



Secondary school teachers' perceptions of interactive whiteboard training workshops: A case study from Taiwan

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The purpose of this study was to explore secondary school teachers' perceptions of interactive whiteboard (IWB) training workshops in Taiwan. This study also sought to identify potential problems associated with the design of IWB training workshops in order to improve their effectiveness. This research employed observations and interviews to collect research data. Observations were made at the training sites, and interviews were conducted with six secondary school teachers from two junior high schools located in central Taiwan. The research data suggest that teachers valued the benefits of using IWBs in classrooms and recognised the necessity of attending training workshops. The teachers also emphasised that knowing practical IWB uses was extremely important and helpful to them to integrate this promising tool meaningfully into their teaching. As a consequence of the research some suggestions have been provided for the purpose of improving the quality of training workshops based on adult learning theories.

Introduction

The adoption of interactive whiteboards (IWBs) in classrooms at various levels of educational institutions has increased significantly in recent years, and this trend has drawn attention from a growing number of governments around the world. In developed and developing countries, such as Australia, the United Kingdom (UK), the United States (US), and South Africa, a huge amount of state funding has been allocated to education sectors for purchasing IWBs, especially in the K-12 school system (Hall & Higgins, 2005; Holmes, 2009; Slay, Siebörger & Hodgkinson-Williams, 2008; Torff & Tirota, 2010). The UK was the earliest adopter of IWBs in the world; a survey published in 2008 shows that 98% of secondary and 100% of primary schools in the UK had IWBs in 2007 (Becta, 2008). Related studies have shown that IWBs reinforce students' motivation and engagement in learning because the interactive features attract their attention and increase concentration (Marzano, 2009; Schmid, 2008; Slay et al., 2008; Smith, Higgins, Wall & Miller, 2005). However, the motivation effects rely heavily on teachers' attitudes and technological skills, and, most importantly, instructors' careful planning of IWB lesson activities (Glover, Miller, Averis & Door, 2007; Holmes, 2009; Torff & Tirota, 2010). Therefore, training teachers to become familiar with IWB technology and to understand the best ways to use it are critical to assure the quality of technology integration in classrooms.

Emerging evidence suggests that teacher' preparedness and students' attitudes affect the effectiveness of technology-enabled learning environments. Harper, Chen and Yen

(2004) noted that attitude, pedagogy, technical and curriculum issues are primary concerns for developing instructors' ICT teaching skills. IWBs are a relatively new ICT tool introduced into classrooms in recent years, and researchers have reported many potential benefits of using them in enhancing students' ICT competence and enriching their learning experiences (Smith et al., 2005). Holmes (2009) further signals that providing appropriate training for teachers is one of the most important factors in the effective use of IWBs in classrooms. In general, training is usually given by companies or suppliers at the beginning stage of IWB installation, which might be enough for already confident ICT teachers, but it is not adequate for most novice adopters (Smith et al., 2005). In other words, additional formal training sessions and informal learning channels should be arranged to make sure that teachers catch the practical use of IWBs, that is, providing opportunities for teachers to exchange ideas and work collaboratively in designing lessons related to the pedagogical practice of using IWBs.

In Taiwan, under the "Integration of ICT in classroom teaching" initiative, the Ministry of Education and National Science Council invested a significant amount of money in IWB equipment and installed it in more than 100 elementary and secondary schools' classrooms island-wide in 2007. These selected schools served as IWB teaching demonstration sites, and each school chose one or two subjects, such as Mathematics, English, Natural Science, or Music, to prepare and plan IWB lesson activities. A group of teachers from the particular subjects worked as a team to actively promote the use of IWBs in classroom teaching by developing strategies and possibly creating content materials suitable for IWBs. The pilot stage of IWB roll out has received positive outcomes, according to teachers' feedback and published reports from the Ministry of Education. In 2009, the Taiwanese central government furthermore announced a national project called "Creating equal digital education environment in elementary and secondary schools", and this plan is to build 6,500 e-classrooms with overhead projectors and IWBs in all elementary and secondary schools (Taiwan Ministry of Education, 2009). IWBs have become a new ICT tool introduced into classrooms for most schools, and training, therefore, has been arranged to help teachers to get acquainted with this new interactive technology tool.

In recent years, much has been written about the use of IWBs in particular subject areas in classrooms (Kennewell, Tanner, Jones & Beauchamp, 2008; Quashie, 2009; Schmid, 2006, 2008; Troff & Tirota, 2010; Zevenbergen & Lerman, 2008), and pedagogical benefits and pitfalls of this new tool (Glover, Miller, Averis & Door, 2005; Smith et al., 2005; Slay et al., 2008), but little research is available focusing on IWB training issues, specifically in discussing IWB training workshops. The aim of this study is to investigate secondary teachers' perceptions toward IWB training workshops by drawing upon observations of, and discussions with, classroom practitioners. It is hoped that the results of the research will contribute to identifying practical implications in developing better IWB training programs for educators.

Facilitating pedagogical practices through IWBs

The most frequently mentioned benefits in relation to the implementation of IWBs in classroom learning environments are the increases in students' interactions, engagement, and motivation (Smith, Hardman & Higgins, 2006). Hennessy, Deaney, Ruthven and Winterbottom (2007) indicated that IWBs are capable of providing "collaborative opportunities for reasoning, hypothesis testing and interpretation that go beyond those afforded by more established classroom devices" (p. 284). Through

the use of IWBs, interaction patterns between teachers and students have changed, and modes of teaching need to be modified (Zevenbergen & Lerman, 2008). As Slay et al. (2008) point out, a shift in teachers' pedagogical practices is a critical element in successful integration of IWBs into teaching and learning environments. In other words, moving a course from traditional black/white boards to IWBs presents a perfect opportunity to rethink the core principles of teaching and learning, and to create new pedagogical models for teachers' practices.

Related literature (Smith et al., 2005) has identified six major benefits of IWBs for teaching including flexibility and versatility, multimedia/multimodal presentation, efficiency, support planning and development of resources, modeling ICT skills, and interactivity and participation in lessons. Glover et al. (2005) argue that a two pronged pedagogical change needs to be carefully addressed, that is, "from the didactic to interactive approach to learning and teaching, and from the use of IWB and multimedia as visual support for lessons to the integration of the technology and media into lesson planning" (p. 158). The above mentioned arguments suggest that the potential use of IWB technology in teaching is capable of fostering pedagogical change.

In general, IWB is controlled mostly by teachers during the class meeting, and the occurrences of interaction depend on teachers' lesson planning which can invoke teacher-pupil and pupil-pupil interactions (Glover et al., 2005; Kennewell et al., 2008). These claims have been supported by some research findings. For instance, Wood and Ashfield (2008) undertook a study involving observations and interviews with teachers and initial teacher education students using IWBs in the UK. The results of their research suggested that, "the teacher's interpretation of whole-class interactive teaching itself was the primary factor in developing materials and opportunities for children to engage with their own learning" (Wood & Ashfield, 2008, p. 94). Similar conclusions were drawn by Wu and Lin (2009), who investigated three experienced elementary school teachers' perceptions toward IWB use in Taiwan. Their research findings indicated that the IWB's highly interactive features and teachers' involvement in designing class activities helped students to better conceptualise new knowledge through exposure to vivid representations of abstract ideas and produce gains in students' motivation and achievement.

Good visual resources are essential components in IWB based classrooms. Successful and innovative use of IWBs requires teachers to make selections from a wider-range of interactive media-rich content, such as IWB supportive software and internet resources, when they organise and structure their lesson plans. As Wood and Ashfield (2008) pointed out, IWBs and associated software enable teachers and students to keep classes lively and interesting. However, Hennessy et al. (2007) furthermore commented, based on the results of their qualitative study, experienced IWB teachers valued the role of pre-planning in conjunction with carefully chosen multimedia materials because it affected the depth of pedagogical interactivity. In other words, the effective integration of IWBs in classroom teaching environments greatly depends upon the adequate preparation of teachers both technically and pedagogically.

IWB training for teachers

ICT competence training has become a vital issue in today's teacher professional development programs worldwide because technology has become an inevitable and essential partner in facilitating classroom teaching and assisting the students' learning

process. Each year, various new technological tools are introduced to the educational market, and these tools offer potential opportunities for teachers to enhance their teaching skills and boost their creativity (Wood & Ashfield, 2008). Usun (2009) claims that more than half of all European countries highlight ICT training as a required section in teacher education curricula for primary and secondary sectors. For instance, in the UK, the *New Opportunities Fund* (NOF) training, a significant investment from the state government, provided funding for training teachers in ICT from 1998-2002, and the outcome of this initiative received satisfactory responses according to a survey conducted by Galanouli, Murphy and Gardner (2004). In their study, although some negative reactions to the content of major and subsidiary training programs were mentioned by the participants, teachers' overall confidence in using computers in their teaching was noticeably increased. ICT in teacher education has also received great attention in the Australasian region. In Australia, the *Digital Strategy for Teachers and School Leaders*, a subprogram of the Australian Government's *Digital Education Revolution*, provides a significant amount of funding to help pre-service and in-service teachers and school leaders to develop ICT proficiency and embed these skills across the curriculum and teaching practices (UNESCO, 2010).

The prevalent use of IWB appears to have some impact in teachers' ICT training issues. Teachers, in addition to understanding ICT tools' role in the pedagogical process, must learn how to adapt to the demands of new technology, such as IWB, that is brought into classrooms. Hall and Higgins (2005) argue that students' engagements in the IWB learning environment may be ineffective if teachers are not adequately trained to use it. Despite the fact that teachers' technology competence strongly determines the effectiveness of IWB use in classrooms, Holmes (2009) asserts that, based upon the framework of *Technological Pedagogical Content Knowledge* (TPCK), knowledge about technology or quality of pedagogy are inadequate for teachers if they do not have sufficient knowledge about how the technology is best used in relation to content knowledge in order to guide student learning. Since IWBs have been enthusiastically promoted recently in classrooms, teachers, indeed, need structured training and technical support in order to understand the full potential of this prominent ICT invention. Thus, effective training models must be designed to help teachers to improve technical and pedagogical understanding of IWB teaching, permitting them to meet the challenges of technological development in the future. Hall and Higgins (2005) suggest that "training in the technical and pedagogical aspects of IWB should be viewed as a continuous process rather than a discrete one, requiring regular training lessons so that teachers can maintain and develop their ICT skills" (p. 109). In other words, giving teachers the opportunities to obtain training formally and informally allows them to become confident technology users and creative teachers.

Various approaches have been addressed to investigate improvements in training design and development to upgrade teachers' ICT (IWB in particular) teaching skills (Holmes, 2009; Quashie, 2009; Smith et al., 2005). However, related empirical studies seldom take adult learning theories into consideration when designing technology-enabled media training workshops or lessons for teachers. Teachers, as adult learners, have many features different from those of pre-adult students. The andragogy concept proposed by Knowles outlines six assumptions of adult learners' characteristics (Merriam, Caffarella & Baumgartner, 2007, p. 86):

1. As an adult matures, his or her self concept moves from that a dependent personality toward one of self directed human being.

2. An adult accumulates a growing reservoir of experience, which is a rich resource for learning.
3. The readiness of an adult to learn is closely related to the developmental tasks of his or her social role.
4. An adult is more problem centered than subject centered in learning.
5. The most potent motivations are internal rather than external.
6. Adults need to know why they need to learn something.

The above arguments provide useful insights into the design of ICT training for teachers. This would seem to imply that a deeper understanding of certain aspects of adult learning while dealing with teachers' professional development issues would help training coordinators to develop effective IWB training courses.

Research context and methodology

This research can be construed as a qualitative case study. According to Merriam (2009), a case study can be defined as an in depth description and analysis of a bounded system, such as a person, a program, a group, or an institute, and the research data come from multiple sources (e.g., observations, interviews, documents/reports, and audiovisual materials). In this study, two observations and six interviews were carried out at two junior high schools located at central Taiwan from July 2009 to February 2010. At the time of the research, the selected two schools had just installed IWB facilities in ten classrooms that catered to different subject areas, and all teachers were asked to attend mandatory training workshops organised by the IWB supplier and experienced teachers. The initial training workshop was given by a certified instructor from an IWB company, and the subsequent course (arranged two weeks after initial training) focusing on IWB practices in particular subjects was conducted by experienced teachers from IWB teaching demonstration sites in northern Taiwan.

The content of the initial one-day training workshop is a six-hour lecture. It is divided into two sections that usually are arranged in the morning and afternoon. Table 1 illustrates the contents of the training workshop.

Table 1: Interactive whiteboard training workshop agenda

Basic functions and features	Duration	3 hours
	Content	Installation of IWB, Board orientation alignment, Digital ink layer and Floating toolbar, Working with objects, Gallery collections: Essentials for educators, Working with Office applications; Writing and saving notes.
Advanced features of software	Duration	3 hours
	Content	Handwriting recognition; Using tables; Using and managing Gallery collections; Linking objects to other content, Advanced text options, Recording interactions, Saving still images, Using rich media and incorporating interactive content; Math tools; Advanced control panel set up; Experience sharing.

Observations were made to examine the setting and environment of the training workshops taking place in the computer labs. The observations mainly focused on the arrangement of training facilities and trainees' behaviors and interactions of trainer-trainees and trainee-trainees while taking the initial training course provided by an IWB supplier. Interview data were collected after 8 weeks of the initial training workshop. I invited six teachers from the training workshops to participate in this

research in order to obtain their thoughts regarding the IWB training workshops. There were four females and two males, and their teaching experiences ranged from 2 to 16 years. All participants were between the ages of 26 and 44. Table 2 shows all participants' demographics.

Table 2: Demographics of teachers interviewed

Teacher	Gender	Teaching subject	Teaching experience (years)
A	Female	Computer	16
B	Female	Math	2
C	Female	Music	15
D	Female	Social science	5
E	Male	Math	4
F	Male	English	8

The following interview questions were used to frame the study:

1. What was the most impressive part of the IWB training workshops?
2. What have you learned significantly from the training?
3. What have you done to apply acquired skills and knowledge into classroom teaching with the IWB?
4. What were the benefits and drawbacks of the IWB training workshops?
5. What can be done to improve the effectiveness of training workshops?

In order to ensure that the process of data analysis was reliable and valid, the interview data were completely transcribed and coded. During the coding process, the author and two research assistants followed the step by step analytical process suggested by Merriam (2009) to group the coded data and identify themes relevant to the research questions. Data re-coding and re-grouping were conducted when the research data did not fit well into the themes. The field notes of observations were triangulated with the interview data to increase validity and reliability of the interpretation of the research findings.

Results

Training workshops are necessary for teachers to become familiar with IWB

The research data revealed that all the teachers valued the importance of training workshops although a few teachers hesitated to participate at the beginning. Prior to the initial workshop, most teachers had not had any chance to use IWB. Attending IWB training enabled teachers to know how to operate IWB, and gave them opportunities to think about the potentials of applying IWB in increasing interactions in their classrooms. One of the interviewees argued that:

For the majority of secondary school teachers, [the] IWB is a brand new tool, and its operations are not like keyboard typing or mouse clicking. Teachers must get training in order to maximise the potentials of its flexibility and versatility features.

Most teachers, in addition to learning the IWB hardware and software operations, were concerned especially about the IWB integration issues.

The initial training workshop was given at a computer laboratory that allowed every teacher to manipulate the IWB's bundled software, but not everyone had a chance to

physically interact with the IWB. Observations indicated that the training instructors were able to get teachers' attention by showing some specific interactive multimedia tool and invited some teachers to the front to repeat the operation procedure. In general, teachers expressed their appreciation for the chance to attend the training sessions, and most of them agreed that the IWB and its associated software are easy to operate. However, the subsequent workshops that focused on sharing IWB use experiences received more feedback than the initial workshops.

The design of training workshops emphasised the interactive features of IWB

One of most impressive and interesting parts of IWB training that was mentioned frequently by the participants was its highly interactive features, demonstrated by the training instructors, especially in the initial training workshops. During the lecture, the training instructors explained some abstract math concepts by manipulating objects on the IWB. In addition, a demonstration about the geography of Taiwan attracted teachers' attention. One respondent made the following comment:

Through the interaction with the images and linking objects on the board, I can actually get clear pictures about the land we live in, and I believe students will enjoy this interactive lesson.

Teachers also expressed their concerns about IWB lesson planning. A teacher pointed out that:

The interactive features are amazing, but I believe that the amount of time and energy to design the lesson activities would be a huge investment.

The similar viewpoints were identified by four other interviewees. This illustrates that the most worrisome aspect of IWB use for secondary school teachers is how to design IWB courses incorporating a variety of interactive activities, as appropriate to the learning objectives.

Experience sharing: The most important element of IWB training workshops

Most participants were keen to know the effective ways of using IWB in classrooms. During the initial and subsequent training workshops, one or two IWB experienced teachers were invited to the podium to share their successful and creative experiences. When the experienced teachers presented their teaching materials, teachers were eager to ask questions and exchange ideas. A teacher said that:

The most valuable part of the training courses is when teachers share their IWB experiences; it allows me to internalise skills, techniques, or ideas so that they can apply to my teaching and to assist my students.

Since most teachers considered that planning IWB teaching lessons was the most difficult part, they expected to learn more about the practical use of IWB in each subject area. The subsequent workshops arranged a group discussion activity for teachers who teach the same subject to get together and design an IWB lesson plan. A teacher shared her views by commenting that:

A specific training workshop should be organised for same subject area teachers, such as English, Chinese, Math, or Natural Science, that would inspire their creative ideas because they have the same language in their teaching domain.

At the time of the study, all training workshops' attendees were from different subjects.

IWB presentations can be reused and suitable to explain abstract concepts

Although the IWB has just been introduced into secondary schools in this study, some teachers already began using it in their class after the training workshops. A social science teacher, who taught seven classes, used the recording function to record all interactions for a lesson unit during a class and played it in other classes without repeating orally. In addition, a music teacher used colorful graphics and applied the movement of visual elements to make a vivid presentation to explain music notations. She noted that:

Music theory is difficult for students to understand, but the IWB's software helps my students to learn these concepts in enjoyable ways.

Teachers' expertise is exploited to a great extent when they make good use of IWBs, and students' learning can be maximised.

Arrange informal training to foster knowledge sharing after workshops

Two interviewees expressed their opinions about how to improve the effectiveness of training workshops. They mentioned that a web platform should be created for teachers to continually exchange or discuss their ideas after the training workshops. Also, the platform can serve as a resource bank that stores all IWB teaching plans, especially those individual or group projects finished in the workshops. An English teacher noted that:

Many teachers do not use [the] IWB immediately after the training workshops, and creating a web portal will help them to find solutions when they have difficulties in designing IWB lesson materials.

His view was echoed by another teacher who was interviewed:

I think teachers may come out with many good ideas after workshops, and they would like to share or get feedback from other colleagues. It will help to set up a blog or wiki to continue our dialogue.

Discussion

The study set out to investigate secondary school teachers' perceptions of IWB training workshops in Taiwan. The results of this research show that the teachers, in general, recognised the necessity of attending IWB training workshops, as an emerging trend has shown that IWBs will soon be an essential ICT tool in classrooms. The training workshops provided opportunities for teachers to physically interact with IWB hardware and software, and to consider the pedagogical aspects of IWB use. As Slay et al. (2008) argue, changing pedagogical understanding and practices is vital to make optimal use of the promising interactive technology tool. Training workshops serve as a medium to help teachers to gain skills and confidence with the IWB technology which might boost their independent and self-directed learning nature, according to adult learning theory. Being self-directing can furthermore help teachers to engage in diagnosing their learning needs, planning their learning process, and evaluating their learning outcomes while learning ICT tools (Merriam et al., 2007).

In this study, teachers highlighted that the IWB's interactive features demonstrated by the training instructor and experienced teachers raised their motivation to learn and interest in discovering effective ways of using IWB, especially when experienced teachers are sharing IWB teaching strategies. These findings furthermore imply that training workshops should provide extended opportunities for teachers to think through new ideas and try out new practices by getting feedback from expert practitioners, and to refine their practice in collaboration with colleagues (Smith et al., 2006). Instead of emphasising the operational skills of application software, training in methodologies and practices related to IWB integration should be the primary concern. A recent study conducted by Mishra and Koehler (2006) suggested that teachers showed tremendous growth in their sensitivity to the complex interactions among content, pedagogy, and technology when given opportunities to engage in the design of educational technology. Adult learning theory also articulates that linking adult learners' prior experiences can stimulate their reflective thinking during the learning process. In addition, adult learners must see value in the technological tool in solving their problems or providing internal payoffs that can increase their learning motivation (Lowe & Holton, 2005).

To put adult learning theory into practice, Mason (2006), based on the results of her empirical studies, proposed that designing courses for working adults needs to provide chances for them to articulate their own ideas, draw on their past experiences, and integrate learning with their jobs. One of the effective strategies is to encourage dialogues and discussions among adult learners during the training (Dobrovolny, 2006). To do so, teachers' IWB training should arrange more sessions and time for teachers to share their thoughts, addressing the problems they may encounter, and discussing practical ways of IWB use in their teaching area. Dobrovolny (2006) advises training coordinators need to customise instructions by considering "learners' prior experiences, their current responsibilities, and their expectations of future responsibilities" (p. 166). Thus, training contents that specifically focus on teachers' teaching subject, practical usage, and opportunities of discussion during the training workshops would definitely help teachers to use IWBs in meaningful and creative ways. It suggests that substantial training workshop design can move educators this direction.

The current study has shown that IWB software plays an important role in creating sound multimedia presentations. This result parallels the findings of a recent study (Kennewell et al., 2008), in which they identified the influence of IWB resources as important in facilitating pupils to learn math. This implies that instructors may need to be aware of the benefits of collecting resources from the Internet or creating their own multimedia clips. Schools, on the other hand, will certainly have to invest money in purchasing commercial IWB software in order to meet the needs of the prevalent use of IWBs.

The findings also point towards the importance of setting up an informal learning space for teachers to share their knowledge and experiences. Golding, Brown and Foley (2009) argue that informal learning accounts for the great bulk of adults' total lifelong learning. Merriam et al. (2007) also note that "informal learning contexts, including social action and community-based learning, are where much adult learning takes place" (p. 430). Regular and effective uses of IWBs require teachers to continually update their teaching and technological skills. Creating a web platform would be an easy solution to facilitate teachers to obtain new skills and gain knowledge through online discussions or to check useful tips beyond training workshops, which may

furthermore build an online community of practice dedicated to effective use of IWB technology. As Samarawickrema, Benson and Brack (2010) suggest, "starting the workshop in a physical space would support group formation and clarification of the nature of the workshop, which would in turn orientate participants to collaborate in the virtual space, offering a blended learning experience" (p. 48). Existing Web 2.0 applications, such as blogs, wikis and social networking sites, are capable of continually fostering teachers' informal learning after training workshops have ended.

Conclusion

The findings from this study provide useful insights into the effectiveness of the IWB training workshops that are currently being carried out in Taiwan. It is only recently that elementary and secondary schools have acquired a number of IWBs for instructional use in the primary and secondary sectors. The results from the teacher interviews raised a number of key issues. A special emphasis was placed on attempting to uncover critical issues which influenced the overall effectiveness of workshop design. The respondents provided a snapshot of how training workshops may help them to get acquainted with IWBs and what can be done to improve the quality of training sessions.

Smith et al. (2005) note, and I concur, that IWB technology "should be used in unique and creative ways above and beyond that which is possible when teaching with normal whiteboards" (p. 99). This research reinforces the importance of providing ICT competency training for teachers because technology alone does not promise a substantial increase of teaching and learning outcomes, it is the way in which it is used that is most important. Since IWB training issues are still a relatively new domain, the results of this qualitative study should not be generalised without caution. Future research is necessary to exam this issue in larger and more representative samples to see how training workshops mediate teachers' learning and use of IWBs. It would be interesting to conduct a study in other training settings, or use a quantitative survey to collect responses from secondary school teachers at similar IWB training workshops nationwide or even across countries.

Systematic training evaluation approaches can be adopted to facilitate future investigations. In particular, the Kirkpatrick's four level training evaluation model (Kirkpatrick, 1994) can be employed to assess IWB training workshops by examining teachers' satisfaction, learning, behaviours, and the degree to which targeted outcomes occur as a result of the training event at different times of the training process. In addition, it seems useful to explore and indentify teachers' particular needs or problems for each subject area while taking IWB training lessons. Besides getting feedback from teachers, more extensive research needs to be undertaken to investigate IWB training instructors' perceptions towards this kind of training and explore ways training coordinators and instructors can utilise and improve the quality of IWB training. Thus, further research in this area is certainly merited.

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