing country has made an investment in providing schools, colleges and higher

institutions with ICT to improve the quality of education in the country (see Chapter Two for more details).

According to Egbert (2009), technology should be seen as a support to teaching and learning in the classroom as it can help teachers to do what they already do in a more efficient and effective ways. In addition to that, he also states that teachers will also be able to create a more interesting and innovative way of teaching with the use of technology. Dirksen and Tharp (1997) state that the main aim of integrating technology in the classroom is to make technology an integral part of the educational environment to aid students' learning and allows teachers to facilitate learning instead of becoming providers of knowledge. According to Roblyer and Doering (2012), integrating educational technology refers to the process of determining the suitable digital tools and the appropriate methods of implementing the tools to address educational problems and needs.

ICT can be used in education for a wide variety of tasks and as mentioned earlier in this section, it is also used in education for administrative purposes. Apart from being used for teaching in the classroom, ICT can help reduce administrative tasks of teachers, which may include record keeping, indexing of resources and timetabling. According to Watson (1987), there is a wide range of data handling software that educators can use to manage and analyse administrative information. Similarly, Crawford (1997) states that schools should not overlook the general purpose software that they already own such as the word processor, spreadsheet and desktop publishing because the use of it can also aid teachers and educators in administrative and management duties such as record keeping and management of data if used effectively. Furthermore, the use of ICT also enables teachers to easily produce lesson plans, letters, forms and handouts with the use of templates (Egbert, 2009). Additionally, the use of ICT in education also allows teachers to communicate easily with relevant authorities, parents, specialists, advisors, governors and even their own pupils. An example is by the use of emails that can cut down response time (Wheeler and Winter, 2005).

The use of ICT in education also enables teachers and students to access and share information easily and allows teachers to gain access to a variety of information and resources available in different form such as images, audio and video using a variety form of hardware and software such as CD-ROM, recorders and the internet The use of

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ICT also allows users to easily make changes to teaching resources or materials, have other alternatives and keep track of previous work and the development of ideas (Loveless and Dore, 2002). However, a study conducted by Reid (2002) reported that teachers felt that having access to information does not guarantee a better learning environment and teachers may lose focus on students as they are more concerned with technology. In addition to that, they believe that changes in education are happening not because of technology, but because teachers are learning more about the nature of human learning. However, Sandholtz et al. (2007) state that continuous use of ICT in education may lead to teachers developing strategic ways of using technology in the classroom and these changes occur when teachers' belief about learning, teacher-student roles and instructional practice changes.

According to Higgins (2003), ICT is a powerful tool in presenting information in a variety of ways through different forms. Information can also be manipulated easily in classroom, providing a context for effective discussion. A qualitative study conducted by Reid (2002) where in-depth interviews were conducted with 13 high school teachers from various subject areas regarding their views on technology and the future of teaching with technology revealed that teachers felt that ICT allowed them to be more creative in terms of preparing teaching resources for helping students to learn as technology opens up more possibilities for teachers. In the education context, ICT is not just regarded as a tool, which can be added or to be used in the classroom as a replacement of existing teaching methods. ICT is also seen as an important instrument added in the classroom to support teaching and learning (Afshari et al., 2009).

The Ministry of Education in Brunei Darussalam has also recognised the benefits of technology in education and has invested heavily on the use of technologies under the current educational plan, which was introduced in January 2008 (see Chapter Two, Section 2.3). A step taken towards the use of technology in education in primary schools in Brunei Darussalam is by providing primary schools with technologies that can help support teaching in the classroom. This includes providing primary schools with interactive technologies that can support teaching and learning in the classroom, specifically the interactive whiteboard (IWB). However, to successfully implement the use of such technology in the classroom, there are several issues that need to be taken into consideration, which this study aims to investigate and will be explained further in this chapter.

1.2 Statement of Problem

The role of ICT in education continues at a rapid pace across the world and Brunei Darussalam has used ICT in education in a variety of ways since the introduction of ICT in the education system in the early 1980s. This includes to facilitate teaching and learning, and for administrative work (Ministry of Education, 2011). The government has taken many initiatives to improve the standard of learning and teaching in classroom by providing the schools with ICT infrastructure, including providing schools and higher institutions with the IWB. At the present time, almost all primary schools in Brunei Darussalam are provided with at least one IWB with the hope that it will be integrated effectively in all subject areas.

However, despite the provision of ICT resources including the introduction of the IWB in primary schools, I have witnessed that the IWBs provided in schools are underused by teachers. Nevertheless, I have only worked in three different government primary schools in Brunei Darussalam. Therefore, this study is conducted to look into how primary school teachers in Brunei Darussalam could be assisted in using the IWB effectively in the classroom.

1.3 Aims and Objectives of Study

This study aims to investigate the perceptions of primary school teachers on the use of the IWB to be able to assist the effective use of the IWB in primary classroom in Brunei Darussalam. The objectives of this study are;

- to explore teachers' attitudes toward the use of the IWB;
- to find out teachers' perceived benefits of the IWB;
- to find out primary teachers' level of IWB training;
- to find out teachers' present level of IWB knowledge;
- and to find out teachers' current practices with the IWB.

1.4 Research Questions

The main research question of this study is

"What is the best practice that can be incorporated to assist the effective use of the IWB in primary classroom in Brunei Darussalam?"

To answer the above question, a number of sub questions were developed, which are;
1) What is the current level of IWB practice by primary school teachers?
2) What are the attitudes of primary school teachers towards the integration of the IWB in the classroom?
3) What encourages primary school teachers to use the IWB in the classroom?
4) What are the barriers and challenges faced by primary school teachers in integrating the use of the IWB in the classroom?
5) What is the level of training received by primary school teachers in Brunei Darussalam?
6) What support have primary school teachers in Brunei Darussalam received in relation to the use of the IWB in the classroom?

1.5 Significance of the Study

The IWB has now become established and embedded in most of the education systems in most developed countries across the world and less interest in it has been shown in the research field at the present time from such countries. However, this study is important as the education system in Brunei Darussalam is still at the early stage of technology implementation. The present education system in Brunei Darussalam, which will be explained further in Chapter Two, also recognises the importance of technology in education and encourages teachers to integrate the use of technology in the classroom. This has resulted in the provision of the IWB in primary schools throughout Brunei Darussalam. Additionally, there is also an increasing interest from the Ministry of Education in providing more IWBs to support teaching in the primary classroom in Brunei Darussalam. Therefore, this study could be important to provide the relevant authorities with information that is vital for the successful implementation and integration of the IWB in the classroom.

Additionally, very limited studies have been made in relation to the use of the IWB in Brunei Darussalam, especially in the primary school context. Furthermore, it is not a common practice for teachers in Brunei Darussalam to make complaints about the problems they face, including when integrating the IWB in the classroom. This study will, therefore, contribute new knowledge of the challenges and barriers teachers face in integrating the use of the IWB in the classroom for teaching and learning. This information is important as a step towards the successful implementation of the IWB through understanding the challenges and barriers faced by teachers, which limit their use of the IWB in the classroom. It is also important to identify the needs and the concerns of teachers involved in the implementation of the IWB to be able to develop strategies and future development plan for successful implementation and integration of the IWB in the primary classroom in Brunei Darussalam.

Moreover, this study will also provide information on the attitudes and perceptions of teachers on the use of the IWB in the classroom, which is important to be able to provide teachers with a rationale of usage. Additionally, this study also aims to understand how teachers perceived the use of the IWB to be able to promote a wider use of the IWB for teaching and learning. It is also important to avoid misconceptions about the use of the IWB. Additionally, information on teachers' level of practice and their level of IWB knowledge will help to determine the best practice and provide appropriate professional development programmes to assist teachers in integrating the use of IWB effectively in their classroom practice.

The information gathered for this study, therefore will also provide information that enables the implementers to determine the necessary support that teachers need to integrate the use of the IWB successfully in the classroom throughout the implementation process. This is in line with the aims of the present education system in Brunei Darussalam, which will be described further in Chapter Two, as the system emphasises the integration of technology for teaching and learning in the classroom.

1.6 Organisation of the Thesis

This section outlines the organisation of the thesis, which is written in nine major chapters. Each chapter will be explained briefly below.

Chapter One: Introduction

This chapter has outlined the background of study by highlighting the benefits of ICT in education, the statement of problem, the aims and objectives of this study, the research questions and the significance of this study.

Chapter Two: Overview of the Education System in Brunei Darussalam

This chapter starts with a brief introduction of Brunei Darussalam. This is followed with the history of the development of education system in Brunei Darussalam starting from the early 1900s up to the present education system, which is the *Sistem Pendidikan Negara Abad ke 21* or *SPN 21* (National Education System for the Twenty-first Century). The present education system is also described briefly in this chapter. Additionally, this chapter presents the introduction and the influence of ICT in the present education system in Brunei Darussalam, especially in the context of primary education.

Chapter Three: The Interactive Whiteboard

This chapter presents the review of the literature found on the interactive whiteboard from both developed and developing countries in implementing and integrating the IWB in the education. The literature presented in this chapter highlights the benefits of the IWB in the classroom for teaching and learning. Furthermore, this chapter also presents issues that arise in relation to the successful integration of the IWB in the classroom.

Chapter Four: The Management of Change

In introducing the use of technology such as the IWB in the classroom, it is important to look into the management of change. This is because it could assist the process of integration by looking into the change process, which involves dealing with concerns of teachers involved in the process of change. This chapter presents a review of literature on the management of change, emphasising the need to consider teachers' concerns and provide sufficient support for teachers to successfully implement changes in the education system, including the implementation of technology such as the IWB.

Chapter Five: The Research Methodology

This chapter discusses the research methodology used for this study. This includes the quantitative and qualitative approaches in collecting data for this study. This chapter also justifies why each approach was chosen and how each instrument was tested for its

reliability and validity. In addition to that, this chapter also discusses the ethical issues that were taken into consideration; how samples were selected; how the data was collected using each instrument; how the data was analysed; and the limitations faced by the researcher in conducting the study.

Chapter Six: The Quantitative Findings

This chapter presents quantitative findings collected for this study using the questionnaire. The data was collected from 75 respondents from seven selected primary schools in Brunei Darussalam. Respondents were selected based on the criteria that they are using the IWB for teaching or have used the IWB for teaching in the classroom before. From this finding, a total of 13 respondents were identified as regular users of the IWB. Meanwhile, a total of 43 respondents were identified as low users and a total of 19 participants were identified as no longer using the IWB. The data were analysed using the Statistical Package for Social Sciences (SPSS) program to generate a frequency analysis and a descriptive mean score from questionnaire data collected for this study. The data analysed is presented in tables and bar graphs in this chapter.

Chapter Seven: The Qualitative Findings

This chapter presents the qualitative finding from two different research instruments. This chapter is divided into two main sections, which are descriptive findings of the lesson observation and the interview. The first section presents the data collected from seven observed lesson taught by regular IWB users. The second section of this chapter presents the analysed interview data collected from sixteen participants, of whom seven were identified as regular users of the IWB, four participants as low users of IWB and five participants who are no longer using the IWB. The seven participants involved in the interviews are those who also participated in the lesson observations.

Chapter Eight: The discussion of Findings

This chapter presents discussion of findings gathered from the three different research instruments, which are the questionnaire, lesson observations and interviews. Important questions addressed in this study are explored and discussed in this chapter by integrating data collected from the three research instruments in relation with the literature found for this study.

Chapter Nine: Recommendations and Conclusion

This chapter presents the recommendations developed as a result of data collected for this study. The recommendations were developed for teachers, headteachers, school administrators and the Ministry of Education to help assist them in developing future plans to successfully integrate the use of the IWB in the primary classrooms in Brunei Darussalam. Additionally, this chapter also concludes the study by answering the research questions mentioned in Chapter One of this thesis.

CHAPTER TWO: AN OVERVIEW OF EDUCATION IN BRUNEI DARUSSALAM

2.0 Introduction

This chapter will present a brief introduction about Brunei Darussalam and an overview of its education system. This chapter outlines the history of education in Brunei Darussalam from the early 1900s up to the present day. That history has influenced the present education system and includes the influence of technology in the education system in Brunei Darussalam. This chapter is presented for readers to have an understanding of the education system in Brunei Darussalam, which has influenced what is expected from teachers.

2.1 Brunei Darussalam in Brief

Brunei Darussalam is a small state occupying 5,765 square kilometres on the north-western coast of the island of Borneo. It is a Malay Islamic Monarchy country which shares the island with Malaysia (Sabah and Sarawak) and Indonesia (Kalimantan). Brunei Darussalam is divided into four districts, which are Brunei-Muara, Tutong, Belait and Temburong district. The capital of Brunei Darussalam is Bandar Seri Begawan and is located in the Brunei-Muara district (Ministry of Education, 2004). The Sultanate is governed by His Majesty Sultan Haji Hassanal Bolkiah Mu'izzaddin Waddaulah Ibni Al-Marhum Sultan Haji Omar 'Ali Saifuddien Sa'adul Khairi Waddien, the 29th Sultan of Brunei Darussalam. His Majesty is the head of state and the executive head of the government and occupies the positions of prime minister, minister of finance and defence minister (Oxford Business Group, 2013).

Brunei Darussalam is bordered by the Malaysian state of Sarawak and the South China Sea and the country is made up of two unconnected territories, which separate the district of Temburong from the western districts of Brunei-Muara, Tutong and Belait (Oxford Business Group, 2011). Figure 1.1 below shows the map of Brunei Darussalam.

Figure 1.1: Map of Brunei Darussalam

(Source: http://www.intute.ac.uk/worldguide/html/839_map.html#map2)

The population of Brunei Darussalam according to the Department of Economic
Planning and Development, Brunei Darussalam is 425,000. The majority of the
population are Malays (67%) followed by Chinese (15%). The rest of the country's
population are from other nationalities. The majority of the population is concentrated
in the capital, Bandar Seri Begawan, which is in the Brunei Muara district. The official
language in Brunei Darussalam is Bahasa Melayu (Malay language). However, English
and Chinese are also widely spoken. The official religion is Islam. However, other
religions such as Buddhism and Christianity are also practised in the country. Brunei
Darussalam is the third largest oil producer in Southeast Asia and is also the largest
producer of liquefied natural gas in the world. Brunei is also well-known for its oil and
gas reserves. More than half of the country's GDP comes from the production of crude
oil and natural gas (Oxford Business Group, 2013).

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2.2 Overview of Education in Brunei Darussalam

According to Upex (2006), during the British Residential Period (1906-1959), educational progress was rather slow in Brunei Darussalam. The country had a poor infrastructure to plan and fund education policy as it was not a wealthy country. Education in Brunei Darussalam received its first mention in the Annual Report issued at that time in 1911. Formal education in Brunei Darussalam started in 1912 with the opening of a Malay vernacular school (Hamid, 2000). Nevertheless, education was not the main concern at that time and it was only in 1916 that some of the wealthy Bruneians saw the importance of education, which resulted in more schools being opened. These early schools followed a curriculum in Malay and were aimed at boys between the ages of seven and fourteen. However, according to Upex (2006), it was stated in the Annual Report that attendance was very poor as these boys are often required by their families to help their fathers with fishing and rice harvest. The interest from parents in education started to increase during the 1920s, which was reflected by the number of increasing attendance in schools and by 1926, a total of five schools was opened in Brunei Darussalam. This includes in the town itself, in Tutong district, Belait district, Temburong district and at Kilanas. Teaching was conducted in the native language, Bahasa Melayu until the year 1927.

By late 1920s, it was clear that the country needed an educated workforce and education was made compulsory and the limited compulsory Attendance Enactment was introduced in 1929. However, this only applied to boys aged between seven and fourteen and who lived within a two-mile radius of the school they were to attend. Additionally, their first spoken language must be Malay (Hamid, 2000). In 1938, an amendment was made to include other races, which are Chinese, Dusun and Iban into Malay speaking schools (Upex, 2006). However, according to Hamid (2000), the compulsory Attendance Enactment was extended to other districts in 1939. According to Upex (2006), there were three systems of schooling developed in the early 1940s, which were Malay schools, Chinese schools and English medium missionary schools.

In 1941, Brunei Darussalam was eventually affected by the Second World War and the new curriculum introduced included the teaching of Japanese for two periods every day. The reading and writing of Jawi, which is an Arabic alphabet adapted for Malay was dropped to accommodate the existing curriculum, while history, arithmetic, hygiene,

Malay language and gardening continued. By the end of 1943, Malay language disappeared from the curriculum with the intention of converting the country into a Japanese-speaking colony. It was in 1940s, after the war, that provision for education in Brunei Darussalam improved (Upex, 2006).

According to Upex (2006), the major influences on the development of education in Brunei Darussalam started in the early 1950s after the appointment of James Pearce as the Director of Education in 1949, when education was then seen as important for funding and development of the country. Pearce was a professional education officer who had trained in educational matters and had previously worked in Malaysia. He was able to grasp the problems related to the development of educational policies in Brunei Darussalam. Under his supervision, age for entry to schools was lowered to six years old. In addition to that, the teaching of English was expanded to primary schools and it was at that time that the education in Brunei Darussalam started to approach education using the bilingual system.

According to Hamid (2000), the government of Brunei Darussalam proposed spending on education in 1954, driven by oil revenues. A five year development plan for education was launched, which led to the educational infrastructure that became the Ministry of Education. Under this plan, new schools were planned, more expatriate teachers were employed and a large number of teachers were trained. According to Upex (2006), six British expatriate school officers arrived in Brunei Darussalam to help reorganise and administer the new educational system under the new plan. In the late 1950s, after the independence of Malaya from Britain, the new Brunei constitution required that the Malay language replace English as the main language of government and officialdom, which involved using the language as a medium of instruction in the education system. It was clearly stated in the Educational Policy Report of 1962 that there was a need for a single language system in the country. However, the 1962 National Education Policy was never acted upon and the country reverted to the pre-1959 policies and the reversion included a bilingual approach to education. An Education Commission in 1970 was formed and encouraged the Malay language as the main language used in education. Nevertheless, the usefulness of English as a second language was also recognised. By the mid 1970s, it was made clear in the education system that an English-Malay mix of instruction was the path to follow (Upex, 2006). This therefore led to the introduction of a bilingual education policy in 1984. The

bilingual education policy was introduced to ensure that pupils would attain a high degree of proficiency in both Malay and English language. According to Hamid (2000), the system ensured the continuous usage and growth of the Malay and English language. Furthermore, the system:

> … allows Bruneians to attain a number of goals, such as, gaining quick access to information on developments in the fields of science and technology (including the transfer of technology); fulfilling the nation's requirements in the importance of expanding area of international diplomacy; taking advantage of opportunities and commerce; and allowing individuals to train in various fields vital to the future development of the country.

(Hamid, 2000:31)

A Curriculum Development Department (CDD) was established in March 1978 under the administration of the Planning, Research and Guidance Unit. A Curriculum Development Centre (CDC) was formed under the department with the aim to focus on curriculum work directed towards four main subjects, which are Malay language, English language, Science and Mathematics. However in 1981, it was renamed the Curriculum and Textbook Unit (CTU) and the role was expanded to include seven additional components, which are textbooks, educational resources, geography, history, art and crafts, home science and preschools. By 1984, three additional components were again included, which are civics/moral education, physical education and music. The role of this unit is to study, plan and prepare school curriculum programmes as well as providing and evaluating educational materials either in print or electronic for classroom use (UNESCO, 2011).

At present, the Ministry of Education (MoE) is responsible for the entire education system in Brunei Darussalam. It is also responsible for all important decision-making policy across the education system in Brunei Darussalam (UNESCO, 2011). The Ministry of Education Strategic Plan 2007-2011 outlines its mission to:

> … provide a holistic education system of an international standard that comprises educational programs with a relevant and balanced curriculum which will develop students to their full potential.

(Ministry of Education, 2007:6)

Education in Brunei was made compulsory under the Mandatory Education Order 2007 to ensure that all children in Brunei Darussalam received at least nine years of formal education either from the government or private primary schools (Ministry of Education, 2013). The government of Brunei Darussalam provides twelve years of free education for all citizens, which include seven years of primary education, three years of lower secondary education and two years of upper secondary education, vocational or technical education (Oxford Business Group, 2013). Meanwhile, permanent residents may apply on a fee-paying basis to attend government and private schools in Brunei Darussalam. The non-government schools are administered by private organisations but come under the supervision of the Ministry of Education under the Education (Non-Government School) Act (Hamid, 2000). The education system in Brunei Darussalam divides primary education into three stages, which are pre-school, lower primary and upper primary. Primary education consists of seven years of education where one year at pre-school level, three years at the lower primary level and two years at the upper primary level (Ministry of Education, 2004). According to Hamid (2000), primary education in Brunei Darussalam aims to provide children with a firm foundation in the basic skills of arithmetic, reading, writing and communication. The primary school curriculum is also intended to provide children with personal growth and character development as well as to guide children to develop their spiritual and moral values under the teaching of Islam. Table 2.1 below shows the number of government schools in Brunei Darussalam by level and district in 2012.

District	Level				
	Pre-Primary	Primary	Secondary	Sixth Form	Total
Brunei Muara District	X	62	20	3	85
Tutong District	X	30	5	1	36
Belait District	X	16	5	0	21
Temburong District	X	11	1	0	12
Total	**0**	**119**	**31**	**4**	**154**

Table 2.1: Number of Schools by Level and District in Brunei Darussalam, 2012.
(Source: Ministry of Education, 2013)

Brunei Darussalam implemented three major educational policies between the years 1997 to 2009 to diversify and broaden the provision of education. Additionally, they were designed to develop the country's human resources. The educational policies

include; inclusive education introduced in 1998; the *Sistem Pendidikan Negara Abad ke 21* or *SPN 21* (National Education System for the Twenty-first Century) introduced in 2008; and education for gifted or talented students, introduced in 2009 (Mundia, 2010).

According to Oxford Business Group (2011:146), the current education system in Brunei Darussalam, the *SPN21* is "MoE's development plan for creating well-educated and skilled citizens, and contributes to the government's mission of providing holistic education". The current education system was introduced to meet the challenges referred to in the *'Wawasan Brunei 2035'* (Brunei's 2035 vision) launched in January 2008. *Wawasan Brunei 2035* wishes to make Brunei Darussalam recognised for; its highly educated, skilled and successful people; for its high quality of living; and for its dynamic and sustainable economy (Ministry of Education, 2010). Under this vision, eight policy directions will be coordinated in the education policy;

1. investing in Early Childhood Education;
2. using the best international practice in teaching and learning;
3. providing high standard of education in secondary and tertiary level of the education;
4. strengthening competency in ICT for student, teacher, education administrator including the integration of ICT into the school curriculum;
5. developing programmes which encourage lifelong learning and improving access to tertiary education;
6. encouraging research, development and innovation in government funded institution, public-private partnership institutions and international institutions;
7. using teaching methods that are cost effective through the use of technology;
8. and improving the management of all educational institutions.

(JPKE, 2012)

Therefore, the current education system was introduced to prepare students to cope with the challenges faced in the 21st century as well as improving students' success rates in education, especially in the three core subjects, which are English Language, Mathematics and Science (Ministry of Education, 2009). In addition to that, under the new system, the curriculum is based on the assumption that at the centre of teaching and learning is the individual learner and takes into account individual strengths and capabilities whilst preparing learners for progression and continuity. It also encourages

schools to create a more effective learning environment and the inclusion of ICT is also incorporated in the curriculum framework in this new education system (UNESCO, 2011). *SPN 21* is also the central platform for a series of reforms intended to coordinate with Brunei Vision 2035 to fulfil the Ministry of Education's mission to provide a holistic education to achieve the "fullest potential for all" (Ministry of Education, 2010:4). In relation to the introduction of SPN21, the Ministry of Education states that:

> … by initiating such an ambitious program to accelerate the continuous development in all aspects of education, the Ministry recognizes that development in must be carefully planned and systematically delivered. SPN21 is intended to extend Brunei's record of continuously improving overall system quality, instruction, and ultimately the intellectual and competitive capacity of Brunei citizens in the 21st century.

(Ministry of Education, 2010:4)

Three main changes were made in the present education system and these include the structure of the education system, the curriculum and assessment and technical education (Ministry of Education, 2009). The new education system has brought changes to the primary curriculum where science, which was a core subject at the upper primary level is now introduced in the lower primary level as a core subject and is taught in English. The teachings of Islam and the Malay Muslim Monarchy are also made compulsory (Oxford Business Group, 2011). According to Hamid (2000), under SPN21, the Islamic way of life and Islamic values are integrated through various curricula. In addition to that, the present education system also:

> … promotes the development of a national identity in which all Bruneians, as loyal subjects under the leadership of the Monarch, have a contributing role in fulfilling the changing needs of the country.

(Hamid, 2000:31)

Furthermore, despite emphasising English as the medium of instruction in the primary curriculum, the present education system also aims to strengthen proficiency in the native language, Bahasa Melayu. Thus, English is still taught alongside Bahasa Melayu, maintaining the bilingual medium of instruction across the primary curriculum under the present education system, *SPN21* (Ministry of Education, 2009).

2.3 ICT in the Education of Brunei Darussalam

His Majesty Sultan Haji Hassanal Bolkiah Mu'izzaddin Waddaulah Ibni Al-Marhum Sultan Haji Omar 'Ali Saifuddien Sa'adul Khairi Waddien expressed his view for establishing e-Brunei in 2000. Since his Majesty's expressed view, a highly proactive and concentrated role and development of the ICT sector has been taken by the Government of Brunei Darussalam. It has led to a development of wider range of e-Government plans, initiatives and strategies (Ministry of Education, 2003).

As discussed in the previous chapter, the use of ICT has brought changes in education worldwide. It is used for a variety of tasks in the education system and has influenced the education system in so many ways. As a result of this, a Department of Information and Communication Technology was established in 2001 under the Ministry of Education, with the mission to provide a quality, secure and efficient service of ICT assistance and support throughout education institutions across Brunei Darussalam. The department aims to provide support for all ICT services; provide efficient and secure ICT services; to identify and implement ICT training; and to prepare ICT-based teaching and learning resources. In addition to that, the department is also responsible for developing and implementing ICT policies and programmes for the Ministry of Education; leading the ICT development in MOE education system; expanding and integrating the use of ICT across the curriculum; and providing ICT technical infrastructure as well as maintenance support and services (Department of Information and Technology, 2014).

As mentioned in the previous section, *SPN 21* encourages schools to create a more effective learning environment through the inclusion of ICT across the curriculum, co-curriculum and the community involvement programme (UNESCO, 2011). The education system has brought changes to the curriculum and assessment, including in the primary schools in Brunei Darussalam. Under SPN 21, the curriculum is organised under eight specific learning areas, which are: languages; mathematics; science; humanities and social science; arts and culture; technology; Islamic religious knowledge and Malay Islamic monarchy; and health and physical education. The system also places emphasis on essential skills which are: communication skills; numeracy skills; problem-solving skills; work and study skills; self-management and competitive skills;

interpersonal skills; physical skills; aesthetic skills; and 21st century skills in digital age literacy (Ministry of Education, 2009).

According to Buabeng-Andoh (2012) many governments have invested in ICT to improve teaching and learning in schools. This includes in Brunei Darussalam where a considerable amount of investment has been made in providing schools with technology. The use of ICT in schools, colleges and higher learning institutions in Brunei Darussalam has improved with the introduction of projects under the ICT sector (JPKE, 2012). The integration of ICT in teaching and learning in Brunei Darussalam started in the early 1980's, where in 1984 computers were supplied only to selected schools throughout the country. By 1999, all primary and secondary schools throughout the country were supplied with desktop personal computers placed in the computer laboratory and in 2002, notebooks and internet connections were made available to schools (Emran and Dhindsa, 2010).

In addition to that, Brunei's national development policy, which is a policy developed based on a five year National Development plan implemented since 1953, has also included the provision for ICT under its 8th National Development Plan (Sidhu, 2010). Under the 8th National Development Plan of Brunei Darussalam, which began in 2001, BND$900 million (GBP424 million) has been allocated for ICT development and the implementation of infrastructure for e-Government projects (Ministry of Education, 2003). This also includes the provision for e-Education projects. The e-education Strategic Plan aims to provide a strong foundation in ICT which will promote excellence in human capacity building and by this it is intended to provide reliable and efficient ICT resources, provide appropriate and relevant training to all stakeholders, increase ICT pervasiveness in the working and learning environment and transform teaching and learning environment where appropriate. Under one of the 28 e-Education projects implemented by the Department of Information, Ministry of Education, a budget of BND$145 million (GBP69 million) has been allocated for ICT in education and from this budget, a total of BND$3 million (GBP143 million) has been allocated for interactive whiteboard (IWB) for teaching and learning as another step towards integrating technology in education. Almost all primary schools are provided with at least one IWB as part of the e-Learning Programmes which is one of the five Pillars of the e-Education roadmap of Brunei Darussalam (Ministry of Education, 2003). In 2005, IWBs were allocated to academic institutions in Brunei Darussalam and teachers were

encouraged to create their own IWB resources and to share their lessons using the IWB using the internet (Emran and Dhindsa, 2010).

According to Derus and Emran (2008), the IWB installed in all learning institutions in Brunei Darrusalam is the Activboard from Promethean and UNESCO (2011) states that teachers in Brunei Darussalam under the new education system are encouraged to make full use of ICT to improve teaching and learning standards in the classroom. In addition to that, the ministry aims to achieve teaching and learning excellence by providing schools with IT infrastructure, ensuring quality and equity of access for all, providing a wide range of quality IT resources to support teaching and learning; and evaluating and selecting software that matches the curriculum needs and standards (Ministry of Education, 2007). Furthermore, the curriculum development department was also made responsible to plan and prepare for the implementation of e-learning and lifelong learning across the educational institutions in Brunei Darussalam (UNESCO, 2011).

Therefore, an implementation plan or strategy designed to establish all the necessary components toward the transformation use of ICT known as *e-Hijrah*, taken from an Arabic word meaning 'to move forward' was also launched in February 2011.The implementation of the plan requires that all previous e-education projects will continue under *e-Hijrah* (Ministry of Education, 2011). According to Ministry of Education (2010), *e-Hijrah* is a plan that will bring together both the structure and the purpose of ICT in education. It is designed to allow educators to get a better view of emerging technologies and how to successfully integrate and implement the technology into the education system in Brunei Darussalam and play an important role in ensuring that the new education system, *SPN21,* meets its intended objectives. It also aims to support the achievement of the national plan, *Wawasan Brunei 2035*. Additionally, it was stated that *e-Hijrah* will be a holistic platform for educators to use technology in a transformational manner in education.

Oxford Business Group (2013:180) states seven objectives of the *e-Hijrah* plan to be met by 2017, which are: setting up a secure, reliable network for all government schools and the MoE; enabling the MoE to access real-time information; delivering ICT support services for school and MoE information technology equipment; incorporating ICT into all facets of SPN21 and future curricula; facilitating an engaging educational experience by way of 21st century pedagogies; combining the Malay Muslim Monarchy philosophy

with next-generation ICT competencies; and producing tech-savvy citizens who are grounded in national values.

Under the *e-Hijrah*, existing plans for the development of ICT school support will continue under a project called Office of Programme Management (OPM). This project will coordinate all activities across the various Ministry of Education departments; provide advisory processes to ensure views of stakeholders are well presented; create lead project teams to develop and deliver agreed programmes of work; and design a change management programme which includes training. *E-Hijrah* also identifies three strategic pathways to achieve the goal by 2017 which are whole-school ICT development, which focuses on building and sustaining a culture of ICT within the Brunei context; the i-Service, which focuses on providing infrastructure and on-site support to schools; and foresight and innovation, which focuses on ensuring access to resources, implementation of new technology and training (Ministry of Education, 2011).

2.4 Summary

This chapter presented the history of education in Brunei Darussalam from the early 1900s to the present education system. It can be concluded that the bilingual education system operating throughout the 1980s and 1900s was established in the 1940s and was recognised by James Pearce, the first Director of Education in Brunei Darussalam in the 1950s. The previous policies have now become accepted and have basically influenced the present education system where lessons, including in the primary classroom are taught in both Malay and English language. Additionally, ICT has also influenced education in Brunei Darussalam. The present education system, the *SPN 21*, which aims to provide a holistic education to prepare students for the challenges in the 21st century and to improve students' success rate in education has recognised the importance of the integrating ICT in the education system for more effective learning. ICT was also recognised in the education system to support teaching and learning. Therefore, the government of Brunei Darussalam has made a considerable amount of investment in technology, including in the provision of technology in the education system. Under the *SPN21*, investment is made by providing schools with ICT resources and teachers are encouraged to use technology in the classroom to support their teaching. This includes providing IWBs throughout primary schools in Brunei Darussalam. However, for a

successful implementation and integration of the IWB, there are issues that need to be addressed. The next chapter will discuss the literature found on the interactive whiteboard, which includes issues that arise in relation to the successful integration of the IWB in the classroom.

CHAPTER THREE: LITERATURE REVIEW (THE INTERACTIVE WHITEBOARD)

3.1 Introduction

This chapter will discuss the literature found on the interactive whiteboard (IWB) and look into the literature concerning the issues that relates to the infusing and implementing of IWBs in the education system.

As mentioned in Chapter One, this study investigates the best practice that can be incorporated to assist the effective use of the IWB in primary classroom in Brunei Darussalam. When used effectively, the use of the IWB can bring tremendous benefits to both teaching and learning in the classroom. This chapter will explore studies found on using IWB in the classroom and how it can benefit both teaching and learning. Criticism found on the use of the IWB will also be discussed in this chapter.

3.2 Interactive Whiteboard

Goodison (2003) states that one of the main functions of technology in classrooms is that it can support and facilitate learning and an example of a computer assisted technology that has now been widely used in classroom is the IWB. An IWB needs a computer, a data projector that projects contents from the computer, a large screen or board known as the whiteboard, and appropriate software. The content can be operated either from the computer itself using a mouse and a keyboard or directly from the whiteboard using fingers or a special pen (Gage, 2005). According to William and Beeland (2002), IWB allows teachers and students to interact with technology as the board allows users to interact with it directly without being tied to a computer.

IWBs come in a variety of sizes and types and Braham (2006) outlines three basic IWBs available which are the infrared or ultrasound solutions, touch-sensitive boards and magnetic resistance boards. The infrared or ultrasound solutions board consists of a receiver that attaches to any flat surfaces and is portable as it can easily be set up or taken down. The receiver receives information from a computer, which it projects onto the selected surfaces and users can interact with the board using pens that communicate with the receiver. Meanwhile, touch-sensitive boards are boards made of soft sheet

materials and are also known as 'soft' boards. The board when touched by a pen or fingertips by users will be registered by the board's software where the computer that is linked to the board carries out appropriate actions. Whereas magnetic resistance boards, also known as a 'hard' board, have a hard cover surface and when touched by pen or stylus the board's software carries out appropriate actions. This type of board needs a stylus pen to work and will not function without the pen. The stylus, which has a pressure sensitive tip allows users to write on the board like writing on a regular board with the additional ability to click, double click or drag objects that appear on the board by tapping the tip of the pen (Betcher and Lee, 2009).

Braham (2006) also outlines different installation options for IWB which are free-standing boards where small boards are installed with brackets on the back to enable it to stand on flat surfaces; board on mobile stand where a larger board is set up on a stand with casters and can easily be moved from one location to another; and fixed-position boards where IWB and a projector are permanently mounted in a fixed location. According to Braham (2006), four items that should be given priority to enhance IWB functions are speakers to be used when showing videos, a scanner to scan pupils' work and display it instantly and to be annotated using specific software on IWB, a video and/or DVD player and remote control devices such as wireless keyboard, a wireless mouse or voting device to control IWB from anywhere in the room.

An earlier observation was made in three Birmingham primary schools, United Kingdom as part of a classroom and school observation module, which I took as a postgraduate student under the Masters of Education in Information Technology programme (Haji Jamain, 2009). Observations conducted revealed that each school visited was provided with a magnetic resistance board and these were installed in a fixed position in all classrooms. Similarly, primary schools in Brunei Darussalam are provided with a magnetic resistance board which is the Promethean™ board and the boards are installed in a fixed position. However, most primary schools in Brunei are only provided with at least one IWB which is often installed in the ICT lab.

3.3 Interactive Whiteboard as an Educational Tool

Bell (2002) states that technologies with interactive applications such as IWB are in high demand for educators who want to involve students in learning with technology.

As mentioned earlier in this chapter, the use of the IWB can be beneficial for teaching and learning in the classroom. However, there are issues that should be taken into consideration in order to successfully integrate the use of the IWB in classrooms.

The use of the IWB can be beneficial both to teachers and learners and can be a powerful tool in the classroom. However, like any other technology, the IWB will only be beneficial when it is used appropriately to add value to teaching and learning (Barber et al., 2007) and according to Burden (2002:4), "the potential benefits of any new technology lie in how it is used". Often, at an early stage, the IWB acts as a replacement of previous tools or technology and Cogill (2006) states that IWB at a basic level is often used like a traditional chalkboard, which is not the best use of the technology. This is because when it is used at a basic level, it is often that teachers do not make use of what the board has to offer, such as the interactive features of the board. There are many ways in which teachers can use the IWB to support teaching and learning in the classroom. The benefits which will be discussed further in this chapter can be achieved through proper change management and professional development programmes which will be discussed in Chapter Four.

According to Gage (2005), the IWB can only help a teacher to teach well when it is used well and in a suitable and relevant way. In other words, a piece of technology should be used in such a way that it can support and facilitate learning processes in classroom (Goodison, 2003) and if not used appropriately, IWBs can be classified as "glorified blackboards" (Burden, 2002:4). However, one of the problems in developing good practices in using technology such as the IWB in the classroom is the difficulty to access the hardware itself. According to Rogers (2000), it is important to have access to resources, which include hardware, training and time for teachers to be able to adapt the use of technology for classroom teaching. Similarly, Buabeng-Andoh (2012:143) states that:

> Effective adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware, software, etc. Obviously, if teachers cannot access ICT resources, then they will not use them. Therefore, access to computers, updated software and hardware are key elements to successful adoption and integration of technology.

According to Betcher and Lee (2009), an ideal situation of an IWB integration is when teachers can access the IWB on demand when they want it. They also state that if the IWB is seamlessly integrated into the daily routine of teachers, they will be able to get the most benefit out of the board. Additionally, the lack of access to resources such as the technology itself will hinder the development of skills required to be able to use it to its maximum potential.

According to Cuban et al. (2001), a campaign launched in United States, where investment was made to increase access to technology in schools as well as to convince teachers to use technology in classroom, has resulted in a slight improvement of technology use by teachers. It produced a modest shift from non-users to occasional users and from occasional users to serious users. Similarly, according to Gage (2005), it is very unlikely that a teacher will move beyond using the IWB in a very basic way if they have insufficient access to it. Teachers will need the continuous use of technology as it may lead them in developing a more strategic ways of using the technology in the classroom (Sandholtz et al., 2007).

However, an outcome of a study by Cuban et al. (2001) on two California high schools in reference to access and use of technology shows that access to technology does not necessarily increase the frequency of usage. Data for the study was collected by conducting interviews with teachers, students and administrators. In addition to that, classroom observation was undertaken, school documents reviewed and surveys were given to both students and teachers of both high schools. Findings of the study revealed that despite having sufficient access to technology, teachers used technology infrequently and in limited ways. Common reasons found from the study were the lack of time to evaluate software and the lack of training available at a convenient time. Additionally, technical issues were also mentioned as one of the issues that influence usage. Similarly, according to Bingimlas (2009), one of the reason teachers make little use of technology is because of the lack of time.

According to Jones (2004), teachers will be discouraged from using technology due to technical problems that he classified into two main areas. The first one is the fear of things going wrong, such as equipment breaking down and secondly is the lack of technical support. Moreover, according to Dawes (2001), teachers remain wary of technology if there is a lack of appropriate and reliable equipment and technical support,

which results in the resistance in using the technology. King (2003) states that there is a need to have a support services to help teachers with problems and develop solutions to problems in order to make transfer of learning possible. According to Clarke (2006), the support should also be provided in a timely manner especially when progress cannot be made until the problems are resolved. This is because problems faced can be demotivating and can contribute to the resistance in using the technology. Thus, there is a need to address technical issues at the beginning of technology implementation and leaders should also consider how to support teachers technically in integrating the use of technology in the classroom (Bannister, 2010).

Therefore, not only will teachers need access to the hardware itself in order to use the IWB effectively, there are also other issues that should also be taken into consideration in developing good practices in using the IWB, such as availability of up-to-date teaching resources, time, support and professional learning development, which will be explained further in Chapters Three and Four.

3.3.1 Teaching Resources

According to Smith et al. (2005), a major benefit of using the IWB in the classroom that has been widely reported is the availability of a range of materials and the facility to manipulate them. The use of an IWB allows teacher and pupils to gain access to a wider range of information and resources in the form of visual, audio and sound. Participants in a small scale study that focused on the introduction of IWB technology in classroom teaching in two Sheffield secondary schools reported by Levy (2002:8) stated that among the benefits of IWB is that it made it easier for them to "draw on a greater number and a wider variety of information and learning resources". Levy (2002) also states that participants valued the ability to increase different type of resources in their lessons. The use of the IWB also allows teachers to display and navigate resources available from the Internet easily. In addition to that, it also enables teachers to access and show video resources easily and efficiently such as from websites, a DVD, CD-ROM and video recorder (Cogill, 2006).

Participants in a study conducted by Beauchamp (2004) where two days of lessons taught by seven teachers were observed and followed by a semi-structured interview revealed that they used different programs with the support of an IWB to allow them to

present their teaching forms in a variety of formats to gain pupils' interest and attention. According to them, this helped in achieving learning objectives. Similarly, interviews conducted by Cogill (2003), where questions concerned were on the effect of the IWB on classroom practices, factors affecting teachers and their views on children's learning revealed that the wide range of materials and software available with the introduction of the IWB in their classroom provided a continual change of environment which helped improve teaching. The interview participants were a teacher with classroom access to the IWB and a teacher with access to the IWB only in the computer suite, as they were deliberately chosen to represent different viewpoints.

Cogill (2006) states that the use of the IWB enables teachers to prepare a high-quality presentation using a wide range of resources. British Communications and Technology Agency (BECTA, 2003) states that teachers can create a clearer, more dynamic and efficient presentation using the IWB which will help in presenting complex concepts to pupils, such as using video presentations. As mentioned earlier, teachers also have wide access to a wider range of software and programs and this allows teachers to create more interesting teaching resources which can be accessed directly from the board using special pens or fingers (Gage, 2005). In a Mathematics lesson I observed in one of the primary schools in Brunei Darussalam, a teacher used the IWB to explain shapes to pupils by drawing different shapes, which can be chosen from the tool box option and can easily be drawn using the special pen. Teachers also used the Internet to show examples of shapes from real objects and could easily move from one application to another without the need to stay at the computer during the lesson.

Similarly, Barber (2007) states that the IWB offer teachers opportunities for creating a more dynamic presentation of knowledge by incorporating a wide range of media. Questionnaire evidence by Glover and Miller (2001) in one secondary comprehensive school on the pedagogic impact of the IWB also shows that teachers felt that one of the results of technology is the improvement of presentations. Similarly, interview participants in a study conducted by Cogill (2003) where two teachers from two different primary schools were interviewed and had access to the IWB stateed that the quality of teaching resources available by using the IWB had brought changes to her range of teaching and had a positive impact on her pupils. A study was conducted by Şad and Özhan (2012) where the participants were 50 primary pupils from different grades in a Turkish primary school, which aimed to investigate their experiences of

IWB in their classroom in terms of their attitudinal and pedagogical perspectives. The results of the study revealed that the ability of the IWB to display a high quality presentation was one of the most appealing features to them. A similar finding was found by a study, which was conducted by Wall et al. (2005) in relation to pupils' views of IWBs and the impact of the IWB on teaching and learning. Eighty pupils were involved in the study; they were Year 6 pupils (aged between 10 to 11 years old) from three different Local Education Authorities (LEA). All pupils involved in the study had been exposed to the use of the IWB for at least a year. A template was designed for the study to initiate discussion about their learning in an IWB classroom. The findings show that pupils frequently mentioned how the IWB assisted their understanding through the different software used by their teacher, the visual display of information and the use of interactive games that have an important influence in supporting and maintaining the learning process.

However, pedagogical aspects need to be taken into consideration when using multimedia in teaching with the use of the IWB. According to a study by Schmid (2008) on the use of the IWB in an English language programme in the summer of 2003 and 2004, students felt overwhelmed by the amount of multimedia presented at a fast pace and in a short period of time. Therefore, it is suggested that in order to take advantage of the use of variety and high quality of teaching resources when the IWB is in use, there is a need to look into the teaching pedagogy.

The use of the IWB can also reduce teachers' workload in terms of preparing teaching resources. This is because information and resources that have been developed for teaching can be saved and re-used at a later time (Levy, 2002). Furthermore, IWB also allows teachers to reuse high-quality material prepared by a teacher or a group of teachers using software packages, and the use of multimedia materials eventually reduces workload (Glover and Miller, 2002). Participants interviewed by Cogill (2006) felt that the use of IWB reduces preparation time in the long term as they there is a facility to cut and paste presentations and resources rather than reproducing a complete new resource. Other than that, participants felt that to make planning and preparation easier, school management should encourage a culture to enable sharing of resources between teachers if similar resources are needed and have already been prepared. According to Cuthell (2005), teachers can develop teaching resources and make them available across the school area network (LAN) thus enhancing collaborative work

between teachers, allowing resources to be developed more quickly and providing teachers with a range of pedagogical possibilities.

One of the benefits of IWB in classrooms mentioned earlier in this section is the availability of wider materials that allow teachers to prepare teaching resources easily. Despite having the benefit of easy preparation of teaching resources, interviews with primary school teachers in Brunei Darussalam revealed that preparing teaching resources could be time consuming, especially when the IWB has just been introduced (Haji Jamain, 2009). A study conducted by Gray et al. (2005) in which 12 teachers participated also revealed that teachers feel that the IWB makes lesson planning and preparation time consuming and that they felt pressurised to spend significantly more time in preparing materials for use with the IWB with the new resources available. This is because in order to integrate new technologies effectively into the curriculum, teachers will need to spend a considerable amount of time in selecting appropriate software to be used in lessons, construct new lesson plans, resolve a number of logistical problems and develop appropriate new methods of assessing student work (Pea, 2000). Derus and Emran (2008) state that teachers who found IWB increasing their workload and took longer time to complete tasks using the IWB are those who lacked adequate skills and confidence. However, a project by North Islington Education which began in 2000 and was evaluated in 2002 revealed that teachers reported that planning a lesson using IWB took longer when they first used the IWB but as they became more familiar with the resources, they were able to plan and prepare for lesson more quickly (Latham, 2002). Additionally, participants of a study conducted by Kennewell and Beauchamp (2003) on the influence of a technology-rich classroom environment on elementary teachers' pedagogy and children's learning revealed that teachers felt their investment of time in learning to use ICT tools, producing resources as well as preparing lessons is worthwhile for its positive impact on the children's behaviour and learning. Furthermore, their study also revealed that time taken in planning and preparing teaching resources can be reduced by a high degree of collaboration between teachers.

3.3.2 Interactivity

Lachs (2000) describes the term 'interactive' used in relation to technology as physically interacting with the technology such as clicking navigation buttons, clicking

on objects and writing answers to questions. In term of IWB use, the term interactive is used to describe both technical and pedagogical interactivity, which are often associated with the participation of learners (Kennewell et al., 2008). This section will discuss both the technical and pedagogical interactivity that occurs in an IWB classroom.

According to Cuthell (2005), the term interactive associated with the IWB is when pupils use the board itself or the ability of pupils to respond to materials presented on the board and Latane (2002) in Glover etal. (2005) demonstrated that interactivity that is associated with all technologies in the classroom needs to be between pupil and pupil as well as between pupil and teacher. Nevertheless, the IWB is said to be 'interactive' in the sense that it responds easily and quickly to user's command using a special pen or fingers (Mercer et al., 2010).

According to Sharp et al. (2002) and Loveless (2002), interactivity can engage users at a number of levels through activities by the use of technology such as the IWB. In addition pupils can get immediate feedback and response from the actions they made. In other words, children can interact physically with the technology itself or get engaged with activities that enable them to make decisions, see the effect and act upon the feedback accordingly. According to Barber et al. (2007), it is important to manage the interaction between pupils and board effectively in order to extract all potential learning opportunities.

Moreover, students have more options in interacting with the IWB in comparison to just being asked to come to the front to write on the traditional whiteboard. According to Bell (2002), the use of the IWB can promote interactivity in classroom as users physically contribute ideas and actions, as the teacher can be stationed at the computer with pupils at the board while other pupils offer suggestions. By encouraging children to write on the board and manipulate words or images on the IWB, teachers are "making their first moves towards using the board interactively" (Beauchamp and Parkinson, 2005:99). Teachers involved in a project run by North Islington Education reported that the introduction of the IWB in the classroom allows pupils to take an interactive role in learning and the use of it also encourages more interactive teaching. In addition to that, pupils are more willing to take part in lessons (Latham, 2002). Examples of how the IWB can be used interactively are the use of 'drag and drop' facilities, 'action buttons' or other kinds of hyperlinks which includes an element of

choice for decision making which can be used in PowerPoint presentations, matching activities by drawing lines using the special pen and clicking on buttons on educational games or software. In addition to that, Aldrich et al. (1998) state that interactivity in lessons using technology also involves the design of effective activities that are engaging and at the same time enable a learner to construct knowledge by taking advantage of the interactive features of the technology.

Another benefit of the IWB is that it can encourage learner participation in the classroom and it can act as a tool for encouraging and supporting classroom dialogue through questioning and discussion activities. Dialogue in the classroom is when pupils are engaged in conversation by building on one another's ideas. It is the building of learning-centred narrative, which encourages reflection of ideas, critical investigation, analysis, interpretation and reorganization of knowledge (Carnell and Lodge, 2002). Alexander (2008) states that one important tool of an effective teacher is dialogue or talk, which, children need in order to think and learn. Compared to traditional methods of teaching where teachers are the only ones who deliver and transmit knowledge, new methods of teaching demand pupil engagement and their active participation in the classroom to construct knowledge. This can be achieved through talk. Graf and Birch (2009) commented that dialogic teaching in the classroom is learning through teacher-pupil interaction or pupil-pupil-interaction. In other words, it is when learning takes place through talk or conversation to address a learning task together. It is when teachers and pupils listen to each other, share ideas, consider alternative viewpoints and articulate their ideas freely in the classroom to reach common viewpoints or ideas. They also state that a dialogic classroom is also when teachers and children build ideas on their own or build ideas around each other's ideas and group them into a line of enquiry.

BECTA (2003) states that the use of the IWB creates more opportunities for classroom interaction and discussion. According to Beauchamp and Parkinson (2005), information projected on the screen using the IWB, which portrays strong images and rich information sources, can act as a stimulus to classroom discussion and this can create and promote an environment that focuses on pupil-teacher and pupil-pupil talk. The ability of the IWB to project and present multimedia materials that are planned and used wisely for a problem-solving activity in classrooms may stimulate thinking and demands for classroom discussion in order to achieve an agreed solution (Barber et al.,

2007). Through interaction, children are able to construct meaning for learning to take place (Alexander, 2008).

According to SMART (2006:5), IWBs are "an effective way to interact with digital content and multimedia in a multi-person learning environment". It creates a learning environment where multiple users can interact with the technology at the same time. This is because the IWB can promote learning activities such as creating digital lesson activities; manipulating texts and images; viewing images and websites in a group; saving notes; presenting information without the need to stand near the computer; using presentation tools to enhance learning materials or teaching resources and presenting pupils' work. The high quality presentations also encourage whole class discussion through questioning activities (Smith et al., 2005). According to Alexander (2008:25), questions are important but need to be handled carefully and questioning through dialogic teaching may 'recall, elicit, check, probe, instruct, develop or manage' knowledge. According to a study conducted by Aminatol and Mogana (2006), teachers felt there was an increase in interaction during questioning and discussion when IWB was used in their lessons. They also reported that pupils responded more readily to the teacher, as well as interacting with other pupils. A total of twelve primary school teachers in Brunei Darussalam participated in the study and data was collected over the period of two months.

However, pragmatic issues can affect the interaction of pupils and teachers with IWB. A study conducted by Hall and Higgins (2005) revealed that students encounter some difficulties when writing on the IWB and this includes casting their shadow over what they are writing. Interview participants in a research conducted by Şad and Özhan (2012) reported that 'decalibration' is one of the least liked features of the IWB, where they described that the board failed to display what they intended to write or draw. According to Beauchamp (2004), this is also a common issue faced by teachers who are at the early stage of implementing the IWB in their teaching. It is also mentioned that the height at which the IWB is mounted from the ground can affect interaction of pupils with the board, especially with young children. Similarly, interview participants observed by Haji Jamain (2009) reported that the height of the IWB makes it difficult for pupils to interact with the board. Thus, pupils will not be able to make meaningful interaction with the board even though it can be replaced with asking questions using ICT vocabulary familiar to children, such as 'click' and 'drag'. According to Braham

(2006), it is important to consider the placement of the IWB to be able to maximise its accessibility. It should be at a height that enables the teacher to have access to all area of the board and visible for pupils to see. However, it must also be set at a height low enough to allow pupils to reach the board.

Furthermore, Barber et al. (2007) also emphasise the importance of classroom organisation to enable teachers to incorporate the IWB and its use in classroom. They state that it is important that pupils should be able to interact with and access the board easily. Thus, there is a need to have sufficient space for pupils to approach the board and to gather around it. Therefore, when putting technology such as the IWB in place, it is important that relevant authorities should consider the use of technology not only by teachers by also by pupils in the classroom (Betcher and Lee, 2009). Therefore, it is important to consider issues that can reduce the value of the IWB before installation of the board.

As mentioned earlier in this chapter, Betcher and Lee (2009) state that often teachers use IWB the same way they use an old conventional whiteboard and they do not take advantage of the interactive features of the IWB during the early implementation of the IWB. A research study conducted by Şad and Özhan (2012) in Turkey, where participants were students from a school where they had only two years experiencing the IWB, revealed in a focus group interview that the interactive features of the board mentioned earlier in this section were never or rarely used in their lessons and students' interaction with the board was rather limited. This indicated that IWBs were not used to their maximum potential. Fifty participants from different grades from a primary school in the eastern part of Turkey participated in this study, where IWBs installed in every classroom was not a familiar setting. Data was collected later during the second semester of the school year and the school was one out of the three schools where IWBs were installed in every class, due to the initiative of the district governorship. Nonetheless, the findings of this study indicated that teachers were at the early stage of IWB integration and needed both technical and pedagogical training.

Different scenarios were observed in an earlier study conducted in two lessons in two different primary schools in Birmingham, United Kingdom as part of a project under the Masters of Education in Information Technology programme (Haji Jamain, 2009). In both the schools observed, IWBs were installed in every classroom. Both lessons

observed, which were a Mathematic and an English language lesson, had the same structure, which was introduction, development and conclusion. In both lessons, pupils were seated at their desks throughout the lessons. In the first stage, which was the introduction stage, both teachers showed visual images and elicited discussion on the topic that pupils would be learning based on the images shown. Pupils responded orally to the teacher's questions and only teacher-pupil interaction were observed in both lessons at this stage. The second stage was the development stage, where teachers developed pupils' further understanding of the topic learned. In the Mathematics lesson observed, the teacher interacted with the board by drawing a shape and asked pupils the number of triangles they could find in the shape shown. An individual pupil volunteered to come to the board and showed the answers by interacting with the IWB. The teacher repeated the same questions with different shapes to give different pupils opportunity to answer the questions and interact with the board. For incorrect answers, the teacher encouraged other pupils to correct mistakes made and let them interact with the board to show the correct answers. A similar situation was also observed in the English language lesson, where pupils were actively interacting in discussion as well as with the board during the lesson development stage. Pupils interacted with the board through online activities that the teacher had bookmarked earlier, before the lesson. The teacher also used the stylus pen to highlight important words during the lesson and saved materials at the end of the lesson.

According to Lai (2010), to take advantage of the interactive features of the board and to encourage a more dialogic classroom, teachers are required to make selections from a variety of interactive media-rich content when they plan and structure their lessons. This may include using web resources and software that support IWB. He also states that a good visual resource is a fundamental aspect in an IWB based classroom. However, although in general the IWB is controlled by teachers, the amount of interaction depends on how teachers plan their lessons (Glover et al., 2005). A study was conducted by the Department of Education at Keele University in the United Kingdom which documented the introduction of IWB within the secondary schools in its initial teacher education partnership. The study took place in schools where the IWB had been introduced and where at least one IWB had been installed. Questionnaire, interview and observational data were obtained from a total of 220 teachers, 46 teachers-in-training, 8 secondary school headteachers, 3 local authority administrators and 112 pupils. Questionnaire responses and observation revealed that there is a need of sufficient time

allocated for lesson planning and the development of resources for a more interactive curriculum delivery (Glover and Miller, 2002).

In addition to that, the quality of interaction in a technology based classroom is a result of teaching instruction or the product of the way pupils cope with the teaching instruction and not the technology on its own. Thus it is important to consider when and why interactive media would be beneficial rather than how to achieve an interactive outcome when constructing a lesson (Dillemans et al., 1998). Nevertheless, according to Wall et al. (2005), the IWB can be an effective tool in the classroom for initiating and facilitating the learning process, especially when it involves pupils' participation and when the board is fully utilised.

3.3.3 Pace, Motivation and Engagement

Research found in the literature also indicates that another benefit of IWB is that it can improve the pace of a lesson and increase pupils motivation as well as pupils' engagement. According to Loveless (2002), a major feature of ICT which contributes to teaching and learning is the 'speed' and automatic function of the technology that carries out tasks such as storing, changing and displaying information, which enables the teacher to manage, read, restore, analyse, display and organise data including teaching resources at higher levels.

According to DfES (2004), the use of the IWB enables resources or topics of lessons structured around a single file. Resources that were prepared in advance can be linked to other resources and this not only helps with planning of a lesson but also improve the flow of the lesson. The ability of moving objects around using IWB and the ability of using the board without the need to move from the computer and board eventually improve the pace of lessons. Similarly, a study that investigated the role of ICT within the classroom setting, conducted by Kennewell and Beauchamp (2003), where twelve lessons were observed and six interviews with teachers were conducted revealed that the pace of lessons improved as teachers developed familiarisation with the content of materials which they prepared in advance as it would appear on the board. Latham (2002) states that teachers interviewed from the North Islington project, which was evaluated to examine the impact of IWB as a resource for teaching and learning in Year 6 and 7, reported that they had a clear view of the lesson flow as they went from one

page to the next using the IWB, which was seen as prompts in continuing the lessons thus enabling the efficient and effective use of teacher time. According to Barber et al. (2007), this reduces interruptions to the flow of lessons when delivering prepared materials. Teachers are also able to focus on teaching instead of becoming preoccupied with managing teaching resources.

Similarly, a case study conducted by Jewitt et al. (2007:311) revealed that IWB texts created in advance by one particular teacher played an important role in structuring his lesson as well as "driving its fast pace". This was due to the ease of movement between screens as it was planned in advance; the ability to move between materials which were linked to each other and preload them; and the ability of moving from one application to another easily. Preparing texts in advance allows the teacher to control the flow of materials and control the lesson. In addition to that, participants interviewed in the study also felt that pace would improve as materials brought up onto the IWB can be accessed easily and quickly and there was no distraction of organising papers or putting up pictures on the board for pupils to talk about. In another study by Beauchamp (2004), a series of lessons by seven teachers were observed over two days, with the aim of developing a generic progressive framework and developmental model for schools introducing the IWB. The outcome indicated that the pace of lessons improved. According to participants, the use of the IWB enabled teachers to open and close files quickly, compared to using the traditional board, where teachers had to write on and wipe off the board. According to Gage (2005), pace can be maintained as lessons can be presented in a more structured way using the IWB as links to preceding material are emphasised. Hyperlinks can be made to different activities, resources and tasks and are available at the click of a pen or tap of a finger.

Cook and Finlayson (1999) state that ICT has increasingly become part of society and has its own contribution to education and has become more familiar to children. Furthermore, ICT enhances the learning process in exciting ways and enables children to take control of their own learning, have access to a wider and a more up-to-date range of resources and communicate efficiently with people on a worldwide scale. The use of the IWB as a tool to help support learning in classroom has its own benefits not only to teachers but also to pupils.

One of the benefits of the IWB to pupils is that it can increase motivation and engagement. According to Dillemans et al. (1998), motivation is when pupils are willing to make an attempt or invest mental effort in order to produce a learning outcome and Wallace (1996:56) defines engagement as "a profound depth of involvement and interest in a subject". Gage (2005) states that when used effectively, the IWB can motivate children and provide them with a lesson that they can remember. Furthermore, Beeland (2002) states that motivation can be affected by student engagement and the use of the IWB can assist with engaging students in learning processes. According to Beeland (2002), an increase in motivation would make children stay on task better. This is because the use of a variety of programs with an IWB can make a lesson more interesting and easier to understand. According to Smith et al. (2005), the use of an IWB motivates pupils because lessons are more enjoyable and interesting. Moreover, lessons are also more enjoyable if pupils are allowed to interact physically with the board (BECTA, 2003). In addition to that, Glover et al. (2005) state that motivation also arises from the quality of presentation using the IWB.

A research study to determine the effect of the use of the IWB as an instructional tool on student engagement conducted by Beeland (2002) through survey and questionnaire, involving ten teachers and 197 students, also claims that students and teachers enjoyed the use of the IWB in the classroom. The study also indicated that student engagement increased when the IWB was in use. Similarly, research conducted by Hall and Higgins (2005) where 12 group interviews were conducted with 72 students of Year 6 in six Local Education Authority (LEA) areas in the North and South England revealed that students favoured the use of the IWB in the classroom because of its versatility, in that it can be used to access a wide variety of resources using a wide variety of programs. In addition to that, pupils enjoyed the multi-media capabilities of the technology and mentioned that it was engaging and held their attention. Similarly, a small-scale study conducted by Shenton and Pagett (2007), with Year 5 pupils of six primary schools in the south-west of England where all have IWBs installed in their classroom, revealed that pupils described their increase in motivation in interviews conducted using terms such as 'enjoyable', 'fun' and 'exciting'. Six teachers who participated in the study also highlighted the motivational effect of IWBs. They described pupils as more motivated, interested, involved and focused in their learning.

Another study which was carried out by a PhD research programme at Lancaster University, United Kingdom on the use of the IWB in an English language programme in the summers of 2003 and 2004 also revealed that students involved in the research reported that their level of motivation increased when the IWB was in use. They reported that it was because of the variety of multimedia resources being used. The study, which aimed to analyse the impact of the IWB in the course, also investigated the pedagogical impacts of the IWB. A total of sixty two students were involved in the study, where the IWB was used extensively in all stages of the English language lesson where they were involved in two different study, respectively. Flipcharts were designed and different multimedia resources were used in the lessons. The findings further revealed that participants felt that the use of multimedia in an IWB classroom made the lesson interesting and facilitated their language learning processes. Research participants also criticised the traditional methods of delivering information through paper handouts or teachers' accounts as 'boring' and unable to stimulate their interest in learning (Schmid, 2008).

Furthermore, interview participants in a small-scale study which aimed to identify how teachers used features of ICT particularly the IWB, to enhance and contribute to young children's learning revealed that teachers felt that the IWB is effective in gaining pupils' attention. The study involved twelve lesson observations followed by six interviews with teachers observed. Interviews involved issues on how they felt about ICT, mainly on the features of technology that affected their teaching, learning and attainment in the classroom. Interview participants also reported that the use of IWB where large display was one of the main features allowed them to keep pupils' attention longer, stimulate their thinking as well as maintain the students' focus on the subject matter rather than the teacher or other pupils (Kennewell and Beauchamp, 2003).

According to Beeland (2002), motivation can increase through engagement during the learning process and an increase in motivation may result in a successful learning effort. However, previous research states that positive attitudes such as increase in motivation with the use of the IWB can be temporary (Higgins et al. 2007; Levy 2002). Nevertheless, according to Şad and Özhan (2012:1190), motivation decline with time when IWBs are in use can be caused by the "failure to blend technology and pedagogy" and should not be associated with the IWB alone. Thus it is recommended that in order to maintain the potential gain of keeping pupils motivated in learning through the use of

technology such as the IWB, it is important to use the technology together with an appropriate teaching pedagogy (Beauchamp, 2004; Şad and Özhan, 2012). This issue will be discussed further in Chapter Four.

3.3.4 Achievement

The implementation of technology such as the IWB can change students' learning environment, which may lead to improvement of pupils' achievement if used effectively (Emran and Dhindsa, 2010). According to a study by Middleton and Murray (1999) which examined the relationship between levels of technology implementation in classroom and test scores in reading and Mathematics, revealed that academic achievement was significantly higher when technology was used. Similarly, a study that involved 85 teachers and 170 classrooms indicated that the use of the IWB was associated with a 16 percentile point gain in student achievement compared to lessons without IWB (Marzano, 2009).

Furthermore, a study conducted by Emran and Dhindsa (2010) suggested that the infusion of the IWB in Bruneian schools improved learning outcomes. Results were obtained by making comparison of achievement test results between classes taught with and without the IWB. However, a study conducted by Derus and Emran (2008) revealed that both the traditional teaching approach and a constructivist teaching approach with the support of the IWB were effective in improving students' achievement. Nevertheless, when the mean gains of achievement scores were compared, the constructivist teaching approach using the IWB managed to produce a higher gain in mean score.

Nevertheless, a pilot programme "Embedding ICT in the Literacy and Numeracy Strategies" by the United Kingdom Government's Primary National Strategy, where IWBs were installed in the classroom in more than eighty schools in six regions of England, shows that the effect size of pupils' attainment was very small during the first year. In addition to that, no significant differences were seen during the second year of the programme. The programme involved the installation of IWBs in classroom of 9-11 year old students and data was collected from the national test in English, Mathematics and Science for 11 year olds and provided by the United Kingdom's Department for Educational Skills (DfES) for the years 2003 and 2004. Data was collected from 67

schools in the six local education authorities (LEA) that participated in the project and a matched control group, which consisted of 55 schools from the same LEAs. Findings revealed that in May 2003, after seven months of IWB use in the project schools, the mean raw test scores in the IWB schools were slightly higher than in the control schools. However, it was noted that the effect size was very small. However, in 2004, no significant differences were found in the raw test scores between the IWB schools and the control schools. It was concluded from the study that the use of the IWB did not lead to further improvement in pupils' achievement in the following year (Higgins, 2010).

Meanwhile, a study conducted for the UK government in 2004-2006 to evaluate the impact of the IWB on teaching and learning in primary schools in England shows positive gains in literacy, Mathematics and Science for children aged 7 and 11. Multilevel modelling, which is an analysis for repeated data, was used to analyse data on pupils' progress. Test data was collected from 100 classes with a total of 2000 pupils from across 21 Local Authorities and the analysis was based on the length of exposure to IWBs experienced by pupils. Findings of this study revealed that when pupils had been taught using an IWB, there were measurable gains in their test score results in Mathematics, English and Science. It was also reported that pupils made positive progress with more exposure to IWBs (Lewin, 2008).

It appears from the studies conducted, that there is an increase in the level of pupils' achievement when the IWB is in use, especially during the early introduction of the IWB. However, findings by Higgins (2010) revealed that the level of pupils' achievement was not identifiable after two years of the IWB use, suggesting that sustained improvement is harder to achieve. Nonetheless, a study by Lewin (2008) revealed that positive progress was made by students with the length of exposure to the IWB. Both studies on the impact of the IWB on pupils' achievement were conducted within a short period of time. Therefore, it would not have been possible to claim the impact of the IWB on pupils' level of achievement.

3.3.5 Teachers' Perception and Beliefs

The use of the IWB not only presents opportunities for teachers in classroom, it also presents challenges (Beauchamp, 2004). Not everyone in the education system responds

quickly to technological advances and according to Reid (2002), not all agree that the use of ICT is a good thing within the educational environment. Abbott (2001) states that a teacher is not likely to move from one technology to another unless there is clear evidence that it is efficient to do so. Cox (2005) states that the introduction of ICT in education in many cases is restricted by the beliefs, attitudes and practices of the teachers, as its effectiveness is not understood. According to Reksten (2000), teachers often find technology threatening and its introduction always brings overwhelming change and risk to teaching staff. This is because there are teachers who are resistant to change and are afraid of failing at something new. In addition to that, teachers are also overwhelmed by the responsibilities of teaching.

In addition to that, when ICT is first introduced in a classroom, often the focus is on the technology itself and less on how the technology could be integrated into instruction to influence teaching and learning. According to Sandholtz et al. (1997), it is often perceived as adding another burden to the already overworked and stressed teachers as they will have to learn and manage the new technology. However, as teachers continued using the technology and found ways to use the technology in strategic ways, its use for teaching and learning changed as teachers changed. Teachers will become more confident in using technology and they will be able to adapt the use of technology in the classroom. Their focus will change from on the technology itself to how technology can help in teaching and learning, as they will become more able to integrate the use of technology in their lessons. This is because teachers become more familiar with the relevant software and teaching resources in order for them to use the technology such as the IWB to meet their specific learning goals (Stein, 2005). This can also be seen from the research of Gray et al. (2005), who conducted a study on a group of language teachers and investigated the practical realities of teachers in integrating technologies into classroom practice, which emphasised pedagogy over technology. The study, which took place from early 2003 until October 2004, revealed that once participants began to feel confident about the use of the IWB, they were able to highlight the benefits of the IWB as a tool for teaching and learning. These include engaging pupils' attention, managing classroom, managing time and resources, better personal organisation, smoother transitions and better mobility.

However, the benefits of the IWB in the classroom rely heavily on the teacher's attitude, skills and planning and criticism of using the IWB in the classroom will be discussed

further in this section. Therefore, it is important to understand teachers' perceptions and expectations on the integration of the IWB in classroom, which are associated with the actual use. Furthermore, according to Buabeng-Andoh (2012), teachers' positive attitudes towards technology can provide useful insight into the integration and adoption of ICT into teaching and learning processes.

Additionally, Salimah and Albion (2004) state that information on teachers' perceptions can help in planning and promote the use of ICT in classroom as the information may help in providing teachers with a rationale for using ICT in classroom. It is important to look into teachers' perceived benefits of the IWB as this information will help in assisting the effective use of the IWB in the classroom by providing a rationale for usage as well as justification for the costs of implementing the IWB.

A study carried out by Cox et al. (1999) to examine the factors relating to the uptake of ICT in teaching, where 44 male and 28 female computer-using teachers participated resulted in findings that teachers who were already regular users of ICT and have confidence in using ICT in the classroom perceived the use of ICT to be useful. The study involved collecting evidence through questionnaire from teachers about their ICT experiences, expertise and use in teaching, their attitudes to the value of ICT for teaching and learning and the training they had received. The findings correspond to the claims made by Davis (1989), who states that people will accept or reject technology depending on whether they perceive the technology to be beneficial or useful to them. In other words, people will use technology if they believe it will facilitate them to perform their task better. Additionally, he also states that other than perceiving the usefulness of the technology, people are more likely to accept technology if they find the technology to be easy to use and require little effort. Furthermore, Betcher and Lee (2009) state that resistance to use technology such as the IWB in the classroom is often caused by the ignorance of what the technology is all about. According to Buabeng-Andoh (2012), the attitudes of teachers towards technology will greatly influence their adoption and integration of the technology into their practice. Similarly, Selwood and Pilkington (2005:169) state that "attitudes towards ICT may well have an effect on readiness to use ICT applications".

3.4 Summary of Literature

As mentioned in Chapter One earlier, the study aims to investigate the best practice that can be incorporated to assist the effective use of the IWB in primary classroom in Brunei Darussalam. The study includes investigating teachers' perceived benefits of IWB, teachers' level of training in using IWB for teaching; teachers' knowledge and current practices of IWB; and teachers' attitude towards the use of the IWB.

This chapter reviewed the literature found on the use of the IWB in the classroom. The literature suggests that the IWB can benefit both teachers and pupils in the classroom if used appropriately. It provides teachers with a wider range of teaching resources; improves quality of teaching resources; reduces workload and improves the pace of lessons. It also increases pupils' motivation and engagement; increases interactivity; creates a dialogic classroom; and improves achievement. According to Kooi (2001), there has been a lack of research conducted in Brunei Darussalam to enlighten policy-makers and teachers on how best to integrate ICT in education. According to Seyal (2012), some recent studies in Brunei Darussalam have been conducted on the use of technology in education only focused on the students. These studies include engaging learners using IWB in Brunei Darussalam primary schools (Aminatol and Mogana, 2006) and the integration of IWB to improve students' outcome (Emran and Dhindsa, 2010). Additionally, according to Seyal (2012), several studies undertaken in the past only focused on the different dimensions of ICT in teaching and learning. This indicates the lack of research made in reference to the effective and successful integration of technology such as the IWB into the primary schools in Brunei Darussalam.

The studies found in the literature presented in this chapter provide a theoretical framework for investigating factors that can influence the successful integration of the IWB in the classroom. It can be seen that studies discussed in this chapter are mostly studies that were conducted before 2010. This is because the IWB has now become established and embedded in most education systems such as in the United Kingdom and less interest has been shown in the research field due to the emergence of other new technology. Nevertheless, the previous studies such as those conducted during the early implementation of the IWB are still relevant to the education system in Brunei Darussalam, as it is still at the early stage of IWB implementation.

It was also mentioned earlier in this chapter that there are also criticisms found in the literature in relation to the use of the IWB in the classroom, such as time and logistical issues. However, although these issues often act as barriers for teachers to use the IWB in the classroom, with proper support and when used effectively, the benefits of using the IWB in the classroom will outweigh the barriers. Nevertheless, although the issues mentioned in this chapter can influence the successful integration of the IWB in the classroom, it is also equally important to look into the change management process. This is because introducing innovation such as the IWB requires people to accept the innovation by changing their current behaviour and practices. This illustrates the need to focus on change management strategies to assist the implementation process of IWB in the primary classroom, which will be explored further in the next chapter (Chapter Four).

CHAPTER FOUR: LITERATURE REVIEW (THE MANAGEMENT OF CHANGE)

4.1 Introduction

Other than looking into the philosophy of the interactive whiteboard (IWB), which was discussed in Chapter Three, it is also important to look into change management as well as issues concerning training or professional development to ensure the successful implementation of new technology in education. This chapter will discuss the importance of understanding change management in introducing and implementing an innovation such as IWB into the education system. This includes the change process; responses to change; models of change; and leadership. In addition to that, this chapter will also look into training or professional development and practices as it is an important issue in successfully implementing change in education.

The section on professional development will discuss issues that are important for teachers to successfully implement and integrate the use of the IWB in the classroom. These include the importance of professional development in implementing changes in the education context; technical and pedagogical development needs; professional development as an ongoing process and support needed for successful implementation of practice.

4.2 Implementation and Change

Educators might overlook the effectiveness of integrating ICT in education, including the use of IWB, which results in the low usage of IWB in the classroom, especially when it is newly introduced in the education system. According to Cox (2005), the use of ICT in education was to improve teaching and learning practices or to present the current curriculum differently, but it is often restricted by teachers' attitudes, beliefs and practices. According to Tinio (2003), the effective integration of technology is a complex process that not only involves the technology itself but also curriculum, pedagogy, teacher competencies; readiness of institution, financing and others. According to Sandholtz et al. (1997), teachers' beliefs govern behaviour and to change

educational practices such as introducing a new educational tool becomes critically important as there is a need to replace old beliefs with a new belief. In addition to that, according to Picciano (2006:239):

> Regardless of the nature of change – whether it be introducing a new teaching technique of implementing a major new administrative policy – individuals involved must understand and to a degree accept what is expected and what is going to be done. Neglecting to develop this understanding among the people who ultimately will most influence success or failure will likely jeopardize the implementation of new project.

Therefore, it is important to manage change to be able to successfully implement the integration of ICT in schools as it will help to understand and guide changes successfully (Salisbury, 1996). Wheeler and Winter (2005) state that the management of change should be conducted in a sensitive manner as changes often bring a culture of uncertainty for teachers. For that reason, it is also important to understand the process of change and this will be explained further in this section.

4.2.1 Change Process

Morrison (1998:13) defines change as "a dynamic and continuous process of development and growth that involves a reorganization in response to 'felt needs'." Change is when a transformation process takes place which can begin by either internal or external forces involving individuals, groups or an organisation. This process leads to an adjustment of existing beliefs, practices and outcomes and it concerns people more than the content of change itself. Hall and Hord (2001) describe change as a process and not an event. According to Hall and Hord (2001:4), change is "a process through which people and organisations move as they gradually come to understand, and become skilled and competent in the use of new ways". Morrison (1998) states that change is a process which occurs over time and Hargreaves (1994) referred to the change process as practices, procedures, rules and relationships that lead to changes as well as sociological and psychological mechanisms which shape the conditions of change.

According to Fullan (2001), change may come voluntarily or because it is imposed on or it can be initiated by dissatisfaction with the current situation. In educational institutions, change can be extremely complex, especially if the change is important as it is linked to emotions of people who are involved (James and Connolly, 2000). Fullan (1999) states that it is also complex due to the dynamics of diversity, equity and power

as change in educational reform involves different individuals with different interests and power who need to be influenced for change to be successful. Fullan (1993) also states that change is complex due to the unexpected factors that are unpredictable and unavoidable, which occur during the process of change such as leaders leaving, change of education policy, new technology or resources invented, people shifting within the organisation and others.

According to Goodison (2003:549), implementing changes in education including integrating ICT is a "dauntingly complex and taxing process". Furthermore, introducing technology into education too quickly would be impossible as education is a very complex organisation (Gillespie, 2006). Furthermore, according to Dillemans et al. (1998), the introduction of ICT in education is challenging as it involves three different layers of the educational system, which are imposing changes on both teachers and learners, changes in knowledge organisation and changes in teaching styles or practice. In addition to that, according to Fullan (2001), a change of practice is involved when implementing change in education, as when a new programme or policy is implemented, because it involves three factors of change which are; the possible use of new or revised materials such as teaching resources or technologies; the possible use of new teaching strategies; and the possible adjustment of beliefs.

According to Hall et al. (1977) people's responses to change are different, including in the education context as people perceive things differently. James and Connolly (2000) state that change can initiate different emotions of the people involved and anxiety is likely to be the highest emotion initiated in the management of both voluntary and imposed changes. This is because the emotions that are experienced during the change process or even the prospect of experiencing emotions because of change can cause anxiety due to the uncertainty and fear of the unknown. According to Fullan (1999), change means 'facing the unknown' and when it is not certain that the proposed change will be successful, it may cause an emotional burden that can arouse anxiety especially during the early stage of change.

According to Fullan (1999), there are three stages of the change process. Stage one is the initiation or adoption process, which is a process that leads up to the introduction of an innovation. At this stage, he suggested the need to consider the relevance of change, which includes the introduction of innovation. This involves the clarification of needs,

process and goals. Additionally, he also suggested the need to consider the readiness of school's to initiate, develop or adopt a given innovation; and the availability and provision of resources. Stage two of the change process is the implementation process, which involves the application or the attempt to put an idea or innovation into practice. Whereas, stage three is the continuation stage, which refers to whether the change or innovation is built into the system or disappears. At this stage, when the innovation is discontinued, it indicates the end point of the change process.

4.2.2 Responses to Change

Although the main purpose of introducing ICT in education is to improve teaching and learning, educators might not understand its effectiveness and would prefer their traditional way of teaching. Participants interviewed by Reid (2002) raised concerns about emphasising technology for the future of education and did not see technology as being more effective than books in presenting information and knowledge to students. However, according to Selwood and Pilkington (2005), the benefits of implementing changes in working practice may not be reflected immediately but at a later time. According to Connor (1995) cited by James and Connolly (2000:19), the main reasons people resist change are:

> …lack of trust; belief that change is unnecessary; belief that change is not feasible; economic threats; the relatively high cost; fear of failure; loss of status and power; threats to values and ideas; and resentment of interference.

This resistance is considered as a natural response as change involves emotions, especially anxiety and may cause teachers to find technology threatening, despite adequate training (Reksten, 2000). Thus, it is important to consider the feelings and perceptions of people involved in the change process for the process to be successfully implemented. In addition to that, Jones (2004) states that many teachers who feel anxious in using technology in the classroom are often those who do not consider themselves as well skilled in using technology and are anxious about using it in front of students who might know how to use technology better than they do.

Rogers (1995) categorises responses to the introduction of change into five categories, which are innovators, early adopters, early majority, late majority and laggards. These categories are grouped according to the degree of adoption in a behavioural context.

Wheeler and Winter (2005) state that Rogers' model is categorised according to the willingness of each group to adopt new ideas. According to Rogers (1995) innovators are those who are active information seekers of new ideas and are often the first to adopt innovation in their system. They are able to cope with the uncertainty that innovations bring and are always interested in new ideas. Early adopters are those who look for information and advice of innovation before adopting it and often serve as a role model for other members. They often adopt new ideas and decrease the uncertainty of the innovation by conveying a subjective evaluation of the innovation to other peers. The early majority are those who took longer than early adopters to decide on completely adopting a new idea. They often adopt innovation after watching early adopters for leadership. The late majority are those who adopt new ideas just after the average member of the system has adapted to the new idea. They need to be convinced before they view the innovation as an essential. It may be due to economic reasons or peer pressure. The idea of uncertainty must be eliminated before adopting the innovation. Meanwhile, laggards, who are also referred to as traditional, are those who are the last to adopt innovation and their decisions are often based on what has been done previously. They tend to question the innovation and change agents and take a long time to decide whether or not to adopt innovation.

Nevertheless, according to Brummelhuis (1995), the process of educational change when an innovation is introduced can be influenced by two distinct school and teacher factors, which are the non-manipulative and manipulative factors. The non-manipulative factors are factors that cannot be directly influenced such as age, teaching experience, availability of external support and policy by government, whereas manipulative factors are factors that can be influenced such as skills and knowledge, attitudes and internal support.

4.2.3 Models of Change

Reid (2002) states that there is a need to hear teachers' views on the use IT in education as the frontline professionals in education. According to Sandholtz et al. (1997), for change to occur, teachers need to be active participants and should act as leaders and according to Durrant and Holden (2006), teachers play an important role in the complex processes of school improvement. Teachers also need to be at the centre of reform efforts because they determine what will happen in the classroom and whether

innovations or change are implemented and because change and improvement usually focus on improving students' learning. Ignoring teachers' concerns and responses may result in resistance to change and may reduce use of technology before it really has a chance to begin (Reksten, 2000).

Additionally, according to Fullan (2001:115), "educational change depends on what teachers do and think". Supporting teachers by acknowledging their concerns and giving them responsibility for planning, tracking and evaluating their activities leads to better school improvement and this helps teachers to develop a meaning for the complex process of change, to be able to work strategically (Durrant and Holden, 2006). According to Fullan (2001), one of the reasons that cause failure in educational change is the assumptions of planner and policy makers without taking into consideration of others' realities. It is important to take into account the realities of others who are involved in the process of change and implementation as it may lead to alterations for a better direction of change or even expose problems of implementation that must be addressed, which may indicate where and when change should start.

According to Durrant and Holden (2006), it is important to consider people's ideas and opinions to be able to get information that will assist change. This also encourages ownership and demonstrates that people are associated with the process of change thus providing opportunities for engagement. Effective change in schools can also be achieved by understanding teachers' desire for change and conservation of practices they already value, which according to Hargreaves (1994) can be done by taking into account teachers' perceptions and perspectives. Moreover, a successful change in education where technology is implemented is achieved when educators build on their professional expertise and learn technology for its educational purposes (King, 2003).

Hall and Hord (2001) classified feelings and perceptions about innovation and the change process as concerns and they named the development pattern of feelings and perceptions as they develop gradually as the stages of concern (SoC). According to Hall et al. (1977:5), concern is "the composite representation of the feelings, preoccupation, thought, and consideration given to a particular issue or task". Concerns in each stage are different as a result of experience and according to Morrison (1998) responses to change are different as different participants view change differently. Furthermore, the type of concern of individuals when an innovation is introduced depends on their

closeness and their involvement with the innovation, which includes their knowledge and experience with it (Hall et al., 1977).

According to Hall and Hord (2011), change in a system occurs when an individual changes and this can be facilitated by the Concerns-Based Adoption Model (CBAM) approach. This approach can facilitate change effort by taking individuals concerns into consideration and is shown in Figure 4.1 below.

Stages of Concern

6 – Refocusing

5 – Collaboration   Impact

4 – Consequence

3 – Management   Task

2 – Personal

1 – Informational   Self

0 – Unconcerned   Unrelated
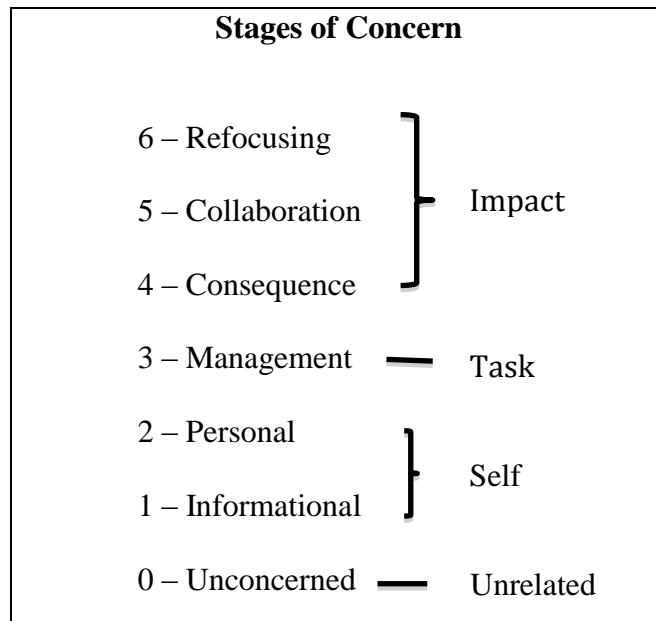
Figure 4.1: Stages of Concern
(Source: Hall and Hord, 2011)

The stages of concern are distinguished into self, task and impact (see Figure 4.1). The self-stage of concern is when the person knows a little but would like to know more (Stage 1 - Informational) and is concerned about where he or she stands in terms of knowledge and what he or she will need to give up when changes arrive and is uncertain about the demands of the innovation (Stage 2 - Personal). The task stage of concern is Stage 3 or the management stage where concern is mainly on the processes and tasks of using the innovation, which often involves issues such as efficiency, organising, managing and scheduling. Meanwhile, the impact stage of concern deals with the impact of usage of innovation (Stage 4 - Consequence); working collaboratively with colleagues (Stage 5 - Collaboration) and exploring more benefits from the innovation (Stage 6 - Focusing).

A similar model by Sandholtz et al. (1997) describes instructional evolution into five different stages when technology is introduced. The model was developed based on the research conducted for the Apple Classroom of Tomorrow (ACOT) project, which gathered data on what happens when students and teachers have continuous access to technology from 1986 until 1989 (Dwyer et al., 1990). According to Sandholtz et al. (1997), the study indicated that in integrating technology into the classroom instruction, teachers moved through five stages of instructional evolution. The stages, which are entry, adoption, adaptation, appropriation, and invention, are similar to the model of Hall and Hord (2011), where concerns changes in each stage. Figure 4.2 below shows a summary of the stages of instructional evolution in a technology-rich classroom.

Stage 5	Invention	New instructional patterns emerges
Stage 4	Appropriation	Change of personal attitude towards technology.
Stage 3	Adaptation	Concerns are focused on their teaching on students and teachers began to utilise the use of technology.
Stage 2	Adoption	Anticipating problems and developing strategies to solve problems.
Stage 1	Entry	Common concerns includes: students misbehavior and attitudes, the physical environment, technical problems, software management and the dynamic of classroom environment.

Figure 4.2: Stages of Instructional Evolution in Technology-Rich Classroom
(Source: Sandholtz et al., 1997)

Stage one of the model, which is the entry stage, is when teachers have had minimal or no experience with the technology itself and are concerned whether the technology would fit into their teaching. Teachers' common concerns at this stage often involve physical and dynamic environment of classroom, technical problems, software management and behaviour management of students. At stage two, teachers are more concerned with how technology can be integrated in their teaching instruction and as teachers usually lack experience of using technology, technology at this stage is often used in a way they are familiar with, which is direct instruction practice. Stage three or the adaptation stage is when technology is integrated into the classroom practice and teachers' concerns at this stage are related to the productivity of their lessons. Stage four or the appropriation stage is when teachers' behaviour towards technology changes as

they are able to understand the consequences of using technology in the classroom. Additionally, teachers at this stage are able to use technology to achieve teaching and learning objectives. They are able to understand the use of technology in the classroom and are capable of using the technology effortlessly to accomplish instructional and management goals in the classroom. Whereas the final stage, which is the invention stage, is when teachers experiment with technology with teaching strategies and ways of relating to pupils and other teachers. It is the stage when teachers' beliefs and behaviour change and they show comfort with their new set of beliefs (Sandholtz et al., 1997).

It is important to understand SoC (Figure 4.1) and stages of instructional evolution in technology-rich classroom (Figure 4.2) as it may help in determining decision making as it takes into account the personal side of the change process. It provides a developmental aspect on how an individual's concerns influence his or her integration of an innovation. According to Hall et al. (1977), concerns about innovation are developmental and there is a need to resolve earlier concerns before later concerns emerge. Understanding both models of change also helps in determining the level of training and workshops needed for participants involved in the change process, as well as in creating a more strategic plan for change. This is because a successful integration of technology can be achieved by not only providing a new training programme but also maintaining existing ones, which can be done by taking into account teachers' concerns and needs of ICT support (BECTA, 1998). In addition to that, the process of change will be more personalised and can be facilitated (Hall and Hord, 2011).

According to Davis (2002), change works in such a way that it will move through each of the stages, according to what an individual is prepared to work through. It is when each concern is taken into consideration and actions are taken that a person will be influenced to work for change. Nevertheless, Hall et al. (1977) state, the speed at which higher levels of concerns develop will depend on the individual and the innovation involved as well as the environmental context. Additionally, they state that attending to concerns is not about manipulating a person but is a way to recognise the presence of concerns within individuals, to be able to assist them in resolving and coping with those concerns. Therefore, understanding the stages of concern will help in facilitating decision making to successfully implement changes such as introducing a new technology in the classroom,.

A study conducted by Dirksen and Tharp (1997) where 27 pre-service teachers were involved in a teaching programme to mentor the development of teaching strategies and the use of technology in the classroom indicates that as level of usage improves due to experience, their concerns change. In this study, as pre-service teachers entered teaching experience, their self-concerns were high and as transition occurred from student teacher to becoming a teacher, demands were more towards student teachers' time and management. Meanwhile, as they progressed through their teaching experience, impact concerns increased. It was also mentioned that successful and systematic integration of technology can be achieved through training and concerns should be addressed to help in adopting innovation. However, as educational is a complex system, even a small change can cause a lot of disruption. It also involves interactions between many people and as a result of this, leaders can only respond as individuals to the limited information presented to them. Other than that, variation in concerns in an organisation may lead to support not available locally within the organisation, that there is a need to seek from other institutions (Davis, 2002).

According to Betcher and Lee (2009), when new technology is introduced, it is often used to do the same things that previous technology did. They state that:

> … if the true potential of these new tools is to be fully realised, there must come a point where teachers start to think in completely new ways; not just to begin using the technology to do things that are merely a digital version of the old, but rather to create entirely new things that were not possible with the old technologies.

(Betcher and Lee, 2009:2)

Therefore, it indicates that teachers go through phases in implementing and adapting technology in the education system. These phases, when identified will be able to help develop future development plans on the teacher's use of technology in the classroom. Duffield (2005:327) states that "if technology integration is to be supported, it is important to understand and recognize the stages educators can be expected to pass through".

According to Dirksen and Tharp (1997), a key ingredient for understanding and describing the process of an innovation is the identification of the level of technology use by teachers. Two frameworks have been selected for this study, which are the 'Substitution, Augmentation, Modification and Redefinition' model, which is often

referred as the SAMR model by Ruben Puentedura (2012) and the three phases in implementing the IWB by Betcher and Lee (2009).

The SAMR model has four levels of technology integration, which are shown in the Figure 4.3 below.

Enhancement	Substitution (Technology acts as a direct tool with no functional change or improvement)
	Augmentation (Technology acts as a direct tool with functional change or improvement)
Transformation	Modification (Technology allows for significant task design)
	Redefinition (Technology allows for the creation of new task, previously inconceivable)

Figure 4.3: SAMR Model by Ruben Puentedura
(Source: Puentedura, 2012)

The SAMR model (Puentedura, 2012) explains the level of technology integration in education as a tool for enhancement and transformation. Enhancement consists of the substitution and augmentation level where the use of technology is to enhance the lesson. It is when technology is being used as a substitute for previous tools, with no or limited functional change or improvement in teaching or learning. Whereas, the transformation stage, which is the modification and redefinition level is when the use of technology helps transform the lesson to accomplish educational goals. This stage is when the use of technology has a significant impact on teaching and learning in the classroom.

Betcher and Lee (2009) state that the routine use of the IWB allows teacher to move from teaching by simply delivering content to a more engaging and media-rich environment, which is an approach more towards deeper and understanding of key concepts. They summarised three predictable phases that teachers go through when implementing and adopting the use of IWB for teaching, which are stated below.

- *Phase one* is when teachers do all things in the old way, where the availability of the IWB in the classroom does not change anything in their way of doing

things. In other words, teachers use the IWB in the same way they used an old conventional whiteboard, where they do not take advantage of the interactive features of the IWB. They also do not share resources with others, do not save their work at the end of each lesson and there are limited use of IWB tools. At this stage teachers feel that the amount of effort to use the IWB for their teaching outweighs its potential benefits.

- *Phase two* is when teachers do old things in new ways as they start to understand the technology. At this stage teachers feel that the IWB has more to offer and adapt old teaching ideas to take advantage of what the IWB can do. At this stage, teachers discover that the use of the IWB for teaching requires a different approach and teachers start to take advantage of the interactive features of the board. They also share resources, use appropriate software and often save lessons for future use.

- *The final stage* is when teachers start to do new things in new ways as they start to master the technology by reinventing the way they approach their lessons. This starts to happen when teachers spend more time using the IWB and develop new skills and ideas for teaching using an IWB. At this stage, teachers tend to use a greater variety of resources. According to Betcher and Lee (2009:52), teachers at this stage are:

> … marked by creative teaching and innovative techniques that start to see teaching and learning move from mere content delivery to a far more meaningful exploration of lesson content through interactivity, rich media and greater student involvement.

By looking into the model of change mentioned in this section, it may help to facilitate the change needed in implementing the use of technology such as the IWB in the education system. The stages of concern model will help to identify concerns of teachers to be able to help assist them and overcome barriers faced in integrating the use of technology in classroom and the model of change in technology helps to identify the level of practice or technology integration to be able to set or develop further teacher development plans or programmes, which is an important aspect of successful technology integration. This issue will be discussed further in section 4.3 of this chapter.

4.2.4 Leadership

In order to implement change in education, leaders also play an important role to ensure its success. Rogers (2000:23) states that "change is facilitated by active leadership". According to King (2003:11):

> In order for technology to have a role in initiating fundamental change in the teaching and learning process, administrators need to demonstrate commitment to its implementation by allocating financial resources, providing time for learning and application, and facilitating collaborative curriculum development. This broad-based commitment starts with educational leadership that will support such allocation and innovations.

According to Gibson (2002), the active involvement of educational administrators in every learning context is needed in the integration of technology into the learning environment. This includes school senior managers, school superintendents, curriculum coordinators, heads of department, and head teachers. In schools, the role of a headteacher is considered important to lead teachers to change and implement technology such as the IWB. This can be done by leaders in school having positive attitudes towards the use of technology and by highlighting the importance of its use as headteachers can be seen as a role model (Donelly, 1995). In addition to that, other than giving a sense of direction on how technology can be integrated into the curriculum, a leader should inspire others, create a vision and translate the vision to actions as well as maintaining motivation (Farrell, 1999).

According to Southworth (1998:120) effective leadership is a "hands on process" where leaders are involved and engaged and also act as participants in teaching and learning control. A report by Stein (2005:2), which identifies the support needed by both individual teachers and schools on the effective use of IWB in the Primary Classroom revealed that:

> … positive leadership and commitment of senior managers with highly effective organizational skills will facilitate the introduction of IWBs in the Primary Classroom and enable CPD opportunities to be presented to accelerate the effective use of IWBs in school and increase teacher confidence and skills.

It was also recommended by experts in the use of ICT in education who were interviewed by Dillemans et al. (1998) that school principals should firmly support their teachers in the adoption and application of technology by creating a physical and

psychological space to try out new ideas. Additionally, they also recommended that principals act as role models in adopting the technology themselves.

However, according to Fullan (1993:28), a leader's personal visions and shared vision should not dominate early as it is important to have "a good deal of reflective experience before one can form a plausible vision". Shared vision, which is important for success, must also derive from the interaction of leaders and organisation members; thus, the merging of both visions takes time. According to Hall and Hord (2001), shared vision is important as it provides the target for change to begin. They also state that many reforms fail because participants do not share mental images or pictures of what their practice or classroom will look like after identifying change that is implemented. According to Farrell (1999) a characteristic of effective leaders includes their clarity of purpose and communications.

Furthermore, school leaders should also encourage and create conditions where teachers should become leaders themselves. This is because, as mentioned earlier in this chapter, teachers should be the change agents in any educational reform, in order to be able to work actively and achieve an educational objective. Durrant and Holden (2006) state that by fostering leadership among teachers, it helps teachers to work necessarily for a change as they are able to make meaning and adopt a critical perspective of the change process that they are involved in. Additionally, according to Afshari et al. (2009), the teacher's role is important in the teaching and learning paradigm shift and they must also be able to understand the potential role of technology in education. Additionally, they will also need to become effective agents to be able to successfully integrate the use of technology in the classroom.

A study was conducted by Wang (2010) to describe how poor leadership can restrain the process of integrating technology in an elementary school from a technology-coordinator perspective. It revealed that interview participants believed that one of the major barriers to a successful integration of technology in schools is the lack of strong leadership by the school leader. A participant of this study, who was a technology coordinator, stated that the lack of vision and commitment by the school leader had a negative influence on the implementing process. The research demonstrated that the ICT coordinator who was an ICT enthusiast, was demotivated by the lack of involvement of the school leader. The participant and his team also felt discouraged and

frustrated when the school leader did not acknowledge and show any interest in what had been accomplished in terms of integrating and implementing technology. This also resulted in the lack of resources management and the failure to foster a potential technology leader.

As mentioned in this section, changes in the educational system such as infusing innovation such as the interactive whiteboard is not an easy task. There is a need to look into change management and the stages of concern, as it is significant to involve people who are closely involved in teaching and learning in schools to be able to plan and develop strategies for change to be successful. According to Gillespie (2006), it is important to involve school managers, ICT subject leaders, school governors and teachers in planning for future development of ICT in schools, as well as in making policy as they are able to maintain focus on relevant objectives that are appropriate with the situation in their own schools. The leadership role of the school leader is also important to be able to assist change in education. Betcher and Lee (2009) state that a critical combination to achieving a successful school-wide implementation of the IWB is by getting strong support from the school leadership and winning over the majority of the staff to the educational value of the IWB.

4.3 Professional Development and Practice

According to Hall and Hord (2001:110), "Change means developing new understanding and doing things in new ways". According to Fullan (1999), staff or professional development is an essential component related to change in practice. Therefore, learning is the basis of change, especially when the change involves the introduction of new technology such as the IWB.

This section will discuss the need for professional development, which is an important aspect of technology integration in the education. The importance of professional development will also be discussed, followed by the technological and pedagogical professional development needs in order to successfully integrate the IWB in the classroom. In addition to that, this section will also look into professional development as a continuous process and the need of having support to ensure the successful process of change.

4.3.1 The Importance of Professional Development

Teachers' knowledge and current practices of the IWB as well as their attitude towards the IWB is an important issue in determining the best practice that can be incorporated to assist the effective use of the IWB in the classroom. As mentioned earlier in Chapter Three, the use of technology such as the IWB in education can be beneficial to both teachers and pupils. However, integrating technology into the education system is not an easy task as it can be challenging and frustrating as well as expensive (Barron and Orwig, 1995). This is because although the price of software and hardware is decreasing, schools need to make constant efforts to keep abreast of the latest developments of equipment and professional development for teachers. Resources also need to be updated regularly to meet growing demand. In addition to that, to take advantage of technology in education, it requires not only up-to-date information on their features and capabilities but also overarching guidelines and procedures to match with educational problems and needs (Roblyer and Doering, 2012).

Therefore, teachers will need high quality, continuous and readily available support in terms of technical and instructional support. This enables them to develop solutions to problems faced and seek help when necessary to ensure the transfer of learning is successful with the help of technology (King, 2003). Additionally, teachers will also need support in terms of getting proper training or professional development to be able to integrate the IWB in the classroom successfully. This is because according to Guskey (2002:381), "High quality professional development is a central component in nearly every modern proposal for improving education".

Similarly, Buabeng-Andoh (2012) also states that one of the key factors to the successful integration of technology into the classroom is teachers' professional development. However, according to Fullan (2001), professional development is not just about teachers simply attending workshops and courses, but it is the development of habits of learning that are probably more powerful if they present themselves day after day. It is also often that the effort required from teachers to master new technologies in the classroom are underestimated (Dillemans et al., 1998). Therefore, it is important to determine the training needed for teachers to be able to integrate the use of the IWB effectively in their lessons, as one of the major barriers to the use of technology is the lack of proper training (Bates, 1995). Furthermore, Barber et al. (2007) state that the

delivery of useful and engaging teaching resources can be challenging with the use of the IWB. Therefore, this section will discuss the importance of professional development to be able to assist the implementation of effective use of the IWB in the classroom.

According to Beauchamp (2004), the IWB may become an information presentation platform rather than a tool for developing a more interactive learning in the classroom. Similarly, Gage (2005) states that it is possible that teachers use the IWB in the classroom like a traditional board without making use of its functionality, especially by teachers with a lack of professional learning. A project evaluated by University of Birmingham, which is the Transforming School Workforce (TSW) Pathfinder Project noted that one of the major factors hindering the use of ICT in school was the quality of ICT training received by the teachers (Selwood and Pilkington, 2005).

A professional development programme is a way in which the teaching workforce can be improved to achieve teaching and learning objectives in the classroom. It can improve teachers' knowledge and equip teachers with skills that allow them to provide improved learning opportunities for children (Hargreaves and Fullan, 1992). According to Guskey (2002:383):

> the three major goals of professional development programs are change in the classroom practices of teachers, change in their attitudes and beliefs, and change in the learning outcomes of students.

Wideen (1987) states that staff development is a way in which teachers can be involved in a school reform and according to Guskey (2002), professional programmes are a systematic way to bring changes in teachers' practices, attitudes and beliefs in the classroom.

Joyce and Showers (2002:1) describe training as "the means by which new knowledge is added to the teacher's professional repertoire". According to them, a person should be able to transfer new knowledge and skills into practice after attending training or staff or professional development programme, which can be achieved by identifying the outcomes that the training is intended to achieve. According to Guskey (2002), the major goals of professional development are change in teachers' practices, attitudes and

beliefs, as well as changing learning outcomes of students. It is a way to facilitate teachers to achieve a high level of performance in the classroom (Farrell, 1999).

According to Lai (2010), to ensure the quality of the IWB integration in the classroom it is important to teach teachers to become familiar with the technology so they will be able to understand how to use it effectively. Moreover, according to Edgbert (2009), for a technology-supported task to be effective in classrooms teachers need to learn and be given support as well as time to learn how to use appropriate technologies. Teachers are more likely to integrate technology when professional development in the use of technology provides them time to practise the use of the technology as well as to learn, share and collaborate with their colleagues (Afshari et al., 2009). Similarly, Cook and Finlayson (1999) state that teachers will need time and sufficient training when new technology is introduced, which is necessary so that they appreciate what the technology has to offer; decide on the possible contribution to the curriculum, familiarise themselves with how the technology works and develop appropriate teaching approaches with the technology to suit the learning needs of pupils in the classroom. In other words, teachers will develop gradually with time and training. However, according to Hall and Hord (2001), the concerns of teachers as they develop are different and it is important to take their concerns into consideration for successful changes to take place.

The need for teacher training and development is demonstrated by a study conducted by North Islington Education (Latham, 2002), which revealed that a teacher who was observed opted to use the IWB in the same way that a traditional board is used was due to the straightforward use of the resources. This shows that the effective use of the IWB depends on the understanding of teachers on how resources can help improve teaching and learning in the classroom and it also depends on how teachers can make learning a positive and challenging experience using the IWB.

Joyce and Showers (2002) identify four components of training, which are theory that focuses on knowledge, modelling that focuses on demonstration of new skills, practice that involves practising the new skills and peer coaching which involves collaboration of teachers in developing and planning materials and lessons to be able to implement the training effectively. According to them, training that includes all four components are significantly more effective and trainers need to identify the level of current

practices to be able to plan and create appropriate training and components to be used. Therefore, it is important to include all four components of training when introducing new technology such as the IWB. Teachers' level of training and current practices of the IWB should also be identified to be able to develop suitable training with appropriate goals and targets according to their needs and ability of using an IWB in the classroom.

However, according to Guskey (2002), in order for professional development to be successful, trainers also need to take into account what motivates teachers to engage in professional development and the process of change; hence the need to look into model of change which was explained in section 3.2 earlier in this chapter. Guskey (2002) also states that teachers' attitudes and beliefs change due to successful implementation after attending professional development, as they believe technology works because they see it work. In other words, professional development leads to changes of practices in the classroom and when there is evidence of improvement, changes in beliefs and attitudes take place. According to Guskey (2002), practices that are found to be useful in achieving learning outcomes will be retained and repeated and practices that are not will be abandoned. Evidence also suggested that a change in teachers' attitudes takes place after there is evidence of student's improvement.

It was also mentioned earlier in this chapter that it is important to look into the stages of concern. It is important to look into teachers' concerns and their priorities in order to understand teacher development. This is because in order for teacher development to be successful, strategies developed should not only focus on teacher's practice but also their voices or concerns, as teachers are those whom the development is aimed for (Goodson, 1992). Malderez and Wedell (2007) state that one of the reasons why reform fails is because programmes are often designed without taking into account teachers' actual needs in the classroom. They emphasise the need to provide professional development that is suitable for teachers by identifying their needs for two main reasons. The first reason is that an important feature of a successful programme is the accurate identification of needs and secondly, programme development is often based on the needs of teachers as it will be provide answers to why the programme was developed.

4.3.2 Technical and Pedagogical Training Needs

According to Robinson (1997), access to hardware and technology alone does not guarantee the successful uptake of technology in the classroom. Margerum-Leys and Marx (2003), in their study distinguish three different types of knowledge in educational technology, which are content knowledge, pedagogical knowledge and pedagogical content knowledge. Content knowledge of educational technology refers to the knowledge of existing tools, which includes knowing their components and capabilities as they are used in the classroom; this is often referred as technological knowledge. Meanwhile, pedagogical knowledge of educational technology refers to the knowledge of pedagogical strategies and the ability to apply those strategies using the technology. Pedagogical content knowledge of educational technology is knowledge that arises from experience constructed using technology in the classroom, which in turn applies to the use of technology in the classroom for teaching and learning.

Educators often failed to recognise the implications for their pedagogical practices when using technology to aid learning process in the classroom. Most past pedagogical practices are still necessary to teach effectively in a classroom where technology is being used. However, the practices require the teacher to have a leading role in the classroom (Cox, 1997). Furthermore, Robinson (1997) states that learning how to use technology in the classroom not only involves learning to use the hardware and software but it also requires the understanding of pedagogy of what computer assisted learning is capable of doing. In addition to that, it also requires an understanding of what the hardware and software are capable of doing to support teaching and learning in the classroom.

Therefore, in implementing the use of the IWB effectively in the classroom, not only do teachers need to be trained technically on how to use the IWB but they will also need to be trained pedagogically. Teachers will need both content or technological and pedagogical knowledge, as mentioned earlier in this section. According to Hall and Higgins (2005), teachers need to learn not only how to use the IWB technically but also how to use it as a tool to support teaching and learning in the classroom. Therefore, teachers will need to learn basic IWB skills and according to Stein (2005), all teachers will need technical training and support when they first use the IWB, to be able to

perform basic IWB functions and use the IWB features. This may increase teachers' confidence in using the IWB. Thus, teachers will be in a position to use it effectively.

According to Stein (2005), as teachers improve their skills, they become more confident and thus more capable of generating teaching resources. Not only that teachers need to be confident to be able to use the IWB to its maximum benefits, teachers also need to change their teaching practice and not use the board only as a presentation tool to replace the traditional board. This is because according to Beauchamp and Parkinson (2005), the ability of projecting existing software often leads to teachers who are new to the IWB using it in the same way as they use an overhead projector or whiteboard. Furthermore, constructing knowledge from information with the use of ICT in the classroom requires more than just the ability to use a variety of ICT techniques and software, but the ability to question, access, interpret, amend, analyse, construct and communicate meaning from the information (Loveless et al., 2001). Therefore, it is important to include both technical and pedagogical aspects of the IWB in any professional development programmes for teachers to ensure the successful integration of the IWB in the classroom. According to Vrasidas and Glass (2005), teachers often fail to take advantage of what the technology affords that can improve teaching and learning in the classroom and use technology to teach in a traditional way because of their lack of pedagogical knowledge. Therefore, they state that teachers' professional development should not only be based on teaching teachers the technical skills, but it should also prepare teachers to use technologies to construct, represent and share knowledge using the technology in the classroom context. This is because, without an understanding of pedagogical principles, the IWB will be just another piece of hardware in the classroom and will not improve the quality of teaching and learning (Betcher and Lee, 2009).

Experts in the use of ICT in education in a series of in-depth interview by Dilemmans et al. (1998) considered well-adapted training as extremely important to implement ICT in education. During the research, thee participants, who were 65 individuals in the field of education, were interviewed on the critical success factors and strategies to implement ICT in the future. They agreed that teacher training should motivate teachers and make teachers believe that technologies can enhance their teaching. It was also agreed that a priority of teacher training should be to provide teachers with the correct pedagogical skills or the teaching itself, rather than the technology, to achieve a maximum

improvement in the quality of teaching and learning. This is similar to what the literature suggests as reported earlier in this section. According to Zhao (2003) this can be achieved by integrating technology into existing teacher training courses rather than offering separate technology training, which could result in teachers focusing on the technological skills rather than the use of technology to assist teaching. This helps teachers to understand and learn what technology can do for them, as the usefulness of technology relies on how it is being used. The importance of integrating technological knowledge with pedagogical and content knowledge is echoed by Mishra and Koehler (2006) through their introduction of the Technological Pedagogical Content Knowledge (TPCK) framework, which will be explained further below.

According to Mishra and Koehler (2006:1020), "Teaching is a highly complex activity that draws on many kinds of knowledge". They state that knowledge of technology should not be separated from knowledge of pedagogy, as it will lead to the design and implementation of professional development that promotes only the learning of specific hardware and software skills as teachers' knowledge bases for teaching with technology. Thus, they introduced a framework for technology integration, which emphasises the connections, affordances, constraints and interactions among and between content (C), pedagogy (P) and technology (T). Content knowledge refers to the knowledge about the subject matter, whereas the pedagogical knowledge refers to the knowledge about the processes and practices of teaching and learning. In addition to that, technology knowledge refers to knowledge about technology, which includes the skills required to operate any given technology. The framework, which suggests that the three bodies of knowledge should not be treated separately is illustrated in the Figure 4.4 below.
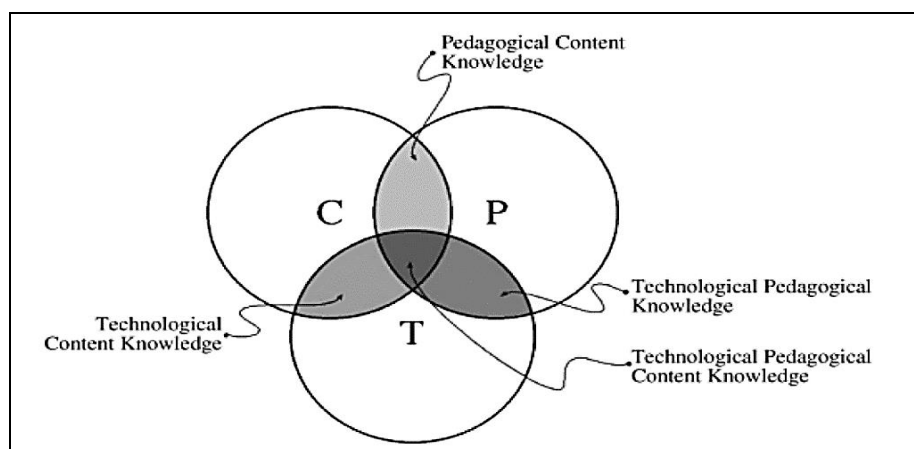
Figure 4.4: Technological Pedagogical Content Knowledge.
(Source: Mishra and Koehler, 2006)

As seen from Figure 4.4 above, the three circles (T, P and C) overlap, which suggests four more kinds of interrelated knowledge showing the relationship between content, pedagogy and technology. Therefore, in addition to the knowledge mentioned earlier, this model introduced three new pairs of knowledge intersection and one new triad, which are pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK) and technological pedagogical content knowledge (TPCK).

According to Mishra and Koehler (2008), pedagogical content knowledge (PCK) is the relationship between content and pedagogy. It is the knowledge of what teaching approaches fit the content and how the element of the content can be arranged for better teaching (Mishra and Koehler, 2006). Whereas, technological content knowledge (TCK) is the understanding of the manner in which technology and content are related. In other words, not only do teachers need to master the subject matter they teach but they also need to have a deep understanding of the manner in which the subject matter can be changed by the application of technology. Technological pedagogical knowledge (TPK) refers to "the understanding of how teaching and learning changes when technologies are used" (Mishra and Koehler, 2008:9). This includes understanding the existence of tools for a particular task, the ability to select appropriate tools, strategies for using the tools' affordances, and knowledge of pedagogical strategies and the ability to apply those strategies for use of technologies. Technological pedagogical content knowledge (TPCK) refers to the intersection of all three bodies of knowledge (content, pedagogy and technology). It is the understanding of how the three bodies of knowledge interact with each other. According to Mishra and Koehler (2008:10), TPCK includes:

> … an understanding of how to represent concepts with technologies, pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help student learn; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones.

In integrating technology based on the 'Substitution, Augmentation, Modification and Redefinition' model (SAMR) by Ruben Puentedura (2012) each level in the SAMR model (see section 4.2.3) can be defined by different knowledge based on the TPCK framework. The substitution level of technology integration is when teachers' knowledge is based on content, technology and pedagogical knowledge. Whereas, the

augmentation level is when teachers' knowledge consists of the pedagogical knowledge, content knowledge and technological knowledge. The next level, which is the modification level is when teachers' knowledge is based on the pedagogical content knowledge, technological pedagogical knowledge and technological content knowledge. Meanwhile the highest level of technology integration based on the SAMR model is when teachers are equipped with technological pedagogical content knowledge or the TPCK (Puentedura, 2014).

4.3.3 Professional Development as a Continuous Process

Investment in training or teacher development as an ongoing process is also important to ensure that teachers have competence with the educational approach with the use of ICT in the classroom to be able to put planning into practice effectively (Cook and Finlayson, 1999). According to Leask (2001), the lack of proper professional development and the constant change of hardware or software may cause unfamiliarity with using the technology, which may weaken teachers' confidence to use ICT in the classroom. In addition to that, the quality of interaction in the classroom is largely dependent on the teacher and cannot be provided by ICT on its own, therefore, teachers need to be confident in using ICT in classroom (Kennewell et al., 2008).

According to Dirksen and Tharp (1997), the process of systemic integration of technology depends on the professional development received by staff and should begin with student teaching. In other words, in facilitating change including in implementing technology in education, it is important that teachers also attend professional development programmes during their pre-service years. Similarly, Homles (2009:1) states:

> In order for future teachers to be suitably prepared to teach using IWBs, it follows that teacher training should provide pre-service teachers with appropriate learning experiences involving this new technology.

Hall and Hord (2001) state that often professional development or workshops are scheduled only at the beginning of a change process. This means that training does not maintain a current awareness of what is possible and needed, including the needs of future teachers. According to Vrasidas and Glass (2005), a one-time workshop and teacher preparation during a course of a semester to prepare teachers to integrate the use

of technology in classroom is not sufficient. Similarly, Digregorio and Sobel-Lojeski (2010) state that a one-time training, especially when it only focuses on the technical side of the technology, is not likely to result in the effective use of the technology. In addition to that, Picciano (2006) states that effective staff development programmes should take place over an extended period of time to allow participants to practise and experiment with the skills and knowledge learned.

Furthermore, according to Wright (2005), to enhance knowledge of meaningful technology integration through identifying professional development needs, there is also a need to form a partnership that not only involves in-service teachers but also pre-service teachers as well as administrators. According to Mumtaz (2000), adequate and careful professional development is important to be able to assist the effective use of technology in the classroom as it can help to raise teachers' awareness of the range of uses and possible benefits of ICT in the classroom. Therefore, it is important that professional development is seen as a continuous process and should also begin during the pre-service year. According to Vrasidas and Glass (2005), both pre-service and in-service teachers should be provided with opportunities to experience technology while engaged in authentic tasks to prepare them for technology integration in classroom.

4.3.4 Providing Support

It has been discussed earlier in this section that professional development is essential to successfully integrate the use of the IWB in the primary classroom. However, it is also important for teachers to receive support at work after initial exposure to new ideas and professional development. According to Fullan (1999), the lack of support for both new and continuing teachers after a change is implemented often indicates the end of many implemented programmes. Thus, apart from the importance of providing technical support as mentioned in Chapter Three earlier, there is also the need to consider other support needed at the continuation stage that was mentioned in section 4.2.1 of this chapter, to ensure that change is embedded or built into the system.

Clarke (2006) states that it is important to give support to teachers who are new to ICT so that their self-esteem and confidence grow with learning. According to Vrasidas and Glass (2005), teachers will need to have access to support throughout their careers as they try to integrate technology into their teaching practice and they also highlighted the

importance of ongoing support for teachers to continue integrating technology successfully into the classroom. According to Guskey (2002), there is also a need to give regular feedback on the effects of the successful efforts made by individuals involved in order for the new practices to be sustained. Additionally, he states that it is also important to provide teachers with follow-up, support, and pressure after the initial training for continuing educational improvement. This is because change mainly occurs after the implementation takes place. In addition to that, King (2003) states that there is important to recognise the need for lifelong learning when considering the implementation of technology in the education, as technology is changing rapidly. This involves the need to seek continuous opportunities to develop the skills needed to implemented it in the classroom.

Another form of support that is important to teacher development after initial professional development is mentoring or coaching. According to Clarke (2006), mentors or coaches are often employed to help and support other members or staff to develop in an organisation. Additionally, he states:

> Their role is to advise and guide people, through helping them develop their self-esteem. This is achieved through simply providing a person to discuss matters with, offering a wider perspective, providing access to experience and generally supporting the individual.

(Clarke, 2006:72)

Dirksen and Tharp (1997) state the importance of mentoring or coaching is to ensure the continuous use of instructional technologies in the classroom by teachers after initial professional development. According to Joyce and Showers (1982), the development of skills through professional development itself does not ensure transfer into practice. They state that teachers will still need to be guided and they need additional information in order to transfer skills learned into practice in the classroom, even after attending professional development. According to Joyce and Showers (1982:5), "When the coaching component is added and implemented effectively, most (probably nearly all) teachers will begin to transfer the new model into their active repertoire". Betcher and Lee (2009) state that having a team of mentors or coaches in schools creates an authentic environment for learning among teachers and allows new teaching ideas to flow rapidly through other staff members.

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Furthermore, coaching is considered as an important component of professional development as it can facilitate the transfer of skills learned during professional development into practice (Joyce and Showers, 2002). They state that coached teachers are more likely to practise new strategies more often with greater skills. Coached teachers also adapt the strategies in more appropriate ways to their own goals and context. In addition to that, they are more likely to retain and increase their skills over time and are more likely to explain the new models of teaching to their students to ensure that their students understand the aim of their strategy. They also state that often, coached teachers demonstrate a clearer understanding of the aims and use of new strategies.

However, in order to assist teachers to adopt changes and integrate the use of technology such as the IWB in the classroom, their concerns which can be identified according to the stages of concern (SoC) by Hall and Hord (2011) and the stages of instructional evolution in a technology-rich classroom model by Sandholtz et al. (1997) as mentioned earlier in section 4.2.3 should be addressed during the mentoring process. This is because according to Hall and Hord (2011:61), "Interventions to facilitate change need to be aligned with the concerns of those who are engaged with the change".

Additionally, understanding and addressing teachers' concerns are important when implementing change such as introducing technology in the education. This is because it will influence the individual's technology integration. According to Hall and Hord (2001) the stages of concern (SoC) can be used as a guideline to design and shape the professional development needs not only during the pre-implementation period of change but also during the implementation process. They also state that other than the ability to provide more relevant workshops and create more strategic plans, understanding teachers' concerns will also help in providing more effective coaching sessions as it takes into account the personal side of the change process. Thus, where concerns are addressed this will result in a change process that is more personalised. In addition to that, a short coaching session is more effective than longer, large-group activities, while evaluation and feedback after initial training are also important to ensure that intended goals or objectives are achieved (Picciano, 2006).

4.4 Summary of Literature

As discussed in this chapter, it is important to understand the process of change as Fullan (1999) suggests that one of the problems that are often faced in education reform is that people do not have a clear understanding of change and the reason for it. Thus, they reject the idea of change as they are given insufficient opportunities to make sense of the new technologies that are introduced for themselves.

The literature presented in this chapter suggests that it is important to look into change management and issues related to training and teacher development as it may help to determine the significant changes that should be implemented to assist the effective use of the IWB in the classroom. This involves including teachers' concerns as well as determining their level of knowledge and practices by looking into models of change in technology in developing strategies, to successfully implement and introduce technology such as the IWB. Furthermore, the barriers that were mentioned in Chapter Three can be overcome by looking into teachers' concerns and an appropriate teacher development strategy could also be developed. Therefore, in order to implement the use of technology such as the IWB in the classroom to assist teaching and learning, teachers need to have experience where they learn how to use technology and explore its features to be able to use it to its maximum potential and to develop teaching strategies or lesson structures that will benefit both teacher and pupils. This can be achieved by providing teachers with the support they need during the implementation process. This support includes providing teachers with proper professional development programmes that are designed according to their needs, as well as providing continuous support after the initial professional development through coaching and mentoring. Additionally, the problem of training or teacher development as well as change in implementing innovation such as the introduction of the IWB was addressed in this chapter.

Based on the factors mentioned above, three main models of managing effective change, which emerges from this chapter and will be used to analysed data gathered for this study are the Concerns Based Adoption Model (CBAM), SAMR model of technology integration and the Technological Pedagogical Content Knowledge model (TPCK). The CBAM model will be used to identify teachers' concerns in integrating the IWB in the classroom to be able to assist them with the successful implementation of IWB. Whereas, the SAMR and the TPCK model will be used to identify teachers'

current level of IWB practices and knowledge to be able to provide information on teachers' professional development needs to be able to assist the successful integration of the IWB for teaching and learning in the classroom. These will be discussed further in Chapter Eight.

It can be concluded that, the studies found in the literature presented both in Chapter Three and Chapter Four provide a theoretical framework for investigating factors that can influence the successful integration of the IWB in the classrooms. The next chapter will discuss the methodology used for this study, which aims to investigate the best practice that can be incorporated to assist the effective use of the IWB in the primary classroom.

CHAPTER FIVE: RESEARCH METHODOLOGY

5.0 Introduction

According to Robson (1993), research design is when research questions are turned into a project and involves all issues related in planning and executing a research project from identifying problems, ways of reporting results as well as publishing results (Punch, 1998). This chapter discusses the design and implementation of methods used for this study, which concerns determining the best practice that can be incorporated to assist the effective use of the IWB in the primary classroom in Brunei Darussalam. The aims of the research involved investigating into teachers' perceived benefits of IWB; teachers' level of training; teachers' knowledge and current practices of IWB; and teachers' attitudes toward the integration of IWB in the classroom. This chapter explains the rationale for the chosen research methods; the research methods used for this study; procedures taken for conducting the research; the research instruments used; ethical and practical issues involved; how the sample was chosen; how the research was conducted; and how data were analysed. In addition to that, the limitations of the study will also be discussed in this chapter.

5.1 Research Methodology

The research design used for data collection of this investigation is a mixed method approach which uses both quantitative and qualitative methods to be able to generate richer data and verify findings, rather than using one method alone. According to Bryman (2008), the term used for using more than one method or source for data collection is triangulation. Bell (2005) states that triangulation allows researchers to cross-check findings in a more extensive study and according to Bryman (2008) triangulation allows the researcher to use quantitative methods to justify findings using qualitative data or vice versa. Triangulation also enhances the validity and credibility of research findings (Greene, 2007). In other words, the findings from one method of study can be checked against findings gathered from the other method of study.

Quantitative method is defined as techniques associated with gathering, analysing, interpreting and presenting data, which are numerical. Bryman (2008:140) describes

quantitative data collection as "entailing the collection of numerical data". In other words, quantitative techniques involve data collection that is numerically based (Walliman, 2006). In this study a questionnaire, which is an example of a quantitative method, was used to collect demographic data of participants as well as their perceptions on the use of the IWB in the classroom focusing on their knowledge, practices and attitudes, which will be explained further in this chapter.

On the other hand, a qualitative approach is when a researcher studies spoken and written representations and records of behaviour and attitudes (Punch, 1998). Remler and Ryzin (2011) state that a qualitative research is defined based on the type of data it produces and in terms of the analysis it employs. The kind of data using the qualitative approach involves different kinds of non-numerical data. According to Creswell (2003), a qualitative research takes place in the natural setting, where the researcher often goes to the site of the participants to conduct the research. This allows researcher to get more detailed information and knowledge about the individual or place that he or she intends to research. Furthermore, it also allows the researcher to be involved in the actual experiences of the participants. Methods of data collection using a qualitative method often require the active involvement of participants, such as interviews, case studies and observations.

Qualitative research is also interpretive, in that researcher makes interpretation of the data such as developing a description of an individual or setting, analysing data for themes or categories and making conclusions about its meaning personally and theoretically (Creswell, 2003). According to Walliman (2006), qualitative methods of data collection focus more on general beliefs and customs as well as information, which are often expressed in words. Burns (2000) states that qualitative research aims to explore other people's views, perceptions and behaviours as it allows access to individual meaning in the ongoing context of daily life.

According to Kvale (2007) a qualitative approach takes place when a researcher is interested in accessing experiences and interactions, which is an important aspect of this study. Kvale (2007) also states that a qualitative research enables a researcher to understand, describe and explain a phenomenon or situation. Therefore, apart from questionnaire, interviews and observations were also used as the method of data collection for this study as it was a suitable approach to achieve the aim of the study,

which is to investigate teachers' perceived benefits of IWB; teachers' level of training; teachers' knowledge and current practices of IWB; and teachers' attitude towards the use of IWB.

Both quantitative and qualitative methods were chosen because they give richer and more valid data for this study compared by using one method alone. According to Wiersma and Jurs (2009:287), the use of more than one method of data collection allows a researcher to assess "the sufficiency of the data according to the convergence of multiple data sources or multiple data-collection procedures". According to Silverman (2006:290), in using mixed methods, "if the findings obtained with all these methods correspond and draw the same or similar conclusions, then the validity of those findings and conclusions has been established". The use of multiple methods in data collection procedures also enhances reliability (Wiersma and Jurs, 2009). The research instruments, which are the questionnaire, observation and interview developed using both research approaches chosen for this study will be explained further in this chapter.

5.2 Setting and Access

The main focus of this study is the perceptions of primary school teachers on the use of the IWB in primary schools in Brunei Darussalam. Thus this study was conducted within the country. As a sponsored student under the Government of Brunei Darussalam, an application letter to conduct a research was written to Brunei Students' Unit in London, United Kingdom to allow the researcher to travel to Brunei Darussalam in order to collect data for this research. An application letter was also written to the Ministry of Brunei Darussalam to seek for permission to conduct the research in government primary schools in Brunei Darussalam for the duration of three years. The letter also included information about the research to be conducted as well as the targeted sample of the research, which was primary school teachers in Brunei Darussalam.

As seen in Table 2.1 in Chapter Two, the total number of primary schools in Brunei Darussalam is 119 schools. The statistics also show that 62 schools are located in the Brunei Muara district, 30 schools in the Tutong district, 16 schools in the Belait district and 11 schools in the Temburong district. However, permission was only given to conduct research in seven primary schools in Brunei Darussalam. Schools selected for

this research were selected randomly by the Ministry of Education itself and all schools are located in the Brunei Muara district. After permission was granted, a permission letter stating that the researcher was allowed to conduct research in the selected schools was forwarded to each of the schools by the Ministry of Education itself. A copy of the official permission letter was also given to the researcher to be taken to the schools selected to ensure access to conduct the research. This study was conducted in two phases where the first phase was the distribution of the questionnaire and the second phase was lesson observations and interviews.

As the questionnaire was distributed earlier in the study (June 2012) as the first phase of the study, permission was again needed as recommended by the Ministry of Education to continue with the second phase of the research, which was to conduct lesson observations and interviews in 2013. Renewed permission was needed to avoid refusal of access to research sites although permission had previously been granted. Therefore, a second letter was written to both the Brunei Students' Unit in London, United Kingdom and the Ministry of Education in Brunei Darussalam. Permission was granted to continue the research in all seven primary schools mentioned earlier. The permission letter was forwarded by the Ministry of Education to the selected schools, which gave access to the researcher to conduct the second phase of the research. An official copy of the letter was also given to the researcher to ensure access to schools involved in the research.

5.3 Sample

A sample is a smaller group drawn from a larger population (Plowright, 2011). According to Newman (2006), the main aim of selecting sample is that "the researcher can study the smaller group and produce accurate generalizations about the larger group". There are two types of sampling which are the probability sample and non-probability sample. Probability sampling is when sample are selected randomly whereas non-probability sampling is when participants are not selected randomly but because of their particular characteristics to provide a sample that meets a particular need, which answers the research aims or questions (Plowright, 2011). According to Newman (2006), in non-probability sampling the researcher seldom decides the sample size in advance. It is often used when the researcher has a limited information on the larger group from which the sample is taken.

As this research aims to investigate into teachers' perceived benefits of IWB; teachers' level of training; teachers' knowledge and current practices of IWB; and teachers' attitude towards the use of IWB in classroom, the sample was selected from a number of primary schools in Brunei Darussalam. The approach used as a result of non-probability sampling was a convenience-sampling approach where samples are selected as a result of convenient access to the research site (Plowright, 2011). According to Bryman (2008:183) a convenience sample is "one that is simply available to the researcher by virtue of its accessibility". It is when participants are conveniently selected or are selected because they are available and easily recruited and are willing to participate in the research. It is also important that the characteristics of the sample participating in the research are described when selecting samples using this approach (Johnson and Christensen, 2012).

A number of schools were identified prior to data collection, based on convenient access to the research site. However, as mentioned earlier in this chapter, permission was only given by the Ministry of Education to conduct research in seven selected primary schools. Nevertheless, the seven schools are the type of schools that the researcher intended to look at, as each school was provided with at least one IWB. In addition to that, the sample size, which was not determined in advance was generated after each school was visited based on the criteria, which will be further explained below.

Non-probability sampling was used to select participants for the questionnaire. They were selected based on the criteria that they had used IWB or were still using IWB for teaching in classroom, as they would be able to provide accurate information for this study concerning the issues of IWB in primary schools in Brunei Darussalam. They were selected using the purposive sampling approach, which is a type of non-probability sampling. According to May (2001), purposive sampling is when the sample are selected because of their known characteristics. It is when participants are selected based on the researcher's own knowledge and opinion about who are appropriate to the topic of the research (David and Suton, 2004). According to Robson (2002:265), it is when "a sample is built up which enables the researcher to satisfy her specific needs in a project". The specification of characteristics using this approach allows the researcher to locate individuals to participate in the study (Johnson and Christensen, 2012). The

use of this approach allows the selection of a sample that answers the research questions that are being addressed. From the results of the questionnaire, the researcher was able to identify and select participants for observation and interview. For this research, participants for observations and interviews were selected from those who participated in the questionnaire, which will be explained further in section 5.6.3 and 5.7.4 of this chapter.

5.4 Ethical Issues

Ethics is an important aspect when undertaking research. Ethical decisions, which are important when conducting research, are concerned not only with what is right, the interest of the study, the sponsors of the study, and the researcher, but also the participants involved in the study (May, 2001). According to Plowright (2011), ethics is concerned with respecting participants throughout the research project by using agreed standards. Participants need to be fully aware of the purpose and aims of the research and they should understand their rights as participants (Bell, 2005). In addition to that, according to May (2001:60), "Ethical decisions will depend upon the value of both the researchers and their communities". Therefore, ethical negotiations involved researcher, sponsors, research participants and those who control access to information, whom the researcher sought out.

For this study, ethical and practical issues were taken into consideration before, during and after data were collected. It involved negotiations with the institution, sponsors and research participants. An ethical approval proforma form was filled in and was submitted to the Ethics Committee of the Faculty of Education, University of Hull before conducting the study. After approval was obtained from the University of Hull (see Appendix E) before conducting the research, further action was taken by applying for permission to conduct the study in Brunei Darussalam. As mentioned earlier in this chapter, permissions were obtained from both the Brunei Students' Unit and the Ministry of Education, Brunei Darussalam to conduct this study in primary schools in Brunei Darussalam (see section 5.2).

Furthermore, ethical considerations related to participants were taken into consideration in this research. They include informed consent; their right of refusal to take part and withdraw from the research without penalty; and confidentiality and anonymity. A

consent form was given to participants involved in the collection of data which included information on the nature and aims of the research that might influence their willingness to participate in the study (see Appendix B, C and D). According to Teddlie and Tashakkori (2009), informed consent refers to the agreement of participants to participate in the study and their understanding of their rights as participants and the risk involved. This is to ensure that participation is voluntary.

5.5 Questionnaire

A questionnaire survey was distributed to produce quantitative data for this study, which was used to generate demographic data of respondents as well as their general views on IWB, which are related to their knowledge, practices and attitudes toward the integration of the IWB in the classroom. According to Robson (1993), the term 'survey' often refers to a collection of standardised information that is collected from a specific section of the population. Samples tend to be large and a relatively small amount of information is generated from an individual. A survey often provides a quantitative or numeric data of trends, attitudes or opinions of a population by studying a sample of a certain population (Creswell, 2003).

The main advantage of using a questionnaire is that it is efficient in providing a large amount of data with a relatively low cost. Furthermore, questionnaires supply standardised answers as respondents are posed the same exact questions and information gathered are deemed more objective (Denscombe, 2003). According to Robson (1993), better standardisation means that data are more reliable as the questionnaire can be designed in a way that the same question has the same meaning to each respondent. Moreover, a questionnaire also allows respondents to answer in their own time and pace and it may reduce fear from direct contact as it can guarantee confidentiality. Verma and Mallick (1999) state that questionnaires have the ability to produce hard data to see how much or how typical representation or viewpoints are. In addition to that, Robson (2002:233) states that a questionnaire provides "a relatively simple and straightforward approach to the study of attitudes, values, beliefs and motives". It allows a researcher to measure different kinds of characteristic as it allows the researcher to include many questions and statements (Johnson and Christensen, 2012).

On the other hand, a questionnaire is not flexible as respondents will be constrained from providing other information related to the study apart from what are being asked. Nevertheless, open-ended questions in a questionnaire can be an alternative for researchers to get more detailed data as respondents have greater freedom to answer the questions and they will be able to answer questions in a way that suits their interpretation (May, 2001). However, according to Denscombe (2003), the problem of open-ended questions is respondents often think answering them is time consuming. Moreover, analysing open-ended questions is also time consuming. This is because data gathered from open-ended questions are quite 'raw'. Therefore, open-ended questions were not used in this questionnaire, as the main aim for using the questionnaire was to collect demographic data and opinions of participants, which could be obtained using closed-ended questions and the attitude scale (see section 5.5.1).

Furthermore, an attitude scale, which will be explained further in this chapter was used in the questionnaire to be able to provide data on respondents' perceptions of the use of the IWB in the classroom as well as their knowledge, practices and attitudes towards the integration of the IWB for teaching and learning. This method is quicker and cheaper to analyse as well as allowing the researcher to compare answers of respondents easily (May, 2001).

In addition to that, instead of using open-ended questions, interviews were conducted as part of this study to generate richer and more in-depth data from respondents. This method will also be explained further later in this chapter. Nonetheless, another disadvantage of a questionnaire is that it is not possible to explain instructions and questions to respondents due to the absence of researcher. There is also a need to keep the questionnaire simple and straightforward as the researcher has no control over how the questionnaire is being interpreted by the respondents (May, 2001). However, this problem can be overcome by piloting the questionnaire before distributing it to the respondents, which was done for this study.

5.5.1 The Questionnaire

As mentioned earlier, a questionnaire was used in this research to generate demographic data of participants as well as their perceptions of the use of IWB in classroom focusing on their knowledge, practices and attitudes which was one of the variables intended to

be studied for this study. It was also mentioned in the previous section that a questionnaire is a relatively simple and straightforward approach when studying attitudes, values, beliefs and motives which this study intend to investigate.

The questionnaire in this study consisted of two sections, which were the demographic data of respondents and the degree of perceptions on knowledge, attitudes and practices of primary school teachers in Brunei Darussalam on the use of the IWB in the classroom.

Section one of the questionnaire aimed to generate demographic data or background of teachers involved in this research study. According to Wiersma and Jurs (2009), demographic data or background of respondents is an important part of a questionnaire as it enables the identification of individuals in terms of classifying variables. For this study, this section of the questionnaire allows the identification of three different categories or groups of IWB users in primary schools in Brunei Darussalam, which are regular users, low users of the IWB and teachers who no longer use IWB in the classroom. This helps to identify samples for observation and interview for this research. This section of the questionnaire included the following data:

- Gender
- Number of teaching years
- Type of Qualification
- Frequency of IWB usage
- How respondents learned to use IWB
- Subjects taught using IWB

Section two of the questionnaire aimed to find out the degree of perceptions of knowledge, attitudes and practices of primary school teachers in Brunei Darussalam on the use of the IWB in the classroom. According to Mujis (2011), a questionnaire can be designed and aimed to convert phenomena such as attitudes and beliefs into quantitative data, which can be analysed statistically by developing a questionnaire that requires respondents to rate a number of statements. For this section of the questionnaire, a Likert scale was used in the questionnaire, where respondents were given a five-point scale to indicate their level of agreement and disagreement, with the middle score

representing a neutral response towards statements on IWB that addressed issues on their perceptions, knowledge, practices and attitudes towards the integration of the IWB in the classroom.

Table 5.1 below shows the table of questions on the degree of perceptions on knowledge, attitudes and practices in relation to using the IWB in the classroom that can be analysed statistically.

1=Strongly Disagree   2=Disagree   3=Neither Agree nor Disagree   4 =Agree   5 =Strongly Agree

No	QUESTION	Scale				
1.	I can get access to IWB easily for teaching.	1	2	3	4	5
2.	I feel that I am capable in integrating the use of IWB in classroom.	1	2	3	4	5
3.	I have lots of ideas about how to use IWB for teaching.	1	2	3	4	5
4.	I have had sufficient training and/or professional development in the use of IWB for teaching.	1	2	3	4	5
5.	I know how to operate IWB effectively.	1	2	3	4	5
6.	I know how to use IWB to support different learning styles of my pupils.	1	2	3	4	5
7.	I know how to use different software with the IWB.	1	2	3	4	5
8.	I am encouraged to use IWB by the school principal.	1	2	3	4	5
9.	I think the use of IWB has positive effect on teaching pedagogy.	1	2	3	4	5
10.	I think the use of IWB motivates pupils and increases the interest of pupils toward lessons.	1	2	3	4	5
11.	I think IWB improves pace of lesson.	1	2	3	4	5
12.	I think the use of IWB makes teaching resources more easily available.	1	2	3	4	5
13.	I think IWB can support teaching and make a lesson more effective.	1	2	3	4	5
14.	I think it is easy to plan and prepare a lesson using IWB.	1	2	3	4	5
15.	I think IWB increases interaction between teachers and pupils in classrooms.	1	2	3	4	5
16.	I think the use of IWB reduces workload.	1	2	3	4	5
17.	I believe the integration of IWB in classroom improves pupils' academic performance.	1	2	3	4	5
18.	I believe it is important to have a technical assistance to support classroom use of IWB.	1	2	3	4	5
19.	In order to encourage teachers to use IWB often, I believe they need training.	1	2	3	4	5
20.	I am interested to attend pedagogy based training on the use of IWB for teaching.	1	2	3	4	5

Table 5.1: Perceptions of Knowledge, Attitudes and Practices in Questionnaire

According to McQueen and Knussen (2002), a Likert scale contains a statement where respondents are allowed to indicate the amount of agreement or disagreement with a

certain issue. Likert scales can be used to measure the intensity of feelings of participants about an area of questions (Bryman, 2008). According to David and Sutton (2004), it is a way to assess individuals' responses to a statement that has been developed by the researcher to measure one of more concepts. Kumar (2011:170) states that a Likert scale is "based on the assumption that each statement/item on the scale has equal attitudinal value, 'importance' or 'weight' in terms of reflecting an attitude towards the issue in question".   An open-ended question was added after the attitude scale to get information regarding training as it is one of the most important aspects in implementing the use of IWB in classroom found in most literature for this research.

5.5.2 Validity of the Questionnaire

According to Bryman (2008:151), validity refers to "the issue of whether an indicator (or set of indicators) that is devised to gauge a concept really measures that concept". According to Remler and Ryzin (2011:106), "the validity of a measure refers to how well the measure actually represents the true construct of interest – the thing we are trying to measure".

Bryman (2008) states different ways of measuring validity, which are concurrent validity, predictive validity; construct validity; convergent validity and face validity. Concurrent validity is when a researcher "employs a criterion on which cases (for example, people) are known to differ and that is relevant to the concept in question" (Bryman 2008:152). Whereas Bryman (2008) states that predictive validity is when a future criterion measure is being employed. Meanwhile, he states that construct validity is when a researcher is encouraged to make hypotheses from a theory that is considered relevant to the concept and convergent validity is when the validity is measured by comparing it to the measure of the same concept through other methods or research instruments.

Bryman (2008) states that face validity is achieved when the measure reflects the content of the concept in questions, which is established by asking other people. Other people, preferably those who have experience or expertise in the field might be asked to determine whether the measures designed reflects the concept concerned for this study. According to Kumar (2011:179), face validity is when "each question or item on the research instrument must have a logical link with an objective". Face validity was

evident in this study as each question in the questionnaire was reviewed by the researcher and her two supervisors carefully in order to ensure there was a reasonable link with the research questions.

5.5.3 Piloting the Questionnaire

A pilot study of the questionnaire was done before distributing the questionnaire to seven selected primary schools in Brunei Darussalam. According to McQueen and Knussen (2002), pilot study is important to identify limitations and areas that need improvement in a questionnaire, such as misleading, confusing and offensive questions. Johnson and Christensen (2010) state that a pilot test should be conducted with a minimum of 5 to 10 people. According to Bell (2005), the purposes of piloting data-gathering instruments are to identify areas that needs improvement, to check whether respondents will be able to understand the questions and instruction, and to test whether respondents will be able to finish on time. Piloting the questionnaire is also important to establish the validity and reliability of the questionnaire (Creswell, 2003).

Twenty government primary school teachers from Brunei Darussalam participated in the pilot study and were selected randomly. The pilot study was conducted to ensure that the questions and instructions were easily understood. It was also conducted to test the length of time needed to complete the questionnaire and to clarify understanding. Although selected randomly, all teachers involved in the pilot study were familiar with the variables under the study through attending workshops or staff development regarding the IWB in their respective schools. They also shared the same characteristic as the questionnaire sample, which is being primary school teachers.

In conducting the pilot study, the questionnaire was given and collected personally by researcher to participants. Discussions were also conducted with participants in groups and individually after the questionnaire was completed to find out their perspectives, views and comments on the questionnaire. According to Johnson and Christensen (2012), this allows a researcher to find out whether participants interpret the questions the way the researcher intended and whether the instructions were clear. It also allows the researcher to determine if any of the questions in the questionnaire are confusing or threatening.

Following the pilot test, several amendments were made to the questions to make them more understandable to respondents, especially in the use of language. Simpler words were used as a result of the pilot study. The questionnaire was not translated, as all participants in the pilot study showed that they understood the questions asked except for one question, which was amended before actual data was collected. From this pilot study, the researcher was also able to estimate the time taken for respondents to complete the questionnaire which is ten to fifteen minutes.

5.5.4 Reliability of Questionnaire

According to Burns (2000:337), reliability is "the absence of errors of measurement in a measuring instrument" and is "the accuracy, stability and relative lack of error in measuring instrument". Reliability is when the instruments used measures what it measures consistently (Wiersma and Jurs, 2009). In other words, it is when a test or research instrument produces the same results under constant conditions on all occurrences.

A reliability analysis was done using split half reliability by measuring Cronbach's alpha which is a "numerical coefficient of reliability" (Santos, 1999). This approach is suitable to multiple-indicator measures such as what is used in section two of the questionnaire for this study (Bryman, 2008; Johnson and Christensen, 2012). According to Field (2003), it is the simplest way to analyse internal reliability and according to Bryman (2008:150), internal reliability is "whether the indicators that make up the scale or index are consistent".

According to Crowl (1996), a split half reliability test is the most common method to determine a test's reliability and the test does not require the same group of people to be tested twice. By using the Cronbach's alpha approach, the coefficient alpha or scale alpha indicates the degree to which the items are interrelated (Johnson and Christensen, 2012). As mentioned earlier, a five point attitude scale was used in section two of the questionnaire in this research and a reliability analysis was done following the pilot study.

Table 5.2 below shows the statistics for the twenty-item scale from section two of the questionnaire, which was assessed using the Cronbach's alpha technique.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q 1	70. 00	60.484	.599	.	.789
Q 2	69.7000	60.747	.604	.	.789
Q 3	69.7500	58.408	.608	.	.786
Q 4	70.5500	61.524	.423	.	.798
Q 5	70.1000	59.779	.524	.	.791
Q 6	69.8000	57.642	.710	.	.780
Q 7	70.3000	55.063	.746	.	.774
Q 8	70.2500	70.618	-.144	.	.839
Q 9	69.0500	66.155	.226	.	.807
Q 10	68.6500	63.924	.608	.	.795
Q 11	69.0500	63.734	.451	.	.798
Q 12	69.2000	58.800	.736	.	.781
Q 13	68.8500	62.766	.590	.	.793
Q 14	69.6500	63.924	.265	.	.807
Q 15	68.9500	60.787	.449	.	.796
Q 16	69.6500	62.661	.254	.	.811
Q 17	69.2500	63.145	.460	.	.797
Q 18	68.8000	71.537	-.236	.	.827
Q 19	68.4000	70.989	-.260	.	.821
Q 20	68.7500	67.987	.064	.	.814

Table 5.2: Statistical Data assessed using Cronbach's Alpha Technique

From the statistics above, an overall scale alpha was produced and is shown in Table 5.3 below, which shows an acceptable value for Cronbach's alpha.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.809	.810	20

Table 5.3 Cronbach Alpha Scale

No questions were removed as a questionnaire is considered as reliable if it scores 0.8 or more. The figure 0.80 is considered as an acceptable level of reliability for an attitude scale (Bryman, 2008 and Field, 2003).

5.5.5 Questionnaire Sample

As mentioned earlier in this chapter, the sample for the questionnaire was not determined in advance. It was generated after each school was visited based on the criterion that they had used the IWB or were still using the IWB for teaching. This criterion enabled the researcher to get more accurate information for this study concerning the issues of the IWB in primary classrooms in Brunei Darussalam. Furthermore, participants would be able to answer research questions addressed in this study.

5.5.6 Administration of Questionnaire

According to Robson (1993), three common ways in which questionnaires are administered are self-completion, face-to-face interview and telephone interview. Self-completion is when respondents fill in questionnaire by themselves whereas face-to-face interview requires the presence of the researcher who acts as interviewer and completes the questionnaire according to the answers from respondents. Telephone interview is when the interviewer contacts respondents by phone to ask questions and record responses from respondents. Bryman (2008) mentioned another approach which is gaining popularity in administering questionnaires, which is the online questionnaire. It is done either through attaching questionnaire in emails or requesting respondents to answer a questionnaire on a web survey.

In implementing the study, a self-completion approach using a paper questionnaire was chosen. According to Bryman (2008), a self-completion questionnaire is cheaper and quicker to administer. Although an online questionnaire reduces response time, a paper questionnaire or survey method is said to have the highest response rate (Wiersma and Jurs, 2009). Schools involved in this study were visited after gaining access from the Ministry of Education. The aims and purpose of study to be able were explained to headteachers to enable them to select respondents for the questionnaire.

As mentioned earlier, only teachers that had used IWB or were still using IWB for teaching in classroom were selected for this research and sample size was not determined in advance. This is because the researcher had limited knowledge on the number of teachers in each of the schools that matched the criteria required for this

study prior to collecting the data. By looking into the school's ICT lab logbook and with the help of ICT teachers who are in charge of ICT rooms in all schools involved, the researcher was able to identify teachers to participate in this study. Once participants were identified, questionnaires were given to teachers and an agreed date was set for the researcher to return and collect the questionnaire, to avoid a longer time for questionnaires to be returned. Each questionnaire was coded with a unique number that identified respondents to be selected for observation and interview as part of the research study.

A cover letter (see Appendix A) was attached to the questionnaire was given to respondents for this study. According to Wiersma and Jurs (2009), a cover letter is an important part of any survey including a questionnaire as a way to introduce participants to the questionnaire and motivating them to respond to the questionnaire. The cover letter includeed a brief background of myself as a researcher, contact details, the aims of the study as well as an indication of how long it will take for respondents to complete the questionnaire. A total of 75 out of 270 teachers, which is 27.77% teachers from the total population of the seven selected primary schools participated in this survey.

5.5.7 Analysing the Questionnaire

The data collected for the questionnaire were analysed using the Statistical Package for Social Sciences (SPSS) program. According to Bryman and Carmer (1999), SPSS is the most widely used program when dealing with quantitative research process. It helps to eliminate the long hours often needed to work out data manually or through calculations as well as to avoid mistakes that occur frequently while analysing data.

Questions in a questionnaire are considered as variables and according to Johnson and Christensen (2012:38), "a variable is a condition or characteristic that can take on different values or categories". There are different types of variables, which are nominal variables, dichotomous variables, interval or ratio variables and ordinal variables. Nominal variables are when categories do not allow rank order, such as gender or religion and dichotomous is when a variable only contains two categories. An interval or ratio variable is when the distances between variables are identical. Whereas, ordinal variables are variables whose categories can be ranked in order but the space or distance of each category is not equal, such as in the questionnaire used for this research study

(see Appendix F). The likert scale used in section B in the questionnaire also produce ordinal variables (Bryman, 2008).

The SPSS program was used to generate a frequency table analysis for this study which is one of the common ways to deal with measuring data generated from interval or ratio variables and ordinal variables. Both of the types of variables were generated from the questionnaire of this study. According to Bryman (2008:322), a "frequency table provides the number of people and the percentage belonging to each of the categories for the variable in question". Robson (1993:403) states:

> A simple means of exploring many data sets is to recast them in a way which counts the frequency (i.e. the number of times) that the certain things happen, or to find ways of displaying information.

The data from the questionnaire was entered manually into the SPSS software for analysis. The results of the questionnaire were analysed using the SPSS software, which generated a frequency table analysis for this study. The results are presented using tables and bar charts, as shown in Chapter Six of this thesis. According to Robson (1993), the bar chart is one of the preferable ways to summarise and present data that correspond to the table of frequency analysis as it is more easily and quickly understood by different audiences.

In addition to that, mean scores and standard deviation data from section two of the questionnaire were also generated using the SPSS software. The mean scores were generated to find the average of the scores from the responses to be able to identify the level of agreement of each question. According to Remler and Ryzin (2011), it is important to calculate the centre of a distribution for quantitative variables, which is the mean. Furthermore, they also state the importance of the standard deviation measurement, which is the spread of a distribution. According to Yates (2004:107), standard deviation is "a measure of 'average' difference between values in the data set and the mean". It is used to determine whether the results are grouped together or widely spread. A large standard deviation indicates that the values are widely spread, whereas a smaller standard deviation indicates that, on average, the results are close to the mean.

Table 5.4 below shows the mean scores and standard deviation data that were generated from the questionnaire.

Mean Score and Standard Deviation

Question	N	Mean	Std. Deviation
Q 1	75	3.3867	.99856
Q 2	75	3.6667	.77692
Q 3	75	3.4933	.79480
Q 4	75	2.9067	.88796
Q 5	75	3.2533	.87137
Q 6	75	3.4267	.80829
Q 7	75	3.0000	.86992
Q 8	75	3.7867	.70315
Q 9	75	3.9733	.61454
Q 10	75	4.2133	.62154
Q 11	75	3.8000	.61512
Q 12	75	3.9067	.66115
Q 13	75	4.0667	.64375
Q 14	75	3.5333	.74132
Q 15	75	3.9200	.67303
Q 16	75	3.4533	.94859
Q 17	75	3.8667	.70391
Q 18	75	4.2667	.72286
Q 19	75	4.5467	.59940
Q 20	75	4.1733	.64459
Valid N (listwise)	75		

Table 5.4: Mean Scores and Standard Deviation

A descriptive analysis of Table 5.4 above will be presented in the next chapter (Chapter Six).

5.6 Observation

According to Creswell (2003), observation is when researcher takes field notes on the behaviour and activities of participants at the research site. Robson (1993) states that observation is a type of data collection where action and behaviour of participants are the central aspects of the enquiry.

Observation is often used to find out what is going on in a certain situation. It is a technique where the researcher watches what participants do and then describe, analyse and interpret what he or she has observed. According to Hennink et al (2011:170):

> Observation is a research method that enables researchers to systematically observe and record people's behaviour, actions and interactions. The method also allows researchers to obtain a detailed description of social settings or events in order to situate people's behaviours within their own socio-cultural context.

As mentioned in Chapter One, the main aim of this study is to find out the best practice that can be incorporated to assist the effective use of the IWB in primary classroom in Brunei Darussalam and it involves looking into attitudes and current practices of teachers on the use of the IWB. Therefore, observation was used as a method of data collection to generate data for this research as observation allows a researcher to observe behaviour by watching what people do and recording it in some way, such as video recording and field notes, to be able to describe, analyse and interpret what has been observed (Robson, 1993).

According to Robson (1993) the major advantage of observation is the ability of researcher to get data by watching what participants do and by listening to what they say. Researchers do not have to ask people about their views, feelings and attitudes. It also has the ability to provide the researcher with a bigger picture and less biased findings compared with interview, as what people do may be different from what they say. He also states that data from observation can complement information gathered using other methods. Furthermore, Kumar (2011) states that observation is the best approach in collecting data when behaviour is involved. This is because according to Cohen et al. (2007) the researcher will be able to view directly what is taking place in the research setting, rather than relying on second-hand information. Observations also have the ability to reveal behaviour and characteristics as well as give insight on group interactions that respondents might not be aware of (Burton et al., 2008).

On the other hand, conducting observations can be time consuming. It is also difficult to simultaneously record and observe at the same time. Field notes taken during an observation can also be subjective and recording observation can be inconvenient (Hennink et al., 2011). The use of an observation schedule prepared in advance in

addition to field notes taken and proper observational skills can overcome this problem. These measures ensured that important facts, events and behaviour related to the study were recorded. The observation schedule used for this research will be described further in section 5.6.2 of this chapter.

5.6.1 Observation Format

Observation was used for this study as it allowed me as a researcher to investigate how IWBs are being used in the classroom by primary teachers in Brunei Darussalam. According to Beauchamp (2004), observation can also be used to identify a range of pedagogic practice on the use of technology in the classroom and can explain what is happening in the classroom. This information obtained by observation is important for this study as it can give information regarding teachers' knowledge and current practices on using the IWB in the classroom. This information is also vital to determine the best practice and appropriate training needed to assist the successful implementation and integration of the IWB in the classroom. According to Fullan (2001), appropriate training is important to ensure the success of change. It is also important that teachers should be convinced about how the proposed training will benefit their practice. Thus it is important to look into current practices to be able to set realistic goals and provide appropriate training on the use of the IWB in the classroom.

According to Plowright (2011), there are four types of observational research, which are full-observer, observer as participant, participant as observer and full participants. Full observer is when the observer, who is often the researcher, has very minimal contact with research participants, whereas observer as participant is when the observer has some interaction with the research participants. Participant as observer is when the observer takes a more active role in the participants' activity, while full participant observation is when the observer uses his or her established role or position to conduct a research in an organisation or when the observer secretly becomes a participating member and join the organisation. It is when the observer participates in the life or community of his or her participants while maintaining a distance to observe the situation (Hennink et al., 2011).

For this study, a full observer observation was conducted, which aimed to identify key to current practices of teachers involved in using IWB in their lessons. Full observer

observation is when a researcher takes a detached role and does not attempt to participate in any of the activities conducted. A detached role can avoid contamination of data from social interaction with the researcher (Combs and Smith, 2003). In addition to that, according to Plowright (2011), a full-observer approach allows a researcher to gather data from a more naturalistic setting where normal or day-to-day activities take place. Hennink et al. (2011) state that this type of observation allows a researcher to get a broader view of what is being observed and it allows the researcher to observe, listen and take notes more easily. Observation was conducted by taking the issues mentioned into consideration. Therefore an observation schedule (see section 5.6.2) was used to record observations conducted for this research. In addition to that, as mentioned earlier, field notes were also taken.

5.6.2 Observation Schedule

The main aim of conducting observation for this study was to identify current IWB practices of teachers involved as well as to identify factors that can influence their use of the IWB in the classroom. According to Cohen et al. (2007), observation can be facts such as number of items on a table; or events and behaviours such as the amount of interaction in the classroom. Merriam (1998) in Hennink et al. (2011:190) states that in preparing for observation, researchers "need to pay attention to shifting from a 'wide' to a 'narrow' perspective, such as focusing on a single person, activity or interaction, and then viewing the overall situation". Thus, an observation schedule was designed for this study to focus on and investigate the following facts, event and behaviour:

- location of IWB, which may influence the use of the IWB;
- features of the setting of the IWB, which may influence how activities are carried out, and;
- activities carried out using the IWB.

The observation schedule was designed to include information that may influence or facilitate the use of the IWB by primary school teachers in Brunei Darussalam. This includes information on the lessons conducted and classroom environment that may influence the use of the IWB, such as the location of ICT room, room temperature, curtain or blinds installed and the classroom layout. Therefore, the observation schedule was designed into four parts which are:

- information on the observed lessons;

- seating arrangement;

- use of IWB, and;

- interactivity.

Figure 5.1 below is the first part of the observation schedule, which was used to fill in information as follows:

School							
Date/Time							
Year			No of Pupils				
Subject/Topic							
Teacher's Name							
Location of ICT Room							
Type of IWB							
Room Temperature		Hot		Ok		Cold	
Curtains/Blinds		Not Available		Partial Blackout		Full Blackout	

Classroom/ICT Room Layout (Sketch)

Figure 5.1: Observation Schedule - Information of Observed Lesson

According to Podmore and Luff (2012), a checklist includes a list of specific behaviours that a researcher is interested in and it requires a researcher to prepare a coding sheet which is often followed by a process of ticking off specific behaviours each time they occur. A checklist helps researchers to focus in their observation as a schedule prepared earlier before the observation includes a list of what interests the researcher or what the study aims to investigate. It is also designed to record an analysis that summarises a series of observations. The checklist, which was designed as part of the observation schedule for this study, also aimed to identify classroom organisation and teaching strategies involved when using the IWB in the classroom.

Figure 5.2 below shows the seating arrangement checklist, which was designed based on a typical lesson structure in primary schools in Brunei Darussalam where lessons are

divided into five different stages which are set induction, introduction, development, activity and closure. It aims to investigate how teachers arrange pupils in the classroom when the IWB is being used in lessons.

	Set Induction		Introduction		Development		Activity		Closure	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Infront of Board										
Individually at Desk										
In Groups										

Figure 5.2: Observation Schedule - Seating Arrangement Checklist

Figure 5.3 below shows a checklist that was designed to investigate teachers' use of IWB for teaching. It aims to find out their level of knowledge or practices of using IWB, which would help in creating follow up questions for the interview. It focuses on the use of the Internet, organisation of resources as well as the use of multimedia (images, audio and video) that are often associated with the IWB as mentioned in the literature (Chapter Three).

Interactivity	Set Induction		Introduction		Development		Activity		Closure	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Teacher – Board										
Pupil - Board										
Teacher – Pupil										
Pupil – Pupil										
Whole Class										
Group Work										
Other Notes:										

Figure 5.3: Observation Schedule - Use of IWB Observation Checklist

Figure 5.4 below shows a checklist that was designed to investigate the interaction that occurs in the classroom when the IWB is being used. It includes technical or physical interaction with the board and pedagogical interaction, which includes teacher-pupil interaction, pupil-pupil interaction, whole class interaction as well as group work.

Internet		Yes		No	
Use of Images		Yes		No	
Use of Audio		Yes		No	
Use of Video		Yes		No	
Files		In folders		Not in Folders	
Programs/Software used:					

Figure 5.4: Observation Schedule - Interactivity Checklist

The checklist allows the researcher to easily record observational behaviour as well as facts that answers the research questions. Other than the observation schedule prepared before conducting the research, field notes were also taken throughout the observation.

5.6.3 Observation Sample

As mentioned earlier in this chapter, participants for observations were selected from those who participated in the questionnaire. Participants of the observations were teachers who are regular users of the IWB who were identified from the responses generated from the questionnaire distributed to seven primary schools in Brunei Darussalam.

In conducting the observation, after gaining access from the Ministry of Education, the researcher made several visits to each school involved in this research before conducting observations. Apart from explaining the aims of the study, a list of possible teachers to be observed and interviewed was given to headteachers during the first visit. In all cases, the school contacted the researcher after each visit stating the teachers who were available and willing to participate in this study, thus the researcher was unable to choose which lessons were to be observed.

5.6.4 Conducting Observation

According to Plowright (2011), access to participants for a full-observation requires a high level of planning as it requires a researcher to be present at the research site, which in this case was in the classroom. Thus, apart from getting permission from the authorities, access needed to be negotiated with participants, as observation could only be done when participants were ready or available. As mentioned earlier, the researcher was contacted by the school authorities stating the list of teachers who were willing to participate in this study. A visit was then made to the school to meet up with teachers mentioned. Arrangements were then made with each participant to conduct observation according to their preferred time and were agreed by both participants and researcher. An observation consent form (see Appendix D) was filled in by participants before each observation was conducted.

Before the observations were conducted, the participants were informed that their details would be kept confidential and anonymity would be maintained. Participants were also informed that they had the right to withdraw from the study at any time. All participants were also informed that confidentiality would be assured and this included their details and the data collected for this study. Additionally, participants were also informed that pseudonyms would be used in any reporting process. Permission to video-record the lessons was also requested before conducting the observation.

As mentioned earlier in this section, full observer observation was carried out for this research. Spradley (1979) in Silverman (2006) states that the reliability of observation can be improved through having systematised field notes. This includes taking short notes made at the time of the observation; expanded notes made after each observation; a journal to record problems and ideas that arise during each observation; and a provisional running record of analysis and interpretation.

The observation for this study was done by the researcher sitting in the class and filling in the information and ticking the checklist prepared on the observation schedule (see appendix G). Each observation took one hour to conduct. None of the participants agreed to be video-recorded, therefore, field notes were taken throughout the lesson observation. Data collected from the observation was organised based on what was intended to be investigated. This included the nature of activities carried out in each lesson, including the structure of the lesson, seating arrangement, settings of the IWB, teaching strategies used, the interaction that occured during the lesson and available technology equipment. Expanded and personal notes, which included the researcher's own reflections on what had been observed, were also written after each observation was conducted. In addition to that, follow up questions were also created as a guide for the interview to make sense of data collected during the observation and as a means to validate findings of the observation. According to Podmore and Luff (2012: 97), validating observational data through interview "ensures that observations accurately depict what they are designed to show, and that observations are meaningful and 'ring true' to practitioners".

5.6.5 Analysing the Observation

Becker (1979) in May (2001:164) lists four distinct stages of observation analysis which are:

Stage 1: The 'selection and definition of problems, concepts and indices'.
Stage 2: A check on 'frequency and distribution of phenomena'.
Stage 3: The 'construction of social system models' which 'consists of incorporating individual findings into a generalized model of the social system or organization under study or some part of the organization'.
Step 4: The withdrawal from the study field to a final analysis and writing up of the results.

At the *first stage* of observation, the researcher determines the types of data which may be available for the study and once it is established, further investigation is made (May, 2001). For this study, as mentioned earlier, an observation schedule was prepared prior to the observation, which allowed the researcher to focus on the types of data that were to be observed for this study.

The *second stage* involved the observation of lessons where the researcher used the observation schedule and took field notes to record data by observing patterns of behaviour, facts and factors that may influence the use of the IWB in the classroom. None of the participants agreed to be recorded. Therefore, as mentioned earlier in this section, field notes were taken carefully to make sure important data were recorded for this study. Expanded notes were also written after each observation where ideas, questions and personal views were recorded for validation and further investigation through interviews with the participants.

The *third stage* involved the comparison of data collected to be able to develop a concept or theory based on the data collected.

The *final stage* involved the final analysis, where data collected were analysed thoroughly, and additional data taken during the observation was taken into consideration. The additional data was not included as the focus of the study prior to

data collection, but was found to be useful and related to this study. It was followed by writing up of the findings, which are presented in Chapter Seven.

5.7 Interview

Another method of data collection used for this study was interview. The interview which was conducted after questionnaire was distributed and observation was conducted, aimed to complement and validate data collected from the two methods. Robson (1993:228) describes interview as a "flexible and adaptable way of finding things out" and is "a conversation with a purpose". Interviewing is a way of extracting information or generating data through asking questions where interviewers or researcher ask questions and respondents provide answers. It is a special form of conversation, which may vary from highly structured, semi-structured, standardised, quantitatively oriented, guided to unstructured (Silverman, 2004).

According to Robson (2002), interview has the potential to produce rich data and allows the researcher to modify his or her line of enquiry following up participants' responses to investigate underlying motives. Similarly, Burns (2000) states that interview allows a researcher to investigate in a more detailed manner. According to Bell (2005), a skilful interviewer can investigate responses, motives and feelings which a questionnaire can never do. The ability of non-verbal cues in a face-to-face interview may also help a researcher to understand verbal responses and add to the dimensions of data collected. In addition to that, interview allows researcher to probe responses, and to investigate motives and feelings.

Scott (1997) states that interviews have the ability to access past events as well as substituting for direct observation where the researcher is unable to observe. Interviews also enable a researcher to access peoples' perceptions, meanings and definitions of situation and constructions of reality (Punch, 1998). Similarly, Patton in Johnson and Christensen (2012:202) states that a qualitative interview "allows a researcher to enter into the inner world of another person and to gain understanding of that person's perspective".

On the other hand, preparation of an interview is time consuming as it requires careful planning. This is because conducting an interview requires an interviewer to secure

necessary permission; arrange appointments; confirm appointments and reschedule appointments due to absence of participants. Interviews can also be inconvenient as the researcher will have to fit into the interviewee's time or schedule (Bell, 2005). In addition to that, analysing data from interview is time consuming as interviewers may need to transcribe audio recordings, if used during the interview and write up notes as a follow up. Furthermore, the data generated from interviews are often non-standard, which is time consuming to analyse (Descombe, 2003).

Interviews are also time consuming to conduct and length of interviews varies with each participant. In addition to that, the presence of an interviewer may elicit biased responses from interviewees. Furthermore, not all people are expressive and perceptive; thus, the results of interviews may be biased (Creswell, 2003). However, this can be avoided when designing the interview schedule and by using appropriate skills when conducting the interview. It is the responsibility of the researcher to keep respondents' attention focused on task and keep the flow of the interview moving along smoothly as the free-flowing nature of an interview may cause the conversation to get away from the main topic of the research. This can be avoided with appropriate skills and it can be done naturally as the direction of conversation can be controlled minimally to make sure the conversation stays on focus (Burns, 2000). According to Johnson and Christensen (2012), good listening skills are important for a qualitative interview to be successful as they allow the researcher to get detailed information from the interviewees. In addition to that, an interviewer also needs to be prepared with probes and prompts as it can help in getting a greater clarification and deeper understanding of what the interviewee talks about.

Furthermore, in conducting interviews, the researcher might face a situation where an interviewee refuses to be recorded; therefore it is important for the researcher to be prepared in advance to overcome this problem. A notebook can be used to record data from interviews if participants refuse to be recorded (Cohen et al., 2007).

For this research, interviews were used as part of data collection in this study to validate findings from the questionnaire and observation. This is because, not only does the interview allow the researcher to get richer data but it also help the researcher in investigating the underlying motives of participants (Robson, 2002). Therefore, it is used to validate findings from the observations conducted for this research. It is also used as the research aims to investigate teachers' perceptions, beliefs, concerns and

underlying issues related to the implementation of IWB in classroom, which as mentioned earlier can be achieved by conducting interviews. Section 5.7.5 of this chapter will explain how the interviews for this research were conducted and how the issues mentioned in this section were taken into consideration to ensure important data were collected for this study. In addition to that, it will explain how interviews were managed to achieve the aims of this study.

5.7.1 Types of Interview

According to Plowright (2011), the most common types of interview often used for social research are structured, semi-structured and unstructured interview. According to Bryman (2008), a structured interview is a standardised interview, which is fully structured and requires the administration of an interview schedule. Each participant will be given exactly the same questions. Whereas, a semi structured interview is where the interviewer prepared a set of questions in advance but has the ability to modify their order, change their wording, give explanations, eliminate inappropriate questions or add questions during the interview process, based on his or her perception of what seems appropriate (Bryman, 2008). Meanwhile, an interview is considered as unstructured interview when a researcher has a general idea of interest and concern and then develops conversation within the area informally with participants. It has an open-ended character that enables interviewees to answer questions according to their own reference (May, 2001). In other words, interviewers will only have a list of topics or issues prepared (Robson, 2002).

For this study, semi-structured interviews were chosen to get more in-depth answers from participants concerning issues related to attitudes, perceptions, beliefs and concerns in relation to the integration of the IWB in the classroom. A less structured interview allows interviewer and interviewee to discuss specific topics in depth and may be conducted to identify how people make decisions; people's own beliefs and perceptions; the motivation of certain behaviour; the meaning people attach to experiences; people's feeling and emotions; the personal story or biography of a participant; in-depth information on sensitive issues; and the context surrounding people's lives (Hennink et al., 2011). Thus it was used in this study to validate data generated from both questionnaire and observation findings. Similarly, Plowright (2011)

states that a less structured interview is more suitable when researching about feelings, which is another important aspect of this research.

According to Bryman (2012), the flexibility of a semi-structured interview allows a researcher to bring up questions following responses and this can give insight into what the interviewee sees as relevant and important. It also allows the researcher to provide additional explanations, if required to help participants understand the questions. Interviewer can also seek for clarification and elaboration on answers given by interviewees and according to May (2001:123), "this enables the interviewer to have a more latitude to probe beyond the answers and thus enter into a dialogue with the interviewee". Kvale (1996:124) states that a semi-structured interview:

> … has a sequence of themes to be covered, as well as suggested questions. Yet at the same time there is an openness to changes of sequence and forms of questions in order to follow up the answers given and the stories told by the subjects.

Kane (1993), states an approach is considered useful when it allows a researcher to convey a sense of meaning of what they want to participants, which can be done using a semi structured interview. This is because a semi structured interview assumes that it may take different kinds of questions, which may be arranged in different order to get the same information from different individual. Thus, this method was chosen as questionnaire findings showed that primary teachers in Brunei Darussalam have different educational backgrounds; hence, there was a need to vary questioning style to generate the same information from participants.

In conducting the interviews for this study, the face-to-face interview was chosen as the interview method to collect data through the semi-structure interview approach. According to Czaja and Blair (1996), it is when interview and interviewee are together in the same location. The main advantage of this method is that the interview takes place in a location that is convenient for the participants, which increases participants' cooperation. Face-to-face interview also allows interviewers to have more control of the response situation than when other method such as the telephone interview is chosen. It also allows interviewers to easily probe for additional information from the interviewees and rapport is also better as participants are able to see the interviewer.

However, face-to-face interview is expensive to conduct as the interviewer needs to travel to meet the interviewee. It is also time consuming to conduct and participants may be hesitant to answer questions that are related to their personal type of behaviour. For this study, the researcher travelled to Brunei Darussalam from the United Kingdom to conduct face-to-face interviews with participants of this study. The cost and time disadvantages of this method, however, were compensated by the advantages of the method.

5.7.2 The Interview Questions

A semi-structured interview schedule was developed for this study, which aims to investigate teachers' perceptions and expectations on the use of the IWB, to be able to provide a rationale for usage as well as to promote a wider use of the IWB for teaching and learning in the classroom. In addition to that, it aims to investigate teachers' level of IWB training and their IWB skills and knowledge to help assist the effective use of the IWB in the classroom. Furthermore, it was also used to validate current practices observed during lesson observations and to investigate issues that influence the usage of IWB for teaching in primary schools in Brunei.

The interviews were grouped into two main categories, which are:
a) Personal details
b) Issues concerning IWB in the classroom

The interview consists of seven main questions, which were open-ended. According to Remler and Ryzin (2011), open ended questions used in qualitative interviews allow participants to respond to questions using their own words. In addition to that, they also encourage detailed and in-depth answers from participants. The interviews were conducted with regular users of the IWB who participated in the lesson observation; with low users of the IWB; and with those who no longer used the IWB for teaching. They were conducted to validate the findings of the observation; thus, they were also designed to allow the researcher to get more information on the observation findings. In addition to that, they also aimed to investigate issues concerning the use of IWB in classroom both from regular users and low users. Furthermore, the research also aimed to find out the concerns of teachers who no longer use the IWB. Therefore, the interview schedule (see Appendix H) was designed to cover the following themes:

- Accessibility of IWB

- Factors influencing usage of IWB

- Barriers to usage of IWB

- IWB training

- Perceived benefits of IWB

- Challenges faced in implementing the use of IWB

- IWB resources

- Suggestions on improving the use of IWB

According to Kvale (1996), interview questions should relate to the topic of the investigation. Thus, for this research, interview questions were developed thematically. Therefore, the interview schedule was developed to cover the themes mentioned above.

5.7.3 Piloting the Interview

According to Silverman (2006), one way of ensuring the reliability of an interview is through pre-testing the interview schedule. Piloting the interview is important as it is difficult to predict how interviewees will interpret the interview questions (Hennink et al., 2011). It also helps to ensure that each participant understands the interview questions in the same way and that answers from participants can be coded during data analysis without the possibility of uncertainty (Silverman, 2006). Pilot interviews for this study were conducted according to the stages below:

- The interview schedule was shared with four PhD students, whose their opinions and comments were taken into consideration.

- Interview questions were translated into the Malay language by the researcher, with consultation from three colleagues and a language teacher from the Ministry of Education, Brunei Darussalam. The use of the Malay language was chosen to ensure that participants could easily respond to the interview questions and would not be restricted by the language barrier.

- Pilot interviews were conducted with three primary school teachers who shared the same characteristics as the interview sample to test the length of the interview and clarify understanding. An interview was held with each teacher

and lasted for thirty minutes. Their opinions and comments were taken into consideration.

The pilot testing of the interview resulted in amendments to interview questions according to the recommendations and comments gathered from the pilot study.

5.7.4 Interview Sample

As mention earlier in this chapter, lesson observations of regular IWB users were conducted for this study. Teachers involved in the observations were interviewed to validate the observation findings as well as to investigate issues concerning the implementation and integration of the IWB in the classroom. For his study, which focuses on the attitudes, beliefs and perceptions of primary school teachers, interviews were also conducted with teachers who were low users of IWB and who were no longer using the IWB in the classroom.

Based on the questionnaire, in which teachers were identified as regular users, low users and no longer using IWB, a list of possible teachers to be interviewed was generated and given to the headteacher during the first visit to each of the schools. As mentioned in the previous section, the school contacted the researcher after visiting the school with a list of teachers who were willing to participate in the interviews. A follow up visit was then made and arrangements for interview were made with participants according to their preferred time.

5.7.5 Conducting the Interviews

King and Harrocks (2010:42) state that "whatever happens in the interviews themselves is crucial". Therefore, when conducting interviews, it is suggested that researcher should take note on the following areas:

- The interview setting
- Recording
- Building rapport
- How (not) to ask questions
- Probing

- Starting and finishing interviews
- Managing 'difficult' interviews

For this study, interviews were conducted in the school area. Each participant in this study selected a room where they preferred to be interviewed and these included the library, the staffroom and the ICT lab. Arrangements for interviews were made with each of the participants and interviews were conducted according to participant's preferred time. For participants who were involved in the observations, interviews were conducted after the observations were conducted, according to their preferred time. Each interview lasted for approximately 30 to 45 minutes.

An application software, Audio Note available for download on an iPhone and iPad was used to record interviews with the consent of participants. According to Robson (2002), taping or recording an interview gives a researcher a permanent record of the interview that allows researcher to concentrate on the data collected from the interview. In addition to that, according to May (2001) it can also assist interpretation by allowing interviewer to take note of non-verbal gestures of the interviewee during the interview, rather than writing and looking down at their interview notes. Furthermore, it can also be replayed and this improves transcripts (Silverman, 2006). Nevertheless, an interview template was also prepared in advance for note taking in the case of technological issues with the audio recorder or if participants declined to be recorded during the interviews.

In conducting the interview, rapport was built with participants of this study by having small talks at the beginning of the interview to make them feel comfortable and to establish a relationship. According to Yates (2004), this stage is important as it will establish a frame of reference for the interviewees where they are able to set up expectations of what is to follow. At this stage of the interview, participants were informed about the background of the researcher and the aims of study before conducting the interview. In addition to that, a written consent form (Appendix D) was filled by each interview participant before the interview was conducted. They were also given assurance that their participation would remain anonymous and that their responses would be kept securely. Permission to record the interview was also requested before each interview. However, according to Bryman (2012), the use of a recorder during interviews may disconcert respondents and in some cases it causes participants to refuse to be recorded. For this study, the majority of the participants refused to be

recorded, despite the assurance that their participation would remain anonymous and that their responses would be kept securely. They mentioned that they were not comfortable with being recorded. Therefore, as mentioned earlier, notes were taken as an alternative.

All participants were also informed that confidentiality would be assured and this includes their details and the data collected for this research. All recorded forms which were used throughout the data collection for this research were kept securely. Pseudonyms are used in any reporting process and written transcripts of interview were kept securely.

In addition to that, appropriate questions and probes during the interview were used as it can "add depth to interview data" (King and Horrocks, 2010). According to Robson (1993), probing allows a researcher to expand on a response from a participant of an interview. It also helped in managing difficult interviews. Furthermore, according to Remler and Ryzin (2011), the use of probes in an in-depth interview help to guide and structure a discussion. Probe questions such as "how", "when" and "what" were used to encourage participants to give more detailed information for this study. Listening probes such as proper eye contact, nods and use of appropriate response statements were also used. Additionally, positive verbal and non-verbal reinforcement was used to acknowledge responses from interviewees. Non-verbal reinforcer are similar to the listening probes used during the interview. Additionally, verbal reinforcer such as 'ok', 'yes' and 'I see' were used. According to Yates (2004), reinforcement can increase the amount of talking by interviewees and will make participants feel that they are making a contribution to what the researcher is investigating. Other than that, bias during interview was reduced by the researcher focusing on her role as an interviewer and avoiding making interruptions during the interviews.

In concluding the interview, simple questions and questions concerning participants' suggestions for further developments of IWB were asked. This is because according to King and Harrocks (2010), a good way to ease participants out of an interview is by asking questions that give them much control, such as asking for suggestions. Furthermore, according to Robson (2002), asking simple and straightforward questions at the end of an interview allows the removal of tensions that might have built up during the interview. Interview data were analysed after the interview and findings were put

into a format to allow participants to view the data for verification purposes. The analysis of the interview findings will be explained further in the next section.

5.7.6 Analysing the Interviews

For this study, the interview data was analysed using two approaches that are commonly associated with the content analysis and grounded theory approach. According to Silverman (2006), analysing data using the content analysis method requires a researcher to establish a set of categories and count the number of words or phrases that fall into each category. Bryman (2008:275) states that it is "an approach to the analysis of documents and texts that seeks to quantify content in terms of predetermined categories and in a systematic and replicable manner".

In contrast, a grounded theory approach is "an approach to the generation of theory out of data" (Bryman, 2008:541). According to Hennink et al. (2011:208), "it is a process for developing empirical theory from qualitative research that consists of a set of tasks and underlying principles". The main process of analysing qualitative data using this approach is coding, where data collected are broken down into categories known as codes (Bryman, 2008). Codes are identified by reading the data collected and each code refers to an issue, opinion, topic or idea that is found in the data (Hennink et al., 2011). The process of coding is a way of organising data collected through data reduction from a qualitative research method that often produces large quantities of descriptive data (Wiersma and Jurs, 2009). Data are more meaningful when identified as codes and coding allows a researcher to take a step closer in drawing conclusions on the data collected (Bell, 2005). The data was analysed using both approaches and was analysed according to the steps below:

Step 1: Transcribing raw data
Step 2: Clearing repetitive data
Step 3: Translating the data
Step 4: Code development
Step 5: Classifying and categorising data into codes
Step 6: Presenting data

The first step in analysing the data collected from interview was transcribing raw data into text and into computer files. This allowed the researcher to put findings into a format that allowed participants to view the data for verification purposes. It also allowed the organisation of data into folders for further reference. This step involved the writing up of transcriptions of audio recorded data into MS Word.

The second step involved the clearing of repetitive data from the transcript produced in the first step of data analysis. This step focused on getting important data from the interviews that is relevant and answers the research questions. A copy of each edited transcript was then shown to each participant by the researcher for verification. None of the interview participants of this research asked for amendments of the edited transcript.

Step three involved translating the data into the English language as interviews were conducted in the Malay language (see appendix I). This was done as the findings of the data collected from the interviews will be presented in the English language. To ensure that the translation preserved the informal style of language when translated, the translation was done with the help of a language teacher, from the Ministry of Education, who is bilingual.

Step four involved the development of codes for data analysis. According to Saldaña (2009:3), "a code in qualitative inquiry is most often a word or short phrase that symbolically assigns a summative, silent, essence-capturing, and/or evocative attribute for a portion of language-based or visual data". Dey (1993) states that some categories or codes may be established in advance, especially in a less or unstructured research. For this study, categories or codes were identified beforehand emerging from the literature and the research questions. These codes, which are developed before or at the beginning of a research study are known as a *priori* code (Johnson and Christensen, 2012). Thus, at the early stage of data analysis the priori codes below were identified:

- Accessibility
- Factors that influence usage
- Barriers
- Training
- Perceived benefits

- Challenges
- Resources
- Suggestions

Step five involved the classifying and categorising data into codes. This helps in knowing the data as well as making meaningful comparison between different sets of data (Dey, 1993). Transcribed data was reread and categorised according to the codes identified prior to data collection mentioned in step four with the help of word processing software. Sub-categories were then derived from the data after carefully reading the data. The data was then reread and commonalities of issues emerged from rereading the data. The commonality of issues emerging in the data generated new codes which are known as in-vivo codes. In-vivo codes are identified by identifying specific word or phrases used by participants in the study (Hennink et al., 2011). Codes that emerge from the data were identified through the open coding method, which is an element of the grounded theory approach. In other words, data was analysed using the analytical approach of grounded theory where it is a "preliminary process of breaking down, examining, comparing, conceptualizing and categorizing data" (Silverman, 2006:96). According to Strauss and Corbin (1998:101), open coding is "the analytic process through which concepts are identified and their properties and dimensions are discovered in data". According to Warren and Karner (2005), open coding is the process of identifying analytic patterns and themes from data collected. As mentioned earlier, transcribed data was examined and was then categorised according to codes identified prior to data collection. Data was analysed further by finding the underlying issues brought up by participants of the interview, where they used words and phrases that highlight issues that were important and relevant to the research. These issues, identified through the open coding method were noted and new codes or sub-categories emerged from the data. This reduced data to small set of themes and according to Strauss and Corbin (1998), this process of open coding method, which involves searching out the concepts by looking for codes, is an element of grounded theory analysis. Although this study have utilised a grounded theory approach in analysing interview data, this research was not a grounded theoretical study.

In addition to that, memos were used to label data as well as to write down ideas that emerged about the codes and relationships between them during the coding process (see appendix J). According to Strauss and Corbin (1998:220), the use of memos "provide

storehouse of analytic ideas that can be sorted, ordered and recorded, and retrieved according to the evolving theoretical scheme". Furthermore, memos also make it easier for researcher to retrieve and sort codes, as well as cross-referencing the codes. According to Johnson and Christensen (2012), memoing is an important tool to record insights gained from reflecting on data. It is also useful as the researcher will be able to keep track of ideas generated during data analysis.

Step six involved presenting the data, which was presented in categories using headlines derived from codes identified prior to data collection and can be found in Chapter Seven of this thesis.

5.8 Limitations of Study

In doing this study, there are limitations found which influenced the results of the study. This includes constraints faced by the researcher as well as methodological issues. One of the main limitations of this study was that the researcher was unable to access to a wider population due to the restriction of access. Although an application letter was written to gain permission to enter all primary schools in Brunei Darussalam, the researcher was only able to gain access to seven out of 119 primary schools which were selected randomly by the Ministry of Education. In addition to that, schools selected for this research were limited to schools located at the Brunei Muara district of Brunei Darussalam. This limited the researcher in selecting sample for this research. Therefore, readers should consider that the small sample was limited to teachers from seven selected primary schools located in the same district.

During the distribution of questionnaire, a date was agreed for the collection of completed questionnaires. However, the researcher was unable to collect all questionnaires on time as some respondents did not return the questionnaire on time. This caused a delay in the analysis of the data. Furthermore, the target sample identified for observations and interviews from questionnaire respondents was limited to willingness of respondents to participate in the research. A list of the target sample was given to headteachers or ICT teachers of each school and researcher was contacted with a list of participants who were willing to participate in this study. In some schools, although permission was granted to conduct research from the Ministry of Education, the school's administration took more than two weeks to respond to the researcher's

request for access to willing participants for the study. This could be improved by having more direct contact with the target sample instead of through school authorities.

In addition to that, as mentioned earlier in this chapter, the application for access to primary schools was for the duration of three years from the beginning of the study to be able to complete two phases of the study, which were the distribution of questionnaire and observations followed by interviews. However, before the second phase of the study, the researcher was informed that there was a need to reapply for permission to gain access to schools and participants of this study. A second application letter was then written to apply for access to conduct the second phase of the study. This caused a delay in data collection as it had to go through the administration process both with the sponsorship board as well as the Department of Schools under the Ministry of Education. Thus, the researcher had to extend the time taken for data collection in Brunei Darussalam. Furthermore, as a PhD student based in the United Kingdom, the researcher was only allowed 128 days of leave per year; thus, data collection for observation and interview was collected within the time frame, which was from January until June. In addition to that, few schools had term breaks during the duration of data collection, and most schools conducted term exams and tests before each term break. As a result of this, participants were not willing to be observed. Furthermore, the time frame also involved the holy month of Ramadhan, where school and working hours are shortened in Brunei Darussalam, which restricted the researcher's presence at the schools involved. Additionally, the researcher needed to make regular visits to the schools involved in this study to gain access to research participants and arrange time with participants before conducting lesson observations and interviews. This restricted the time for the researcher to conduct lesson observation repeatedly, which could minimise the Hawthorne effect and generate more accurate data for this research. Nevertheless, the quality of data collected for this study is not affected by the issues mentioned above.

5.9 Summary

This chapter outlined the research methods used for this study, which is concerned with determining the best practice that can be incorporated to assist the effective use of the IWB in primary classroom in Brunei Darussalam. The rationale of the chosen methods, which are the quantitative and qualitative methods, was discussed in this chapter. This

chapter also outlined the research instruments used for data collection, which are the questionnaire, observation and interview. Administration and how data was generated using each research instrument were also explained in this chapter. Additionally, this chapter also discussed ethical considerations and how the sample for each research instrument was selected in conducting this study. The limitations of the study were also presented in this chapter. Analysis of the data collected using the quantitative approach, which is the questionnaire, will be presented in the next chapter (Chapter Six). Meanwhile, descriptive analysis of the data collected using the qualitative approach, which involved the observation and interviews will be presented in Chapter Seven of this thesis.

CHAPTER SIX: QUANTITATIVE FINDINGS

6.1 Introduction

As mentioned in Chapter One, this study aims to investigate the best practice that can be incorporated to assist the effective use of the IWB in primary classrooms in Brunei Darussalam. It aims to find out the perceptions of primary school teachers on the use of the IWB in primary schools throughout Brunei Darussalam, which raises issues involving the IWB which are teachers' perceived benefits of the IWB; teachers' level of IWB training; teachers' IWB skills, knowledge and current practices; and teachers' attitude towards the integration of the IWB in the classroom.

The findings presented in this chapter are results of data obtained from the questionnaire. As mentioned in Chapter Five, only seven selected primary schools from 119 schools in Brunei Darussalam were involved in this study. In addition to that, all schools involved in this study are located in the Brunei Muara district (see Table 2.1 in Chapter Two). As mentioned in Chapter Five, data collected for the questionnaire was analysed using the SPSS software. Findings were generated using the frequency analysis method and are presented this chapter using tables and bar graphs. In addition to that, mean scores and standard deviation data from section two of the questionnaire will also be presented using tables in this chapter.

6.2 Information on Schools and Research Participants

As mentioned earlier, seven primary schools from the Brunei Muara district were involved in this study. Table 6.1 below shows the information on each school involved in this study, which includes the number of pupils, classes, ICT lab and IWB.

School	No. of Pupils	No. of Classes	No. of ICT Lab	No. of Interactive Whiteboard
A	746	22	2	1
B	556	20	1	1
C	531	19	1	1
D	276	14	1	1
E	217	14	1	1
F	578	25	2	1
G	282	15	1	1

Table 6.1: Information on Schools Involved

Table 6.1 above shows that each school has a different number of pupils and classes. Although it can be seen that schools with a larger population and number of classes have two ICT labs, each school is only provided with one IWB.

The total number of teachers and number respondents from each school is presented in Table 6.2 below.

School	No. of Teachers			No. of Questionnaire Respondents
	Male	Female	Total	
A	8	40	48	20
B	6	34	40	9
C	9	39	48	10
D	4	28	32	7
E	3	22	25	9
F	8	37	45	8
G	8	24	32	11
Total	46	224	270	75

Table 6.2: Number of Teachers and Respondents

As seen from Table 6.2 above, a total of 75 out of 270 primary school teachers from seven selected government primary schools in Brunei Darussalam participated in the questionnaire survey. From the questionnaire findings, 13 participants were identified as regular users of IWB. Meanwhile, a total of 43 participants were identified as low users and 19 participants were no longer using the IWB (see section 6.3). However, only a total of 16 teachers were involved in the interviews, of whom seven participants were regular users of IWB, four participants were low users of IWB and five participants were no longer using the IWB. A total of seven classroom observations were conducted for this research from three different primary schools in Brunei Darussalam. As mentioned earlier, each school involved in this study was provided with only one interactive whiteboard,despite the different number of pupils and classrooms in each school. Every school involved in this study was provided with a Promethean board.

6.3 Questionnaire Findings

This section presents findings of data collected using the survey (questionnaire), in which 75 respondents were involved from seven Bruneian government primary schools. Respondents were selected based on the criterion that they were using the IWB for

teaching or had used the IWB for teaching in the classroom before. As mentioned in section 5.5.1 (Chapter Five), the questionnaire was divided into two parts and the results of the questionnaire will be presented in this section.

Part one of the questionnaire was on the demographic data of the respondents, where the questionnaire includes questions relating to the background of the respondents and their usage of the IWB. The findings of this section of the questionnaire, which was analysed using the frequency analysis method is presented in section 6.3.1 in both table and bar graph.

Part two of the questionnaire was on the knowledge, attitudes and practices of primary school teachers relating to the integration of the IWB in the classroom. Findings of this section of the questionnaire, which was analysed using the frequency analysis method is presented in section 6.3.2 in the form of tables. Additionally, mean scores and standard deviation data from this section of the questionnaire will also be presented and described further.

6.3.1 Part 1 – Demographic Data of Respondents

As mentioned in the previous section, a total of 75 teachers from seven different primary schools in Brunei Muara district participated in the questionnaire and this included eight (11%) male respondents and 67 (89%) female respondents. Figure 6.1 below shows the number of respondents according to their gender.
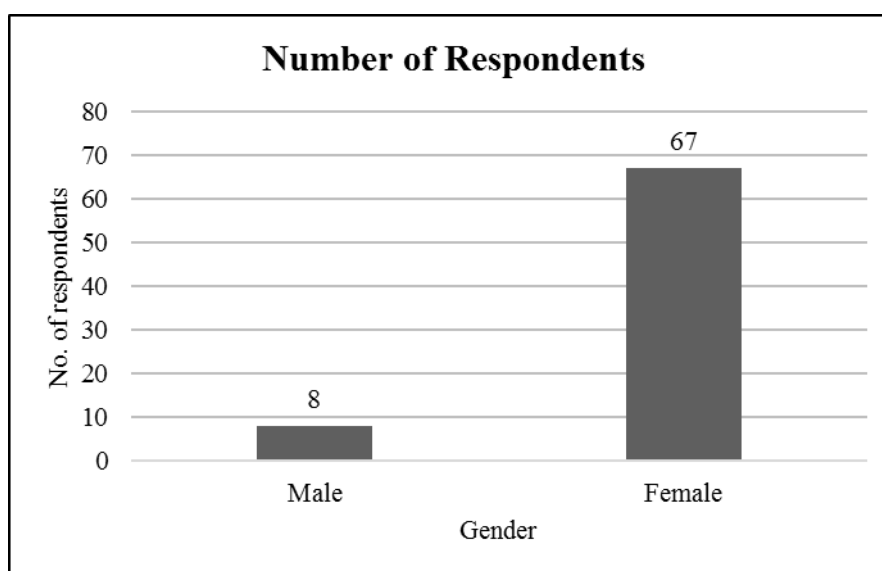
Figure 6.1: Number of Respondents

Table 6.3 below shows the number of primary school teachers for both genders in all four districts in Brunei Darussalam in 2012.

Number of Primary School Teachers by District, 2012		
District	**Male**	**Female**
Brunei Muara	414	1407
Tutong	146	383
Belait	95	268
Temburong	89	64
TOTAL	**744**	**2122**

Table 6.3: Number of Primary School Teachers in Brunei Darussalam, 2012
(Source: Ministry of Education, 2013)

Therefore, as seen from the table above, the number of female teachers is significantly higher than male teachers in primary schools throughout Brunei Darussalam including in Brunei Muara District. Table 6.4 below shows the number of teaching years of respondents who were involved in the questionnaire survey.

No. of teaching years	No. of respondents (Frequency)	Percentage (%)
1	1	1%
2	6	8%
3	6	8%
4	7	9%
5	9	12%
6	1	1%
7	2	3%
8	6	8%
9	12	16%
10	3	4%
11	2	3%
13	5	7%
14	2	3%
15	1	1%
16	2	3%
17	1	1%
19	1	1%
22	1	1%
No Response	7	9%
Total	**75**	**100%**

Table 6.4: Number of Respondents' Teaching Years

As seen in Table 6.5 below, in terms of qualification, six respondents (8%) involved in this study were certificate holders; 28 respondents (37%) were diploma holders, 38 respondents (51%) were bachelor degree holders, 2 respondents (3%) were masters degree holders and 1 respondent (1%) had other qualification. None of the respondents were PhD holders.

Academic Qualification	No. of Respondents (Frequency)	Percentage
Certificate	6	8%
Diploma	28	37%
Bachelor Degree	38	51%
Masters Degree	2	3%
PhD	0	0%
Other Qualification	1	1%
Total	**75**	**100**

Table 6.5: Qualification of Respondents

However, according to the Education statistics in Brunei Darussalam in 2012, there is a high number of primary school teachers in Brunei Darussalam who are diploma and bachelor degree holders, which is shown in Table 6.6 below. The results of the questionnaire findings also show high numbers of respondent with both the qualifications mentioned. The statistics in Table 6.6 also include qualifications of primary teachers from the Ministry of Education, Ministry of Religious Affairs and private schools in Brunei Darussalam.

Academic Qualification	Male	Female	Total
PhD	5	5	10
Master	70	234	304
Post Graduate	0	0	0
MBBS	0	0	0
Bachelor Degree	565	1544	2119
HND, ND, OND, Dilpoma	249	766	1015
HNC, ONC, NC, Certificates	124	391	515
City and Guilds	2	2	4
BC GCE A Level	91	308	399
BC GCE O Level	97	693	790
BJCE, PMB, LCE, SRP	58	3	61
Others	0	0	0

Table 6.6: Teachers' Academic Qualification in Bruneian Primary School, 2012
(Source: Ministry of Education, 2013)

Figure 6.2 below shows that a high number of respondents reported that they used the IWB very rarely in their lessons, which is 37 (49%) respondents. A total of 19 (25%) of respondents reported that they no longer used IWB for teaching, 8 respondents (11%) reported that they used IWB more than once per week, 6 respondents (8%) reported that they used IWB less than once per week, 3 respondents (4%) reported that they used IWB once per day and only a total of 2 (3%) of the respondents reported that they used IWB in every lesson.
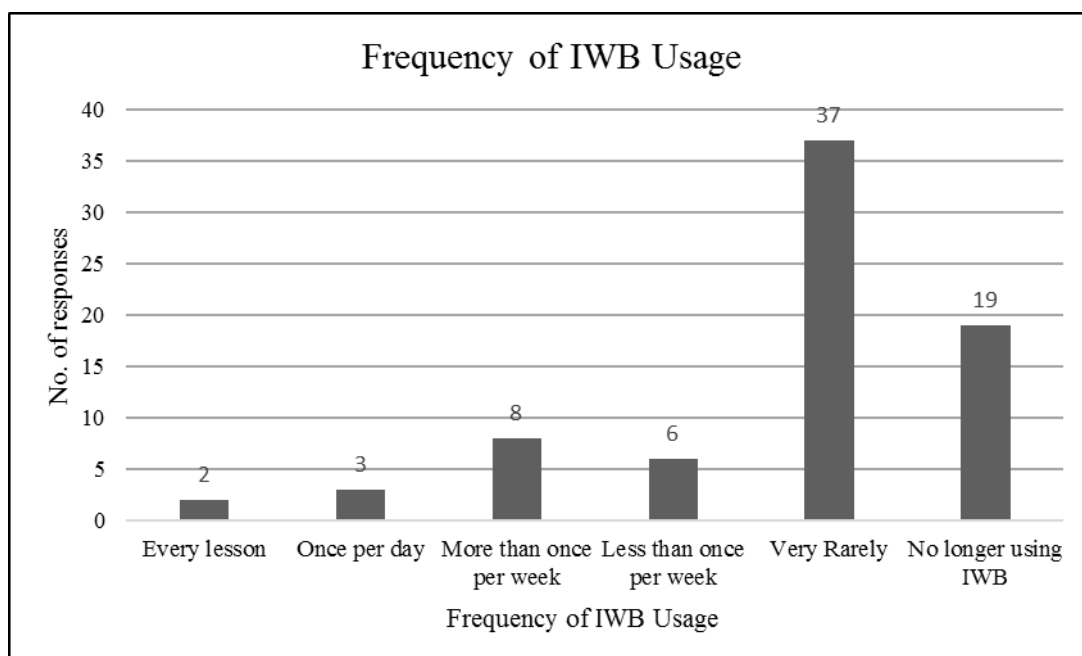
Figure 6.2: Frequency of IWB Usage by Respondents

From the findings shown in figure 6.2 above, respondents were identified into three different categories, which are regular IWB users, low IWB users and no longer using the IWB. Table 6.7 below shows the number of respondents identified in each category.

Categories	Frequency of Usage	No. of Respondents
REGULAR IWB USERS	Every lesson	2
	Once per day	3
	More than once per week	8
	TOTAL	**13**
LOW IWB USERS	Less than once per week	6
	Very rarely	37
	TOTAL	**43**
NO LONGER USING IWB	No longer using	19
	TOTAL	**19**

Table 6.7: Categories of Respondents

As seen from Table 6.7, only 13 respondents (18%) were identified as regular users of IWB, who used IWB either in every lesson, once per day or more than once per week. Meanwhile, a total of 43 respondents (57%) were identified as low users, who rarely used IWB for teaching or used the IWB less than once per week. A total of 19 participants (25%) were identified as no longer using the IWB.

Figure 6.3 below shows from whom respondents learned how to use the IWB for teaching. This was a multiple response question. From this question, a total of 145 responses were generated from 75 respondents. As seen from figure 6.3 below, there were a high number of responses that stated that they learn how to use the IWB from ICT teacher, which was 56 (39%) responses, followed by 45 (31%) responses which stated that they learned how to use the IWB from staff development. Furthermore, 19 (13%) responses show that they learned to use the IWB from a workshop by the IWB provider and 20 (14%) shows that they learned how to use the IWB by themselves and only 5 (3%) responses learned how to use the IWB from others.
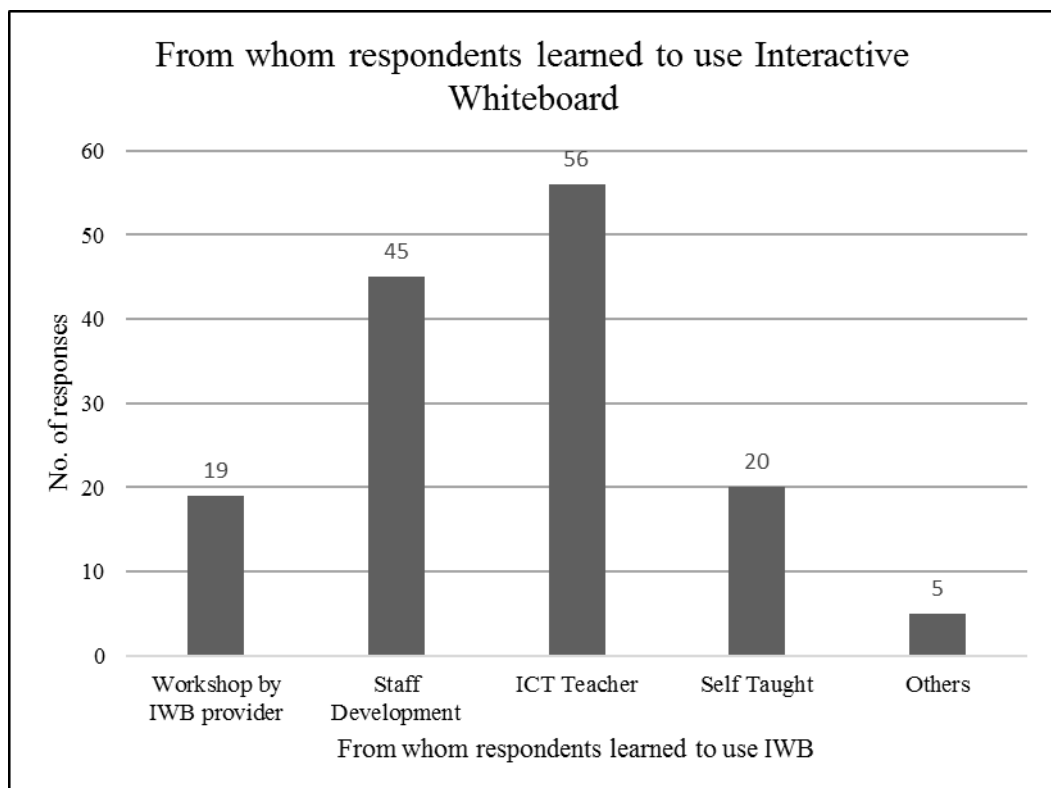
Figure 6.3: From Whom Respondents Learned to Use Interactive Whiteboard

In terms of subjects taught using the IWB, a total of 100 responses were generated from respondents. However, six respondents did not respond to this question. As seen from

figure 6.4 below, there were a high number of responses that stated they used the IWB for teaching Mathematics with a total of 29 responses. It was followed by Science with a total of 28 responses. In addition to that, the finding shows that there are 18 responses for English; 13 responses for Malay; 3 responses for Social Studies; 4 responses for Art and other subjects; and 1 response for Religious Knowledge.
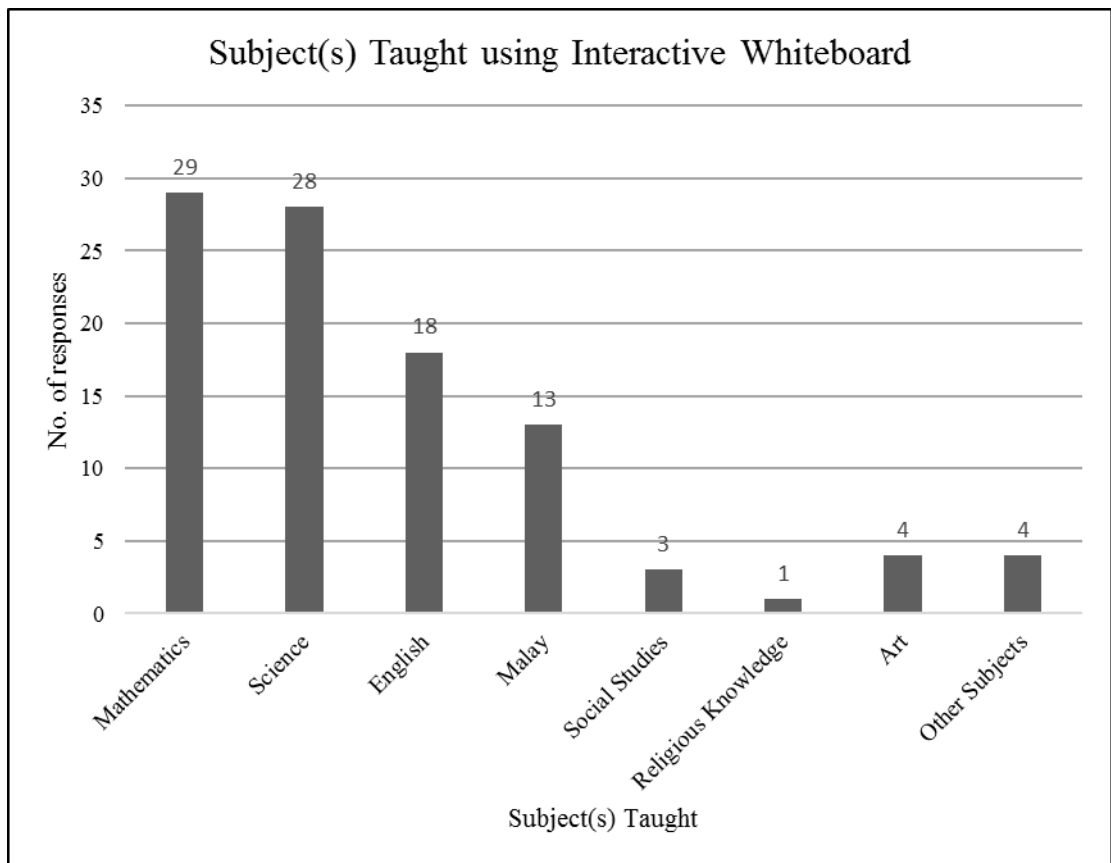
Figure 6.4: Subjects Taught Using Interactive Whiteboard

It can be seen from figure 6.4 above that primary school teachers in Brunei Darussalam most often use the IWB to teach core subjects, which are Mathematics, Science and English Language.

6.3.2 Part 2 – Degree of perceptions on Knowledge, Attitudes and Practices

Part two (see section B of appendix F) of the questionnaire was on the degree of perception on the knowledge, attitudes and practices of primary school teachers on the use of the IWB in the classroom. The findings generated using the SPSS software are shown in Table 6.8 below.

1=Strongly Disagree 2=Disagree 3=Neither Agree nor Disagree 4 =Agree 5 =Strongly Agree

No	QUESTION	1	2	3	4	5
1.	I can get access to IWB easily for teaching.	4 (5%)	10 (13%)	20 (27%)	35 (47%)	6 (8%)
2.	I feel that I am capable in integrating the use of IWB in classroom.	2 (3%)	4 (5%)	15 (20%)	50 (67%)	4 (5%)
3.	I have lots of ideas about how to use IWB for teaching.	2 (3%)	5 (7%)	25 (33%)	40 (53%)	3 (4%)
4.	I have had sufficient training and/or professional development in the use of IWB for teaching.	5 (7%)	16 (21%)	37 (49%)	15 (20%)	2 (3%)
5.	I know how to operate IWB effectively.	3 (4%)	9 (12%)	32 (43%)	28 (37%)	3 (4%)
6.	I know how to use IWB to support different learning styles of my pupils.	2 (3%)	6 (8%)	28 (37%)	36 (48%)	3 (4%)
7.	I know how to use different software with the IWB.	2 (3%)	19 (25%)	34 (45%)	17 (23%)	3 (4%)
8.	I am encouraged to use IWB by the school principal.	0 (0%)	2 (3%)	22 (29%)	41 (55%)	10 (13%)
9.	I think the use of IWB has positive effect on teaching pedagogy.	0 (0%)	1 (1%)	12 (16%)	50 (67%)	12 (16%)
10.	I think the use of IWB motivates pupils and increases the interest of pupils toward lessons.	0 (0%)	1 (1%)	5 (7%)	46 (61%)	23 (31%)
11.	I think IWB improves pace of lesson.	0 (0%)	1 (1%)	20 (27%)	47 (63%)	7 (9%)
12.	I think the use of IWB makes teaching resources more easily available.	0 (0%)	1 (1%)	17 (23%)	45 (60%)	12 (16%)
13.	I think IWB can support teaching and make a lesson more effective.	0 (0%)	1 (1%)	10 (13%)	47 (63%)	17 (23%)
14.	I think it is easy to plan and prepare a lesson using IWB.	0 (0%)	5 (7%)	31 (41%)	33 (44%)	6 (8%)
15.	I think IWB increases interaction between teachers and pupils in classrooms.	0 (0%)	1 (1%)	17 (23%)	44 (59%)	13 (17%)
16.	I think the use of IWB reduces workload.	1 (1%)	10 (13%)	29 (39%)	24 (32%)	11 (15%)
17.	I believe the integration of IWB in classroom improves pupils' academic performance.	0 (0%)	3 (4%)	15 (20%)	46 (61%)	11 (15%)
18.	I believe it is important to have a technical assistance to support classroom use of IWB.	0 (0%)	2 (3%)	6 (8%)	37 (49%)	30 (40%)
19.	In order to encourage teachers to use IWB often, I believe they need training.	0 (0%)	0 (0%)	4 (5%)	26 (35%)	45 (60%)
20.	I am interested to attend pedagogy based training on the use of IWB for teaching.	0 (0%)	0 (0%)	10 (13%)	42 (56%)	23 (31%)

Table 6.8: Teachers' Degree of Perceptions on Knowledge, Attitudes and Practices

As seen from Table 6.8 above, following their responses, the majority of respondents in this study felt that they could get access to IWB easily, where 6 (8%) respondents strongly agreed with the statement, 35 respondents (47%) agreed to the statement, 20 (27%) respondents neither agreed nor disagreed, 10 (13%) respondents disagreed and 4 respondents (5%) strongly disagreed with the statement.

The majority of the respondents also agreed that they were capable of integrating the use of the IWB in the classroom, where 54 (72%) respondents agreed with the statement, whereas 15 (20%) of the respondents neither agreed nor disagreed with the statement while 6 (8%) respondents disagreed with the statement. A high number of the respondents also agreed that they had lots of ideas about how to use the IWB for teaching, where 3 (4%) strongly agreed, 40 (53%) agreed, whereas 25 (33%) of the respondents neither agreed nor disagreed with the statement. Only 5 (7%) of the respondents disagreed and 2 (3%) of them strongly disagreed with the statement.

In terms of training, 37 (49%) of the respondents neither agreed nor disagreed with the statement that they have had sufficient training and/or professional development in the use of the IWB for teaching in the classroom. Only 17 (23%) of the respondents agreed that they felt they had sufficient training and 21 (28%) felt that they did not.

As indicated in table 6.8, a total of 32 (43%) respondents neither agreed nor disagreed that they knew how to operate the IWB effectively. In addition to that, 31 (41%) of the respondents felt that they knew how to operate the IWB effectively while 12 (16%) respondents felt that they did not. A high number of respondents, which is 39 (52%) respondents, agreed that they knew how to use the IWB to support different learning styles of their pupils while 28 (37%) neither agreed nor disagreed and 8 (11%) disagreed with the statement. Furthermore, 34 (45%) of the respondents neither agreed nor disagreed that they knew how to use different software with the IWB, while 20 (27%) agreed and 21 (28%) of the respondents disagreed with the statement.

A high number of respondents, which is 51 (68%) respondents agreed that the school principal encouraged them to use the IWB for teaching while 22 (29%) neither agreed nor disagreed and only 2 (3%) showed their disagreement with the statement. Furthermore, 62 (83%) of the respondents agreed that the use of the IWB has a positive effect on teaching pedagogy while 12 (16%) respondents neither agreed nor disagreed

and only one respondent disagreed with the statement. A total of 69 respondents (92%) felt that the use of the IWB motivates pupils and increases the interest of pupils toward lesson while 5 (7%) of the respondents neither agreed nor disagreed with the statement. Meanwhile, only one (1%) respondent disagreed with the statement.

The majority of the respondents, which is 54 (72%) respondents, agreed that the use of IWB improves the pace of lesson while 20 (27%) of the respondents neither agreed nor disagreed with the statement. Only one (1%) respondent showed disagreement with the statement. 57 (76%) respondents also agreed that the use of IWB makes teaching resources more easily available, while 17 (23%) neither agreed nor disagreed and only one (1%) respondent disagreed with the statement. A high number of respondents, which is 64 (86%) respondents agreed that the IWB can support teaching and make lessons more effective. However, 10 (13%) of the respondents neither agreed nor disagreed with the statement and only one (1%) respondent showed disagreement.

A total of 39 (52%) of the respondents agreed with the statement that it is easy to plan and prepare a lesson using an IWB while only 5 (7%) respondents disagreed with the statement. However, a total of 31 (41%) respondents neither agreed nor disagreed with the statement. A total of 44 (59%) of the respondents agreed that the use of IWB increases interaction between teachers and pupils in the classroom and a total of 13 (17%) respondents strongly agreed with the statement. However, 17 (23%) of respondents neither agreed nor disagreed and only one (1%) respondent disagreed with the statement. A total of 35 (47%) of the respondents agreed that the use of IWB reduces workload while 29 (39%) respondents neither agreed nor disagreed with the statement. Meanwhile, 10 (13%) of the respondents disagreed and only one (1%) respondent strongly disagreed with the statement.

As shown in Table 6.8, 11 (15%) of the respondents strongly agreed and 46 (61%) of the respondents agreed that the integration of the IWB in the classroom improves pupils' academic performance. A total of 15 (20%) respondents neither agreed nor disagreed and only 3 (4%) of the respondents disagreed with the statement. Furthermore, most respondents believed that it is important to have technical assistance to support classroom use of the IWB, where 37 (49%) respondents agreed and 30 (40%) strongly agreed with the statement. Only a total of 6 (8%) neither agreed nor disagreed and only 2 (3%) respondent disagreed with the statement.

In addition to that, as shown in Table 6.8, the majority of the respondents believed that training is needed in order to encourage teachers to use the IWB often, where 45 (60%) respondents strongly agreed and 26 (35%) agreed with the statement. Only four (5%) of the respondents neither agreed nor disagreed with the statement and no participants disagreed with the statement. Furthermore, 23 (31%) of the respondents strongly agreed and 42 (56%) of the respondents agreed with the statement that they are interested to attend pedagogy-based training on the use of the IWB for teaching. Meanwhile 10 (13%) respondents neither agreed nor disagreed with the statement. None of the participants disagreed with the statement.

Respondents in this study were also asked about what they thought might be useful regarding training on the use of the IWB in the classroom. They stated that training through staff development should be done phase by phase. They also stated that training should be done using appropriate software as well as software that is easily accessible to them. In addition to that, respondents also stated that training should be for teachers who are interested to use the IWB in the classroom and for teachers who already have basic ICT skills.

Furthermore, respondents also stated that there should be opportunities for teachers to use the IWB after being trained. Moreover, respondents stated that teachers should attend the IWB training according to relevant to the subject they taught. In addition to that, respondents also stated that authorities should prepare relevant IWB resources to be applied in the actual lesson. Respondents also mentioned the need to provide more workshop and training on the use of the IWB in general and for specific subjects. They also stated the need of updating knowledge on the IWB for teachers.

The descriptive analysis of the mean scores and standard deviation for each question in section two of the questionnaire were also generated using the SPSS software and are divided into three groups, which are skills and knowledge; teachers' perceptions; and support and training. Based on the attitude scale (see section B in appendix F), where respondents were given a five-point scale to indicate their level of agreement and disagreement, the mean scores were divided into three main categories, which are high level (scale 3.5 and above), moderate level (scale 3.0 to 3.4) and low level (scale below 3.0).

Table 6.9 below shows the mean scores and standard deviation for teachers' responses to IWB skills and knowledge generated from the questionnaire.

No.	Question	Mean Score	Std. Deviation	Level
2.	I feel that I am capable in integrating the use of IWB in classroom.	3.6667	.77692	High
3.	I have lots of ideas about how to use IWB for teaching.	3.4933	.77692	
6.	I know how to use IWB to support different learning style of my pupils.	3.4267	.80829	Moderate
5.	I know how to operate IWB effectively.	3.2533	.87137	
7.	I know how to use different software with the IWB.	3.0000	.86992	

Table 6.9: Teachers' Responses to IWB Skills and Knowledge

As seen from Table 6.9 above, there is a high and moderate level of agreement among teachers in relation to their IWB skills and knowledge as indicated from the mean scores generated for this questionnaire. Meanwhile, Table 6.10 below shows the mean scores and standard deviation for teachers' perceived benefits of the use of the IWB in the classroom.

No.	Questions	Mean Score	Std. Deviation	Level
10.	I think the use of IWB motivates pupils and increases the interest of pupils toward lessons.	4.2133	.62154	High
13.	I think IWB can support teaching and make a lesson more effective.	4.0667	.64375	
9.	I think the use of IWB has positive effect on teaching pedagogy.	3.9733	.61454	
15.	I think IWB increases interaction between teachers and pupils in classrooms.	3.9200	.67303	
12.	I think the use of IWB makes teaching resources more easily available.	3.9067	.66115	
17.	I believe the integration of IWB in classroom improves pupils' academic performance.	3.8667	.70391	
11.	I think IWB improves pace of lesson.	3.8000	.61512	
14.	I think it is easy to plan and prepare a lesson using IWB.	3.5333	.74132	
16.	I think the use of IWB reduces workload.	3.4533	.94859	

Table 6.10: Teachers' Perceptions

As seen from Table 6.10 above, a high mean score was obtained indicating a high level of agreement for question 10, 13, 9, 15, 12, 17, 11, 14 and 16 of section two of the questionnaire on teachers' perceived benefits of the IWB in the classroom. Table 6.11 below shows the mean scores and standard deviation on questions related to support and training received by primary teachers in relation to the use of the IWB in the classroom.

	No.	Questions	Mean Score	Std. Deviation	Level
Support	18.	I believe it is important to have a technical assistance to support classroom use of IWB.	4.2667	.72286	High
	8.	I am encouraged to use IWB by the school principal.	3.7867	.70315	
	1.	I can get access to IWB easily for teaching.	3.3867	.99856	Moderate
Training	19.	In order to encourage teachers to use IWB often, I believe they need training.	4.5467	.59940	High
	20.	I am interested to attend pedagogy based training on the use of IWB for teaching.	4.1733	.64459	Moderate
	4.	I have had sufficient training and/or professional development in the use of IWB for teaching.	2.9067	.88796	Low

Table 6.11: Teachers' Responses to Support and Training

As seen from Table 6.11 above, a high mean score was obtained indicating the level of agreement on the importance of technical assistance. In addition to that, a high level of mean score was also obtained for question 8 indicating that respondents felt they were encouraged to use the IWB by their school principal. In terms of training, it can be seen that high mean scores were obtained for questions 19 and 20, which indicated that respondents in this study recognised the importance of training and were interested to attend pedagogy based IWB training. Meanwhile, a low level of mean score was obtained for question 4 of the questionnaire indicating the insufficient training received by respondents.

6.4 Summary of Findings

This chapter presented findings from the questionnaire collected from seven selected government primary schools in Brunei Darussalam. All schools involved in this study

are located in Brunei Muara district. The questionnaire was distributed by the researcher herself after obtaining access to each school from the Ministry of Education, Brunei Darussalam. A pilot study was conducted before distributing the questionnaire to ensure the reliability of the questionnaire.

A total of 75 teachers out of 270 teachers participated in this questionnaire for this study. The questionnaire was divided into two distinct sections. Section one was used to collect the demographic data of the respondents and section two was used to collect the quantitative data on the knowledge, attitudes and practices of primary school teachers on the use of the IWB in the classroom. As seen in this chapter, the questionnaire was analysed using the frequency analysis method and presented using tables and bar charts. From the questionnaire findings, a total of 13 respondents were identified as regular users of the IWB. Meanwhile, a total of 43 respondents were identified as low users and a total of 19 participants were identified as no longer using the IWB. This chapter also presented an analysis of findings on the degree of perceptions on knowledge, attitudes and practices of primary school teachers in Brunei Darussalam on the use of the IWB in the classroom, based on data collected using an attitude scale questionnaire (see section B in appendix F). In addition to that, this chapter also presented the mean score and standard deviation score, which was also generated using the SPSS software. The next chapter (Chapter Seven) will present qualitative findings that were collected for this research, which are the observation and interview findings. The findings in Chapter Seven will complement findings in this chapter and will be discussed in Chapter Eight.

CHAPTER SEVEN: QUALITATIVE FINDINGS

7.1 Introduction

As mentioned in the earlier chapters, this research aims to investigate the best practice that can be incorporated to assist the effective use of the IWB in primary classrooms in Brunei Darussalam. It aims to find out the perceptions of primary school teachers on the integration of the IWB in the primary classroom, which raises issues involving teachers' perceived benefits of IWB; teachers' level of IWB training; teachers' level of IWB, teachers' current IWB practices; and teachers' attitudes towards the integration of the IWB.

The findings presented in this chapter are the descriptive analysis of qualitative data obtained from two research instruments, which are lesson observations and interviews. As mentioned in Chapter Five, only seven selected primary schools were involved in this research and all schools are located in the Brunei Muara district. It was noted in Chapter Six (Table 6.7) that the result of the questionnaire findings has identified respondents into three different categories, which are regular users of the IWB (13 respondents), low users of the IWB (43 respondents) and no longer using the IWB (19 respondents). However, the observation findings presented in this chapter are based on observations conducted with seven teachers who were regular IWB users. In addition to that, it is followed by the descriptive analysis of interview data that was collected from interviews conducted with all seven regular IWB users involved in the lesson observations, four teachers who were low users of the IWB and five teachers who were no longer using the IWB.

7.2 Observation Findings

As mentioned earlier, a total of seven classroom observations were conducted for this research. All lessons observed were taught by teachers who were regular users of the IWB identified from the results of questionnaire findings. As mentioned in Chapter Five (section 5.6.3), participants were selected based on their availability and willingness to participate in this study. As a result, seven teachers form three different schools were involved in the lesson observations for this study.

The lesson observations conducted for this study were designed to investigate teachers' current practices using the IWB and notes were taken concerning the following:

- location of the IWB, which may influence the use of the IWB;
- features of the setting of the IWB which may influence how activities are carried out;
- and activities carried out using the IWB.

This section will presents findings of lesson observations conducted for this study.

7.2.1 Location

As mentioned in Chapter Six, schools involved in this research were provided with only one IWB despite the different number of pupils and classes in each school (see Table 6.1). The IWBs were installed in the ICT lab of each school. Although all lessons observed involved in this study were only from three different schools, the researcher was given the opportunity to visit the ICT lab of all schools involved in this study. From the observation, all the ICT labs of schools involved in this study are located away from the regular classrooms. In two of the schools, the ICT lab is located on the third floor of the building along with year 6 classes. Meanwhile, in two other schools, the ICT lab is located in a different block with year 6 classes, which is located away from other classrooms. However, the lab is nearer to the staffroom and administration block. In three other schools, the ICT lab is located at the administration block. As stated in Chapter Six (see Table 6.1), two schools involved in this study have two ICT labs and it is noted that in both schools, the ICT labs are located next to each other. However, in both schools observed, only one of the rooms has IWB installed while the other room is only equipped with personal desktops and an overhead projector.

7.2.2 Room Layout and Setting of IWB

From the observation in all seven schools involved in this study, typical layouts of an ICT lab where IWBs are installed are shown in Figures 7.1 and 7.2 below. The IWB is located in front of the room and a teacher's desk is located not too far from the board, where the main computer that connects to the IWB is kept. As mentioned in the

previous chapter, every school involved in this study is provided with a Promethean board. The only interactive tool provided with the IWB is an ActivPen.

In all rooms observed, in front of the board is an open space where children are often seated when the IWB are being used by the teacher. The space in front of the IWB varies depending on the size of the room. In one of the rooms observed, a small step was installed in front of the board which was used by one of the teachers to access the upper part of the IWB. This indicated that the IWB is mounted at a height that is not accessible for both teachers and pupils.
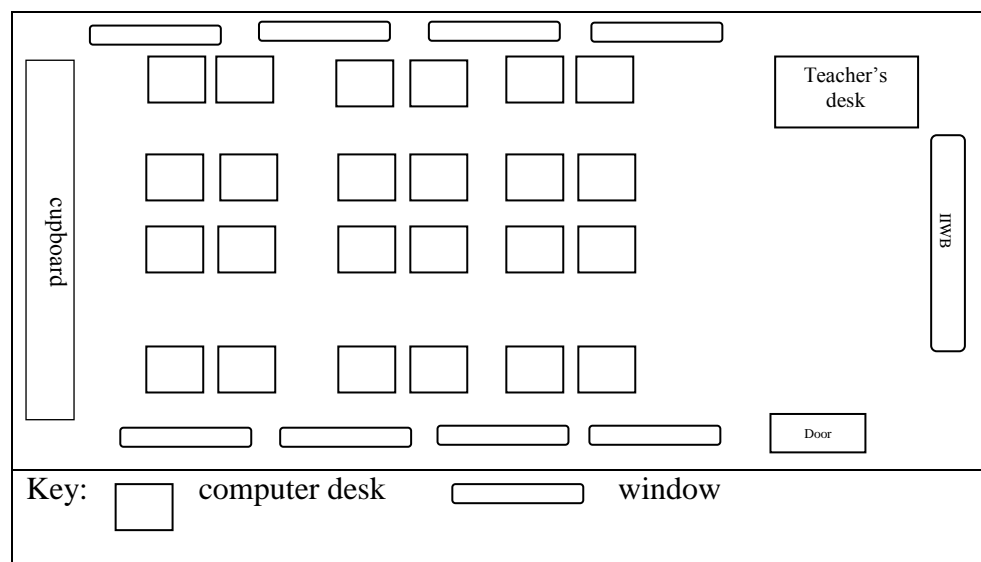
Figure 7.1: ICT Room Layout 1
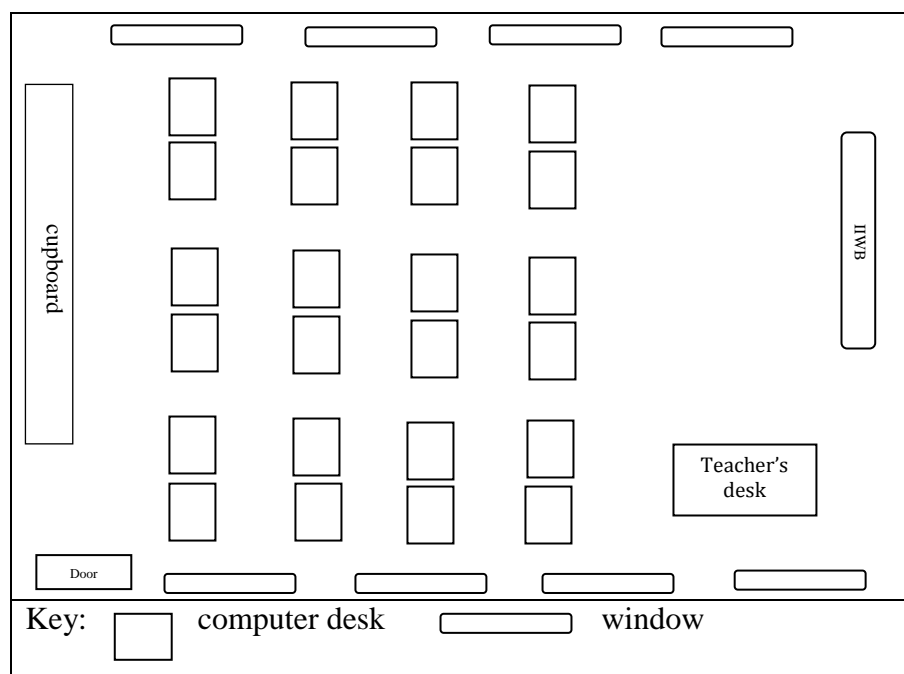
Figure 7.2: ICT Room Layout 2

In all ICT labs where IWBs are installed, it can be seen that only small desktop speakers are provided as the main audio output when the IWB is in use. In most rooms the speakers are already connected to the main computer. However, there are also rooms observed where the speakers are not readily connected to the computers and are kept away. All rooms have blackout curtains installed. However, in one of the rooms observed, the upper part of the window was not covered with curtains, thus creating a reflection on the board when in use, as well as reducing the quality of visual images shown on the board. All rooms are equipped with an air conditioner which is switched on only when the room is in use. Additionally, all desks in the lab are placed quite close to each other and are equipped with a personal computer, which includes a desktop speaker, a keyboard and a mouse. According to all teachers, each personal computer is not connected with the IWB. As seen in the diagrams above, there are two ways in which the desks in the ICT lab are typically arranged. Diagram 7.1 shows that the desks are arranged not facing the IWB whereas diagram 7.2 shows that desks are arranged facing the IWB.

7.2.3 Lesson Observation

Seven lesson observations were conducted for this study. The lessons were taught by seven different participants. The observed lessons involved participants teaching both lower and upper primary classes, who were regular users of the IWB. Three of the observed lessons were teachers teaching lower primary classes, which involved two lessons that were year one classes and one lesson that involved a year three class. Meanwhile, four of the observed lessons were teachers teaching upper primary classes, which involved two lessons of year four classes and two lesson that involved year five classes.

Lesson observed using the IWB were conducted in the ICT lab where the IWB is installed. All lessons observed required pupils to move from their classroom to the ICT lab. In all of the lessons observed, pupils arrived at least five minutes after the actual time the lesson was scheduled to start and ended at least three minutes early. In three of the lessons observed, participants had to supervise their year one and year three pupils moving between their classroom and the ICT lab. Meanwhile, in all other lessons observed where participants taught upper primary lessons, participants only waited for pupils at the lab. As observed, only lower primary classes needed supervision when

moving from their classroom to the lab, while pupils from upper primary classes did not need supervision.

In four of the lessons observed, computers and the IWB were only switched on when teachers and pupils arrived at the ICT lab as the lab was not used by anyone before the lesson started. In two of the lessons observed, audio output was not readily connected to the computer, thus both participants had to set up the audio output by connecting the speaker to the computer by themselves. All lessons observed adopted the same general structure which was presented by participants in their lesson plan shared before each observation with the researcher. These are set induction, introduction, lesson development, lesson activity and closure.

The first stage of all the lessons observed is the set induction stage. In all lessons observed, pupils were seated in front of the board. There were no specific seating arrangement in front of the board and pupils were seated as soon as they came into the room. In all of the lessons observed, visual images were used during set induction where teacher and pupils recalled a topic learned from their previous lesson. The teacher asked questions based on the pictures shown and elicited discussions with pupils. In all the lessons observed, only the teacher interacted with the board at this stage, while pupils watched and responded orally to the teacher's questions.

In six of the lessons observed, participants used visual images during the introduction stage where they introduced a new topic to pupils. Participants explained the new topic while pupils listened and used visual images to help explain new terms and concepts. It was followed by discussion as a whole class based on visual images shown and also questioning activities with individual pupils. Only one participant used video presentation at this stage by showing a short clip and paused the video at a certain point to explain new terms and concepts to pupils. Similarly, video presentation was followed by discussion as a whole class together with questioning activities with individual pupils. Questioning activities that took place show that teachers and pupils were able to get immediate feedback from the lesson. At this stage of the lesson, all participants ran through the presentation quickly and only the teacher interacted physically with the board.

The third stage of a typical lesson using the IWB is the lesson development stage. At this stage all participants developed further knowledge and concepts by using visual images, animation or video presentation. At this stage, questions were often asked to individual pupils, while other pupils were also encouraged to help support the individual in answering questions. A whole class discussion was also a common sight at this stage of the lesson. At most times during this stage, pupils responded to questions orally when asked by the teacher and they were able to get immediate feedback as the teacher showed the answer by interacting with the board. Pupil-board interaction was very limited at this stage.

The fourth stage of a typical lesson using the IWB is the lesson activity stage. At this stage, participants conducted different classroom activities such as question and answer, interactive games, quizzes, group work as well as written task. At this stage, a lot of teacher-pupils interaction took place in all lessons observed. All of the lessons observed also involved a lot of questioning activities where the teacher asked questions and pupils answered. A lot of discussion took place at this stage where the teacher and pupils discussed a concept based on images or videos shown. Pupil-board interaction was also higher at this stage. In two of the lessons observed, participants used interactive games from selected websites and asked individual pupils to come to the board to give answers. In one of the lessons observed, pupils also came to the board to do a mathematical activity involving the drawing of shapes. However, there were times when participants did not let pupils interact with the board. As observed in all of the lessons, at this stage, participants also asked questions and let pupils answer orally before showing pupils the correct answer by interacting with the board. Participants also gave immediate feedback on activities done at this stage. In all lessons observed, written work was given at the end of this stage, where pupils sat at individual desks and completed their work quietly.

The final stage of every lesson observed was the closure stage. It involved participants summarising the topic or new concepts learned in the lesson with pupils. It took place in the form of discussions or question and answer activity while pupils were seated in front of the board or in some cases seated at their individual desks. In six of the lessons observed, it was done by showing visual images on the board while the teacher elicited discussions based on what was shown. Questions were asked and pupils answered questions orally. Only one different scenario was observed, where individual pupils

interacted with the board when giving answers to the teacher's questions regarding the topic learned during the lesson.

From lessons observed in this study, pupil-pupil and teacher-pupil interaction was higher during the activity stage. Pupil-board interaction was also higher at this stage. Although there was some pupil-board interaction observed during the lesson development stage, it was very minimal. Pupils also had difficulties reaching the upper part of the board. In all lessons, it was also observed that questions were answered orally by students while teachers checked for the correct answer by interacting with the board throughout lesson development and the lesson activity stage. It was also noted that in all of the lessons observed, although participants paused during presentation to elicit discussions and check pupils' understanding, they ran through the presentation quickly. In addition to that, participants only used basic windows software including presentational software such as Power Point, Paint, web browser and Movie Player. Furthermore, none of the lessons observed involved the use of any specific IWB software. All participants organised their resources in folders which allowed them to access their resources easily which resulted in better flow of lesson.

In conclusion of the lesson observations conducted for this study, a compilation of a typical lesson using an IWB was made and is presented in Table 7.1 below.

	Set Induction	Introduction	Development	Activity	Closure
Seating arrangement	In front of Board	In front of Board	In front of Board	In front of Board/Individual Desk	In front of Board
Teacher-Board Interaction	High	High	High	High	High
Pupil-Board Interaction	Nil	Nil	Low	High	Low
Teacher-Pupil Interaction	High	High	High	High	High
Pupil-Pupil Interaction	Nil	Low	High	High	High
Whole Class Interaction	Nil	High	High	High	High
Group Work	Nil	Nil	Nil	High	Nil
Software used	Presentational Software (Power Point, web browser and Movie Player).				

Table 7.1: Compilation of a Typical IWB lesson

As seen from Table 7.1 above, a typical IWB lesson by regular IWB users in primary schools in Brunei Darussalam adopted the same general structure, which were set induction, introduction, lesson development, lesson activity and closure. A typical IWB lesson involved pupils sitting in front of the board during the set induction, introduction, development and activity stage. Pupils were only seated at their individual desk when written work or group work were given during the activity stage. Additionally, pupils were seated in front of the board during the closure stage, where, often question and answer activity took place to summarise the lesson. A typical IWB lesson also involved a teacher standing in front of the class and only moved around during the activity stage to assist pupils with tasks given.

In terms of interactivity, a typical IWB lesson in primary schools in Brunei Darussalam involved a high level of teacher-board interaction throughout the lesson, whereas, pupil-board interaction was only higher during the activity stage. Meanwhile, low pupil-board interaction during lesson development and closure was a common sight in an IWB lesson conducted by primary school teachers in Brunei Darussalam. Often, questions by teachers were answered orally throughout the lesson except during the activity stage, where pupils were allowed to interact with the board. A typical IWB lesson also involved a high level of teacher-pupil interaction throughout the lesson, where pupils and teachers were engaged in active classroom discussions through question and answer activities. Often, this was done by teachers showing multimedia resources on the IWB that stimulated classroom talk. The level of pupil-pupil interaction was lower during the introduction stage and higher during the development, activity and closure stage. Additionally, level of whole class interaction was higher during the introduction, development, activity and closure stage. A common sight of a typical IWB classroom in primary school in Brunei Darussalam also involved teachers giving group work and written tasks during the activity stage. Additionally, teachers only used basic windows software, which were presentational software such as Power Point, web browser and Movie Player.

7.3 Interview Findings

This section presents the interview findings gathered for this study. As mentioned earlier in Chapter Five, the interviews with the participants were semi structured and

aimed to investigate teachers' perceptions and expectations on the use of IWB to be able to provide a rationale for usage as well as to promote a wider use of IWB for teaching and learning in classroom. In addition to that, they aimed to seek information on teachers' level of IWB training or professional development and their IWB knowledge to help assist the effective use of the IWB in the classroom. They also aimed to investigate issues faced by teachers in integrating the use of the IWB that influenced their usage. Furthermore, interviews were conducted with participants involved in the lesson observations to validate observation findings on their current level of IWB practices. The interviews were analysed into different themes which are:

- Accessibility
- Factors that influence usage
- Barriers to usage
- Training
- Perceived benefits
- Challenges
- Availability of resources
- Suggestions

As mentioned earlier in this chapter, a total of 16 teachers participated in the interviews of whom seven were identified as regular users of the IWB, four participants as low users of the IWB and five participants were no longer using the IWB. The list of participants involved in the interview and their level of IWB usage according to the categories identified in this study (see Table 6.7 in Chapter Six) is shown in Table 7.2 below.

Regular IWB Users	Low IWB Users	No Longer Using IWB
Ammara	Aerol	Hana
Anne	Nina	Lela
Sofea	Raaqiy	Tiara
Alisa	Aiesya	Aiman
Leena		Aked
Zara		
Adeela		

Table 7.2: List of Participants and their Level of IWB Usage

A descriptive analysis of the interview findings will be presented in this section.

7.3.1 Accessibility

Twelve of the participants interviewed felt that the location of the ICT lab where the IWB is installed in their respective schools is not strategic. According to them, this is because the labs are located quite far away from classrooms. This includes in the administration block, on the third floor or in a different block far away from where classrooms are located. Participants reported that this can cause problems such as time wasted from pupils taking a long time to walk from their classrooms to the ICT lab, especially when not supervised.

All of the participants involved in this study reported that priority in using the ICT lab in their respective schools is given to ICT lessons. Therefore, teachers can only use the IWB when there is no ICT lesson taking place. However, in one of the schools where there are two ICT labs, a participant reported:

> Although priority is given to ICT lessons, sometimes the ICT teacher will use the ICT lab without the IWB next door for the ICT lesson to give us other teachers teaching various subjects chances to use IWB.

> (Anne, regular user)

Five out of seven participants who were identified as heavy users of the IWB reported that a timetable was provided and created each term by the teacher in charge of the ICT lab for them to use the IWB. They also reported that because of the timetable provided, they had an equal chance with other teachers in their school to use the IWB for their lessons. All of them stated that the timetable provided was on a monthly basis, where a specific subject was given the priority to use the lab each week. However, participants also reported that not all teachers would be using the lab during the allocated time given for them. This gave other teachers an opportunity to access the ICT lab and use the IWB even if it is was not the time allocated for them to use the ICT lab. One of the participants stated:

> … there were quite a lot of times that I used the IWB outside the allocated time for me but I will have to check in advance if no one will be using the IWB from the ICT teacher or from the teacher who is supposed to use the IWB according to the time table given. However, it basically means that there are times during my lesson that I am not able to use the IWB as it was scheduled for other teachers to use.

> (Ammara, regular user)

However, most regular users of the IWB had better access to the lab because they were also teaching ICT as a subject. Five out of seven teachers who were regular users of IWB taught at least two ICT lessons. Furthermore, two of them were also qualified ICT teachers who also taught other subjects other than ICT.

Only one teacher out of nine teachers who were low users of the IWB and no longer using the IWB reported that they had a proper timetable for the use of the ICT lab in their respective schools. Eight other participants stated that there was no proper timetable created or provided for them in order to use the ICT lab at their respective schools. They reported that in order for them to use the IWB, they would need to check with the ICT teacher whether the ICT lab would be in use for ICT lessons as priority is given to ICT lessons. They would also have to check if other teachers would be using the room. One of the participants reported that they needed to book the room at least one week in advance to ensure that other teachers were aware that the room would be in use. However, all of the participants stated that it was still possible to access the IWB by checking with the ICT teacher on the day they want to use the IWB. According to them, this would depend on whether the ICT lab would be in use or not for ICT lessons or by other teachers.

A participant who no longer used the IWB for teaching stated that the current timetable for ICT lessons in her school made it difficult for her to use the IWB. She stated:

> The lab is only available for thirty minutes as there are ICT lessons conducted in the lab every alternate period during most of my lessons when I want to use IWB. ICT lessons are conducted during first period, third period, fifth period and so on during certain days. It means that on certain days, the room is only available for other teachers to use for at least thirty minutes. I find it quite difficult especially for an hour lesson.

(Tiara, no longer using IWB)

Nevertheless, nine of the participants involved in this study felt that access to the IWB was easy as they did not have any restrictions on using the IWB as long as the ICT lab was not in use. As one participant stated:

> … not all teachers will be using the ICT lab even if there are time allocated for them to use it. We can still access the IWB as long as no one uses the lab. All we need to do is check in advance with the ICT teacher or simply ask the teacher who are supposed to use the lab if he or she will be using the room or not.

(Raaqiy, low user)

Another participants stated:

> … no bookings are required to use IWB. Although it is better to check with the ICT teacher a few days in advanced, I usually check on the day itself. I'd use it if it is available but if it is not, I usually just resume my lesson in the classroom.

(Aiesya, low user)

7.3.2 Factors Influencing IWB Usage

A total of 75 participants were involved in the survey of this study and only a small percentage (18%) from the total number of participants were identified as regular users of the IWB. For this study, only seven regular IWB users participated in the lesson observations and interviews. They were asked questions concerning factors that influenced their IWB usage.

Two out of seven participants stated that their personal interest in using ICT for teaching had influenced them in using IWB for teaching. Meanwhile, five out of seven participants involved in the interviews stated that the main factor that influenced their IWB usage was the benefits that it brings to teachers and pupils. Participants reported that lessons are more interesting with the use of multimedia resources and more interesting classroom activities can be conducted using the IWB. One participant stated:

> … the use of IWB attracts pupils' attention and helps me with getting them engaged in learning. I guess that is one factor that encourages me to use it more often. The kids love it and it also makes my work easier as I can use a lot of interesting resources easily.

(Ammara, regular user)

Two other participants mentioned that they used the IWB for teaching because they felt that it reduced their workload and the time taken in lesson preparation. One participant stated:

> It is easier for me to find resources for teaching and the quality of resources is better as I can use images, videos and sounds. It saves me time as I used to spend hours preparing my resources before I discovered IWB.

(Anne, regular user)

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Another participant stated that knowing what the board has to offer and the availability of interesting features to be used for teaching and learning encouraged her to use the IWB. Participants also stated that the interactive features of the board are 'fun' to use and make teaching more lively and interesting.

Another major influence of IWB usage that was reported by participants of this study is that they had better access to the board. According to five of the participants, a proper timetable system provided by the ICT teacher gave them better opportunity to use the IWB. In addition to that five out of seven participants also taught at least two ICT lessons in a week which means that they spent more time in the ICT lab. As teachers who also taught ICT as a subject, they had regular access to the board. Thus, they felt more confident to use the IWB for teaching. According one participant, regular access to the board allowed her to discover and learn how to use the board on her own thus increasing her confidence. She stated:

> … it was like a learning process in the beginning, learning how to use IWB. Lessons moved smoothly after a while as I finally know what to do, what to click and how I can manage my resources and pupils. When I know what to do and what to expect, I feel more comfortable and confident using IWB in front of my pupils.

(Alisa, regular user)

However, five out of seven participants admitted that they lacked skills and knowledge in using IWB for teaching but claimed that the IWB is easy to use, which encourages them to use the IWB more often. One teacher reported:

> … IWB is easy to use. It is just like using a computer and I owned a computer so it was not that much of a problem to me. The only difference is that the IWB is like a touch screen computer.

(Leena, regular user)

7.3.3 Barriers to Usage

As mentioned earlier in this chapter, a total of 43 participants were identified as low users of IWB and 19 participants were no longer using IWB from the survey conducted. However, for this study, only four participants who were low users of IWB and five participants who were no longer using the IWB were involved in the interviews and were asked questions regarding the barriers to using the IWB for teaching.

Six out of nine participants reported that the major barrier they faced in using the IWB for teaching was the difficulty to access the board itself. One participant stated that he felt that one IWB is not enough for the whole school; therefore regular access is impossible. Similarly two other participants reported that they had difficulty to access the board as priority to use the ICT lab where IWBs are installed was given to ICT lessons. All of them reported that they could only use the lab when there were no ICT lessons.

In addition to that, three participants reported that they felt it was inconvenient that there was a need for pupils to move from their classroom to the ICT lab in order for them to access the board. They also stated that it wasted their time and they found it difficult, especially when dealing with lower primary pupils, as they would need to be supervised when going out of their classroom. One of the participants stated:

> Since it is installed at the ICT lab, pupils have to go there and sometimes with upper primary pupils, they get carried away and arrive late. Whereas, if it is the lower primary pupils, we need to monitor them most of the time. Letting them walk without supervision from their classroom is not recommended. Once they arrive at the lab, there is also a need to settle them down and arrange their seating. I feel that it is time consuming.
>
> (Sofea, regular user)

Another participant added that due to the difficulty of accessing the IWB on a regular basis as her lesson often clashed with ICT lessons, it made her forget the IWB skills she learned during workshop she attended. She also stated that because of that, she felt less confident to use the IWB in front of the pupils. Another participant stated that the lack of access made it difficult for her to master and apply the skills learned in regard to the IWB, thus making her reluctant to use the IWB for teaching.

Three participants stated that another barrier in using the IWB is that they do not know how to use the IWB using the specific software or application available. They admitted that their lack of skills and knowledge made them feel less confident. They also reported that their lack of skills also made it difficult for them to manipulate the board so they used it only for specific topics that they taught to take advantage of its projection capabilities. According to them, it helps to explain difficult terms and concepts to pupils, especially when teaching subjects with English as the medium of instruction. One participant stated:

> I used IWB when I was teaching science as a subject two years ago. That was because I needed to show pupils videos and demonstration which is impossible or time consuming to do practically in the lab. I have to admit that I used it only for specific topics where I needed to show videos, as I do not know what else I can do with the board.

> (Raaqiy, low user)

Five participants stated that time is another barrier in using the IWB. They reported that they felt that they did not have enough time for preparing lessons and resources to be used with the IWB. One participant stated that she did not have enough time to prepare resources and lessons with the IWB as she had a lot of work to do because not only did she teach three different subjects, she was also a class teacher and was also given school administrative work. In addition to that, she also reported that she was responsible for non-teaching duties such as monitoring pupils at specific times of the school day. When asked about reusing teaching materials, one of the participants stated:

> The subjects that we teach are not the same each year and it can be any subject or any level. This year I am teaching Mathematics and Social Studies whereas last year I taught English language. Once I had to switch to teaching another subject in the middle of a school term. The changes of subject taught each year makes it difficult for me to have something that I can reuse. I will have to create new teaching resources with the new subjects I will be teaching, which is time consuming.

> (Lela, no longer using)

7.3.4 Training or Professional Development

Training or professional development is important to ensure that teachers are equipped with necessary skills and knowledge to be able to use the IWB to its maximum potential. As mentioned earlier in this chapter, the interview also aims to investigate teachers' level of training and their knowledge to help assist the effective use of the IWB in the classroom.

Interviews revealed that only two participants had attended formal training when the IWB was newly introduced in primary schools throughout Brunei Darussalam in 2006. It was organised by the Ministry of Education and held outside school. According to both participants, the trainer was invited from the IWB supplier by the Ministry of Education. Both participants were the only teachers from their respective schools that were sent for the training. They also stated that they were selected to attend the training sessions because they were ICT teachers of their respective schools.

Both participants reported that the training was divided into two sessions. It involved training on the basic use of IWB and how it can be used for teaching; using different software and applications that support IWB features and creating resources to be used with the IWB. According to both participants, the training involved hands on activities where participants had the opportunity to try the IWB with the assistance of a trainer. Samples of teaching resources as well as websites available to download resources were also shared in one of the sessions. Both participants reported that they were assessed at the end of each session and were expected to facilitate other primary school teachers to use the IWB for teaching in the classroom through workshops organized by the Ministry of Education.

Both participants reported that training was beneficial but not sufficient. They also reported that there was no follow up training held after the two sessions. Workshops where they acted as facilitator were also held after they completed the formal training. The workshops were attended by selected teachers from primary schools throughout Brunei Darussalam. It was reported by the participants that the teachers who attended the workshops were expected to share what they learned with their colleagues through staff development in their respective schools.

Similarly, other than facilitating teachers from other schools, both participants also shared what they learned from the training with their colleagues during staff development at their respective schools. One participant shared a handout that she created herself to help her colleagues in learning to use the IWB for teaching, which was also shared with the researcher during the interview. However, the handout focuses on the use of the IWB in Mathematics and only includes minimal information for use in other subjects.

Three other interview participants stated that they attended an IWB workshop held by a local facilitator. They reported that they were selected by their school administration randomly as representatives for their schools. One of the participants was identified as a low user of IWB while two of other participants were no longer using the IWB. All three participants had no background in ICT but knew how to use a computer. They only attended the workshop once and shared what they learned from the workshop during staff development. One of the particpants stated:

> … it was a short four days workshop and I was expected to teach other teachers how to use the IWB after the workshop. We were assessed at the end of the workshop by submitting a small project. I was not confident that I have enough skills and knowledge to teach other teachers. Nevertheless, I did my best and shared what I learned from the sessions with other teachers as requested.

> (Lela, no longer using)

Eleven out of sixteen of the interview participants reported that they had never attended any formal training or workshop on the use of the IWB. Only four participants stated that they learned how to use the IWB from staff development when the IWB was newly introduced in primary schools throughout Brunei Darussalam. Staff development was conducted by teachers who attended a workshop by a local facilitator that lasted for two to three hours. It involved learning how to use the IWB; creating resources using IWB software and how it can be used for teaching. All four participants reported that no technical issues were brought up during the staff development.

Meanwhile, seven participants stated that they learned how to use the IWB by themselves and only sought for help from the ICT teacher when needed. One participant stated:

> I learned how to use IWB by myself. I tried different type of software and applications by myself. It was like trial and error until I finally found what I feel easy to use and manipulate. I also received help from the ICT teacher but it was very minimal. I ask for help only if I feel that I need to.

> (Aiesya, low user)

In addition to that, another participant stated:

> I never attended any training or staff development on the use of IWB. I learned how to use IWB myself but asked the ICT teacher personally for help when needed. I am lucky enough that she is willing to spend some of her spare time teaching me about the functions of IWB or anything related to the IWB.

> (Hana, no longer using)

When asked about their willingness to attend training or professional development on the use of the IWB, six participants showed their interest. Participants admitted their lack of IWB skills and knowledge; thus they felt less confident in using the IWB for teaching. In addition to that, they stated that they were willing to attend IWB training to improve their skills and knowledge. One participant, who was a low user of the IWB and learned how to use the IWB through staff development, stated:

> I feel that we need continuous training especially that technology is moving at a fast rate. We need to be updated with things related to IWB such as the latest software

available or even latest resources available for teaching. The chance of me using the IWB on a regular basis is higher if I have better access to resources and know how to use the IWB properly. I really want to learn how to use it and if I do, I will probably use it more.

(Aerol, low user)

Similarly, two participants who had attended training organised by the Ministry of Education stated that they were willing to attend further training and felt that they needed continuous training. However, seven participants stated that they might consider attending training depending on the situation in the future, such as availability of hardware and the availability of time. One participant stated:

I do want to attend training but I do not know if I can fit in some time for that now. I might consider attending it in the future. Lately I am occupied with lots of work. I have my daily marking to do, meetings to attend and on top of that, I also have administrative work to do. I do not even have time to prepare my teaching resources if I were to use the IWB now.

(Tiara, no longer using)

7.3.5 Perceived Benefits

All interview participants agreed that the use of the IWB enabled them to use a variety and better quality teaching resources for teaching, which had a positive impact on their teaching. One participant stated that the use of the IWB in the classroom allows a better presentation of teaching resources which is clear and high in quality rather than using a projector alone. One participant stated:

… I can use videos, images and audio which I can easily prepare. It is like bringing real life into classroom. The use of different and interesting resources capture pupils' interest and it help pupils understand topic better.

(Nina, low user)

Similarly another participant stated:

The IWB helps make my lesson more interesting as I am able to provide a variety of resources for teaching. It helps me deliver my lesson in a more interesting way by showing them all sort of things from videos animation, images and simply audio. The high quality of resources available made it easier for me to explain difficult concept or terms especially for my social studies lesson as it is taught in their second language.

(Anne, regular user)

Eight participants mentioned that the use of different type of resources using the IWB makes lesson more interesting. Three participants reported that it helps them in

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explaining difficult concepts and helps pupils to understand topic better, especially in subjects where the medium of instruction is English. Four participants stated that the use of the IWB can make lessons 'fun' as there are a lot of learning activities that can be conducted using the IWB. One participant, who had attended a formal training stated:

> Lessons with IWB can be fun and interesting. It can be beneficial to both pupils and teacher. However, we need to know how to use the software and know what we can do with the board. There is actually a lot you can do with the board but you have to be very committed to learn how to use it.

> (Zara, regular user)

Eight participants reported that one of the benefits of using the IWB is that it allowed them to organise and manage their teaching resources easily. Participants also stated that the use of IWB replaced teaching resources that they usually have to carry around. One participant mentioned:

> I do not have to carry around my teaching resources. All I need now is just a pendrive or an email account. I just need to send my teaching resources to my email and download it before using them.

> (Adeela, regular user)

Additionally, seven participants also reported that organising teaching resources by saving it in folders improved the pace of their lessons. A participant stated:

> I think it help me deliver my lesson in a more effective way. It improves my pace of lesson as I only need to stand infront of the board and everything is just one click away. No time is wasted from finding and sticking resources on the board like I usually do in my normal classroom.

> (Leena, regular user)

Similarly another participant stated:

> … it saves time as it improves pace of lesson especially if you know what to do with IWB. However I think it only applies if you know how to use IWB especially if you know where everything is saved. It actually has a lot of benefits if you use it properly and if you use the appropriate resources or software.

> (Sofea, regular user)

Participants also felt that the use of the IWB for teaching had a positive impact on teaching and learning in the classroom. They stated that the use of the IWB helped them deliver their lessons in a more effective way. According to three participants, the interactive features of the board proved to be beneficial not only to them as a teacher but also to pupils. Participants mentioned that pupils were more engaged with the resources by interacting with the board allowing them to develop their learning. It also

made lessons fun as children enjoyed interacting with the board. Two participants mentioned that their pupils were often more engaged and motivated when the IWB was used for teaching. Another participant stated that she believed that children were more attentive especially when interesting resources were used in their IWB lessons. Nine participants stated that one of the benefits of using the IWB for teaching is that it can help capture pupils' attention and improve engagement in learning. One participant stated:

> … my pupils pay more attention when I use IWB. They show more interest in learning and follow instructions. They are more motivated to learn and clearly enjoyed the lesson more. They are more engaged in discussion and in doing task given after that.
>
> (Adeela, regular user)

Six participants stated that the use of the IWB in the classroom improves teacher-pupil interaction and pupil-pupil interaction. They stated that it also allows a more active discussion as they are able to use and manipulate a variety of teaching resources that can elicit classroom talk. They also mentioned that they are able to conduct activities that encourage classroom interaction by using the IWB. Furthermore, according to participants, discussions that take place through questioning and answer activities also allow teacher and pupils to get immediate feedback on their teaching and learning.

Moreover, two participants stated that the use of the IWB improves pupils' achievement in the classroom. They stated that they are able to achieve their lesson objectives and pupils are able to answer better during questioning activities in the classroom. In addition to that, they stated that the improvement in the performance of their pupils can be seen from the written task given at the end of their lesson using the IWB. One of the participants stated:

> … my lesson objectives often involved my pupils to achieve a set of goals in terms of written task given towards the end of all my lessons. It is often that their level of achievement are better when teaching with the IWB. It is also that they are able to answer my questions better orally in lessons conducted using the IWB.
>
> (Nina, low user)

Meanwhile, a participant reported that other than the ability of controlling the content on the personal computer from the board itself, the only benefit it has for teaching is its projection capabilities as it has the ability to display high quality visuals on the board. Nevertheless, the participant reported that she no longer used the IWB and had never attended any professional development or IWB workshop.

7.3.6 Challenges

As mentioned in Chapter Four, it is important to take into account the realities of others for a better direction to change or even expose problems of implementation that must be addressed which may indicate where and when change should start (Fullan, 2001). This section explores the challenges or difficulties that all participants involved in this study experienced when using the IWB as a tool for teaching in the classroom.

All participants in this study expressed their concerns on the lack of technical support not only for the IWB but for all ICT infrastructure available at their respective schools. All participants stated that they did not have any technical support available at school and only relied on their ICT teacher for minor technical problems. Participants reported that for major technical problems faced with the IWB, they needed to call the IWB vendor directly for technical support. For any other technical problems with any ICT equipment available in the school, including the computer that is connected to the IWB, they needed to call the ICT department of the Ministry of Education for technical support. All participants reported that technical support from both IWB vendors and the Ministry of Education was often not received in a timely manner when they faced any glitches.

One participant stated:

> I have experienced waiting for more than a week for technical support to come from the IWB vendor to check for problems she faced with the IWB. I made several phone calls and when they finally came, it took them another couple of days for it to get fixed. … another experience of mine was when the main computer that connects to the IWB broke down. It was the only computer that has the IWB software installed and as usual it took more than a week just to get it fixed.
>
> (Lela, no longer using)

Another participant reported having to repair the IWB at the school's own expense after a request for technical help was not answered in a timely manner. According to the participants, the inadequate technical support and regular hardware breakdown resulted in them being less willing to use the IWB for teaching.

Furthermore, five participants stated that they found the lack of assistance and support in using the IWB, especially when they first started using the IWB, as a challenge. Although participants reported that they had attended an IWB workshop, they felt that it

was insufficient and they still need to be assisted in integrating the use of IWB in the classroom. All five participants stated that they found the use of IWB challenging due to their lack of skills and knowledge on the IWB. One participant stated:

> … I do know about what the board offers but I do not know how to use it other than using it as an overhead projector except that it has a pen and a board which we can write on. I probably can ask the ICT teacher but she is not always around.

> (Raaqiy, low user)

Another common challenge that participants faced in using the IWB for teaching was the difficulty of accessing the board itself. As mentioned earlier in this chapter, all schools involved in this research had only one IWB, despite the different number of pupils in each school and the IWB was installed in the ICT lab. Eight participants reported that they felt that they often had difficulties in accessing the board as priority was given to ICT lessons.

Five participants reported that getting pupils to come to the lab on time could be a challenge. Participants reported that time was often lost from waiting for pupils to arrive to the ICT lab, thus, lessons often started later than scheduled. Participants also reported that it could be more challenging with lower primary pupils, as there was a need to supervise them. One participant stated:

> … it is quite a disappointment that sometimes I am not able to use the lab as there is an ICT lesson going on. When I do have access, there are other things to deal with such as informing my pupils and making sure they know about it. They are primary kids, sometimes you cannot expect them all to turn up on time especially the younger ones.

> (Nina, low user)

Similarly another participant stated:

> … with lower primary pupils, not only do you have to bring them to the ICT lab but you have to make sure you send them back to their classroom. Whereas, for upper primary pupils, we have to let them leave the lesson at least five minutes early so they will be on time for their next lesson.

> (Leena, regular user)

Participants also reported that other challenges they often faced when using the IWB were pragmatic issues which affected their interaction with the board. Three participants reported that the board was mounted at a height that made it difficult for them to reach the upper part of the board, thus making it even more difficult for pupils to interact with the board. Seven participants reported that they had experienced problems with

ActivPen not working with the IWB and they did not have spares. Furthermore, one of the participants stated that because getting a replacement for the ActivPen can take a while, she was quite reluctant to let children to come to the front and interact with the board. Teachers also reported that they experienced the ActivPen not corresponding to what they wrote on the board during their lessons. Six out of seven participants admitted that they did not know how to calibrate the ActivPen with the board. Only one participant stated that she knew how to calibrate the pen, as she had attended a formal IWB training.

Three participants reported that the brightness of their IWB projector was dim, so it did not project clear visuals on the board thus reducing the quality of their presentation. Additionally, one participant stated that the curtains in the ICT lab did not cover the upper part of the window, allowing bright sunlight to get through. She reported that this caused the IWB to display poor quality images when in use.

Seven participants reported that having an outdated computer connected to the board was a major problem they faced, especially as it was the only computer where the IWB driver was installed. They reported that it could be a problem as the computer sometimes crashed and could not be switched on when they wanted to use the IWB. Participants also reported that outdated computers often took a while to start up, which often caused a loss of time. In addition to that, as mentioned earlier, in cases where the computer broke down, technical support was not available on site. Other than that, participants also reported that the projector or board sometimes did not work. One participant stated:

> … there was this one time I went to the lab with my pupils and was unable to switch on the board. The ICT teacher was not there and I did not know what to do with it. I just had to take my pupils back to class and informed the ICT teacher regarding the issue and let her deal with it.

(Nina, low user)

Three participants stated that they sometimes faced difficulties in showing videos as the only audio output was a small desktop speaker which sometimes did not work. They also stated that the speakers were not always readily connected to the computer and they had to spend a considerable amount of time to connect the speakers to be used during their lessons. They also reported that the desktop speaker did not produce audio loud enough for classroom use. According to them this could be a challenge especially if

pupils were seated further away from the computer where the speakers were connected. Therefore, they preferred to have pupils seated in front of the board when the IWB was in use. However, one participant reported that the space in front of the board was not big enough. He stated:

> The pupils are seated in front of the board when the IWB is in use. However, the space in front of the board is limited as our ICT lab is very small. It can be a challenge to organise the pupils in front of the board, especially with large groups of pupils.
>
> (Aerol, low user)

Five participants of this study also stated that another difficulty they faced when using the IWB was problems with the internet connection. This was especially when participants had to send resources to be used during the lesson to their email or when trying to retrieve saved resources online. Moreover, according to participants, it could be a problem when they had planned to use resources and interactive games available online as part of their lessons using the IWB. In addition to that, one participant reported that there are interesting resources and interactive games to be found online that could not be access from the school as they had been filtered by the authorities. In the interview, she stated:

> … I have tried to access some interesting and interactive educational games online that I would like to use for my teaching. However, I could not access them from school as they are being blocked. There are quite a number of websites I tried to access from school but failed. If I am not mistaken those websites have names that include 'fun' or 'game'. I was told I could probably email the authorities the link to the website so I could access it from school but I never did.
>
> (Nina, low user)

Another challenge that participants faced in using the IWB was the time needed to prepare lessons and teaching resources. Seven participants reported that they felt preparing lessons using the IWB to be time consuming. One participant stated that finding the appropriate and preparing teaching resources for their lessons could be a challenge as not everything is available online. In addition to that, two participants stated that the inability to install software that supports the IWB provided by the Ministry of Education on their own personal computer made it difficult to create teaching resources. Although they could create it at school at a convenient time, the ICT lab where the only computer that has the software installed is always occupied.

Four participants reported that setting up the IWB could be time consuming especially if it had not been used before their lesson. One participant stated:

> … and sometimes the teacher before you uses the lab did not use the speaker and you have to connect the speakers to the computer yourself. Sometimes it also takes quite a while to wait for the computer and the IWB to start up if it has not been used earlier. It is quite a hassle, really.

<div align="right">(Aerol, low user)</div>

Similarly, another participant reported:

> Sometimes it took me quite a while to switch on the computer, board and everything. Sometimes the wires are unplugged after being used by others, speakers not connected, curtains are left open and I had to settle all that on top of settling my kids down. Sometimes the ICT lab is locked, I have to look for the ICT teacher for keys. It can take up quite a lot of time from my one hour lesson.

<div align="right">(Leena, regular user)</div>

7.3.7 Resources

One of the benefits of the IWB as mentioned in Chapter Three is that the use of the IWB in the classroom allows teachers to use a wider range of resources as well as display a higher quality of presentation for teaching. When asked questions concerning resources provided for the IWB, only three participants reported that there are resources provided by the Ministry of Education, whereas 13 other participants reported that they were not aware if there are IWB resources provided by the Ministry of Education.

According to all three participants, all IWB resources provided by the Ministry of Education are stored on CD-ROM. However, one participant stated that all of the CD-ROMs are password protected. Furthermore, the participant admitted that she did not have the password to access the resources. She also reported that some of them are not working at all. All three participants reported that resources provided by the Ministry of Education are limited and some were not suitable for the level of their pupils.

All sixteen participants interviewed reported that they often used resources that they created themselves when they used the IWB for teaching. One participant stated:

> … I prefer creating my own resources on my own as I know what my pupils need. Some resources provided are too advanced for my pupils and I'm afraid that they have difficulties in understanding them. I also like variety and the resources provided are quite limited. For example, for science, there is one video provided to teach multiple topics, my pupils might get bored with it. That is why I prefer adding a variety of resources I got from the internet.

<div align="right">(Aerol, low user)</div>

Participants also reported that they preferred creating their own resources as they would have a better understanding and greater control of their resources. One participant stated:

> I sometimes use resources I created from previous years which I edited if I find something new and interesting. Sometimes the syllabus changes a bit; so do my pupils. I match it with their ability such as using simpler words. I prefer using resources I created as I will know the content better.

> (Nina, low user)

Four participants stated that they created resources only if they could not find any appropriate resources online, especially for subjects such as Malay language, History and *Melayu Islam Beraja* (Malay, Islamic and Monarchy knowledge). Participants also stated that they often used interactive games that they found online for teaching with the IWB.

Eleven interview participants reported that there were no resources shared between teachers in their respective schools and were not aware if any resources were provided by the school. According to participants, the resources they created were only for their personal use. However, all participants stated that they were willing to share their resources with their colleagues. Nevertheless, five participants stated that they shared their resources with their colleagues. One participant who was identified as a regular user and had attended formal training stated she created resources for other teachers but had not shared them with others as she did not know if any teachers were interested in using them for teaching. Another participant stated:

> There are no IWB resources shared between teachers here and I am not aware if there is anything provided by the school or the Ministry. But I do share my resources with my close colleagues and basically that is just it. We also share where we can get resources online such as new websites we discovered.

> (Anne, regular user)

When asked questions concerning preparing and creating IWB teaching resources, eleven participants reported that creating teaching resources is time consuming. One participant stated:

> It can be time consuming to created teaching resources especially if you have not been making resources for quite sometime using a particular software. You tend to forget what to do. It is like not using a computer for quite a while, you might forget what to do and where to click. If you use it on a regular basis, it will be easier.

> (Alisa, regular user)

Similarly three other participants agreed that creating teaching resources can be time consuming, especially if the person is not familiar with the software. Meanwhile, three other participants stated that although creating teaching resources can be time consuming, they can be edited and reused again in the future. The also stated that it is also easy to create resources as source of images and videos are often available online as stated by one participant in the interview:

> … preparing the teaching resources for IWB can be time consuming but you can easily find the content of your resources from the internet It is easy to get pictures, audio and videos form the internet these days. It is a matter of choosing the right one and then creating them using any software available.

> (Adeela, regular user)

Two participants stated that they had difficulties creating resources because the IWB software installed at school could not be installed in their personal computer; thus they were unable to create their teaching resources using the IWB software at their own spare time. One participant stated:

> … it is difficult for me to create teaching resources as the IWB software could not be installed in my own laptop. If I need to create a new teaching resources, I can only do it in the ICT lab. The problem with that is the lab is often occupied and I do not have much free time as I am teaching 31 periods per week this year. My free time is often occupied with marking as I have a large number of pupils in most of the classes I teach.

> (Tiara, no longer using)

7.3.8 Suggestions

As mentioned in Chapter Four, Durrant and Holden (2006) state that teachers need to be at the centre of reform efforts because they determine what will happen in the classroom and according to Sandholtz et al. (1997), teachers need to be active participants and leaders for a successful change to occur. Participants of this study made a number of suggestions on how to improve the use of the IWB in primary school in Brunei Darussalam. In addition to that, they also stated factors that might make them consider using the IWB regularly in the future.

Thirteen participants of this study suggested that in order to improve the use of the IWB, there is a need to provide more IWBs in schools. This is because participants felt that access to the board is important to be able to develop their confidence and expertise

in using the IWB to its' maximum potential. Restriction in access to the board gives participants limited opportunity to develop their IWB skills thus making them reluctant to use the IWB even if they had time scheduled for them to use the IWB. Participants felt that it is important to create an environment where access is not an impediment. One participant stated:

> … provide more IWB so access will not be a problem. If we use the board regularly, the better skills we develop. How can we learn to use it of getting close to it is even difficult? Sometimes it is frustrating when someone else is using the room when you already planned to use IWB for teaching.

(Hana, no longer using)

Two participants suggested having the IWB installed in every 'special room' for a start such as English room and Mathematics room so teachers will have better access to the board. According to them, teachers will not be too dependent on one IWB and can use other IWBs if technical problems occur. Participants also stated that having IWB in other rooms other than the ICT lab will create a better classroom setting. This includes better seating arrangement and desks will not need to be equipped with personal computers that can be a distraction to pupils, especially when the computers are not connected with the IWB. Seven participants suggested having IWB installed in every primary classroom to improve the use of it for teaching and learning.

Thirteen participants also suggested that other than improving access to the hardware itself, teaching resources and IWB software should be made accessible for teachers. As teachers nowadays have other responsibilities other than teaching, they find it difficult to find time to prepare and create teaching resources. Participants suggested having resources shared not only at school but also with other schools using any means possible such as through the ICT teacher of each school or through the World Wide Web.

One participant suggested that relevant authorities should not only provide teaching resources but also make other teachers aware that there are online resources that can be easily downloaded. Furthermore, a participant also mentioned that as Brunei's primary curriculum is different from those of other countries, it is sometimes difficult to find appropriate resources online. This, it was suggested that relevant authorities to provide teachers with information on IWB resources that are appropriate and relevant to Brunei's primary curriculum. Another participant stated that teachers should be

involved in the process of planning, designing and creating teaching resources in order to create more relevant and appropriate teaching resources. Two participants also suggested that providing IWB software that can be installed in personal computers would allow teachers to create resources at their spare time outside school hours. They also stated that this will help in the familiarisation of the software, which will eventually improve teacher's confidence when using the IWB in the classroom.

As mentioned earlier in this chapter, training or professional development is also an important aspect to ensure teachers are equipped with skills needed to use the IWB to its maximum potential. Thirteen participants of this study stated that teachers should be provided with proper and continuous professional development or training. This is because they believed that one of the main reasons that the IWB is underused is because teachers do not know how to use the IWB effectively due to the lack of IWB skills and knowledge. Participants also felt that they needed to be updated regularly with recent knowledge, information and resources on the IWB. One participant stated:

> … we need to be updated on the latest information on IWB. The latest software, tools and resources. The last time I heard about IWB was years ago and I have heard nothing about IWB after that although there are talks about integrating the use of ICT across the curriculum.

(Aiman, no longer using)

Participants also suggested professional development should be conducted based on subject matter and teachers' interest and needs such as basic usage of IWB, creating and designing IWB resources as well as technical and pedagogical skills. Two participants who were identified as regular users and had attended formal training suggested the need to increase teachers' awareness on the existence and benefits of the IWB to improve use of the IWB for teaching. A teacher who was a regular IWB user stated that she was willing to give support or assistance to teachers who were willing to use the IWB in terms of usage and creating IWB teaching resources. Additionally, she expressed her concern on the lack of support received by teachers from both the school and implementers in promoting the use of technology including the IWB in the classroom. She also stated that:

> … personally I think we need to create awareness on the existence of IWB in schools. I do not think all teachers are aware of what they can do with IWB. Some teachers probably do not know it even exists in this school.

(Anne, regular user)

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When asked about the support they received from school or the Ministry of Education in integrating the use IWB for their lessons, all participants stated that they were encouraged to integrate the use of ICT in their lessons as it is beneficial for both teaching and learning but without mentioning the IWB as the specific ICT tool. One of the participants stated:

> … it is always mentioned in school meetings that there is a need to integrate the use of ICT in our lessons and we can use what is available in the school such as the projectors, the IWB and the MacBook. However, I do not consider it as receiving support but simply just words of encouragement or probably just delivering what the Ministry said.

> (Zara, regular user)

Another participant who also had attended a formal IWB training expressed concerns about how teachers still preferred to use an overhead projector as they had never attended any formal IWB training and were not exposed to what the board has to offer. A participant who was a qualified ICT teacher but also taught other subjects other than ICT reported that she has had the opportunity to observe lessons by her colleagues as she occasionally stayed in the ICT lab even when their lessons were taking place. The participant reported that it is often that teachers used the IWB as they would use an overhead projector. Similar to other participants, she believed that proper professional development and better access to the IWB would improve the use of the IWB by teachers.

Five participants also suggested that having good technical support is also important as the lack of technical support often causes fear among teachers in using technology. Participants of this study suggested having a proper call centre for complaints related to ICT infrastructure including the IWB. Other than improving the technical support, they also suggested the need to improve ICT infrastructure in schools such as providing schools with up to date hardware and software to avoid unnecessary glitches. One participant stated:

> … the computers should be up to date and so does the software. The room where IWB are installed should be well maintained and well equipped such as having a proper audio output system. It would be better if teachers know that everything is working fine before using the board.

> (Aiesya, low user)

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7.4 Summary of Findings

This chapter presented a descriptive analysis of the lesson observation and interview data that was collected for this research. Observation findings were presented by comparing lessons by seven regular IWB users. The findings from the interviews, which were conducted with 16 participants, were also presented in this chapter. They were presented in categories that were derived before data was collected. Interview findings shows the different issues raised by participants relating to the implementation of the IWB in primary schools in Brunei Darussalam, which include accessibility; factors that influence usage; barriers to usage; teachers' perceived benefits of IWB; challenges teachers faced in using IWB; IWB resources; and suggestions for improving the use of IWB in the classroom. The findings presented in this chapter together with the quantitative findings in Chapter Six will be discussed in the next chapter (Chapter Seven).

CHAPTER EIGHT: DISCUSSION OF FINDINGS

8.1 Introduction

As presented in the previous chapter, this study has drawn together findings from three different research instruments, which are the questionnaire, lesson observations and interviews. As mentioned in Chapter Five, both quantitative and qualitative approaches were used to complement each other and to enhance the validity and credibility of research findings. This chapter seek to integrate both quantitative and qualitative findings of this research and to explore the important questions addressed in this study. In addition to that, this chapter will also discuss the summary of findings in relation to the implementation of the Interactive Whiteboard (IWB) in primary schools in Brunei Darussalam.

8.2 Summary of Study

As mentioned in Chapter One, the major research question investigated for this study is "what is the best practice that can be incorporated to assist the effective use of IWB in primary classroom in Brunei Darussalam?". This study has explored teachers' perceived benefits of IWB, teachers' level of training in using IWB for teaching; teachers' knowledge and current practices of IWB; and teachers' attitudes towards the use of IWB. As previously discussed, these issues are important to determine the best practice that can be incorporated to assist the effective use of IWB in primary classroom in Brunei Darussalam.

8.3 Discussion of Findings

The review of the literature discussed in Chapters Three and Four shows that there are a variety of issues that can influence the implementation of IWB for teaching and learning in the classroom, which this research has taken into consideration and will be discussed further in this section. These include the factors that influence teachers' uptake of IWB; accessibility and availability of the IWB; teachers' perceived benefits of IWB; barriers and challenges in integrating the use of IWB; issues related to IWB resources; the

management of change; current level of IWB practices; and teachers' professional development needs.

8.3.1 Demographic Data

As mentioned in Chapter Five, seven schools from the Brunei Muara district were involved in this study. All schools involved are provided only with one IWB despite the different number of pupils and classes in each school (see Table 6.1 in Chapter Six). A total of 75 respondents were involved in the questionnaire and from the total mentioned, only eight respondents were male and a total of 67 respondents were female. However, this finding is not significant for this study as the statistics of teachers in Brunei Darussalam primary schools (see Table 6.3 in Chapter Six) show that the number of female teachers is considerably higher in Bruneian primary schools, including in the Brunei Muara district.

Findings also revealed that a high number of respondents were teachers who had been teaching for nine years (see Table 6.4 in Chapter Six). However, due to the limitation of this study, it is unclear why the number is significantly higher. Nonetheless, it is apparent that the IWB was introduced during the early years that they started teaching.

As seen in Table 6.5 in Chapter Six, a high number of the questionnaire respondents were degree holders (38 respondents) and diploma holders (28 respondents). However, as shown in Table 6.6 in Chapter Six, according to the Education statistics in Brunei Darussalam in 2012, there is a high number of primary school teachers in Brunei Darussalam who are degree and diploma holders. Therefore, it is concluded that there is no significant issue related to teachers' qualification and the usage of the IWB in primary classroom in Brunei Darussalam as the majority of primary school teachers are diploma and degree holders.

Evidence from the questionnaire as seen in Figure 6.4 in Chapter Six also revealed that primary teachers in Brunei Darussalam often used the IWB for core subjects, which are Mathematics, Science and English language. Further investigation on this issue revealed that this was because more resources are available for core subjects, especially for Mathematics and Science. Additionally, teachers also admitted in the interviews that they taught Science using the IWB to take advantage of the projection capabilities and

to help them explain difficult concepts and terms, which are taught in English. This issue will be further explored in this chapter (section 8.3.4).

8.3.2 Accessibility and Frequency of Usage

One of the major issues found in the literature and findings of this research in relation to the implementation of IWB is access to the physical hardware or the board itself and how it can influence the use of IWB for teaching. As mentioned earlier, findings of this study show that only 75 of the teachers out of 270 teachers from the seven selected primary schools participated in the questionnaire. In addition to that, respondents of the questionnaire were based on the criterion that they are using the IWB for teaching or had used the IWB for teaching in the classroom before. It is also mentioned in Chapter Six that, from the findings, only 13 respondents of this research were identified as heavy or regular users of the IWB, where they use the IWB in every lesson, once per day or more than once per week. Meanwhile, a total of 43 respondents were identified as low users, who rarely used the IWB for teaching or used the IWB less than once per week, whereas a total of 19 participants were identified as teachers who no longer use the IWB for teaching. This indicated that the used of the IWB by primary school teachers in Brunei Darussalam for teaching in the classroom is low.

Although the use of the IWB by primary school teachers in Brunei Darussalam is low, questionnaire findings indicated that the IWB is easily accessible. According to the questionnaire findings, a high number of respondents (41 out of 75 respondents) agreed with the statement that they could easily get access to the IWB for teaching. However, a total of 20 out of 75 respondents neither agreed nor disagreed with the statement. Meanwhile a total of 14 respondents disagreed with the statement. However, further investigation of this issue in the interview revealed that teachers felt that they could easily access the IWB as there was no restriction on using the IWB in their respective schools as long as it was not in use for ICT lessons or by other teachers. Furthermore, participants also reported that they did not need to book the room in advance. Nevertheless, they also reported that this did not guarantee that the IWB was always available for them to use.

It was also noted from the interviews that participants reported better access to the board itself as a major influence on their IWB usage. In addition to that, it was revealed

from the interviews that participants who were low users of the IWB and who no longer used the IWB felt that the difficulty of accessing the board was a major barrier for them in using the IWB for teaching. This is because their schools are only provided with one IWB, which is installed in the ICT lab. Furthermore, they reported that priority of the ICT lab where the IWB is installed is given to ICT lessons. In addition to that, participants also felt that the lack of access resulted in teachers being unable to apply skills learned from attending workshops or training, therefore making them feel less confident to use the IWB for teaching. Similarly, the majority of interview participants including regular users of the IWB also reported difficulty to access the board as a major challenge they faced in integrating the use of the IWB in their lessons. However, interview findings revealed that most of the regular IWB users were also teaching ICT as a subject; thus they had better access to the ICT lab where the IWB is installed. This demonstrates that teachers who have better access to the IWB are more likely to use it for teaching compared with teachers who do not have regular access to the board. In addition to that, as they also teach ICT as a subject, this indicated that they are teachers with ICT skills. Therefore, the findings also suggest that teachers with ICT skills are more inclined to use the IWB.

The findings of this study, therefore, demonstrated the importance of access to the hardware itself as one of the important factors that influences the use of the IWB in primary schools in Brunei Darussalam. This indicates that there is a need to provide adequate hardware in order to increase the use of the IWB by primary school teachers in the country. This supports Mumtaz's (2000) view that it is important to provide teachers with adequate facilities to successfully integrate technology into classroom. Limited access to the hardware itself will limit what teachers are able to do with the technology in the classroom. The findings of this research also correspond to a campaign launched in the United States where investment was made in hardware and software, which aims to improve access of technology in the classroom and to convince teachers to use new technologies in the classroom. (Cuban et al., 2001). The campaign, where access to technology was improved resulted in a slight improvement in use of technology in the classroom by teachers, where it produced a modest shift from non-users to occasional users and from occasional users to serious users (see Chapter Three, section 3.3). However, the authors also stated that outstanding access to technologies does not guarantee frequent use and it is also important to determine how technology is being used and this will be discussed further in section 8.3.9.

When asked about their suggestions in order to improve the use of the IWB, the majority of the participants involved in the interviews felt that there is a need to provide more IWB in every primary school. They feel that access to the board itself is important for them to develop their skills so that they will be more confident in using the IWB for teaching hence increasing and improving their usage. This supports Mumtaz's (2000) view that the level of access to technology can determine the level of technology use by teachers. Furthermore, this also supports Buabeng-Andoh's (2012) view mentioned in the literature review (Chapter Three, section 3.3) that the availability and accessibility of ICT resources including hardware and software can influence the effective adoption and integration of ICT into teaching in schools.

The findings of this study also present the evidence that organisation of resources can influence the use of the IWB. The majority of participants, who are identified as regular IWB users revealed in the interview that their respective schools provided a timetable, which was created each term by the teacher in charge of the ICT lab for them to use IWB. According to them, this gave every teacher an equal opportunity to use the IWB for teaching. It was noted in the interview findings that only one teacher who was identified as a low user of IWB reported that their school had a proper timetable for the use of ICT lab that gave teachers access to the IWB. Furthermore, a participant who no longer used IWB for teaching reported that the improper timetabling system in using the ICT lab at her school was a contributing factor that led her to not use the IWB for teaching. This findings indicated that better organisation of resources resulted in better frequency of IWB usage by teachers. Moreover, the findings also correspond to the research conducted by Pelgrum (2001) where a worldwide survey among national representative samples of schools from 26 different countries shows that organisation of physical access to hardware can influence frequency of technology usage. The study conducted on the perceptions of educator regarding the obstacles that are perceived as an impediment for realising ICT related goals revealed insufficient hardware as the main obstacle. However, it was reported that it is not necessarily that the hardware is inadequate, as stated by research participants, but the infrequent use is also associated with the lack of teachers' knowledge and skills. In addition to that, it also depends whether or not the resources are organised by schools to ensure proper access for all teachers. Similarly, according to Jones (2004), despite the introduction of schemes such as the National Grid for Learning (NGfL) launched in 1998 to increase levels of ICT

equipment in schools, a high number of respondents to the BECTA survey in 2003 still reported the lack of hardware as a barrier to the use of ICT. Jones (2004) suggests that the problem might not be the inadequate physical hardware present at the school but it may be a problem caused by poor organisation of the resources in schools. This argument is supported by Pelgrum (2001) when he states that it is also important to look into how the use of available hardware could be enhanced rather than just investing in providing more hardware for better accessibility to increase use of technology.

Therefore, the findings of this research suggest that, other than providing more IWB in schools to increase usage of the IWB, organisation of the physical access to the hardware itself by schools can also influence the frequency IWB use in schools. As seen in Table 6.1 in Chapter Six, schools with larger populations have two ICT labs, but only one of the labs is installed with an IWB. This suggests that although the priority is given to ICT lessons, a proper organisation of the room to access the hardware can be arranged to give teachers of other subjects more access to the IWB.

When discussing issues concerning access to the IWB, it also appears in the research findings that the location of the ICT lab where the board is installed can also influence the use of the IWB. It was noted from the interviews that teachers felt that the location of the ICT lab in their respective schools was not strategic as it was often located quite far from classrooms. It appears that participants in this research felt that the location of the ICT lab is important as it there is a need to move pupils from their classroom to the ICT lab. The majority of the participants reported this as one of the challenges they faced in using the IWB for teaching. Similarly, findings by Levy (2002) suggested that teachers prefer to have an IWB in their own classroom rather than moving their pupils to other rooms just to teach with the IWB. The findings also reported that frequent use and access to the IWB act as a motivator for teachers and allow the development of IWB skills, thus raising teachers' confidence in using IWB. This statement corresponds to the findings of this research, where interview participants of this research who were regular users of the IWB stated that they felt confident in using the IWB for teaching as they had regular access to the board.

It appears from the research findings that accessibility is linked with the frequency of IWB usage in primary schools in Brunei Darussalam. Additionally, findings also indicated that the location of where IWB is installed also influenced the frequency of

IWB usage. This leads to a conclusion that it is important to create an environment where access is not an impediment to encourage the use of the IWB for teaching and learning in primary schools in Brunei Darussalam. This may include installing the IWB at a strategic location, providing more hardware or providing adequate access to the IWB through proper organisation of the hardware as mentioned earlier in this section. An example is by creating a proper time table, which gives teachers equal opportunity to use the IWB.

8.3.3 Factors Influencing Usage

As mentioned earlier in Chapters Five and Seven, interview participants involved in this study included teachers who were identified as regular users of the IWB. This section will discuss the findings on factors that influence the uptake of IWB by regular IWB users.

It has been seen through the research evidence that regular users of the IWB show positive attitudes towards the IWB and find the use of the IWB beneficial for teaching and learning. When asked about the factors that encouraged them to use the IWB, interview participants of this study mentioned that the use of the IWB reduced their workload in terms of preparing their lesson as one of the factors. Participants also mentioned in the interview that the interesting feature of the board, which is the interactive feature as one of the factors that influence their IWB usage. According to them, this is because it helps them to create a more interesting lesson.

However, as mentioned in Chapter Seven (section 7.2.3), observation findings of all lessons observed taught by regular users revealed that interaction level with the board is only high during the fourth stage of the lessons, which is the lesson activity stage. This indicated that participants did not fully utilise the interactive features of the board although claiming it as one of the factors that influenced their usage. Nevertheless, further investigation of this issue revealed that the reason why they were reluctant to let children interact with the board is because of the fear of equipment breakdown. Participants also highlighted their experience with technical issues such as the ActivePen not working and the long time taken to get a replacement. Additionally, they also stated that the height at which the board is mounted is too high for pupils, which

makes it difficult for children to interact with. This issue will be discussed further in section 8.3.5.

Another major factor contributing to the use of IWB is the access to the board itself. This was discussed earlier in section 8.3.2, where findings indicated that access to IWB influenced the frequency of IWB use among participants. Nevertheless, a noticeable pattern was found from the findings of the interview, where the majority of regular IWB users were also teaching ICT as a subject. This finding indicated that they had better access to the board and spent a considerable amount of time at the ICT lab. Participants of this study also reported that regular and easier access to the board itself allowed them to develop their IWB skills. Therefore, they were more confident in using IWB for teaching. This supports Davis's (1989) view that people will accept technology if the find the use of it to be beneficial, easy and require less effort. It was also mentioned in the literature that positive behaviour towards technology by teachers will influence their usage of it in the classroom (Chapter Three, section 3.3.5).

It has been seen from the findings that the main factors of IWB usage by participants who are identified as regular users are better access to the board and their knowledge of what the board has to offer in terms of improving teaching and learning in the classroom. The findings also presents evidence that factors that influence teachers to use the IWB in Bruneians primary schools are mostly manipulative factors that can be influenced (see Chapter Four, section 4.2.2) such as teachers' attitudes towards IWB, teachers' ICT knowledge and skills; and the availability and accessibility of IWB. For example, teachers' attitudes, knowledge and skills can be influenced by sufficient professional development, whereas availability and accessibility of the IWB can be influenced by increasing access either by providing more IWB or a better organisation of the hardware as mentioned earlier in this chapter.

8.3.4 Perceived Benefits of the Interactive Whiteboard

It has been reviewed in the literature that teachers who do not recognise the advantages of using technology are less likely to use technology for teaching. Therefore it is important to make teachers aware of the benefits of the IWB for teaching and learning in classroom. As mentioned earlier in this chapter, this research also aims to investigate the perceived benefits of the IWB by primary teachers in Brunei Darussalam to be able

to promote a wider use of the IWB usage. It is also important to avoid misconceptions about the use of the IWB and to be able to provide teachers with a rationale of usage. In order to investigate this issue, all interview participants, which included regular and low IWB users, and those who no longer used the IWB, were asked questions in relation to their perception of the IWB.

Quantitative findings of this study revealed that a high number of respondents agreed with the majority of statements that describe the benefits of the IWB (question 9, 10, 11, 12, 13, 14, 25 and 16 of the questionnaire in Table 6.8 and Table 6.10 for the analysis). Meanwhile, interview findings revealed that all participants felt that the use of the IWB enabled them to use a variety and better quality of teaching resources that allowed them to make their lessons more interesting. Participants also reported that it helped them in explaining difficult concepts and helped pupils understand the topic better, especially in subjects where the medium of instruction is in English. As mentioned in Chapter Two, the medium of instruction for core subjects in primary schools in Brunei Darussalam is English language, which is not the native language. Thus, this is consistent with the findings mentioned in section 8.3.1 earlier, where most questionnaire respondents stated that they used the IWB to teach core subjects especially Mathematics and Science, which are taught in English. This highlights the findings of study by Şad and Özhan (2012) and Wall et al. (2005) as mentioned in Chapter Three (section 3.3.1), which revealed that pupils felt that the use of the IWB assisted their understanding in the classroom through high quality visual presentation, use of different software and use of interactive games.

Other than that, participants of this study also felt that the use of the IWB increased pupils' motivation, engagement and attention in the lessons. This was consistent with the questionnaire findings of this research, where the majority of the respondents (69 out of 75 respondents) agreed with the statement that the use of the IWB motivates and increases the interest of pupils towards lessons using the IWB. Interview findings also revealed that participants felt that that the use of the IWB allowed them to easily manage their teaching resources. This was also revealed in the lesson observations conducted where all of the participants organised their teaching resources in folders, which resulted in better flow of the lesson. This was highlighted in the literature review (Chapter Three, section 3.3.3) and Kennewell and Beauchamp (2003) confirm that pace improved as the features of the IWB and the advanced preparation of resources by

teachers enable teaching materials to be brought up onto the IWB easily. Both questionnaire and interview findings support these claims, where participants of this research felt that the use of the IWB improved the pace of their lessons. It was noted from the questionnaire findings of this study that a high number of respondents (54 out of 75 respondents) agreed with the statement that the IWB improves the pace of lessons. Moreover, further investigation in the interview regarding this issue revealed that teachers felt that pace improved as they had a better control of resources using the IWB, especially if it was organised in folders. There are a number of research studies that support this claim as presented in Chapter Three (section 3.3.3). Moreover, Beauchamp and Parkinson (2005) argue that the change in pace of the lesson as well as the improved transitions between parts of the lesson is perhaps one of the most important aspects that the IWB offers.

Another common benefit of the IWB perceived by participants of this study is that the IWB improves pupil-pupil and pupil-teacher interaction as it encourages active discussion. It can be seen from the questionnaire findings that a high number of respondents agreed that the IWB increases interaction between teachers and pupils in classrooms and the results of the interview confirmed this findings. Interview participants highlighted that the use of various resources helps create more interesting lessons that involved active classroom discussions. Results of observation support this finding as in all lessons observed, it was seen that presentations of teaching resources were often followed by discussions as a whole class or questioning activities with individual pupils in most stages of the lesson. As mentioned in Chapter Three (section 3.3.2), Alexander (2008) in his work claims that children will be able to construct meaning for learning to take place through talk or dialogue.

This study also revealed that a high number of respondents of the questionnaire agreed that the use of the IWB has a positive effect on teaching pedagogy. Similarly, interview findings present evidence that participants felt the use of the IWB has a positive impact on teaching and learning in the classroom. They also felt that the IWB helped them to achieve lesson objectives and deliver their lesson in a more effective way. This finding is consistent with the questionnaire findings, where a high number of respondents (64 out of 75 respondents) agreed that the IWB can support teaching and make lessons more effective. In addition to that, participants also felt that the use of the IWB helped improve their pupils' academic performance. The questionnaire findings are consistent

with the interview findings where more than half of the respondents agreed with a similar statement. However, further investigation revealed that their claims were made based on the ability of pupils to give answers during questioning activities and from the written task given to pupils when the IWB was used in the lesson. This indicated that the claims made by participants of this study were not made based on a valid measurement of the level of pupils' performance. Furthermore, as mentioned in the literature (Chapter Three in section 3.3.4) it would not have been possible to claim the impact of the IWB to the pupils' level of achievement especially as the study was conducted within a short period of time.

However, interview findings of this research revealed that a participant reported that she was not aware of any other benefits of the IWB other than its projection capability. Further investigation confirmed that the participant no longer used the IWB and had never attended any professional development programme or workshop on IWB. Another participant reported that she felt that not all teachers were aware of the existence of the IWB and what they could do with the IWB in the classroom, thus resulting in resistance to usage. Therefore she suggested the need to create awareness on the existence and the benefits of the IWB in schools to encourage the use of it for teaching and learning. This is in line with the claim made by Betcher and Lee (2009), who state that resistance to use of the IWB in classroom is often caused by ignorance of what the IWB is all about.

As mentioned in the literature (Chapter Three, section 3.3.5), Buabeng-Andoh (2012) in his work suggests that teachers' positive attitudes toward the use of technology can easily provide useful insight about the adoption and integration of ICT into teaching and learning processes in the classroom. Findings of this research confirm that the majority of the participants were aware of the benefits of the IWB, indicating that they were aware that the use of technology such as the IWB can improve teaching and learning in the classroom. Nevertheless, there was no noticeable difference that was noted between participants who were regular users, low users and no longer using the IWB when expressing their positive views. However, findings indicated that when participants were not aware of how the IWB can improve teaching and learning in the classroom, it was because they had never attended any professional development programme and did not know what the IWB has to offer. Teachers who have never attended any professional development programme are less likely to have a positive attitude towards

the use of the IWB in the classroom as they do not perceive the use of the IWB as beneficial in the classroom. This finding corresponds to the claim made by Cox et al. (1999), in which they state that teachers may not accept the use of technology in their teaching if they see that there is no need to change or question their current professional practice. This is also recognised by Higgins (2010), who states that technology may enhance teaching pedagogy when teachers and pupils understand its potential and recognise it as a pedagogical means to achieve their teaching and learning objectives.

The findings lead to a conclusion that generally primary teachers in Brunei Darussalam have a positive attitude towards the use of the IWB in the classroom and perceive the IWB as beneficial for teaching and learning in the classroom. It is supported by a high level of mean scores in Table 6.10 (Chapter Six), which indicated a high level of agreement on statements that are related to the benefits of the IWB in the classroom. It can be seen from the findings that the benefits mentioned by participants in this study are echoed in the literature review framework in Chapter Three of this thesis. Nevertheless, findings of this study suggest that it could be argued that professional development is one of the factors that can contribute to the positive attitudes of teachers towards the IWB use in the classroom. This is because positive attitudes can be influenced by attending professional development programmes as other than improving their skills and knowledge to increase their confidence, it would also help teachers to see the potential of the IWB to improve their teaching and learning in the classroom.

8.3.5 Barriers and Challenges to IWB use

In the education context, barriers in relation to the implementation of technology refer to the things that prevent teachers from using technology to its maximum potential (Gillespie, 2006). It is important to look into the barriers and challenges that are faced by teachers in order to successfully integrate the use of IWB effectively in the classroom, which this study has taken into consideration. It was highlighted in the literature review (Chapter Four) that there is a need to take account of teachers' concerns in implementing changes in the education system such as introducing and implementing new technologies. Therefore, this section will discuss teachers' views on what obstructs them from using the IWB for teaching and what obstacles they faced in using the IWB in the classroom.

As mentioned in Chapter Five, interview participants of this research were selected based on the criterion that they had used the IWB or were still using the IWB for teaching in the classroom. This section seeks to explore and discuss the findings in relation to the barriers and challenges, which are inter-related, that are faced by teachers who are regular users, low users and no longer using the IWB in order to integrate the IWB for teaching and learning in the classrooms.

Among the issues that arise from the evidence gathered from interviews with participants who were low users or who no longer used the IWB is the difficulty to access the board itself. Findings indicated that participants felt that the difficulty to access the board as the major barrier they faced. As mentioned in the previous chapter, it appears in these research findings that in all school involved in this study, priority in using the ICT lab where the IWBs are installed is given to ICT lessons, thus giving participants less opportunity to use the IWB on a regular basis. Furthermore, one participant remarked that her lack of confidence in using the IWB is because of the inability to apply and master the skills she learned from the workshop she attended, due to the difficulty of accessing the board on a regular basis, thus making her feel reluctant to use the IWB. Additionally, the findings of the research also revealed that participants felt that it is inconvenient for them to use the IWB as they need to move pupils from their classroom to the ICT lab. This has led to participants' unwillingness to use the board. Participants felt that it wasted their time and they found it difficult, especially when dealing with younger children, as they needed to be supervised when moving from one room to another. Both issues mentioned by participants who were low users or no longer used the IWB were also echoed by participants who were regular users of the IWB. Interview findings revealed the difficulty of access and the time wasted in moving pupils from the classroom to the lab as common challenges faced by all IWB users in this research. This was also seen through the observation conducted, where in most lessons observed pupils arrived at least five minutes after the actual time the lessons were scheduled to start. Both issues have also been discussed in section 8.3.2 of this chapter as influencing the frequency of IWB usage among primary school teachers in Brunei Darussalam.

Quantitative findings of this research, which can be seen in Table 6.8 in Chapter Six revealed that a high number of respondents felt that they were capable in integrating the use of the IWB in the classroom. A high number of respondents also agreed with the

statement that they had lots of ideas about how to use the IWB for teaching. This is in contrast with the interview findings, where participants who were low users of the IWB and those who no longer use the IWB admitted their lack of IWB skills and knowledge and reported it as one of the barriers in using the IWB for teaching. Similarly, interview findings also revealed that the majority of the participants involved in the interview, including regular users of the IWB, felt that their lack of skills and knowledge were a challenge in integrating the use of the IWB in their lessons. They also felt that they needed to be assisted when using the IWB, which indicated the lack of confidence and support after the introduction of the IWB in the education system. As mentioned in Chapter Four (section 4.3.4), it is important to give teachers continuous support such as mentoring and coaching after the introduction and implementation of technology in schools including after initial professional development takes place, as a way to assist teachers to successfully integrate the use of technology in their practice. This supports Joyce and Shower's (1982) view as mentioned in Chapter Four, where they state that teachers will begin to transfer the new model into their active repertoire when a coaching component is added and implemented effectively.

The majority of the participants also admitted to not knowing the basic IWB skills and knowledge such as calibrating the ActivPen. As mentioned in Chapter Three, Beauchamp (2004) claims that it is a common issue faced by teachers who are at the early stage of IWB implementation. Moreover, participants of this study also admitted that they have had limited knowledge of IWB software available. It was also seen through the observation conducted with regular users of the IWB that participants did not use any specific IWB software and only used basic Windows software for teaching using the IWB. Participants confirmed in the interview that it was because of their lack of knowledge on the IWB software available and as mentioned earlier in this section, they considered this as one of the challenges they faced in integrating the IWB in their lessons. This finding suggests that participants of this study in general had a low level of IWB knowledge.

Another common barrier reported by the majority of the participants, who were low users of the IWB or no longer using the IWB was their lack of time to prepare lesson using the IWB. This includes planning the lesson as well as preparing resources to be used with the IWB. This was consistent with the interview findings, with a majority of interview participants, including participants who were regular users of the IWB, who

revealed that time was one of the challenges they faced in integrating the use of the IWB in their lessons. Participants felt that they did not have enough time as they have other responsibilities other than their teaching responsibilities, which included administrative work. This corresponds to Bingimlas (2009) claims that teachers make little use of technology due to the lack of time (see Chapter Three, section 3.3). However, quantitative findings indicated a high level of agreement that it is easy to prepare a lesson using the IWB and that the use of IWB reduces workload (see Table 6.10 in Chapter Six). Furthermore, two interview participants who were identified as regular users felt that the use of the IWB reduces workload as it reduces the time taken to prepare their lesson due to teaching resources that are easily available. They also stated that the resources can be reused and edited in the future and this is in line with the claims made by Levy (2002) in Chapter Three, section 3.3.1. These findings also correspond to the research conducted by Bennett and Lockyer (2008), whose study on the introduction of the IWBs in Australian primary schools revealed a similar finding where teachers felt that the introduction of the IWB has assisted them in preparing and presenting their teaching resources. It was stated in their findings that participants reported that time is saved by the ability to use existing electronic resources available online or on CD-ROMs.

However, the findings of this study also revealed that 31 out of 75 respondents neither agreed nor disagreed with the statement that preparing and planning lessons using the IWB is easy. In addition to that, 29 out of 75 of the respondents neither agreed nor disagreed with the statement that the use of the IWB reduces workload as reported in Chapter Six (section 6.3.2) of this thesis. This findings correspond with the findings of a study by Kennewell and Beauchamp (2003), where participants of their study stated that the planning of an IWB lessons took a lot more thought as they needed to prepare how to use the board and its correct features. Nevertheless, as mentioned in Chapter Three, participants of their study also revealed that the time taken in planning and preparing for an IWB lesson was reduced by a high degree of collaboration between teachers. Moreover, Derus and Emran (2008) suggest that teachers who find the use of IWB to increase their workload are those who lack adequate skills and confidence.

Interview findings of this study, however, revealed that primary school teachers in Brunei Darussalam do not necessarily teach the same subjects every year. Therefore, they need to create new resources when teaching new subjects and reported it as time-

consuming. In addition to that, longer time is needed for participants to prepare teaching resources because they lack the skills and knowledge in creating and designing IWB resources. Nonetheless, it can be seen that with proper knowledge and skills, the time taken to prepare lessons using the IWB can be minimised. Issues on IWB teaching resources faced by teachers will be discussed further in the next section.

In addition to that, participants of this study revealed that not only can lesson preparation using the IWB be time consuming, they also reported the time taken to set up the IWB as a challenge, especially if it has not been used before their lesson. It has also been seen through lesson observation that in a few lessons observed, participants had to spend a considerable amount of time to switch on the computers and set up the IWB before starting the lesson. Furthermore, in two lessons observed teachers had to connect speakers to be used during their lesson. Levy (2002) in her work suggests that difficulties in setting up technology such as IWB are evidence of teachers' inexperience.

In relation to support and assistance needed to successfully integrate the use of the IWB in the classroom, quantitative findings of this study indicated that a high number of the respondents agreed on the importance of having technical support to support classroom use of IWB. Further exploration of this issue in the interviews suggested that participants find the lack of technical support not only for IWB but also for all ICT infrastructure available in school as a challenge for them. Furthermore, a participant stated inadequate technical support was one of the reasons for her unwillingness to use the IWB for teaching. It was also revealed in the interviews that there was no technical support on site and participants highlighted the need to improve the level of technical support in schools to reduce fear among teachers in using not only the IWB but also other technologies available. Additionally, participants also reported that they did not receive technical support in a timely manner when needed. This supports Hall and Higgins's (2005) view that teachers will lose their confidence if problems with technology occur and cannot be rectified quickly by the teacher or a qualified technician. According to them, this will result in the lack of technology use.

Therefore, the findings of this study suggest that there is a need to improve technical support in schools to support the integration of IWB in the classroom. This is in line with Bannister (2010) recommendation as stated in Chapter Three, where she mentioned the need to address technical issues at the beginning of technology

implementation and the importance of leaders to considering how teachers will be supported technically with their technology implementation in the classroom. The need of technical support, especially for new ICT learners or when learning a new technology is also echoed by Clarke (2006) to ensure that self-esteem and confidence in using the technology grow with learning. However, it was also mentioned that support should be given in a way that encourages ICT learners to develop problem solving skills so that they will not be too dependent on outside support. Common problems could be identified and may be supported by providing handouts for problem solving. Additionally, as mentioned in Chapter Three (section 3.3), it is also suggested that there is a need to provide technical support in a timely manner as problems faced can be demotivating especially when progress cannot be made until problems are resolved.

It was also noted from the interview findings that participants felt that pragmatic issues were one of the challenges they faced in using the IWB for teaching. It was also acknowledged in the literature (Chapter Three) that pragmatic issues can affect the use of the IWB in the classroom. Among the issues mentioned by participants of this study were the height at which IWBs are mounted; blackout curtains not properly installed; internet connectivity issues; and problems with hardware such as outdated hardware and insufficient audio output. It is suggested by Levy (2002) that there is a need to have efficient blinds in the classroom where the IWB is installed to avoid poor quality of images projected due to sunlight, while Beauchamp (2004) suggested that the IWB should appropriately be installed at a height that can be reached by both teachers and pupils to fully take advantage of its interactive capability. It was noted in the findings that participants reported that the audio output provided, which was a small desktop speaker, was not loud enough. As mentioned in Chapter Three, Braham (2006) suggests that speakers are among the items that should be given priority to enhance IWB functions. Additionally, problems with outdated hardware were also recognised by Dawes (2001) who states that lack of appropriate equipment and unreliable equipment are among the reasons that teachers resist the use of technology and it was recommended in the 1997 Stevenson report, which detailed the state of educational computing in the UK, that teachers should be provided with up-to-date equipment in classroom to encourage the integration of technology.

Other than that, a participant reported that the space available in front of the board is not big enough for her pupils to be seated in front of the board. It was seen in the

observations that some of the ICT labs are small in size, thus limiting the space available for children to be seated in front of the board. Barber et al. (2007) in their work suggested that it is important to ensure that there is sufficient space in front of the board for pupils to approach the board easily and for pupils to gather around it. According to them, the approach of arranging pupils to sit in front of the IWB will enable pupils to see the board more clearly. It was also highlighted in Chapter Three that seating pupils in front or around the IWB also enables children to use the board more quickly as well as giving the opportunity for teachers to guide and get engaged with pupils more readily. This approach was used by all observed participants of this study, where the pupils were seated in front of the board when the IWB was in use. Therefore, they suggested that it is important for anyone who is in charge of supervising and planning of IWB installation to consider the location of the IWB before the installation. This is to ensure that it is located and installed appropriately by taking into account the arrangement of space within the classroom. As mentioned in Chapter Three, classroom organisation is important for teachers to incorporate the use of the IWB effectively. Therefore, the evidence of this study suggests that it is important to look at issues that may reduce the value of IWB before and after installation of IWB as it can influence the successful integration of IWB in classroom, as mentioned in Chapter Three of this thesis.

The findings lead to a conclusion that teachers find accessibility; the lack of skills and knowledge; lack of time to prepare and set up an IWB lesson; lack of support; and pragmatic issues as barriers and challenges to the implementation of IWB for teaching in classroom. The research suggests that there is a need to look into the barriers and challenges faces by teachers to help facilitate decision making to ensure the successful implementation of the IWB for teaching and learning. It can be used as a pointer for further development for the effective use of the IWB in the classroom.

8.3.6 Teaching Resources

The literature in Chapter Three outlined that one of the benefits of using the IWB is the ability for teachers to use a wider range of teaching materials and the facility to manipulate them. This was agreed by the majority of questionnaire respondents (see Table 6.8 in Chapter Six) where they felt that the use of IWB makes teaching resources more easily available. Therefore, to ensure that the IWB is used to its maximum

potential by teachers in the classroom, it is important to look into the availability and accessibility of IWB resources, as they can influence the use of the IWB for teaching and learning.

Interview findings of this research revealed that all participants created most of their resources to be used with the IWB themselves as they felt that they would have better understanding and better control of what was projected on the board. These findings correspond with what was highlighted by Kennewell and Beauchamp (2003) when they state that the teaching resources developed by teachers will maintain a remarkable pace to lessons as teachers are familiar with the content which will appear on the IWB.

Findings of this research also revealed that participants often created their own resources because the education system in Brunei Darussalam has its own curriculum and online resources shared by educators especially from other countries are sometimes not suitable and not relevant for their lessons. This finding is supported by Koenraad (2008) who he states that the majority of the collection of free materials or resources made by IWB suppliers are often related to the Canadian and American curriculum. However, at the present time, many educators from all over the world have started producing their own materials and share their materials online. However, the limited resources shared by primary teachers in Brunei Darussalam indicated that teachers need to create their own resources and also have to spend a considerable amount of time to create resources if they want to use the IWB for teaching. This was highlighted by the majority of participants in the interviews, who reported that it is time consuming to create IWB resources. In addition to that, participants reported that the software available, which was installed with their school's IWB, was not available for personal use. Therefore, they had to create their IWB resources at school during their free time, which was often limited due to other workload and is also constrain by the availability of the ICT room. This is in line with Buabeng-Andoh's (2012) view that the workload of teachers can influence their acceptance of technology adoption in the classroom. It is a common situation for a primary teacher in Brunei Darussalam to teach a minimum of 25 periods per week with additional time allocated for other non-teaching duties, administrative work and extra-curricular activities. Furthermore, the ICT lab is always occupied, thus restricting teachers from accessing the IWB software for creating teaching resources. Additionally, participants of this research were not trained to create or design IWB teaching resources. Unskilled teachers may result in lower quality

resources being created, as well as longer time needed in creating and designing resources as teachers are not familiar with the IWB software available.

The key issue emerging from the findings above is the lack of access to software outside school hours and this revealed that participants saw the difficulty in creating and designing IWB resources only during school hours as a challenge. Bannister (2010) in her work suggests that teachers should have access to the IWB software outside school hours as easy access to software is a key factor in successfully beginning to use the software. This will allow teachers to create resources and prepare their lessons during their free periods in school or from home.

However, three interview participants of this research acknowledged that although creating IWB resources can be time consuming, it can be reused and edited easily for future use. This supports the view of Smith et al. (2005) that problems teachers face in preparing and creating IWB resources can be overcome over the years as they can be reused and shared. Furthermore, two interview participants who were identified as regular users felt that the use of the IWB reduces workload as it reduces time taken to prepare their lesson due to multimedia resources easily available. It was also echoed by other interview participants, who stated resources are easy to create as sources of images, audio and video are often available online. Nevertheless, as mentioned in the previous section, participants also mentioned creating IWB resources as one of the barriers and challenges they faced in integrating the use of the IWB due to workload, their lack of skills and knowledge and the different subjects taught each year. However, it can be seen that with proper access to software as well as proper knowledge and skills, time taken to prepare lessons using the IWB can be reduced.

Further investigation in relation to IWB resources in the interviews revealed that there are IWB resources provided by the Ministry of Education. However, this was reported by a minority of interview participants, whereas the majority of interview participants reported that they were not aware if there are any IWB resources provided by the Ministry of Education. Additionally, participants also mentioned that the resources provided are limited and some are inaccessible. Findings also revealed that participants also felt that some of the resources provided were not suitable for their pupils. It was not clear how many and for what level the resources are provided but evidence suggested that resources are provided in the form of CD-ROM and for core subjects, which are

Mathematics and Science. This evidence reflects the poor understanding of the relevant authority in designing resources that suit the educational needs of Bruneian primary classrooms. Fullan (1999) in his work recommended availability and provision of resources are important to go forward with a change and must be considered as early as the first stage of a change process, which is the initiation stage that was described in Chapter Four of this thesis (section 4.2.1).

All participants also revealed that there are no resources provided by the schools to be used with the IWB. In terms of shared resources, the majority of the participants did not share resources they created with their colleagues. It was also noted in the findings that participants complained that some useful websites with IWB resources are inaccessible. This indicated the need to review the access to online materials for teachers and the need to involve teachers in decision making and it was argued by Gillespie (2006) that it is the challenge for schools to make the most effective use of the internet while avoiding misleading or appropriate information being accessed by teachers and pupils.

Evidence gathered in this study shows that there is no sharing of resources among teachers in schools and with other schools throughout the country. Evidence of this study suggests that this factor influenced the use of the IWB by primary school teachers in Brunei Darussalam. In addition to that, one of the challenges cited by teachers in the interviews regarding the implementation of the IWB in the classroom is the difficulty of accessing the IWB software and their lack of skills and time to create IWB resources. Therefore, it is important to create a sharing culture not only within the school itself but also with teachers from other schools. This is because according to Cogill (2006), it will make lesson planning and preparation easier especially when similar resources are needed and have already been prepared. It is also in line with Cuthell's (2005) claims as mentioned earlier in Chapter Three that sharing resources encourages collaborative work between teachers, which enables resources to be developed more quickly and at the same time provides teachers with a range of not only IWB resources but also pedagogical possibilities.

Several suggestions were also made by participants of the interviews in relation to IWB resources these include improving access to teaching resources; making software available and accessible for personal use; creating a sharing culture throughout schools in Brunei Darussalam; and providing more and relevant resources.

There is a wealth of evidence in the study that two main problems emerging in regard of IWB resources are the availability and the accessibility of resources. In addition to that, teachers often do not have available time to create or design their own resources. The study also presents evidence that factors involving resources can influence the attitudes of teachers in using IWB for teaching. The findings therefore suggested that it is important to improve and revise teaching resources provided for the use in the IWB classroom. It is also important that the resources available are relevant to the curriculum in Brunei Darussalam and are of high quality in a way that can encourage the process of learning with the support of IWB. As mentioned in Chapter Four (section 4.2.4), this can be done by involving teachers to ensure that focus are maintained on relevant objectives that are appropriate to the situation in the classroom or school (Gillespie, 2006). In addition to that, it is essential to create a sharing culture so that teachers can cooperate and collaborate in creating relevant resources for teaching as well as to share resources, which should be made accessible for teachers.

8.3.7 The Management of Change

As mentioned in Chapter Four, change management is important in introducing and implementing an innovation such as the IWB in the education system. The research recognises that in implementing the IWB in teaching, this study shows different concerns by participants involved. This seemed a common thread when implementing change in the educational context. As outlined in Chapter Four, it was mentioned that people have different concerns during the process of change (Hall et al., 1977). Therefore, it is important to take teachers' concerns into consideration in order to successfully implement the use of IWB for teaching and learning. This supports Durrant and Holden's (2006) view that teachers are the centre of educational reform as they are the ones who will determine what will happen in the classroom. It can be seen, therefore that the findings of this study, which involved the concerns of teachers regarding the implementation of IWB could help to decide the proper action to be taken in order for the successful implementation of IWB in schools. In addition to that, by looking into teachers' concerns it allows the elimination of barriers that can hinder the successful implementation of the IWB.

Teachers' concerns in implementing IWB for teaching and learning mentioned earlier in this chapter consist of different issues. The issues involve accessibility issues; factors that influence teachers' IWB use; how teachers' perceived IWB; barriers and challenges teachers faced; availability and accessibility of IWB resources; and teachers' training or professional development needs. It can be concluded based on the concerns mentioned by participants in this study that primary school teachers in Brunei Darussalam are still at the early stages of technology adoption based on both Concerns-Based Adoption Model (CBAM) by Hall and Hord (2011) and the stages of instructional evolution in technology-rich classroom by Sandholtz et al. (1997), which was mentioned in Chapter Four (section 4.2.3). This is because the findings of this study indicated that participants know little about the IWB but would like to know more about the IWB. In addition to that, participants were uncertain about the demand of the innovation. Furthermore, participants' concerns mentioned earlier involved the physical environment, technical problem, software management and the dynamics of the classroom environment. These are both mentioned in Chapter Four (section 4.2.3) as the early stages in the CBAM model and the entry stage of the instructional evolution model.

All of the concerns mentioned earlier should be taken into consideration as doing so can facilitate decision making to ensure the successful implementation of the IWB in the education system in Brunei Darussalam. This is because according to Davis (2002), when concerns are taken into consideration and actions are taken, it will influence a person to work for a change. This supports Bingimlas (2009) view that resistance to change indicates that something is wrong and that there are reasons for refusing change. Therefore, regular consultations could be arranged between the authority and teachers as a platform for feedback and regular review including addressing teachers' concerns. This can be used as a guide for further development and to ensure that improvement can be made accordingly. As mentioned in the literature (Chapter Four), evaluation and feedback are important to ensure that intended goals or objectives are achieved (Picciano, 2006).

However, as mentioned earlier in Chapter Four, in order for change to be successful, leaders play an important role to ensure its success. As seen from Table 6.8 in Chapter Six, it appears that the majority of respondents of the questionnaire felt that they were encouraged to use of IWB by their school principal. Only two respondents disagreed with the statement and 22 respondents neither agreed nor disagreed. This is in contrast

with the findings of the interviews, where participants stated that they were always encouraged to integrate the use of ICT in their lessons but without mentioning IWB as the specific ICT tool. Nevertheless, findings of this study revealed that participants were only verbally encouraged to integrate the use of technology in their teaching by their school principal and evidence suggested that no other support were given by the school principal in assisting teachers to successfully integrate the use of the IWB in the classroom.

It can be seen from the research evidence that there is a lack of support from school including the principal in integrating the use of technology including the IWB in the classroom. As mentioned in Chapter Four (section 4.2.4), Wang (2010) states the lack of vision and commitment by school leaders has a negative influence on technology integration. Therefore, there is a need for leaders in schools to take an active role in supporting teachers to successfully integrate the use of technology such as the IWB in the classroom. The importance of good leadership in the process of integrating the use of technology in schools was highlighted in Chapter Four (section 4.2.4). This supports Fullan's (2001:83) view that:

> … the principal is the person most likely to be in a position to shape the organizational conditions necessary for success, such as development of shared goals, collaborative work structures and climates, and procedures for monitoring results.

As recommended by Farrell (1999), a leader should inspire and give a sense of direction for teachers as a way to support technology implementation in schools. This includes inspiring teachers to change, creating a vision and translating it into actions as well as maintaining stimulus for change. Similarly, Betcher and Lee (2009) in their work also suggest that to bring less enthusiastic teachers to be involved in an IWB programme, there is a need to have a visionary principal who are able to demonstrate a committed leadership to the programme.

8.3.8 Teachers' Current Level of Interactive Whiteboard Practices

The current level of IWB practices is important in determining the level of professional development needs for teachers. It can be seen from Table 6.9 (in Chapter Six) that high and moderate levels of mean scores were obtained on questions related to the IWB skills and knowledge of respondents. Questionnaire findings of this research revealed

that the majority of the respondents (54 out of 75 respondents) felt that they were capable of integrating the use of the IWB in the classroom. It also revealed that more than half of the respondents (45 out of 75 respondents) felt that they had lots of ideas about how to use the IWB for teaching. This findings indicated positive attitudes towards the use of the IWB for teaching, which as suggested by Selwood and Pilkington (2005) can influence teachers' readiness in using ICT applications. The findings, however, revealed that a high number of respondents neither agreed nor disagreed that they knew how to operate the IWB effectively.

As mentioned in Chapter Five, participants of the observation were selected based on the criteria that they are regular users of the IWB. Through the lesson observations conducted, it was seen that when using the IWB, all participants arranged their pupils to sit in front of the board. It was noted from the interview findings that participants felt that it would be easier for pupils to see the board. This was because the desks in the ICT lab where the IWB are installed are equipped with desktop computers that are not connected with the IWB, which often distract pupils. In addition to that, interview findings also revealed that participants preferred pupils to be seated in front of the board because pupils can hear audio better, as audio output is just a small desktop speaker, which they reported is not loud enough if pupils are seated further away. This is in line with Barber et al. (2007) recommendation that recommended pupils to be grouped around the IWB as pupils will be able to have a clear view of the board. As mentioned earlier in section 8.3.5, by arranging pupils to sit in front of the board, pupils will be able to interact with the board quickly and the teacher will be able to guide and engage with pupils more readily. However, seating pupils near the board means that there will be pupils that will be viewing the board from an acute angle (Barber et al., 2007).

Observation findings of this study also present evidence that all participants used multimedia presentation throughout the lessons to elicit whole class discussion and question answer activity. This indicated that participants took advantage of the ability to create a dialogic classroom with the support of the IWB. This is in line with Beauchamp and Parkinson's (2005) recommendation that the IWB can be used to stimulate classroom discussion. It is also suggested that the IWB can be used to promote pupil-teacher and pupil-pupil talk, thus creating a dialogic environment that leads to a condition where pupils' learning objectives are achieved more readily, which participants of this research seemed to practise.

However, it was noted from the observation, that pupils' interaction with the board was very limited throughout all the lessons observed. This seems a common practice observed in all lessons. It was only during the fourth stage, which is the activity stage, that pupils' level of interaction with the board was higher. This pattern is similar to an earlier research by Dhamotharan and Abdullah (2006) on the use of the IWB in Brunei Darussalam primary schools. Two schools were involved in the study and twelve IWB lessons were observed followed by interviews with twelve teachers. The study, which was conducted in 2006, focused on the use of the IWB for engaging primary school learners in the teaching and learning of English in Brunei Darussalam primary schools, revealed that teachers used the IWB mainly for whole class teaching. It includes explaining and demonstrating with an attempt to integrate the use of the IWB by calling pupils to the board and asking them to click on the board before returning to their seats. They suggested that it may be because of teachers' lack of knowledge on the potential use of the IWB. Nevertheless, as mentioned in Chapter Three (section 3.3.2), Dillemans et al. (1998) in their work suggest that the level of interaction does not indicate the quality of interaction. They commented that although the frequency of interaction can be a powerful indicator, it must be complemented by the purpose of the interaction in the context of the objectives of learning. Therefore, further investigation on this issue was conducted through the interviews.

As an outcome from further investigation in the interviews, it was revealed that participants felt reluctant to let pupils to interact with the board because they feared that the ActivPen might be damaged and getting a replacement may take a while. This indicated the fear of using technology among participants due to the inadequate technical support. This is consistent with the claim made by Jones (2004) who pointed out that one of the barriers to teachers' ICT use that can have a negative impact on the use of ICT by the teacher is the fear of equipment breaking down or fear of doing damage to the equipment. Additionally, as mentioned earlier in this chapter, participants also reported that they felt reluctant to let pupils interact with the board because the board was mounted at a height too high for pupils to interact with. Further investigation also discovered that majority of the participants did not know how to calibrate the ActivPen, which is basic IWB knowledge. The ActivePen is the only IWB tool provided with the IWB. It was not clear why other IWB tools are not provided despite the ability

of other tools such as a pointing device and a voting device that can get pupils engaged in learning from their seats.

Nevertheless, it can be seen from the observation findings that the majority of the participants used presentation software and none of the participants used any specific IWB software in their lessons. It was also mentioned by one participant who had the opportunity to observe lessons by her colleagues as she was an ICT teacher and occasionally stayed in the ICT lab that often teachers use IWB as they would use an overhead projector. Interview findings also revealed that a participant who no longer used the IWB stated that he used the IWB to teach Science by showing pupils video demonstrations that are time consuming to conduct in a real classroom. This indicated that the participant, who no longer teaches Science used the IWB only for its projection capabilities. This was consistent with the questionnaire findings where 34 out of 75 of the respondents neither agreed nor disagreed that they knew how to use different software with the IWB. Meanwhile, 20 respondents agreed with the statement and 21 respondents disagreed with the statement. This findings indicated the lack of IWB skills and knowledge among primary teachers in Brunei Darussalam. Furthermore, Tanner et al. (2005) suggest in their work that the use of presentational software indicates that teachers are in the early stages of IWB use, with limited interactivity with the board.

It can also be seen through the research evidence that participants who are identified as regular users of IWB did not fully use the available features of IWB, which is important to engage learners in the lesson. This indicates that participants are inexperienced and Levy (2002) suggested that it will reduce the value of the IWB. The interactive features using the pedagogical software such as ACTIVstudio and flipcharts on the board are recognised by Cuthell (2005) to provide the scaffolding where learners can interact with learning materials thus allowing teachers and pupils to move between the different stages of learning. This corresponds with the claim made by Betcher and Lee (2009), that it is the specialised software for the IWB that gives extra functionality to the board. However, findings of this study indicated that the interactive feature of the IWB, which is one of the most cited benefits of IWB mentioned in research, was not fully utilised by participants of this study. Armstrong et al. (2005:459) suggest that:

> … the IWB potentially affords interaction if the teacher perceives that it can be used in this way, and uses appropriate software that also affords interaction. The IWB may not afford interaction if it is perceived as a presentational tool only.

Moreover, as mentioned in Chapter Four, Gage (2005) commented that this might be because of the lack of professional learning and according to the research findings, it was noted that participants of this research felt that they lacked the professional development needed to successfully integrate the use of the IWB in their lessons. This finding also corresponds to claims by Tanner et al. (2005) that the level of interactivity in an IWB lesson depends on the teacher's ability to manipulate the features of IWB. The findings also correspond with the findings of the North Islington Education project where it was noted that the effective use of IWB depends on the degree of teachers understanding on how the resources available can be used to create a positive and challenging experience for learners (Latham, 2002). In other words, teachers should know how to manipulate the board and resources to promote effective learning and not to simply focus on what the board can do. It is also noted that confidence level and competence with technology may influence teachers' practices and this can be greatly influenced by teachers' professional development, which will be discussed further discussed in the next section, where teachers' technological and pedagogical needs will be pointed out. The findings of this research suggested that participants lacked the appropriate IWB skills and knowledge and feared the use of technology due to the lack of technical support.

It has also been seen through the research evidence that participants of this study ran through their lesson presentations quickly. This might cause pupils to have difficulties taking in the information and knowledge presented. This correspons to the findings by Schmid (2008), whose study on the process of multimedia integration using the IWB in English language classroom revealed that students felt overwhelmed when receiving too much information in a short period of time. Additionally, the study revealed that the fast pace of lessons resulted in students having difficulties in understanding the content. This supports Higgins's (2010) view that pace in an IWB lesson should be balanced with pupils' level of understanding. Therefore, as mentioned in the literature (Chapter Four, section 4.3.2) it is also suggested that there is the need to pay more attention to the pedagogical aspects of using technology to be able to create a lesson that will benefit not only teachers but also pupils. The importance of including pedagogical aspects of IWB in professional development programmes will be discussed further in the next section.

As mentioned earlier in Chapter Four (section 4.2.3), the identification of level of practice can help in facilitating the development of further professional development programme to successfully implement IWB in the classroom. It can be concluded from the observation findings of this research that participants were still at the early stage of IWB implementation. As mentioned in Chapter Four (section 4.2.3), according to the 'Substitution, Augmentation, Modification and Redefinition' (SAMR) model (Puentedura, 2012), it can be seen, from the lesson observed and from the interview findings that teachers in Brunei Darussalam are at the Enhancement level of technology integration, where technology is being used as a substitute for previous tools with no or limited functional change or improvement in teaching and learning. Similarly, Betcher and Lee (2009) describe this as Phase One where teachers do not take full advantage of the interactive features of the IWB. This is also because the majority of participants admitted to not sharing resources with others, did not save material at the end of each lesson and used limited IWB tools.

As mentioned in Chapter Three, the IWB can be a valuable tool in education if used effectively. It was also highlighted that the IWB can support teaching and learning in the classroom. The identification of teachers' current practices and the stages they are in from the findings of this research can help determine the level of professional development needed by teachers to be able to successfully implement and integrate the use of the IWB in the classroom. It can be concluded that primary teachers in Brunei Darussalam are still in the early stage of IWB implementation as the lesson observations revealed the limited use of the IWB features by teachers.

8.3.9 Professional Development

As mentioned in Chapter Four, one of the major barriers to the use of technology is the lack of proper training or professional development. It is one of the major factors that can influence the use of technology in schools. It was also highlighted in the literature that professional development is important to make sure that teachers have the competence and the confidence to use technology in the classroom.

Questionnaire findings of this study revealed that the majority of respondents neither agreed nor disagreed with the statement that they had sufficient training or professional development in the use of the IWB for teaching. It was also revealed that only 17 out of

75 respondents of the questionnaire agreed that they had sufficient training. Meanwhile 21 respondents disagreed with the statement (see Table 6.8 in Chapter Six). In addition to that, the majority of the respondents felt that training or professional development programmes encourage teachers to use IWB often and they were also interested in attending pedagogy based training on the use of IWB for teaching. This issue was further investigated in the interviews and findings present evidence that all participants who had received IWB training or attended IWB workshop stated that they were held only when the IWB was newly introduced in primary schools in Brunei Darussalam.

It has also been stated by interview participants of this study that the lack of proper training or professional development is one of the challenges they faced in implementing the use of the IWB in the classroom. Low users and participants who no longer used the IWB also mentioned in the interviews that their lack of IWB skills and knowledge was one of the barriers in using the IWB. This evidence suggests the lack of sufficient professional development received by participants involved in this study. The findings of this study also correspond to the research project conducted by University of Birmingham, which noted the quality of ICT training received by teachers as one of the major factors hindering the use of ICT in schools (Selwood and Pilkington, 2005).

It also appears that only two participants had attended formal IWB training and they stated that they only attended training when the IWB was newly introduced in primary schools throughout Brunei Darussalam. They were then appointed as facilitators to workshops on IWB training for primary school teachers in Brunei Darussalam. Despite attending formal training and acting as facilitator, these participants felt that the training they attended was not sufficient. It was noted that training involved the basic use of the IWB, how the IWB can be used for teaching and using different software and applications that support the IWB features and creating resources to be used with the IWB. Other participants of this research cited staff development at school as their source of IWB knowledge, which was conducted by teachers who attended workshop held by a local facilitator. This was confirmed by interview participants who attended the workshop, who reported that they attended the workshop only once and shared what they learned during staff development at school. Similarly, they also mentioned that it was held when the IWB was newly introduced in primary schools. This findings suggest that professional development in regard to IWB use was not seen as an ongoing process.

Meanwhile, questionnaire findings of this study revealed that the majority of respondents learned how to use the IWB from their ICT teacher (see Figure 6.3 in Chapter Six). This is consistent with the interview findings where a high number of interview participants reported they learned how to use the IWB themselves and from the ICT teacher. Some of these were teachers who started working after IWB was introduced in primary schools in Brunei Darussalam. This indicated the lack of professional development during their pre-service years and the need to provide adequate professional development programmes for both in-service and pre-service teachers. According to UNESCO (2011), the Sultan Hassanal Bolkiah Institute of Education, which is one of the faculties under the University of Brunei Darussalam, aims to prepare primary, secondary and technical school teachers and education administrators for their roles as educators. Their programmes are based on the belief that professional development of teachers as a continuous process, thus providing programmes for pre-service and in-service courses for teachers throughout their careers. Although participants of this study had previously enrolled in programmes under the faculty, none admitted to receiving any professional development programme on the integration of the IWB in the classroom.

There are a number of studies supporting this view and an example is presented by Wright (2005), who recognised a best practice of technology integration plan by The University of Alabama's College of Education. The plan recognised the need for a technology development plan not only for the faculty and in-service teachers but also pre-service teachers. The objectives include sharing technical skills, equipment, and people as well as professional development opportunity. The plan, which involved several programmes and instructional activities, has assisted in the success of promoting and supporting technology use in schools. Therefore, findings of this research suggest that it is essential to create a technology integration plan that involves providing necessary professional development not only for in-service teachers but also pre-service teachers. This is to ensure that they are equipped with the necessary skills and knowledge needed to achieve successful IWB integration in the classroom. The importance of professional development programmes during the pre-service years was discussed in Chapter Four (section 4.3.3) and was also echoed by Davis (2002:255) who states:

> … if schools of education are to use new technology as tool to expand and enhance their teacher education programmes, field sites where pre-service teachers can observe and actively participate in exemplary uses of new technology for learning and teaching must be provided.

In line with questionnaire findings, interview participants of this research showed interest in attending training on the IWB as they felt they had a low level of confidence because of their lack of skills and knowledge of IWB. Participants also expressed the need of continuous training and findings also indicated the different needs of professional development in integrating the IWB in the classroom. It was suggested by participants that training should be conducted based on subject matter and based on teachers' interests and needs, such as basic usage of IWB, creating resources and pedagogical training. It was recognised by Bannister (2010) that IWB software contains various tools that can be used for specific subjects. This concern raised by interview participants corresponds with the claim made by Glover and Miller (2002:6) that "most successful strategy occurred where a technologically and pedagogically competent advisor worked alongside teachers in the development and use of interactive whiteboards within specific subject areas". However, it was also revealed in the interviews of this study that primary school teachers in Brunei Darussalam are not guaranteed to be teaching the same subject every year. This indicates that IWB training should be designed appropriately to meet the changing demands of teachers involved. This is in line with Bates' (1995) recommendation that it is important to determine the training needed for teachers to be able to integrate the use of IWB effectively in the classroom.

Questionnaire findings of this research also revealed that 34 out of 75 respondents neither agreed nor disagreed that they had the know how to use different software with the IWB. A total of 20 respondents agreed with the statement, while 21 respondents disagreed with the statement. Moreover, it has been seen through the lesson observations that none of the participants used any specific IWB software in their lessons despite some of them having previously attended IWB workshops organised by the Ministry of Education. This evidence highlight the low level of skills and knowledge related to the use of the IWB for teaching, which indicates the lack of efficient professional development. It was confirmed by participants in the interviews when they stated that they were not familiar with the IWB software available and felt that they lacked the proper training needed to use the IWB effectively for teaching.

Findings therefore suggest that a suitable professional development programme is central for improvement and the successful integration of the IWB in primary classroom in Brunei Darussalam.

However, interview participants also stated that other factors should also be taken into consideration before attending any professional development. These are availability of hardware itself and the time available for them to attend professional development. This is consistent with Clarke's (2006) view that one of the main barriers for attending professional development is time, as it needs to be fitted into the existing busy life of teachers. Therefore, teachers should be given adequate and suitable time allocated to attend professional development. Additionally, they should also be given adequate time to prepare and plan their lessons, as well as access to the board itself to be able to use IWB to its maximum potential after attending professional development programme. This is in line with Glover and Miller's (2002) recommendation that sufficient time should be allocated to teachers to enable them to plan their lessons and develop resources that can be geared into interactivity when using IWB. This also corresponds to the research by Cuban et al. (2001) who studied two schools, that outstanding access to technologies does not guarantee frequent use. From the study they conducted, they found two common reasons for limited and infrequent use of technology in the classroom where access is not a problem. The first reason is the lack of time teachers have to find and evaluate software and the second reason is that software training not available at convenient times for teachers to attend. Therefore, other than access, factors such as time allocated for professional development programmes and the development of practice, which was mentioned in Chapter Four should also be taken into consideration before making further development strategies.

Nevertheless, findings of this study indicated that all factors in relation to training appear to be beyond teachers' control. The lack of sufficient training resulted in less confident teachers, thus making them feel reluctant to use the IWB. This supports Jones's (2004) view that insufficient training received by teachers will lead to low levels of confidence, which eventually will result in teachers not using technology to its maximum potential. Findings of this study also suggest that it is also important to include two aspects of training to successfully implement the use of IWB in primary classrooms in Brunei Darussalam, which are the technical and pedagogical training of IWB, as highlighted earlier in Chapter Four (section 4.3.2). It was stated by Cox et al.

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(1999) that ICT professional development courses where the focus is only on technical aspects of ICT will result in teachers not knowing how to use technology for teaching but only how to fix and run certain software with the technology. This indicates the importance of both aspects of training for successful implementation of technology such as IWB for teaching. This is also supported by Beauchamp and Parkinson (2005), who state that it is also important to change teacher's own practices in developing long-term changes in learning with the support of the IWB in the classroom. Therefore, the findings of this study suggest that there is a need to meet the professional development needs for the successful implementation of IWB by taking into account both technical and pedagogical issues.

It can be concluded that there is a need to provide primary teachers in Brunei Darussalam with professional development programmes that reflect their needs in order to successfully integrate the use of the IWB effectively in the classroom. This was highlighted in Chapter Three (section 3.3) where it was also stated that Joyce and Showers (2002) identify four different components of effective training that focuses on knowledge, modelling, practice and peer coaching. Additionally, they claim that a successful professional development will need trainers to identify the level of current practices to be able to plan and create appropriate training and components to be used. Malderez and Wedell (2007) made a similar claim in relation to providing professional development which is suitable for teachers and state that one of the reasons why many reforms fail is because programmes are designed without taking into account teachers' actual needs.

As an outcome from the findings discussed in this section, it is argued that primary school teachers in Brunei lack sufficient professional development in order to use the IWB effectively in the classroom. This is supported by a low mean score in Table 6.11 (Chapter Six), which indicated a low level of agreement by respondents of the questionnaire to the statement that they have had sufficient training or professional development in the use of the IWB for teaching. It appears that training had a significant impact on the successful implementation of the IWB in primary schools in Brunei Darussalam. These findings correspond to other research, which noted the importance of professional development (BECTA, 2004; Armstrong et al., 2005). As mentioned earlier in this section, evidence emerging form this study also indicated that training or professional development was only conducted when the IWB was newly

introduced in primary schools in Brunei Darussalam and was not compulsory. In addition to that, findings of this study fully support the importance of receiving continuous professional development programmes in order to successfully integrate the use of IWB for teaching and learning. This is also recommended by Wright (2005) as technology changes rapidly. Thus there is a need for the education system to be aware of the latest technological needs to prepare teachers to use and integrate technology successfully in the classroom. As suggested by Hall and Higgings (2005), continuous professional development can help teachers maintain and develop their skills.

Findings of this research also acknowledge that regular professional development is needed both in the technical and pedagogical aspects of the IWB. Nevertheless, continuous professional development should also identify both in-service and pre-service teachers' needs, which can enhance teachers' knowledge and skills to effectively integrate the use of the IWB in the classroom. It is also suggested by Kennewell et al. (2008:64) that technology on its own "cannot (yet) provide the sustained, contingent, reciprocal and reflective qualities of classroom interaction that we associate with improvements in learning". The quality is said to be highly dependent on teachers; hence the need to equip teachers with the essential skills and knowledge for the successful implementation of technology in the classroom. This is also in line with Farrell's (1999) recommendation that it is better to have less hardware available in schools and effectively used by teachers who are highly trained, than to have more hardware available that is underused or used ineffectively by teachers who lack skills and confidence. However, it is still important that teachers have the resources readily available for them, including the hardware and software, as King (2003) suggested that it will enable teachers to apply what they have learned during professional development into practice.

8.4 Summary of Discussion

The aim of this study is to investigate the best practice that can be incorporated to assist the effective use of the IWB in primary classroom in Brunei Darussalam. Therefore, as mentioned in Chapter One, this study involved investigating teachers' perceived benefits of IWB; teachers' level of training; teachers' knowledge and current practices of IWB; and teachers' attitudes. This chapter discussed the findings in relation to the research questions and literature reviewed in Chapters Three and Four of this thesis. It

has been noted earlier in this chapter that it seeks to integrate both quantitative and qualitative findings of this study to answer questions addressed in this research. This chapter has highlighted the issues arising from the findings presented in Chapters Six and Seven in relation to the implementation of the IWB in the primary classroom in Brunei Darussalam.

It was evident from the research findings that accessibility can influence the frequency of IWB usage by teachers. It was also one of the contributing factors cited by participants of this study as what encourages them to use the IWB. Participants reported better access to the hardware itself as a major reason for their usage. Additionally, they were teachers who had better ICT skills as they also taught ICT as a subject. It is also concluded that participants of this study generally had a positive attitude towards the use of the IWB in the classroom and were aware of the benefits of the IWB for teaching and learning. It is also apparent from the research findings that their positive attitude is also one of the factors that contributed to the uptake of IWB for teaching. However, Hall and Higgins (2005) in their work suggested that teachers should be able to use the IWB effectively with confidence if they realise the potential of IWBs, which is not consistent with the findings of this study. Findings have been drawn from the analysis that despite having positive attitudes towards the implementation of IWBs, participants showed a lack confidence and the lack of IWB skills and knowledge in integrating the IWB in classroom practice. Evidence of the research, however, indicates that it was because of the inadequate professional development and support received.

Additionally, participants of this study highlighted a number of barriers and challenges they faced in integrating the use of the IWB for teaching, which hindered the successful integration of the IWB in their lessons. The barriers and challenges faced by teachers ought to be taken into consideration before making further decisions in relation to the implementation of the IWB in the classrooms. Overcoming these barriers will allow the successful integration of the IWB in the future. It was prominent that barriers and challenges faced cited by majority of the participants include access to the board; the lack of IWB skills and knowledge; lack of time for training; lack of time to plan and prepare lessons using the IWB; pragmatic issues; and the lack of technical support and assistance. Analysis of current practices on the use of the IWB also revealed the need for appropriate professional development in terms of the technical and pedagogical aspects of IWB among participants.

All issues mentioned above should not be taken lightly, as they can influence the successful integration of the IWB in classroom. Although increasing access may improve the uptake of IWB use, it does not necessarily mean that it will be used to its full potential. Therefore as suggested in the literature and the research findings, the factors emerging from the data collected that was mentioned above should be taken into consideration before making further investment in IWB. They should be addressed to ensure the successful integration of the IWB in the classroom.

As mentioned in Chapter Four, change and improvement such as implementing technology in education usually focus on the technology itself and ways to improve students' learning. However, it is equally important to look into change management strategies as this can facilitate the successful implementation of technology, such as the IWB. In addition to that, a significant feature of this research was the need to implement effective change management strategies that should be included in any developmental projects such as the implementation of technology in education. As mentioned in Chapter Four, the change management model used for this study were Concerns-Based Adoption (CBAM) model and the instructional evolution model (see Chapter Four, section 4.2.3), SAMR model of technology integration model (see Chapter Four, section 4.2.3) and the Technology Pedagogical Content Knowledge (TPCK) by Mishra and Koehler (see Chapter Four, section 4.3.1). These models were used to identify teachers' concern, teachers' level of IWB integration as well as teachers' current knowledge of the IWB to be able to assist them to successfully integrate IWB in the classroom. It was evident from the research findings that teachers are still at the early stage of change of IWB implementation based on the CBAM model and the instructional evolution model as their concerns are mainly on the physical environment, technical problems and software management issues.

Furthermore, as mentioned in Chapter Four (section 4.2.3), teachers go through phases in implementing and adapting the use of technology. Research findings indicate that participants of this study are still at the early stage of implementation based on the SAMR model of technology integration as mentioned in Chapter Four (section 4.2.3). This is because teachers involved in this study did not take full advantage of the IWB features due to the lack of support and inadequate professional development. As mentioned in Chapter Four, this indicates that teachers are at the substitution stage of

the SAMR model, where technology are being used as a substitute of previous tools with no functional change or improvement. Additionally, findings of this research based on the TPCK framework by Mishra and Koehler indicates that teachers' knowledge are only based on content, technology and pedagogical knowledge. This suggests a lack of technological pedagogical content knowledge, which is needed to successfully integrate the use of technology in the classroom.

It can be concluded that there is a need to address teachers' concerns and needs in implementing technology such as the IWB in the classroom. This is because, as mentioned in Chapter Four (section 4.2.3), when concerns and needs are addressed, it will encourage people to work for a change as they are able to develop meaning for the complex process of change. It is also important to look into teachers' level of technology implementation and their level of IWB skills and knowledge as mentioned earlier to be able to identify the professional development needs as well as support needed by teachers to be able to assist the effective integration of the IWB in the primary classroom. By looking into the literature discussed in Chapters Three and Four and taking the findings of the investigation into account, several recommendations were developed to assist the effective use of IWB in primary schools in Brunei Darussalam and will be presented in the next chapter.

CHAPTER NINE: RECOMMENDATIONS AND CONCLUSION

9.0 Introduction

It has been discussed in the literature review (Chapter Three) that the use of the IWB can be beneficial in the classroom if used effectively. However, as discussed in both Chapters Three and Four, there are issues that need to be taken into consideration to ensure the successful implementation of the IWB in the classroom. The previous chapter drew together findings for this research based on the questions addressed for this study from three different research instruments, which are the questionnaire, lesson observations and interviews. The study was conducted in seven selected primary schools in Brunei Darussalam. A total of 75 teachers participated in the questionnaire. In addition to that, seven lesson observations were conducted with regular IWB users and a total of sixteen interviews were conducted with regular and low IWB users as well as teachers who no longer use the IWB. This chapter will present the recommendations that are made based on the research findings of this study. The conclusion of this study will also be presented in this chapter.

9.1 Recommendations

From the research that was conducted in seven selected primary schools in Brunei Darussalam, several recommendations are made to help improve the integration of the IWB in the primary classroom. The recommendations are developed for teachers, headteachers, school administrators and the Ministry of Education.

9.1.1 The IWB classroom

It is noted from the literature and the findings of this study that there are various issues that can influence the use of the IWB in the classroom, which include the classroom environment. Therefore, based on evidence of this study, several suggestions are made and should be taken into consideration before investing further into the technology.

Before installing the IWB, it should be noted that the location of the room where the IWB is installed may influence the uptake of the IWB by teachers. This is especially true when there is a need to move pupils from one room to another. Therefore, the room where the IWB is installed should be at a location that is convenient for all teachers and pupils. The size of the room should also be taken into consideration as there is a need for appropriate room size to organise the classroom and pupils when the IWB is in use to be able to use the IWB to its maximum benefit. There should be enough space for pupils to gather in front of the board and for pupils to interact with the board.

In addition to that, the IWB should be mounted at a height that can be reached by both pupils and teachers to ensure that pupils can easily interact with the board. The room where the IWB is installed should also be installed with blind curtains to ensure that it projects high quality visuals that are not affected by the sunlight. Additionally, other than providing the ActivePen, there are other tools that can be provided to support teaching and learning in the classroom such as the voting device. In addition to that, it is also important to ensure that the IWB is connected to a reliable internet source for ease of use as teaching resources can be stored and obtained online. A proper audio output is also vital to enable teachers to show pupils useful video presentations during their lessons. The factors mentioned are important to ensure that the IWBs can be used easily and seamlessly by teachers as a step towards an effective use of the IWB in the classroom.

9.1.2 Improve Access to Hardware and Software

It was evident from the research findings that one of the major problems faced by the teachers in using the IWB is access to the IWB itself (see Chapter Seven, section 7.3.1). It was also concluded in Chapter Eight (section 8.3.2) that accessibility is linked with the frequency of IWB usage in primary schools in Brunei Darussalam. Therefore, there is a need to create an environment where access is not an impediment to encourage the use of the IWB for teaching and learning.

It has also been noted that most primary schools in Brunei are only provided with one IWB, despite the different number of pupils in each school. All IWBs are also installed in the ICT lab, in which priority of using the lab is given to ICT lessons. Therefore, primary schools in Brunei Darussalam, especially schools with larger populations and

number of classes, should be provided with more than one IWB to allow easy access to the board. This will give teachers of other subject areas better access to the IWB.

Additionally, as mentioned in the Chapter Eight (section 8.3.2), poor organisation of resources, including the hardware can also be a problem even if schools are provided with sufficient IWBs. It is evident from the research findings that a proper organisation of the hardware where a timetable was provided to give teachers equal opportunity to use the IWB resulted in the improvement on the frequency of IWB usage by teachers. Therefore, although in the long term there will still be a need to provide more IWBs, at present, schools can improve the use of the IWB through better organisation of the hardware. However, school administration and headteachers play an important role to ensure better organisation of the IWBs in their respective schools. This will give teachers a better opportunity to use the IWB for teaching. Furthermore, there is also a need to make software accessible to teachers and not to have it only available in the ICT lab where the IWB is installed. This is to enable teachers to create resources with the IWB software easily without the need to be in the ICT lab. Nevertheless, the improvement of access to both hardware and software will allow teachers to explore and develop necessary skills to use the IWB effectively for teaching. Additionally, this will also help in raising confidence levels among teachers, hence improving and increasing the use of IWB for teaching and learning.

9.1.3 Provide Effective Professional Development programmes

As mentioned in the literature (Chapter Four), teachers who have attended professional development programmes are more confident to use technology in the classroom. As discussed in the Chapter Eight, the majority of the teachers admitted their lack of confidence was due to their lack of skills and knowledge of the IWB. Findings of this study also revealed that IWB training was conducted when the IWB was newly introduced. It was mentioned in Chapter Four (section 4.3.3) that a one-time workshop is not sufficient for teachers to successfully implement the use of technology in the classroom.

Therefore, the Ministry of Education in Brunei Darussalam, which is responsible for providing training and professional development programmes for teachers, should consider investing in professional development programmes that should be seen as a

continuous process. Teachers should be provided with regular professional development opportunities to develop their skills and knowledge and they will also need to be updated with the latest information on IWBs. Additionally, there is also a need to provide programmes for pre-service teachers where they could experience the use of IWBs before integrating the IWBs in their lessons. Therefore, the Sultan Hassanal Bolkiah Institute of Education, which is one of the faculties under the University Brunei Darussalam that aims prepare primary, secondary and technical school teachers and education administrators for their roles as educators should consider designing programmes for both in-service and pre-service teachers that involve the skills and knowledge needed to successfully integrate the use of the IWB in the primary classroom.

However, there is a need to identify the professional development needs of teachers for successful integration of the IWB in the classroom. Findings of this research suggest that teachers' level of IWB knowledge based on the 'Substitution, Augmentation, Modification and Redefinition' model or SAMR (Puentedura, 2012) model is at the substitution level of technology integration, where the IWB is being used as a substitute for previous tools with no or limited functional change or improvement in teaching or learning. According to the Technological Pedagogical Content Knowledge (TPCK) framework (Mishra and Koehler, 2006), at this stage teachers' knowledge is only based on content, technology and pedagogical knowledge.

The identification of the stage mentioned above helps determine the level of professional development or training that teachers have received. Therefore, this information will help implementers in designing professional development programme that suit the needs of primary teachers in implementing the use of the IWB in the classroom. Furthermore, findings of this study point towards the importance of providing teachers with both technical and pedagogical knowledge of the IWB. It is noted from the literature (Chapter Four) that both technical and pedagogical knowledge are important to ensure the effective use of the IWB in the classroom. Therefore, professional development programmes should be designed by taking into account both technical and pedagogical aspects of the IWB. Teachers will need to learn the basic skills of IWBs to be able to operate and use the IWB in the classroom. In addition to that, teachers will also need to learn pedagogical skills to use the IWB effectively to support teaching in the classroom.

According to majority of the experts in the use of ICT in education interviewed by Dillemans et al. (1998), the required content of teacher training, which the Ministry of Education should take into consideration are:

- teacher training programmes should be designed to motivate teachers and transform their negative attitudes to positive beliefs that teaching will be enhanced by the introduction of new technologies;
- and the priority of teacher training programmes should be on providing teachers with the correct pedagogical skills to use technology in their own lessons.

9.1.4 Provide Support for Teachers

Support is one of the most important ingredients in ensuring that change is successful. There is a need for primary school teachers to be supported throughout the implementation process in order to successfully integrate the use of the IWB effectively in the classroom. Evidence of this study indicates that primary teachers received a lack of support in integrating the use of the IWB in their lessons. Therefore several recommendations are made based on the concerns raised by participants of this study and are described below.

Support from School Leaders

School leaders should support teachers in integrating the use of the IWB in any way possible. School administration including headteachers play an important role in ensuring the successful integration of the IWB in the classroom. Headteachers should create a vision to encourage teachers to use the IWB. In addition to that, they should create and inform teachers of realistic instructional goals to allow teachers to work together and achieve the desired goals. Headteachers should also provide support when necessary and convince teachers of the benefits of the IWB.

Technical Support

The lack of technical support is seen as one of the challenges teachers faced in integrating the use of the IWB in the classroom. It was also revealed in the findings (see Chapter Seven, section 7.3.6) that participants stated the need to call the IWB vendor directly for problems with the IWB and the ICT department of the Ministry of Education for problems with any other ICT equipment in schools. In addition to that,

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participants complained that responses to technical glitches were usually not received in a timely manner. Therefore, it is recommended that the Ministry of Education should invest in improving technical support to ensure the effective use of technology including the IWB in primary schools in Brunei Darussalam. A proper call centre for complaints and problems should be set up to manage problems arising at schools in relation with the IWB as well as with other technologies available in schools. An ICT co-ordinator, who is responsible for managing, monitoring and reviewing ICT could be appointed in each school to ensure that resources are managed efficiently. In addition to that, an ICT co-ordinator could also be responsible for assisting teachers in using technology in the classroom.

Furthermore, findings of this study revealed that ICT equipment including the IWB provided in schools is poorly maintained. Therefore it is important that hardware should also be maintained to ensure that there will be fewer technical glitches occurring due to outdated hardware. Hardware should also be replaced or updated regularly to keep up to date with the rapid change of technology. This is important to ensure that teachers are able to integrate the use of technology effectively in the classroom.

Support after Initial Training

It is important that teachers should receive support in implementing the use of technology in the classroom. This includes after attending initial training. Findings of this study revealed the lack of support that teachers received from both school and implementers in integrating the use of the IWB in the classroom and this includes after attending training and workshops. Therefore, one way of ensuring that teachers are supported in implementing the use of the IWB effectively in the classroom is through mentoring and coaching.

A team of support staff could be appointed in each school to coach and mentor teachers as a way to help and support teachers implement the use of IWB after attending professional development. Other alternative is by providing outside experts or consultants for each school who will be assigned to provide support and coach teachers from respective schools. Mentoring or coaching will be able to ensure that the skills developed from attending professional development are put into practice and the use of the IWB is continuous.

9.1.5 Provide Relevant Teaching Resources

As mentioned in Chapter One, the Curriculum Development Department (CDD) is responsible for providing educational materials for classroom use. It was noted that the ICT department is also responsible for ICT based teaching and learning resources for schools throughout Brunei Darussalam. Both departments should cooperate and collaborate in providing more relevant resources for teachers to be able to integrate the IWB into the existing curriculum. According to Picciano (2006), planning for technology requires the involvement of the people who will use the technology itself. Therefore, teachers should also be involved in designing and creating teaching resources to ensure that the resources are suitable for classroom needs. This is to ensure that teaching resources are designed to suit the curriculum needs in Brunei Darussalam primary classrooms.

In addition to that, it was also revealed in this study that primary school teachers do not share their IWB resources and found that creating IWB resources can be time consuming. Therefore, there is a need to encourage a sharing culture among them for their mutual benefit. Primary school teachers should collaborate and cooperate in creating teaching resources to be used in an IWB classroom for their own benefit, as it can reduce time taken to prepare the IWB resources as shared resources can be used and edited by other teachers. This will be useful as primary teachers in Brunei Darussalam do not necessarily teach the same subject every year, hence the need to provide them with resources that they can easily use and edit when they are given new subjects to teach. With the increasing connectivity through the World Wide Web, teachers can easily maintain a close relationship and share their resources through social networking sites. There is also a need to ensure that teachers can easily access the resources available.

It was also seen from the Ministry of Education website (http://moe.gov.bn) that there are useful and interesting websites that are shared by the ministry for primary teachers, which can be used in an IWB lesson. However, none of the websites are specifically based on the primary curriculum in Brunei Darussalam. Thus, it is recommended that the resources made available online should be expanded and should include resources that are relevant and suitable for teaching and learning in Bruneian's primary classroom. Teachers of this study also stated that there are educational websites that can be used in

an IWB lesson, but which could not be accessed from school, thus indicating the need to review the filtering of relevant websites in primary schools by involving teachers in the decision making. Furthermore, this study also revealed that the limited resources provided for the use of IWB are only for core subjects, especially Mathematics and Science. Therefore, the Ministry of Education should consider providing resources for other subjects across the curriculum to ensure the successful implementation of the IWB in the classroom.

9.1.6 Reduce Teachers' Workload

It should be noted that in the teaching profession, teachers are responsible for preparing and planning their everyday lessons; teaching in the classroom; marking; and evaluating their lessons. A common situation in primary schools in Brunei Darussalam is that teachers teach a minimum of 25 periods and a maximum of 31 periods a week. In addition to that, primary teachers are also responsible for other additional duties such as administrative and non-curricular duties. Workload is even greater for teachers who hold certain positions in the school, such as a class teacher or head of department. As a result of this, teachers felt that they do not have enough time to prepare and plan an IWB lesson or attend professional development on the use of IWB.

Therefore, it is suggested that teachers' workload should be reduced to be able to allocate time for them to attend professional development in regards to the use of IWB in the classroom. Additionally, teachers will also need sufficient time to practise the use of the IWB and develop appropriate skills needed for its effective use. Teachers also need time to prepare resources and lessons to be used in an IWB classroom. Furthermore, time is also needed for teachers to evaluate their lessons as well as time for marking pupils' work.

9.1.7 Evaluation and Feedback

Findings of this research revealed that no additional support in relation to the implementation of the IWB has been provided after it was introduced in 2005. Findings of this study suggest that there is a need to have a regular consultation with people involved in the change process, which are school administrators, teachers, curriculum and resources developers, vendors and implementers to ensure that goals and objectives

are achieved. Furthermore, implementers would also be able to evaluate the implementation process and address concerns of people involved especially the teachers for further development plan and improvement. As stated in the previous chapter, this will also help influence people to work for a change. Furthermore, it will also help in sustaining new practices by teachers involved in the change process.

9.1.8 Further Research

This study provides several insights for further research on the implementation of technology such as the IWB in primary schools in Brunei Darussalam. Research findings show that further research needs to be undertaken to be able to successfully integrate the use of the IWB in the primary classroom in Brunei Darussalam. This study is limited only to primary schools located in the Brunei Muara district and due to the limitation of this study, only seven government primary schools were involved. Such study should be conducted by involving more schools and by considering schools of different districts in Brunei Darussalam. In addition to that, research should also include private schools in Brunei Darussalam. The most interesting point for further research, which was made by several participants of this study is the professional development needs. Therefore, it could be beneficial to conduct a research that focuses on assessing and identifying the professional development needs of primary teachers to implement the use of the IWB effectively in the classroom.

9.2 Conclusion

It was presented in Chapters Three and Four that the IWB can be a powerful tool in the classroom if used effectively. The main focus of this section was to address the main research question for this research which is: "What is the best practice that can be incorporated to assist the effective use of the IWB in primary classroom in Brunei Darussalam?". In order to answer the research question, sub questions were developed and were investigated in this study. The findings in relation to the research questions addressed in this study are presented below.

1) What is the current level of IWB practice by primary school teachers?
The current level of the IWB practice by primary school teachers in Brunei Darussalam based on the different models presented in Chapter Four is that they are at the early

stages of technology implementation. This involved teachers not using the IWB to its full potential and not taking full advantage of the IWB features due to the lack of support and inadequate professional development received. Based on the SAMR model (Puentedura, 2012), primary school teachers in Brunei Darussalam are at the enhancement level, where according to the TPCK framework by Mishra and Koehler (2006) at this stage teachers' knowledge is only based on content, technology and pedagogical knowledge. This suggests that teachers lack the technological pedagogical content knowledge to successfully integrate the use of the IWB effectively in their lessons.

2) What are the attitudes of primary school teachers towards the integration of the IWB in the classroom?

Participants of this study generally have positive attitudes towards the integration of the IWB and perceived the IWB as beneficial for teaching and learning in the classroom. There was no noticeable difference that was noted in between participants who are regular users, low users and no longer using the IWB when expressing their positive views. Nevertheless, there is no significant relation between teachers' attitude and their IWB competence. As indicated in the previous chapter, despite having positive attitudes towards the integration of the IWB in the classroom, participants of this research showed their lack of confidence, skills and knowledge to effectively implement the use of the IWB for teaching and learning. As mentioned in Chapter Eight, this was because of the inadequate professional development and support received by the teachers.

3) What encourages primary school teachers to use the IWB in the classroom?

Interviews were conducted with regular IWB users to find out what encourages them to use the IWB despite the barriers and challenges they faced in integrating the IWB in their lessons. One of the main factor that encourages participants to use the IWB in the classroom is access to the board itself. It is apparent that teachers who are regular users of the IWB have better access to the board as they also teach ICT as a subject, which suggests that they are teachers with ICT skills. Additionally, it was noted from the findings that their schools have better organisation of the technology, where a proper timetable is provided, giving teachers equal opportunity to use the IWB. Another encouraging factor is that participants find the use of the IWB to be beneficial for teaching and learning in the classroom. It was also revealed that participants felt the

interesting features of the IWB allow them to create more interesting lessons and they mentioned it as one of the factors that also encourages them to use the IWB for teaching.

4) What are the barriers and challenges faced by primary school teachers in integrating the use of the IWB in the classroom?

The most common barriers and challenges faced by teachers in integrating the use of the IWB in the classroom are listed below:

- *Lack of access to the Hardware and Software*

Findings revealed that the IWB are not always accessible as it is installed in the ICT lab, where priority is given to ICT lessons. This limits teachers' access to the board itself. Additionally, teachers felt that the location where the IWB is located is inconvenient. Findings also revealed that IWB software are not available for personal use and is only accessible in the ICT lab where the IWB are located.

- *Lack of IWB Skills and Knowledge*

Findings revealed that participants felt they lack the skills and knowledge to integrate the use of the IWB effectively in their lessons. Participants of the observation who are regular IWB users also admitted to not knowing how to use IWB software, which resulted in their use of presentational software. Similarly, interview participants who are low IWB users and no longer using the IWB also reported their lack of IWB skills and knowledge. This has led participants to feel reluctant to use the IWB for teaching.

- *Lack of Support*

The lack of technical support is one of the barriers mentioned by participants of this study. As a result of this, teachers developed fear in using the technology as they are afraid of technical glitches that they might encounter. Participants also stated that the lack of additional support and assistance in implementing the IWB in their lessons after it was introduced was one of the challenges they faced.

- *Lack of Time*

Participants of this study felt that they do not have sufficient time to attend professional development as well as to prepare IWB lessons and resources due to their teaching and non-teaching workload.

- *Pragmatic Issues*

Pragmatic issues that were mentioned by participants of this study, which affect their IWB use are the height of the IWBs are mounted; blackout curtains not properly installed; internet connectivity issues; and problems with hardware and software.

According to the Concerns-Based Adoption Model (CBAM) model and the instructional evolution model (see Chapter Four, Section 4.2.3), the findings of this research indicate that teachers are still at the early stage of change when IWB is implementated. This is indicated by the concerns addressed by participants of this research, which are the physical environment, technical problem and software management issues.

5) What is the level of training received by primary school teachers in Brunei Darussalam?

It is evident that participants of this research did not receive sufficient training or professional development. IWB training was also conducted only when the IWB was newly introduced in the education system of Brunei Darussalam. Additionally, formal training was only attended by selected teachers who were then appointed as facilitators to conduct workshops on the IWB for primary school teachers in Brunei Darussalam. Findings also indicated that professional development on the use of the IWB in the classroom was not conducted on a regular basis. It is also noted that teachers had not received any professional development on the use of the IWB during their pre-service years, despite the introduction of the IWB in primary schools throughout Brunei Darussalam. In addition to that, it can be seen that teachers lack not only the technical skills to be able to use the IWB effectively in classroom but they also lack pedagogical skills, indicating the lack of efficient training or professional development.

6) What support have primary school teachers in Brunei Darussalam received in relation to the use of the IWB in the classroom?

This research indicated that primary school teachers in Brunei Darussalam received minimal support in integrating the use of the IWB in the classroom. Although teachers are verbally encouraged to integrate the use of IWB in the classroom, teachers felt that they lack the proper support needed to be able to put skills and knowledge into practice.

Findings revealed that no support was given after initial professional development to help teachers to implement what they have been taught.

9.3 Summary

Findings of this research show that primary school teachers in Brunei Darussalam generally have a positive attitude towards the implementation of the IWB in the classroom and are willing to attend professional development on the use of IWB for teaching and learning. Based on evidence gathered from this study, it is hoped that information and issues addressed by participants involved would be taken into consideration before investing further in the technology. It is also presented in this chapter that with a proper support mechanism throughout the implementation process, implementers can assist teachers to integrate the use of the IWB effectively for teaching and learning in primary classrooms in Brunei Darussalam.

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APPENDICES

APPENDIX A: Questionnaire Cover Letter

<div align="right">UNIVERSITY OF Hull</div>

Dear respondents,

I am a PhD student at the University of Hull, United Kingdom and I am a Brunei Government sponsorship holder. I am conducting a research on primary teachers' perceptions on Interactive Whiteboards (IWB) in Brunei Darussalam. The aim of this research is to find out about teachers' knowledge related to the use of the IWB in classrooms; attitudes of teachers towards the use of IWB in classrooms and teachers' practices with usage of IWB in classrooms throughout primary schools in Brunei Darussalam.

Attached with this letter is a questionnaire that asks a variety of questions about the perception on the use of IWB. The questionnaire should take you about 10-15 minutes to complete and your participation is voluntary. All questionnaires received will be held as strictly confidential.

Thank you in advanced for your participation.

If you have any further questions or concerns regarding the questionnaire, you may contact me at +673-8657711 / +447926128542 or by email at hjh_ain@hotmail.com / H.N.Jamain@2010.hull.ac.uk

Yours sincerely,

Hajah Noraiman Al-Ain Binti Haji Jamain
PhD Education
University of Hull
United Kingdom

The contact details of supervisors are: Dr. Trevor Male Email:
t.d.male@hull.ac.uk Tel: 01482-465224 / Kevin Burden Email:
k.j.burden@hull.ac.uk Tel: 01482-466731

APPENDIX B: Consent Form (Institution)

THE FACULTY OF EDUCATION ETHICS COMMITTEE
CONSENT FORM: For Institutions/Organisations

___

I, ………………………………………………….…………………….of ……………………………………………………

Hereby give permission for …………………………………………………........................

To be involved in a research study being undertaken by HAJAH NORAIMAN AL-AIN BINTI HAJI JAMAIN and *I understand that* the purpose of the research is to find out about teachers' knowledge related to the use of interactive whiteboard in classroom; perceptions and attitudes of teachers towards the use of IWB in classrooms and teachers' practices of IWB in the classroom throughout primary schools in Brunei Darussalam.

and that the involvement for the institution means the following: -

I understand that

1. the aims, methods, and anticipated benefits, and possible risks/hazards of the research study have been explained to me.
2. I voluntarily and freely give my consent for the institution/organisation to participate in the above research study.
3. I am free to withdraw my consent at any time during the study, in which event participation in the research study will immediately cease and any information obtained through this institution/organisation will not be used if I so request.
4. I understand that aggregated results will be used for research purposes and may be reported in scientific and academic journals.

I agree that

5. the institution/organisation **MAY / MAY NOT** be named in research publications or other publicity without prior agreement.
6. **I / WE DO / DO NOT** require an opportunity to check the factual accuracy of the research findings related to the institution/organisation.
7. **I / WE EXPECT / DO NOT EXPECT** to receive a copy of the research findings or publications.

The contact details of the researcher are: hjh_ain@hotmail.com / H.N.Jamain@2010.hull.ac.uk or tel. +673-8657711 / +447926128542

The contact details of the secretary to the Faculty of Education Ethics Committee are Mrs J.Lison, Centre for Educational Studies, University of Hull. Cottingham Road, Hull, HU6 7RX. Email: J.Lison@hull.ac.uk tel. 01482-465988.

APPENDIX C: Consent Form (Questionnaire)

**THE FACULTY OF EDUCATION ETHICS COMMITTEE
CONSENT FORM: (QUESTIONNAIRE)**

I, ………………………………………………..…………….. of …………….………………………………………………………

Hereby agree to participate in this study to be undertaken

by **HAJAH NORAIMAN AL-AIN BINTI HAJI JAMAIN**

and *I understand that* the purpose of the research is to find out about teachers' knowledge related to the use of interactive whiteboard in classroom; perceptions and attitudes of teachers towards the use of IWB in classrooms and teachers' practices of IWB in classroom throughout primary schools in Brunei Darussalam.

I understand that

1. Upon receipt, my questionnaire will be coded and my name and address kept separately from it.
2. Any information that I provide will not be made public in any form that could reveal my identity to an outside party i.e. I will remain fully anonymous.
3. Aggregated results will be used for research purposes and may be reported in scientific and academic journals.
4. Individual results will not be released to any person except at my request and on my authorisation.
5. That I am free to withdraw my consent at any time during the study in which even my participation in the research study will immediately cease and any information obtained from me will not be used.

Signature: ………………………………………………….   Date: …………………………………………………

The contact details of the researcher are: hjh_ain@hotmail.com / H.N.Jamain@2010.hull.ac.uk or tel. +673-8657711 / +447926128542

The contact details of the secretary to the Faculty of Education Ethics Committee are Mrs J.Lison, Centre for Educational Studies, University of Hull. Cottingham Road, Hull, HU6 7RX. Email: J.Lison@hull.ac.uk tel. 01482-465988.

APPENDIX D: Consent Form (Observation & Interview)

THE FACULTY OF EDUCATION ETHICS COMMITTEE
CONSENT FORM: (OBSERVATION AND INTERVIEW)

___

I, ………………………………………………..…………….. of …………………………………………………………………

Hereby agree to participate in this study to be undertaken

by **HAJAH NORAIMAN AL-AIN BINTI HAJI JAMAIN**

and ***I understand that*** the purpose of the research is to find out about teachers' knowledge related to the use of interactive whiteboard in classroom; perceptions and attitudes of teachers towards the use of IWB in classrooms and teachers' practices of IWB in classroom throughout primary schools in Brunei Darussalam.

I understand that

1. the aims, methods, and anticipated benefits, and possible risks/hazards of the research study, have been explained to me.
2. I voluntarily and freely give my consent to my participation in such research study.
3. I understand that aggregated results will be used for research purposes and may be reported in scientific and academic journals.
4. Individual results will not be released to any person except at my request and on my authorisation.
5. I am free to withdraw my consent at any time during the study, in which event my participation in the research study will immediately cease and any information obtained from me will be used.

Signature: ……………………………………………………….   Date: …………………………………………………

The contact details of the researcher are: hjh_ain@hotmail.com / H.N.Jamain@2010.hull.ac.uk or tel. +673-8657711 / +447926128542

The contact details of the secretary to the Faculty of Education Ethics Committee are Mrs J.Lison, Centre for Educational Studies, University of Hull. Cottingham Road, Hull, HU6 7RX. Email: J.Lison@hull.ac.uk tel. 01482-465988.

APPENDIX E: Ethical Approval Letter

UNIVERSITY OF Hull

ETHICAL PROCEDURES FOR RESEARCH AND TEACHING
IN THE
FACULTY OF EDUCATION

PERMISSION TO PROCEED WITH RESEARCH: ETHICAL APPROVAL

Reference Number:	10/320
Name:	Hajah Noraiman Al-Ain Binti Haji Jamain
Programme of Study:	PhD Education
Research Area/Title:	Teacher's views/perspectives on the use of interactive whiteboard in primary schools in Brunei Darussalam
Image Permission Form	N/A
Name of Supervisor:	Dr Trevor Male
Date Approved by Supervisor:	17 May 2011
Date Approved by Ethics Committee:	2 June 2011

APPENDIX F: Questionnaire

Please read carefully before starting the questionnaire:

I am collecting this questionnaire as part of a study on primary school teachers' perceptions on Interactive Whiteboards (IWB) in Brunei Darussalam. You have been selected to take part for this study as you have used IWB for teaching and your answers are important to the success of this study. This is an anonymous questionnaire and you do not have to write your name or any other information which identifies you. Please complete all questions.

SECTION A: Demographic Data

Please tick where appropriate.

1. Gender: ☐ Male ☐ Female

2. How long have you been teaching? (count this school year as a complete year) :

    _____ year(s).

3. Highest Qualification:

    ☐ GCE 'A' Level ☐ Certificate ☐ Diploma

    ☐ Bachelor Degree ☐ Master Degree ☐ PhD

    ☐ Others (Please Specify) _____

4. How often do you use IWB for teaching?

    ☐ Almost every lesson ☐ At least once per day ☐ More than once per week

    ☐ Less than once per week ☐ Very rarely ☐ Never

5. a) From whom did you learn to use interactive whiteboard (you can tick more than one):

    ☐ Workshop by IWB company provider ☐ Staff Development

    ☐ ICT teacher ☐ Self Taught

    ☐ Other (Please Specify) _____

    Please skip question b and go straight to **question 6** if you tick only **one** of the above.

    b) Which from the above (question 5a) has the biggest impact towards your use of the

    IWB in the classroom? _____

6. What subject(s) do you often use IWB for?

    ☐ Mathematics ☐ Science

    ☐ English ☐ Malay

    ☐ Social Studies ☐ Religious Knowledge

    ☐ Art and Design ☐ Other (Please specify) _____

SECTION B: Usage of Interactive Whiteboard

Please read each statement and then circle the number which shows <u>how you feel</u>.

1=Strongly Disagree   2=Disagree   3=Neither Agree nor Disagree   4=Agree   5=Strongly Agree

No.	QUESTION	Scale				
1.	I can get access to IWB easily.	1	2	3	4	5
2.	I feel competent in integrating the use of IWB in classroom.	1	2	3	4	5
3.	I have lots of ideas about how to use IWB for teaching.	1	2	3	4	5
4.	I have had sufficient training and/or professional development in the use of IWB for teaching.	1	2	3	4	5
5.	I know how to operate IWB effectively.	1	2	3	4	5
6.	I know how to use IWB to support different learning styles of my pupils.	1	2	3	4	5
7.	I know how to use different software with the IWB.	1	2	3	4	5
8.	I am encouraged to use IWB by the school principal.	1	2	3	4	5
9.	I think the use of IWB has positive effect on teaching pedagogy.	1	2	3	4	5
10.	I think the use of IWB motivates pupils and increases the interest of pupils toward lessons.	1	2	3	4	5
11.	I think IWB improves pace of lesson.	1	2	3	4	5
12.	I think the use of IWB makes teaching resources more easily available.	1	2	3	4	5
13.	I think IWB can support teaching and make a lesson more effective.	1	2	3	4	5
14.	I think it is easy to plan and prepare a lesson using IWB.	1	2	3	4	5
15.	I think IWB increases interaction between teachers and pupils in classrooms.	1	2	3	4	5
16.	I think the use of IWB reduces workload.	1	2	3	4	5
17.	I believe the integration of IWB in classroom improves pupils' academic performance.	1	2	3	4	5
18.	I believe it is important to have a technical assistance to support classroom use of IWB.	1	2	3	4	5
19.	In order to encourage teachers to use IWB often, I believe they need training.	1	2	3	4	5
20.	I am interested to attend pedagogy based training on the use of IWB for teaching.	1	2	3	4	5

Please write anything else you feel that might be useful regarding training on the use of IWB in classroom:

…...

....

😊   *Thank you for your participation*   😊

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APPENDIX G: Observation Schedule

School						
Date/Time						
Year		No of Pupils				
Subject/Topic						
Teacher's Name						
Location of ICT Room						
Type of IWB						
Room Temperature		Hot		Ok		Cold
Curtains/Blinds		Not Available		Partial Blackout		Full Blackout

Classroom/ICT Room Layout (Sketch)

Seating Arrangement

	Set Induction		Introduction		Development		Activity		Closure	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Infront of Board										
Individually at Desk										
In Groups										

Teacher's use of the IWB

Internet		Yes	No
Use of Images		Yes	No
Use of Audio		Yes	No
Use of Video		Yes	No
Files		In folders	Not in Folders
Programs/Software used:			

Interactivity

Interactivity	Set Induction		Introduction		Development		Activity		Closure	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Teacher – Board										
Pupil - Board										
Teacher – Pupil										
Pupil – Pupil										
Whole Class										
Group Work										
Other Notes:										

APPENDIX H: Interview Schedule

<u>HEAVY USER</u>

1. How many IWB are there in your school? How can you access them?

2. Are you trained to use IWB? If so, how?

3. What encourages you to use IWB for teaching?

4. Are there any difficulties you faced in using IWB for teaching? If so, what?

5. How are the resources used in your lesson with IWB created?

6. From your experience of using IWB, what do you think are the benefits of IWB for teaching?

7. What suggestions do you have on improving the use of IWB for teaching?

<u>LOW USER/NO LONGER USING</u>

1. How many IWB are there in your school? How can you access them?

2. Are you trained to use IWB? If so, how?

3. What prevent you from using IWB for teaching?

4. What are the difficulties you faced in using IWB for teaching?

5. How are the resources used in your lesson with IWB created?

6. From your experience of using IWB, what do you think are the benefits of using IWB for teaching?

7. What will make you consider using IWB in the future?

APPENDIX I: Sample of Interview Transcript

Participant 2

I: Interviewer   A: Interviewee

I: How many IWB are there in this school?

A: Just one.

I: What about ICT lab?

A: We have two ICT labs but only one is provided with an IWB. The other room has computers tough. You have seen one of the rooms, I will show you the other room later.

I: Ok. What do you need to do to access the IWB for teaching?

A: I need to ask the ICT teacher if no one is using the lab especially for ICT lessons. Although priority is given to ICT lessons, sometimes ICT teacher will use the ICT lab without the IWB next door for ICT lesson to give us, other teachers teaching various subjects chances to use IWB.

I: So that means by checking in advanced with the ICT teacher if the room will be in use or not?

A: yes and booking it in advanced just to let other teachers know that someone will be using the lab.

I: Whenever you want to use the IWB, is the room always available?

A: yes, it is most of the time especially that my lessons this year happen to be when there are no ICT lessons going on. However, last year it was different. My lessons were mostly at the same time with ICT lessons so I did not have the chance to use it that much. Basically the availability depends on whether there will be ICT lesson conducted or not. Priority of both rooms are given to ICT lessons. There is a timetable on the door which shows when the ICT lab is being used for ICT lessons and for other subjects as well.

I: What do you mean for other subjects?

A: Actually, there is a timetable made where each week, the room is allocated for specific subjects. For example, this week is for Mathematics and priority is given to Mathematics lessons. However, it is only applicable when no ICT lesson is conducted.

I: Does that mean this week, teachers teaching other subject cannot use the IWB?

A: They can if it is not being used by anyone. They can always check in advanced with the ICT teacher.

I: Who creates the timetable?

A: The ICT teacher. She made it on a termly basis so basically we have a new timetable each term.

I: How did you learn to use IWB? Are you trained to use the IWB?

A: I am not trained to use IWB. In fact I never attended any formal training or workshop. I learned to use it by myself and a little bit of help from the ICT teacher at times.

I: Is the ICT teacher always available when you need help?

A: Not really. I have to wait when she is available or not teaching. Sometimes I asked her for help during break time or lunch time.

I: Was there any staff development or sharing session held on IWB that you ever attended?

A: No, I never attended any.

I: Ok. How many years have you been in the teaching profession?

A: I have only been teaching for seven years.

I: Was it in this school that you first tried using IWB or do you have any experience of using them when you had your teaching practice or maybe during your university years?

A: The first time I used IWB was actually during my teaching practice and I used it a lot back then as well as when I started teaching.

I: Were you aware that the primary schools are provided with the IWB before you started teaching practice?

A: I was not aware of the existence of the IWB at that time. I discovered the board when I decided to use the ICT room to show my pupils videos for my lessons and started to learn to use IWB from that point.

I: You mentioned that you learn to use it yourself. Could you explain how you discover what you can do with the board?

A: It is just like using a computer and I owned a computer so it wasn't that much of a problem. The only difference is that it has a touch screen. I had some free time when I did my teaching practice and the room was often available. I started to play around with the board and discover what I can do with it and used it for teaching.

I: Having said that, you are a regular user of IWB. What encourages you to use IWB?

A: It actually makes teaching easier.

I: In what ways does it make teaching easier?

A: It is easier for me to find resources for teaching and the quality of resources are better as I can use images, video and sounds. It saves me time! I used to spend hours

preparing my resources before I discovered IWB. I also like the fact that I can just stand near the board and manage my resources from there. Everything is just clicks away using IWB and it saves time.

I: Are there any difficulties you faced in using IWB for your teaching?

A: Yes of course there are.

I: Can you give me some examples?

A: As you can tell, this lab is located quite further away from the main block. If I need to use the IWB for teaching, I have to ask my pupils to come here. You know how kids are, sometimes it took them quite a while to get here and back to their class. Time are sometime wasted from that.

A: Last time the remote was not working and we had to wait ages for a replacement. I had to use a long ruler to switch it on!

I: Long ruler? I don't get what you mean.

A: The on and off button is on the projector which is hanged infront of the board and when the remote was not working, I took a long wooden ruler to switch it on.

A: There was this one time the electricity shut down quite a couple of time every day due to some technical issue and there were times that when I was teaching, the electricity went off. For that reason, I rather teach in class as it went on for weeks.

A: It is usually that technical issues are the causing difficulties such as pen not working and board could not be switched on.

I: In case of such difficulties, who are the one responsible to fix it?

A: The ICT teacher are the one usually responsible to fix small issues but if she could not fix it we have to call the Ministry for technical help.

I: How long does it usually take?

A: A couple of days or even longer.

I: As I observed, there are quite a number of resources you used using IWB. Do you create it yourself or are the resources provided?

A: I created all my resources myself.

I: How long does it take to create the resources?

A: It depends. Some of the resources took shorter time to create and some took longer time.

I: Do you make new resources for each lesson?

A: Not all the time. Sometimes I used resources from my previous year or simply edit whatever I have if I can find anything new and interesting.

I: From what was observed, you used basic windows software. Could you tell me why you decided to use them instead of using other software?

A: To be honest, I only use the software I am familiar with. I am aware that there is an IWB software installed in the lab but I do not know how to use it. It is only installed in the lab and access to it during free time is limited. I do not have time to learn and make resources from it.

I: Are resources for IWB shared between teachers in this school or are there resources provided by the school or the Ministry of Education?

A: There are no IWB resources shared between teachers here and I am not aware if there is anything provided by the school or the Ministry. But I do share my resources with my close colleagues and basically that is just it. We also share where we can get resources online such as new websites we discovered.

I: Apart from using it to teach Mathematics, do you use it to teach other subjects?

A: Sometimes I use the IWB to teach Social Studies and of course for ICT.

I: Oh, so you're teaching more than one subject. What other subjects do you teach?

A: This year, I teach three subjects which are Mathematics, Social Studies and one ICT lesson.

I: Which subjects do you often use IWB to teach?

A: Mathematics.

I: Is there any particular reason for that?

A: Yes. It is because resources for maths are easily available online so it is easier for me to create resources that I can use in an IWB lesson.

I: From your experience of using IWB, what do you think are the benefits of IWB for teaching?

A: The IWB helps make my lesson more interesting as I am able to provide a variety of resources for teaching. It helps me deliver my lesson in a more interesting way by showing them all sort of things from videos animation, images and simply audio. The high quality of resources available made it easier for me to explain difficult concept or terms especially for my social studies lesson as it is taught in their second language.

A: It is easier for me to find resources for teaching and the quality of resources is better as I can use images, videos and sounds. It saves me time as I used to spend hours

preparing my resources before I discovered IWB. Pace of lesson are also better as things can be organised easily in folders.

A: For the quiz, it's from the internet, I googled it. It is quiet easy to get interactive games, quizzes from the internet nowadays. Oh yeah, another difficulty is that there are quite a lot of websites being blocked by the Ministry which is actually quite useful for teaching. I hope they will look into that matter one day. Apart from that, the internet connection can be a problem as well. Sometimes we are unable to connect to the internet.

A: Pupils pay more attention when I use the board and they like it when I let them come to the board to answer questions.

I: What about the pupils? Do they always sit in front of the board when you use IWB?

A: yes

I: Is there a reason for that?

A: It is easier for them to see the board and it's easier for me to manage them. As you can see, the desk are not facing the board. They can get distracted by the computers on the desk.

I: In your opinion, what can we do to improve the use of IWB?

A: Personally I think we should create more awareness on the existence of IWB in schools and how they can actually use it. I think some just don't know what to do with it.

A: We have special rooms for different subjects here in this school such as the Mathematics room. By providing it in each room might help improve the use of it rather than depending on the one at the ICT lab. Especially that the desk in the lab has computers, it is quite a distraction for kids when seated at the desk.

A: and training should be provided so teachers know how to use it.

I: Since you said earlier that you never attended any training, are you willing to attend one?

A: of course! I would like to know more about what I can do with it.

I: What aspect of the IWB would you like to learn?

A: Probably the latest software or anything that helps. There's no point to provide more if no one knows exactly how to use it. I wasn't confident myself when I first started using it. I would also recommend the improvement of access to software. Perhaps by providing more computers or laptops with access to the software so we could learn and practice with it. It would also be easier for us to even create our resources during our free time.

I: you made a good point there. And how did you gain your confidence?

A: I use it quite regularly and that is when I started to feel confident using it. I discovered new things, new software, how I can make my lesson more interesting to pupils each time. It was like a learning process at the beginning. Learning how to use the IWB. Lessons move smoothly after a while as I know what to do, what to click and how to manage my resources and kids.

I: Do you have any other suggestions on how to improve the use of IWB?

A: As I mentioned earlier, access to the software is very important. I hope they allow us to install those software for free in our personal computer. It is expensive if we have to purchase it on our own. However, if improve access to the software that also depends on the time we have to create and prepare for a lesson using such technology. Teacher nowadays have a lot to do. Not only teaching and marking, we also have administration duties to think of.

A: Other than that, personally I think we need to create awareness on the existence of IWB in schools. I do not think all teachers are aware of what they can do with IWB. Some teachers probably do not know it even exists in this school.

APPENDIX J: Sample of Memo

<div align="right">**Memo 4.2**</div>

Theme Four: Training

- Formal or Informal training received by participants.
- How they learn how to use the IWB.

"I attended a workshop when IWB was newly introduced to primary schools. It was beneficial as it taught us how to do different things using the IWB. I was the only person sent by my school at that time for training and held a staff development soon after to teach other teachers in my school."

"I think the workshop was not sufficient although it helped a lot. There are no follow up sessions after that"

<div align="right">*Participant 3*</div>

"I attended a two days training in 2006 outside school organised by the Ministry of Education on the basic use of IWB with hands on activity. We were also taught on how to make resources with the use of IWB."

"… I was expected to teach other teachers how to use IWB after that training. I wasn't confident though but did it anyway"

"… I think I was not sufficient and should be ongoing."

<div align="right">*Participant 4*</div>

- Only attended training conducted in 2006/2007.
- Was one of the teachers being trained as a facilitator who then trained other teachers in workshop organised by the ministry.
- Expected to share skills and knowledge with teachers in his school and other schools.

<div align="right">*Participant 6*</div>

"I attended a workshop held by Sham who I think is a specialist ICT teacher who went for a proper training conducted by the Ministry of Education as he knows how to use the software and everything related to the IWB. However, the workshop was only held once and there is no follow up after that up to today"

<div align="right">*Participant 1*</div>

"Attended a workshop conducted by local facilitator as a representative from my school when IWB was newly introduced. I was picked randomly by my school administrators to attend the training for two days. It was beneficial but I think It was too short and not sufficient."

"… shared what I learned with colleagues after that during staff development once, which lasted for 2 hours"

"… no follow up training after that"

<div align="right">*Participant 8*</div>

Type of training received: <u>Workshop</u>

- Workshop or training on IWB was held only during the introduction of IWB in primary schools. i.e. 2006 (check this again). This shows that training or professional development received by teachers is <u>not continuous</u>.
- Teachers feel that the workshop was beneficial but <u>not sufficient</u>.
- Teachers attending workshop were asked to share what was learned with their colleagues at their respective schools although they are not confident in using the IWB themselves.
- Teachers felt the need to have an ongoing training or professional development (check with other data of participants receiving different form of training)
- This also indicates the lack of support after implementation of the IWB (check on the importance of support after implementation – Coaching? Mentoring?)