Interactive Whiteboard Integration into Music Teaching and Learning: Preschool Children as a Case Study

Angela Leea, Yen Huai Jen*a

*aAssistant Professor, Early Childhood Education and Care Department, TransWorld University, 1221 Zhennan Rd., Douliu, Yunlin, 640, Taiwan

Abstract

This comparative research paper contrasts the use of interactive whiteboards (IWB) and older models of teaching (OMT) to examine the effect of both upon children’s learning attitude and their learning outcomes. This article extends the existing literature by addressing three key questions: 1. What are the reported advantages and disadvantages of integrating IWB into musical teaching and teaching without this technology? 2. How does each of these models of teaching perform in the music classroom when assessed using a standardized measurement? 3. Are there any significant differences in children’s learning attitudes and learning outcomes when comparing these two models for teaching music in preschools? This study was conducted across two preschool classrooms in a regional daycare center in Taiwan. Classes were held as a ‘one-off’ 50 minute lesson for the purposes of the experiment. One classroom used IWB and the other used older training methods. The research method entailed observational analysis of children’s musical activity and a Likert Scale checklist was utilized to measure children’s attitude towards music learning and their level of musical achievement. The participants included two head teachers, fourteen children, and five aides spread across both classrooms. Additional data were collected at the conclusion of the lesson via in depth interviews with the two classroom teachers. These interviews were intended to elicit evidence of perceived attitudinal change and validation of learning efficacy. The program of music activities used in this study offered multiple opportunities for children to improve their attitudes in the classroom while also acquiring musical skills and theory. The findings of this research showed that children are able to increase their own level of engagement and reach a high level of achievement during individual and peer play in a structured setting that is overseen by a professional. IWB and traditional methods of teaching both proved effective: it was the teacher’s pedagogy, rather than technology per se, that brought about the benefits.

Keywords: interactive whiteboard; attitude; high achievement; music; early childhood education

* Yen Huai Jen. Tel.: 886-923211138; 886-912395090
E-mail address: leehe91014@yahoo.com.tw
1. Introduction

The impact of today’s technology is challenging all forms of teaching and learning. There is a growing body of research concerning the role of Interactive Whiteboard (IWB) in education: in the last decade, it has been introduced and examined in classrooms worldwide in places as diverse as the United Kingdom, Austria, Czech Republic, Denmark, Hungary, Ireland, Italy, Portugal Switzerland, Australia, United States, and Taiwan (Ghislandi & Facci, 2013; Prosser & Ayre, 2010). Many schools in European countries and Australia (Wong, et al., 2013; Campbell & Martin, 2010) have already invested heavily in the installation of IWB in classrooms. Most Taiwanese primary schools have recently installed at least one IWB demonstrating that educational systems in Taiwan follow the trend of new technologies. The challenge for teachers is that they are now required to utilise new teaching methods to incorporate technological developments and provide effective educational experiences for their students. In the past, teachers typically stood and spoke from the front of the classroom next to a blackboard or later a whiteboard. Students’ attentions were focused on a static screen. This style of teaching did not harness the visual or auditory stimulations now available via technology and it frequently failed to connect teaching with learning. Piquing and maintaining students’ learning motivation is essential for long-term learning.

When compared to older model of teaching (OMT) – in which the entire teaching process centers on the teacher, with teachers setting the goals, content and schedule – Interactive Whiteboard (IWB) stands in stark contrast. One of the major concepts of IWB is valuing individual needs in which users can contribute to set the learning schedule and create plans and goals based on their own needs. This inherent feature of IWB fosters a more effective learning method. In the IWB learning process, learners become initiative takers who actively seek out knowledge instead of being passive learners and mere receptacles (Lee, 2012). Current education policies by governments worldwide have propelled IWB into classrooms due to its positive effects on teaching and learning (Kershner et al., 2010; Campbell & Kent, 2010; Nolan, 2009; Wood & Ashfield, 2008; Chen, 2006; Armstrong et al., 2005, Beauchamp, 2004). The benefits of IWB are manifold. It provides touch, visual and sensory stimulation, which research shows increases students’ learning motivation. IWB is also interactive, bringing a level of dynamism into the classroom previously unheralded.

There is little published research literature on the use of IWB in the music classroom and its effect upon those involved. In light of the foregoing discussion it is clear that comparative research contrasting interactive whiteboard (IWB) and older models of teaching is warranted to examine the effect of both upon children’s learning attitude and achievement. This study embarks upon that challenge by using music teaching for preschool children as a case study. It intends to extend the existing literature on this issue by addressing three key questions: 1. What are the reported advantages and disadvantages of integrating IWB into musical teaching and teaching without this technology? 2. How does each of these models of teaching perform in the music classroom when assessed using a standardized measurement? 3. Are there any significant differences in children’s learning attitudes and learning outcomes when comparing these two models for teaching music in preschools?

2. Limitations of the study

Despite all the advantages of IWB in facilitating learning, IWB is still not utilized effectively in most preschool settings in Taiwan. Another limitation is the generalisability of the research findings given that participants in the present study came from a specific county in Taiwan. The findings in no way represent a comprehensive analysis of nor unqualified recommendations for the nation.

3. Literature Review on IWB

In the past decade, there has been a growing body of literature describing the benefits of IWB technology in conceptualizing practice and pedagogy (Prosser & Ayre, 2010). In the field of music education, Nolan (2009) presents recent research on interactive whiteboard use, numerous teaching ideas for general music educators, and two full-length music lesson plans demonstrating interactive whiteboard use. Baker (2007) explains that the use of
IWB is to encourage each learner to have a positive experience in the music classroom. In the field of pre-service teacher education and teacher education, Wong et al. (2013) analyze the acceptance and use of IWB among early childhood science student teachers. Their findings provide several significant implications for the research and practice. Such as that “social influences and facilitating condition did not have significant influence on IWBs among early childhood student teachers (p. 12). Campbell and Martin (2010) found positive pedagogical benefits in IWB use by first-year pre-service teachers teaching mathematics. Lehner (2010, p.18) maintained that teachers have been able to successfully use IWBs for the preparation of lessons, learning has been extended in an innovative way, and the technology is generally perceived as enriching learning and teaching through its interactive capability and software. With respect to early childhood education, Morgan (2010) found that children between the ages of three to seven years experienced advantages in interactivity and play in the classroom though interactive whiteboard use.

Several researchers focused on the advantages of technology such as IWB (Northcote, et al., 2010) and emphasize the enthusiasm of the “missioner” in the school or classroom. For example, Glover et al., (2005) define the “missioner” as a teacher who not only grasps the technology but also has the ability to envisage how it could be used to further advantage. Such missioners frequently pioneer software that meets a variety of learning situations and their efforts convince colleagues and students alike of the pedagogic advantages of the new technology.

General findings of the benefits of IWB are as follows (Smith, et al., 2005). Beauchamp (2004) found gains by school teachers as they become more fluent in technology use and more aware of children’s confidence as users of the technology. Armstrong et al. (2013) utilized a series of case studies to illustrate how teachers have deepened and enhanced their own reflections on their changing pedagogic practices of working with IWB technology. Teachers were the mediators between students and the new software and their effectiveness promoted quality interactions and interactivity. They assert that using IWB brought tangible change in teacher’s ability to conceptualize and apply strategies that address the complexities of classroom teaching. IWB can be used to support a teacher’s preferred style of whole-class interactive teaching. It can also support creative teaching and learning in areas such as literacy and mathematics (Wood & Ashfield, 2008). The functionality of IBW can also be harnessed technology to support learning in science (Hennessy et al., 2007) to improve English language acquisition (learning the new vocabulary, engage in learning) (Hur & Suh, 2012).

4. Method

4.1. Participants

Participants for this study consisted of two head teachers and fourteen children from a preschool in Yunlin County in Taiwan. Additionally, there were five aides who were fourth-year students of the Early Childhood of Education and Care, Transworld University, Taiwan. The five aides assisted the researcher in classroom management when she held the musical programs and complete the checklists. Each participant attended one of the 50-minute class program in the school. Informed consent was obtained from the parents of all children. The researcher contacted a number of school administrators to invite teachers to participate in the study. Only one school agreed to participate in the research. A limited sample of four teachers consented to be involved. The two teachers interviewed averaged 6+ years of teaching, and their ages ranged from 28 to 40 years. Though not music specialists, all were qualified for Early Childhood Education. A subsample of fourteen children was initially tested and their results were compared to a final evaluation at the conclusion of the twelve weeks.

4.2. Procedure

A mixed methodology design was use for this experiment. Quantitative data were collected via Likert-scale checklists. Qualitative data comprised in-depth interviews with teachers and also annotated descriptions written ‘in situ’ by teachers when observing remarkable student achievement. The researcher contrasted two comparable groups of seven students: one group from the experimental (IWB) class and the other from the control (older models of teaching) class. Results were controlled to ensure consistency of variables such as time of day, length of time etc. This study also used observational research; this is methodology is used quite often in educational settings.
Observational research gives direct access to what is actually happening in a setting and is conducive to researching a wide range of phenomena such as learning attitude. The researcher and four assistants observed fourteen children once a week over a period of twelve weeks, for a total twelve sessions. Each session took place in a classroom with the researcher, with a controlled condition with the children in the class sitting on the floor in front of the whiteboard. In the experimental condition, children sat on chair in front of the IWB. The researcher stood in front of all participants and the five aides stood directly behind the participants. From this vantage point, the teachers encouraged the students to complete the tasks during each session. Each session was videotaped in its entirety to capture the dynamics in the room. These recordings were later used for analysis: they were coded to measure the learning attitude and level of achievement of the program for the participants.

4.3. Measurement

A Likert-scale used to measure learning attitude and level of achievement was adapted from Valerio et al., (2012), Ritchie and Williamon (2011) and Tuan et al., (2005), where attitude and high achievement are measured in terms of positive, normal, and negative during interaction between their peers and a researcher. Checklists were accumulated each week to enable a finer-grained analysis. This quantitative data from the observation of the fourteen children was entered into SPSS 12.0 and tables were generated for visual access ability of the results. Descriptive analysis was conducted, first using frequency data for each variable. Wherever appropriate, statistical tests were used to test for specific relationships. A series of t tests were calculated to test for significant differences in the participants’ learning attitude and high achievement in IWB and without IWB, to account for factors which may have been the result of participant-based tendencies. A t test was completed to judge the mean difference for each topic, comparing the scores of IWB and older models of teaching.

An adapted model of “Musical Activity for Learning Attitude and Learning Outcome Measurement” was used to measure IWB and older models of teaching. These were used to collect data by noting each time an attitude and learning outcome occurred. Two set of measurements sought to gauge the amount of attitude and level of achievement between two groups of children. The first set of measurements sought to capture the amount of interaction that occurred between the group children and the researcher from both pedagogies. These measurements for IWB and older models of teaching included: seven statements for musical theory (eg. scale, staff, signature, time, notes, rests, chords) and four for musical skills (eg. motor pattern coordination, eye-hand coordination, speed of movement, indentifying). The second set of measurements sought to identify any decrease in anti-social attitude, and included fifteen statements about learning attitudes (eg. facial expression, imitating, self-esteem, turn taking, caring, respect, courage, honesty, responsibility, tidying up). All changes in attitudes were scored as a percentage derived from the number of attitudes displayed against the total number of opportunities given.

4.4. Reliability

The five assistants involved in the study had taken several undergraduate subjects in early childhood education and had experience working at early childhood education schools, institutions, or centers in Taiwan. All were trained to use the measurement which this researcher tailored for assessing musical activities taught via both pedagogies. Cronbach’s alpha (α) procedure extracted data from the learning attitude and learning outcome measurements in order to assess if the differences in both pedagogies were statistically significant. Each aide used the measurement instrument to record their observations about how they perceived the children’s skills in both pedagogies when participating in musical activities that incorporate various learning tools or computer software programs. The assistants also examined all of the videotaped sessions conducted by the researcher and recorded their observations via the measurement instrument for inter-observer agreement. Inter-observer agreement was calculated using SPSS 12.0. Learning attitudes for IWB between the researcher and the fourteen children were positive (.91) and learning attitudes for older models of teaching were also positive (.90). Similarly, learning outcomes for IWB between the researcher and fourteen children were positive (.90), as were learning outcomes for older models of teaching (.95).
4.5. Social validity

A semi-structured interview was conducted with both classroom teachers at the end of each lesson to assess if there was any significant differences in children’s learning attitudes and learning outcomes when comparing these two models for teaching music. The interview questions were related to the fifteen attitudes measured during the twelve lessons and observations made during musical activities. Interviews lasted approximately 60 minutes and each was recorded and transcribed verbatim. The interviews were analyzed using Interpretive Phenomenological Analysis (IPA) and themes were identified as emerging from the coded transcripts. In addition, after completion of each interview, the researcher separately recorded a coherent narrative of her interpretation of the interviewee’s accounts. Direct quotations are used to illustrate the themes. These quotations have been translated from Mandarin Chinese into English.

5. Discussion and Results

This study compared the use of IWB with older models of teaching to examine the possible benefits that these two different modes of learning music may have for the development of children’s learning attitude and learning achievement. The resulting data is discussed under the headings of each research question: what are the reported of benefits or disadvantages of using IWB and older models of teaching to improve children’s attitudes and achievements in learning in the music classroom; how does each of these models of teaching perform in the music classroom when assessed using a standardize measure; and a comparison of the differences between children’s learning attitudes and learning outcomes when using IWB versus older teaching methods. Each is discussed below.

5.1. Results Pertaining to Research Question 1

Question 1 examined the benefits or disadvantages of integrating IWB into musical teaching and musical teaching without this technology. Findings uncovered a range of opinions from the participants about the efficacy of IWB and the efficacy of using older models of teaching. These findings can be divided into two main topics: the first relates to the benefits of using IWB for improving children’s learning attitude and learning outcomes; the second concerns the benefits of using older models of teaching for cultivating children’s learning attitude and learning outcome.

5.1.1. The benefits of Using IWB: Improving Children’s Learning Attitude

Both head teachers (Amy and Bella) believed that all participants enjoyed using the IWB, and described student’s attitudes as excited and engaged. The children wanted turns at the board and displayed interest in musical activities that used the IWB. The head teachers reported that children showed pride when they could successfully respond to questions on the IWB. However, Teacher Amy said,

The researcher took the time to give explicit instructions regarding the functions and tools of the IWB at the beginning of the lesson. But during the first three weeks of lessons, some of children did not show respect for the IWB. They banged, touched, used the specific pen to draw very hard, dragged the wrong answer, and erased without purpose. This is problematic because as a learning tool, it is very expensive.

All participants needed a refresh of instructions on the basics of operating the IWB at the start of each lesson. In addition, at the beginning of the lessons, participants had to learn skills specific to that lesson such as touching, moving and erasing the IWB. All participants were quick learners and enjoyed learning musical theory through musical software called SFSKIDS FUN WITH MUSIC. The researcher gave clear instructions about this program utilizing demonstration. These lessons were perceived to be more visually stimulating by Teacher Bella, but she also saw problems with participants’ learning attitudes. Teacher Bella stated,

The researcher asked Jung to come forward and use the marker to answer the questions which were shown on the program. But Jung did it wrong and the other participants were teasing and laughing at her. She felt very sad and lost confidence.
Such learning attitudes from participants were frequently evidenced in the first two weeks. IWB has been described by many preschool teachers as being more interactive and resulting in higher child engagement. In contrast, both teachers in the current study were in agreement that with IWB, there were more rules children to follow. After twelve weeks, all participants were familiar with IWB functions and practical skills. Teachers who incorporate use of the IWB into the instruction with ease find that learning the new technology was no longer a barrier; they could fully focus on the lesson and direct children’s concentration towards the lesson at hand without any negative attitude (Gill & Islam, 2011; Harlow, 2010; Vincent, 2007).

5.1.2. The benefits of Using IWB: Improving Children’s Learning Outcome

Data were collected to gain insight from the two teachers’ perspectives as to whether the IWB improved instruction with children. Teacher Amy stated,

The increased visual representation helped the children pay attention longer and facilitated the development of leadership skills by getting them actively involved in front of the other participants. For example, Ch’s engaged in beating different 2/4, 4/4 time and distinguished pitch representation. Ch’s took pride in being able to instruct the other children.

Both teachers agreed that having an IWB in the classroom made participants learn more efficiently. The researcher utilized the musical activity or games and, using the technology, saved the progress made to be reopened at a later time or to be repeated many times by children to aid children’s memory of the right answers. Much time was saved through the easy pack up of materials or resetting the musical activity, and this freed up time for participants to focus on the researcher’s instruction. Teacher Bella stated,

Chang tried use the specific pen to answer the rhythmic patterns in the challenges he faced. But he did it wrong and he could simply swipe up with his writing hand and try again. He did eventually get right answer. The researcher recorded his incorrect attempts as an example to show everybody where they might go wrong.

Both teachers agreed that with many of these changes to instruction, the researcher cultivated interactions between children, making it more likely for children to participate. The teaching method motivated children’s interest in learning, and teachers specifically noted increases in positive learning outcomes. Both teachers saw a major disadvantage of IWB is that none of participants had an IWB at home. This meant they could not have additional practice time with the technology. Private computer use can aid the competency of some participants in skills such as time signatures, rhythm elements, musical staff, and scales but these computer programs do not replicate the full range of possibilities available through IWB use.

Never-the-less, there is a vast and ever-increasing range of musical computer software programs available. Such programs can promote children’s creative expression and accelerate learning through exercises, giving children an edge on their peers. When competent with these home computer programs, children can create their own professional scores quickly and share them with ease.

5.1.3. The benefits of Using Old Models of Teaching: Cultivating Children’s Learning Attitude

Considering the growing concern over the apparent increase of inappropriate behavior within general classroom activity and the increasing awareness of gender and academic disaffection, it is worthy to considering teachers approaches to problem solving. After twelve weeks of delivering the old models of teaching program, it became evident that different attitudes were emerging. Teacher Amy indicated that “the researcher asked Chun to represent the notes on the musical staff based on the ‘Puku’ (Cuculus canorus) song, Chun did it wrong and then he refused to correct it. The first time this happened, he threw the notes and rests and yelling at the researcher. Then, Chun gradually changed his attitude. He was asked to be corrected, was smiling and respectful towards the researcher. He learned how to do the right work.

During lessons, participants grew in confidence because the researcher gave appropriate encouragement and respect to the children. As Teacher Bella explained,

The researcher tried different ways to teach a song. For example, there was a musical staff with treble clef and each line and space represented a different note which corresponded to the melody of song called
‘Shan-ti ch’an-ch’iu wu’ (Aboriginal dance for spring and autumn). As the researcher sang the song, she pointed to the melody and helped children to remember what notes were on the lines and the ones that were in the spaces. After many group exercises doing this, she asked participants to take turn to do it individually. One child named K’ai stood in front of the blackboard for awhile and could not represent any note. K’ai did not feel ashamed as he waited for other children to finish. He asked the researcher to give him another chance.

Patience is another essential quality when interacting with children during musical activities. Both teachers believed that all of the participants were not fast learners and need more time to practice and drill. For example, the researcher picked Chu up and clapped the rhythmic patterns of ‘Shan-ti ch’an-ch’iu wu’ song. Chu did it wrong and the researcher gave her enough time to correct her mistakes. It was also happened with another child called Chun, who could not draw a treble clef on the musical staff. The researcher provided several hints and Chun never gave up. Finally, she did well. The findings indicate that, through appropriate reinforcement during learning, children can intrinsically come to value self-management and responsible attitude.

5.1.4. The benefits of Using Old Models of Teaching: Enhancing Children’s Interest in Musical Theory Learning

Many ways to motivate children to learn musical theory have been developed. For example, children’s songs can be accompanied with games, movements and teaching tools such as musical elements made from cardboard. Teaching tools such as E-Z Music Tiles and signature flashcards are considered useful by the researcher because they capture children’s attention. One teacher, Amy, stated that, “[the] researcher drew a quarter note and Hao quickly responded without mistake. Then, [the] researcher picked up eighth notes and Hao also quickly responded without hesitation.” She continued said that, “the researcher taught children how to read basic sheet music, she drew a standard music staff and asked Chen to pick up Do and Re notes and place them on right space or line. Chen followed quickly and accurately. Then, the researcher made the lesson more difficult. She asked Kai to put the Fa, Sol, Me, and Do notes into the right lines or spaces. Kai tried harder but got it wrong. Another teacher, Bella, stated that “[the] researcher used the teaching tool of rhythm pattern cards which included dotted drill syncopated rhythms of a quarter, eighth, and dotted combinations. The researcher arranged the rhythm pattern cards on the blackboard and asked Kai to clap and count the rhythm. Kai did well.” Both teachers in the older teaching model group agreed that teaching and drilling children using proven pedagogical skills and the flexibility of tailoring choice of materials were most beneficial. These findings are supported by pre-existing research. Shih (1989) believed that using old models of teaching could motivate children’s learning ability and self-learning attitude. Ts’ai (2002) indicated that the advantage of using old models of teaching is that the materials are flexible for teachers to apply.

5.1.5. The benefits of Using Old Models of Teaching: Improving Children’s Ability in Musical Skills

The seven children in this group could sing precisely the same melody of songs that they had learned before. In the process of teaching, teachers used their prior experience to select teaching pedagogy which could develop children’s greater skills in singing, sight reading, and clapping rhythm. One teacher, Amy, indicated that “when the researcher sang the first phrase of ‘Puku’ (Cuculus canorus) song, Chu also could sing first phrase of song. Then, the researcher sang along with the CD which is called ‘Ch’un-shen lai le’ (Spring God Coming), Po followed the melody and was able to sing along for the whole song.” Amy found that children could easily recall songs they had learned in previous lessons. They would get feedback very quickly. The teacher Amy also observed children in the class successfully develop skills in clapping rhythm. She said that “the researcher sang the ‘Yeh Chi Chi’ (Silent Night) song and also clapped rhythm with different patterns. The researcher had repeated this several times and asked the children to imitate. One of participants named Fu did very well. Similarly, the researcher did another song called ‘Shih-lien-yao’ (Picking Lotus Flowers) with clapping different rhythmic patterns. Children also followed the researcher’s pedagogical procedure and one of children named Chu who did well.”

Teacher Bella saw the disadvantage to one child who could not clap when he saw the rest note. For example, in the rhythmic patterns Sol Me C C, Sol Me C C, Re Do Re Do C C etc., he missed the claps. One of children’s named Fu could sing the whole song but skipped all of the rest notes. Teacher Bella indicated that “the
researcher finally gave a review for the whole lesson. She adapted ‘Do Re Mi song’ which all of participants were familiar with and asked children to choose the different notes, clef, and rests to represent on the staff in the right position. All of children did well during the lesson.” Both teachers believed that old models of teaching which use oral instructions were acceptable and could easily be understood by children. They felt this because these lessons were systematically structured around topics and the lessons integrated music theory with learning songs.

5.2. Results Pertaining to Research Question 2

Research Question 2 used a standardized measure to examine the performance of old models of teaching and IWB for teaching using a music to preschoolers. Measured results assessed children’s learning attitude and learning outcomes. The standardized measure used was well-known learning music assessment checklist for preschools. Which assess children attitude, and children outcomes in both skills and theory. Data collected was analyzed using SPSS 12.0 to determine teachers’ perceptions about the benefits and disadvantages of using one or both pedagogies. As shown in Table 1, the results of the t test showed that there was a difference between pre-implementation and post-implementation, indicating that the post-implementation (mean = 59.47, sd = 2.9) reacted more positively than the pre-implementation (mean = 52.07, sd = 4.6) to the questions in learning attitude section (t = .828, p = .021).

Table 1. Children’s learning attitude during musical lesson

| Scale     | Tape of LA  | No | M   | SD  | t   | P*  |
|-----------|-------------|----|-----|-----|-----|-----|
| LA Scale  | Pre-implementation | 7  | 52.071 | 4.6675 | .828 | .021 |
|           | Post-implementation | 7  | 59.471 | 2.9290 |     |     |

N=7, LA= Learning Attitude; *P< .05

As shown in Table 2, the results of the t test reveal that there was a significant difference between pre- and post-implementation. This indicates that the post-implementation measures (mean = 37.62, sd = 4.8) scored higher than the pre-implementation measures (mean = 28.07, sd = 6.4) to the questions in learning outcomes section (t = .912, p = .004). The results of these findings reflect the fact that both pedagogies received positive outcomes from post-implementation and were perceived favorably by teachers who used that method.

Table 2. Children’s learning outcome during musical lesson

| Scale     | Tape of LA  | No | M   | SD  | t   | P*  |
|-----------|-------------|----|-----|-----|-----|-----|
| LO Scale  | Pre-implementation | 7  | 28.071 | 6.4577 | .912 | .004 |
|           | Post-implementation | 7  | 37.629 | 4.8110 |     |     |

N=7, LO= Learning Outcome; *P< .05

5.3. Results Pertaining to Research Question 3

Research Question 3 focused on the differences between the use of IWB integration into music teaching when compared and contrasted with learning attitude and outcomes achieved without IWB use. To determine whether teachers’ beliefs about the role of IWB in teaching music correlate with their perceptions of their old models of teaching in the music classroom, the overall mean score of the two scales (Learning Attitude Scale and Learning Outcome Scale) were calculated separately, and then correlation analysis was used. The results of the t test showed that there were no differences between the two scales pertaining to learning attitude and learning outcomes based on IWB and OMT (see Table 3). In other words, both pedagogies performed equally well.
Table 3. Results of the *t* test according to type of learning topics

| Scale | Tape of Topics | No | M     | SD     | t   | P* |
|-------|----------------|----|-------|--------|-----|----|
| LA Scale | IBW            | 7  | 63.057| 3.7890 | -.542| .209|
|        | OMT            | 7  | 59.471| 2.9290 |     |     |
| LO Scale | IBW            | 7  | 45.771| 8.6123 | .063| .893|
|        | OMT            | 7  | 37.629| 4.8110 |     |     |

N=7, LA= Learning Attitude; LO= Learning Outcome; *P< .05

6. Conclusion

The findings of this study suggest that the effects IWB are equally as beneficial as older models of teaching in Taiwan. The results also provide clear insight into current pedagogy being used in the preschool classrooms. Several questions have been discussed and analyzed to verify the effects of implementing IWB and older models of teaching in the music classroom. Liao (2013) maintained that his study provided teachers with a conclusive accumulation of evidence-based research which demonstrates positive learning outcomes through the use of technology in instruction. Whilst there is some literature regarding the potential benefits of using IWB in education, research results comparing the effects of IWB and non-IWB instruction in Taiwan are conflicting. Reported significant advantages of IWB included Jang & Tsai (2012), Lin et al. (2011), Wang (2011), Wu (2011), Yu (2010), and Huang et al., (2010). By contrast, Chao & Tung (2011), Chen (2011), Lin (2010), Kao (2009), and Kuo (2009) revealed no significant differences between IWB instruction and non-IWB instruction. No significant differences did not mean that either IBW or older models of teaching had no benefit for children’s learning. Rather, these findings seem to indicate that the effectiveness of the technology and teaching tools are directly related to the skill level of the teacher who is operating the IWB or utilizing older models of teaching. The results of this study also demonstrate that improvements in children’s learning attitudes and academic achievement are possible through both pedagogies.

References

Armstrong, V., Barnes, S., Sutherland, R. Curran, S., Mills, S., & Thompson, I. (2013). Collaborative research methodology for investigating teaching and learning: the use of interactive whiteboard technology. *Educational Review, 57*(4), 457-469.

Baker, J. (2007). SMART board in the music classroom. *Music Education Journal, 93*(5), 18-19.

Beauchamp, G. (2004). Teacher use of the interactive whiteboard in primary schools: towards an effective transition framework. *Technology, Pedagogy and Education, 13*(3), 327-348.

Campbell, C. and Kent, P. (2010). Using interactive whiteboards in pre-service teacher education: examples from two Australian universities. *Australian Journal of Education Technology, 26*(4), 447-463.

Campbell, C. & Martin, D. (2010). Interactive whiteboards and the first year experience: integrating IWBs into pre-service teacher education. The Australian Journal of Teacher Education, 35(6), 68-75.

Chao, J. Y. & Tung, S. C. (2011). A study of using interactive whiteboard on problem-based learning in Social Study area of elementary school. *Elementary Education, 31*(5), 82-90.

Chen, S. C. (2011). The Effect of Using Interactive Whiteboard on Sixth Grade Students’ Music Rhythm Learning. Unpublished master thesis, Department of Music, National Pingtung University of Education, Pingtung, Taiwan

Chen, Y. C. (2010). A study on learning motivation of integrating interactive whiteboard into elementary school high graders mathematical teaching. *Journal of Industrial Technology Education, 3*, 1-7.

Chen, H. P. (2006). Think interactive whiteboard for the classroom teaching. *Chinese Information Technology Education Innovation Conference, Taipei*, 19 December 2006.

Ghislandi, P. & Facci, M. (2013). Schools in the digital age: teachers’ training role in the innovative use of the interactive whiteboard. *Journal of Theories and Research in Education, 8*(1), 1-18.

Gill, S. R., & Islam, C. (2011). Shared reading goes high-tech. *The Reading Teacher, 65*(3), 224-227.

Glover, D., Miller, D., Averis, D., & Door, V. (2005). The interactive whiteboard: A literature survey. *Technology, Pedagogy and Education, 14*(2), 155-170.

Harlow, A. (2010). Beginning the day with the IWB in an early childhood classroom. *International Research in Early Childhood Education, 1*(2), 57-68.

Hennessy, S., Deane, R., Ruthven, K., & Winterbottom, M. (2007). Pedagogical strategies for using the interactive whiteboard to foster learner participation in school science. *Learning, media and technology, 32*(3), 283-301.
Huang, T. H., Liu, Y. C., & Yan, W. T. (2010). The effects on 6th grade students’ mathematical achievement and learning motivation using innovative cooperative learning model with the aid of interactive whiteboard. *Curriculum and Instruction Quarterly, 41*(1), 115-140.

Hur, J. W. & Suh, S. (2012). Making learning active with interactive whiteboards, podcasts, and digital storytelling in ELL classrooms. *Computers in the schools, 29*(4), 320-338.

Jang, S. J. & Tsai, M. F. (2012). Exploring the TPACK of Taiwanese elementary mathematics and science teachers with respect to use of interactive whiteboards. *Computers & Education, 59*(2), 327-338.

Jhong, M. Y. (2010). Comparison between older model of teaching and the digital learning. *Taiwan Education Review, 661*, 13-17.

Kao, C. F. (2009). A study on effects of incorporating interactive whiteboard with cooperative learning into the elementary mathematical teaching of learning unit of dilation and scale for high graders. Unpublished master thesis, Graduate Institute of Education Technology, National Pingtung University of Education, Pingtung, Taiwan.

Kerschner, R., Mercer, N., Warwick, P., & Staarman, J. K. (2010). Can the interactive whiteboard support young children’s collaborative communication and thinking in classroom science activities? *Computer-Supported Collaborative Learning, 5*, 359-383.

Kuo, I. L. (2009). *A study on effects of combining interactive whiteboard on learning functional mathematics for children with moderate and severe mental retardation*. Unpublished master thesis, Department of Special Education, National Taichung University of Education, Taichung, Taiwan.

Lee, S. N. (2012). *Mathematics teaching with interactive whiteboard on the geometrical (circle) concept of third graders as an example*. Unpublished master thesis, Department of Mathematics and Teaching, National Kaohsiung University of Education, Kaohsiung City, Taiwan.

Lehner, K. (2010). Case study: Austria. In Edward P. & Jim A., *Interactive whiteboard: national case studies* (pp. 10-23). Belgium: European Schoolnet.

Liao, Y. K. (2013). The effect of IWB on student academic achievement in Taiwan: a meta-analysis. The *Proceedings of the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, Oct 21, 2013 in Las Vegas, NV, United States.

Lin, H. Y. (2010). *Elementary school students’ learning effectiveness and attitudes towards English instruction aided by the interactive whiteboard*. Unpublished master thesis, Department of Information and Learning Technology, National University of Tainan, Tainan, Taiwan.

Lin, C. Y., Wu, F. G., Chen, T. H., Wu, Y. J., Huang, K., Liu, C. P., & Chou, S. Y. (2011). Using interface design with low-cost interactive whiteboard technology to enhance learning for children. *Universal Access in Human-Computer Interaction. Applications and Services Lecture Notes in Computer Science, 6768*, 558-566.

Lopez, O. S. (2010). The digital learning classroom: Improving English language learners' academic success in mathematics and reading using interactive whiteboard technology. *Computers & Education, 54*(4), 901-915.

Morgan, H. (2010). Teaching with the interactive whiteboard: an engaging way to provide instruction. *Focus on Elementary, 22*(3), 3-7.

Nolan, K. K. (2009). SMARTer music teaching: interactive whiteboard use in music classrooms. *General Music Today, 22*(3), 3-11.

Northcote, M., Mildenhall, P., Marshall, L., & Swan, P. (2010). Interactive whiteboards: interactive or just whiteboards? *Australian Journal of Educational Technology, 26*(4), 494-510.

Prosper, E. & Ayre, J. (Eds) (2010). Interactive whiteboard: national case studies. Bussel, Belgium: European Schoolnet. Retrieved from http://mo.eun.org/doc/document_library/get_file?uuid=2db07d1-099e-4a3a-b157-db3d65a393b2&groupId=10620.

Ritchie, L. & Williamson, A. (2011). Primary school children’s self-efficacy for music learning. *Journal of Research in Music Education, 59*(2), 146-161.

Shih, G. K. (1989). *An effective path for teaching*. Taipei: Shuei-niou.

Smith, H. J., Higgins, S., Wall, K., & Miller, J. (2005). Interactive whiteboards: boon or bandwagon? A critical review of the literature. *Journal of Computer Assisted Learning, 21*, 91-101.

Tsai, C. K. (2000). *The comparative study of traditional instruction and web-based instruction – from the exploration of teaching media, classroom management and assessment*. Unpublished master thesis, Department of Information Management, National Sun Yat-sen University, Kaohsiung City.

Tuan, H. L., Chin, C. C., & Shieh, S. H. (2005). The Development of a Questionnaire to measure students’ motivation towards science learning. *International Journal of Science Education, 27*(6), 639-654.

Valerio, W. H, Reynolds, A. M., Morgan, G. B., & McNair, A. A. (2012). Construct validity of the children’s music-related behavior questionnaire. *Journal of Research in Music Education, 60*(2), 186-200.

Vincent, J. (2007). The interactive whiteboard in an early years classroom: A case study in the impact of a new technology on pedagogy. *Australian Educational Computing, 22*(1), 20-25.

Wang, J. C. (2011). *The study of teaching with interactive whiteboard in elementary schools-on the fifth-grade English language study*. Unpublished master thesis, Graduate Program in Social Information, College of Informatics, Yuan Ze University, Taoyuan, Taiwan.

Wong, K. T., Russo, S., & McDowall, J. (2013). Understanding early childhood student teachers’ acceptance and use of interactive whiteboard. *Campus-Wide Information Systems, 30*(1), 4-16.

Wood, R. & Ashfield, J. (2008). The use of the interactive whiteboard for creative teaching and learning in literacy and mathematics: a case study. *British Journal of Educational Technology, 39*(1), 84-96.

Wu, H. L. (2011). *A study of the effects of interactive whiteboard on the numerical and geometrical concepts of sixth graders*. Unpublished master thesis, Graduate Institute of Education, Providence University, Taichung, Taiwan.

Yu, R. H. (2010). *A study of applying interactive whiteboard to the elementary musical game-based learning*. Unpublished master thesis, Graduate Institute of Technological and Vocational Education. National Taipei University of Technology, Taipei, Taiwan.