Approach to Utilization of Electronic Whiteboard in Classroom as Japanese Comparative Advantage

― Survey on Primary Teacher Training Course Students ―

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The purposes of this paper are twofold:（1）*to point out the Japanese comparative advantage and disadvantage that resources of using electronic whiteboard in classroom,*（2）*to investigate the effective factors to improve the pre-service teacher's intention for using electronic whiteboard. For these purposes, a questionnaire survey was conducted on 130 pre-service primary teachers*（undergraduate students）*. Referring to result of this preliminary survey, we constituted the teaching plan which tries to encourage their intention, and carried out the experimental teaching for the 50 examinee. The results indicated two main points:*

（a）*By diffusion of the electronic whiteboard in classroom, although in-service teachers can gain IT media training on their job, pre-service teachers have little occasion to care for it.*

（b）*Effective factors to improve pre-service teacher's intention are realization of lesson diversification and understanding of their effects via electronic whiteboard.*

Key Words：Electronic Whiteboard, Pre-service Teacher Training,

1. Introduction

　　Japan is already an advanced information society in 21 century. ICT media supports all the life of the people as an infrastructure for our culture. Over the past few decades, a considerable number of studies have been conducted on computer aided learning, and several studies have been made on electronic board in classroom. In Japan, according to computerization of school education, introduction of the current electronic whiteboard is advanced. For example, expense required for arrangement of electronic whiteboard on each one school was also added up by ICT School Environment Management Project called the School New Deal Policy（MEXT 2009）. As a result, the penetration of the electronic whiteboard became 16002 elementary schools（75. 8％）in 2010. As stated by the perspective of the teacher training to improve practical skill of ICT tool（MEXT, 2008a, 2008b）, each board of education has promoted the effective use of ICT in the school. As another background for introduction of the electronic whiteboard, there are some research reports about the effect to the improvement of "chalk and talk" method in classroom. Specially, for International educational cooperation, we keep in mind the verification of availability of new media（Ohara, 2006）. About electronic whiteboard, Shimizu（2006）reports the feature and the utilizing method of electronic board focusing on school education through the many cases in classroom. According to investigation of Inagaki et al（2008）, utilizing an

electronic whiteboard set students to help their explanation skill, and to compare with other idea easily. At the same time, Fujiwara and Nagata（2010）pointed out the serious problem that electronic whiteboard is hardly used in daily school life because of poor image on practical use in actual lesson. They bring up the problem of conventional teacher training that has merely described of functional aspects on electronic whiteboard. Moreover, Namihira（2012）reports the developed educational methodology which visualizes the main contents of instruction using the electronic board. Thus, some Japanese advantage with electronic whiteboard is that the physical environment where teachers in is good enough, and the merit/demerit of the application is to be arranged. However, previous research on electronic whiteboard is restricted to what is related in-service teacher training, and little attention has been given to pre-service school teachers. This paper is intended as an investigation of this field. The purposes of our research are to investigate the effective factors to improve the pre-service teacher's intention for using electronic whiteboard.

2. Methodology

The outline of investigation as follows;

Participants; 130 pre-service primary school teachers from undergraduate school（private university）were selected for this research. The reason why undergraduate students are selected as subjects is that they had no formal teaching experience with electronic Whiteboard.

Data collection; Data were gathered in November 2011. Two types of data were collected:

（1）Questionnaire investigation;the questionnaire identify their belief about using electronic whiteboard（autograph, anonymous style）.

（2）Experimental teaching; after questionnaire investigation, 50 participants were taken part in this teaching, and their process was video-recorded.

Material; The questionnaire consists of three group questions（total33 items）; (a) basic information (school grade, gender), (b) status of utilization (utilization experience, intention, reason), (c) beliefs about electronic whiteboard. Specially, questions included in group （c）contain six basic types of validity measures. The question items referred to the feature of the electronic whiteboard（Shimizu, 2006）. It is reasonable to get the information from all examinee in order to conduct a pre- and post-survey in this article.

About "Understanding of Function" items in group（c）as follows;

Q.（c）1-1. User can project immediately the photo taken during lesson on electronic whiteboard.

Q.（c）1-2. There are original functions on electronic whiteboard.

Q.（c）1-3. There is no security uneasiness such as an information leak.

Q.（c）1-4. User can duplicate the copy written in former lesson to electronic whiteboard.

Q.（c）1-5. User can showthe operation at hand on electronic whiteboard.

Q.（c）1-6. User can explain with writing a figure or drawing a graph.

Q.（c）1-7. User can hide the board partially.

Q.（c）1-8. User can save a child's work and use it in other lessons

Q.（c）1-9. User can operate on electronic whiteboard directly without personal computer.

Q.（c）1-10. User can move the place of electronic whiteboard easily.

About "Understanding of Effects" items in group（c）as follows;

Q.（c）2-1. Students can participate in a lesson positively by using electronic whiteboard.

Q.（c）2-2. Students can concentrate on lesson by using electronic whiteboard.

Q.（c）2-3. Students can get interest of lesson by using electronic whiteboard.

Q.（c）2-4. Electronic whiteboard can help students to understand.

Q.（c）2-5. There are visual effects such as moving, expanding and reducing.

Q.（c）2-6. Students tend to take notes easily by using electronic whiteboard.

Q.（c）2-7. Students tend to hold their eyes on electronic whiteboard.

Q.（c）2-8. Electronic whiteboard can keep the sufficient rhythm in lesson.

Q.（c）2-9. Electronic whiteboard can ease a teacher's burden.

Q.（c）2-10. Electronic whiteboard can be applied the various type lessons.

About "Understanding of Operation" items in group（c）as follows;

Q.（c）3-1. User needs to take courses to be able to use the electronic whiteboard.

Q.（c）3-2. User will master the skill of electronic

whiteboard well.

Q.（c）3-3. Data management is easy by using electronic whiteboard.

Q.（c）3-4. User can use an electronic whiteboard more easily than a whiteboard.

Q.（c）3-5. User can utilize the information on electronic whiteboard.

Q.（c）3-6. The operation of electronic whiteboard is easy and everyone can use it.

Q.（c）3-7. Download of teaching-materials software is troublesome.

Q.（c）3-8. User can resolve some troubles in lesson easily.

3. Results of Questionnaire Investigation

Results of Fisher's Exact Test and Findings

A summary of the response is shown in table1. We see immediately in table1, that is, although Japanese pre-service teachers might know the existence of electronic whiteboard, at most only 22% have utilization experience.

Table1. Result of Status of Utilization

N=130	Yes	No
Cognizance	109 （84）	21 （16）
Utilization experience	28 （22）	102 （78）

Moreover, it became clear the reason for not using electronic whiteboard that the reply "there is no opportunity to use" is overwhelmingly high at 76%. Specially, about the intention using electronic whiteboard in questions included in group（b）, we checked by Fisher's exact test and difference was statistically significant（P = 0. 033）. This result basically shows that students who have high intention are already experienced with electronic whiteboard, and they realize the diversity and visual effect of classroom lesson. These lead us to the effective factors of successful lesson to promote the pre-service teacher's intention.

Results of Multiple Regression Analysis and Findings

In order to search for the cause of the intention of electronic whiteboard, we conducted multiple regression analysis（stepwise procedure）by setting them into dependent variables. As a result, it was admitted that "Understanding of Effect"（β_2=0.516, p<.001, R_2=0.266）had influenced to their intention of electronic whiteboard.

The results of standardized partial regression coefficients are shown in Figure1. We use the SPSS ver. 18 for statistics analysis in this research. It was found from the results that the intention of electronic whiteboard does not depend on the understanding of board itself such as function and operation of it, but on "Understanding of Effect" by using board.
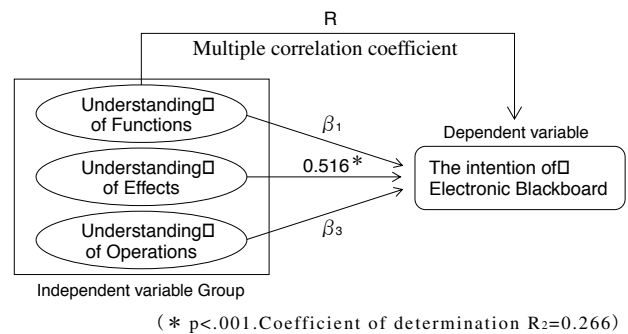

（＊ p<.001.Coefficient of determination R_2=0.266）

Figure 1.Path diagram of Multiple-Regression Analysis to the intention

So far, we have seen how rough insights into pre-service teachers' belief were gained through their responses. It might be inferred that urging "Understanding of Effect" raises a future intention through experience of electronic whiteboard. Therefore, we conduct more qualitative examination by experimental teaching, and this is reported in the next section.

Outline of Experimental Teaching

Based on the lesson plan in Table 2, experimental teaching for the 50 examinees was conducted for the following purposes: 1）To follow up on pre-service teachers' responses in the questionnaire, and obtain direct information concerning their belief around electronic whiteboard, 2）To confirm their modification thorough the practice, with special focus on "Understanding of Effect". The fifty subjects were selected for this lesson.

Results of Experimental Teaching and Pre/Post-Survey

We divided the subjects into three groups（students who select scale 5 to 6: higher intention, scale 4 to 3: middle intention, and scale 2 to 1: lower intention）based on questions included in group（b）on pre/post questionnaire, and verified the result of the experiment lesson. In Figure 3, we can see immediately that the rate of the middle class group decreased from 60% to 16%, and the rate of the high group increased to 81% from 36%. There is considerable validity in this result.

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Figure 2. Photo in Actual Experimental Teaching

Table2. Lesson plan1: the Objects of anterior half is introduction of Electronic whiteboard

Time	Students' Activity	Facilitators' Activity	On Electronic Whiteboard	Focus
5 min.	Describing the characters and pictures in blank paper on Electronic whiteboard freely.		【Handwriting Pen】 User can write characters and lines directly. Moreover, colors and thickness are also changeable.	Insertion (Function) Preserving (Function) Noting (Effects) Data Management (Operation) Keep Tempo (Effects)
		Printing the filled-in page, and explaining that we can keep the handouts for children who absent lessons and share them with other classes.	【Data Preservation】 Data such as "page" can be saved automatically to a USB memory.	
5 min.	Describing the triangle, quadrangles, and star pattern on electronic whiteboard in handwriting.	Showing how to write the star patterns.	【Intelligent Pen】 Figures, lines which were written by hand are operated orthopedically automatically, and user can create beautiful figures and lines simply.	
5 min.	Guessing what kind of bird on electronic whiteboard.	Highlighting the beak of halcyon, and Giving a hint, by shifting a spot.	【A Little bit Spot】 Users can focus on a part of photograph or figure, and can expand the portion further.	Hiding (Function) Intriguing, Concent-Ration, Diverseness (Effects)
10 min.	Thinking about difference of calculation between Japan and other countries. Exchanging their opinions with each other	Showing the "Calculation in German style" recorded before. Explaining an image suitably.	【A Little bit Recording】 User can record his own work on board for a definite period of time.	Decompress (Function) Improving perceptive (Effects)
10 min.	Writing comments in a photograph.	Taking the photograph of a classroom. Printing out the photograph which carried out handwriting. Explaining that user takes a students' photo and projects on the board as actual usage.	【Self-produced Pictures】 User can copy out the picture without the digital camera, and can also carry out an input data by hand writing.	Sharing Information (Function) Using Data. Diverseness (Effects)

Table 3. Lesson plan2：the Objects of posterior half is Arithmetic Practical Teaching

| Time	Students' Activity	Facilitators' Activity	On Electronic Whiteboard	Focus
10 min.	Finding the figure which we tessellate. Discussion with neighbor. Explaining that we can arrange the figures on plane.	Showing the follows: 1）regular tetragon (square) 2）regular pentagon 3）regular triangle 4）regular hexagon 5）regular octagon	【Drawing the figure】 User can prepare quickly, and reduce teacher's burden.User can keep sufficient pace, and change the colors visually.	Reduction burden, Tempo, Visual Effect, Intriguing, Concent-Ration (Effects)
15 min.	Demonstration step by steps, and understanding that we can tessellate every quadrangle.	Explaining the how to move and rotate the figure.	【Decompress of Figure】 User can draw same figures easily and reduce own burden.	
	Question: What is the common feature of the figure which we can tessellate?			
	Making 360 degrees from the sum of the internal angles.	Showing an example of the tessellation of regular hexagon, viewing the honeycombed structure.	【Moving and rotation】 User can deepen the student's understanding, set their eyes up and urge concentration.	Intriguing, Insertion Operation on board (Function)
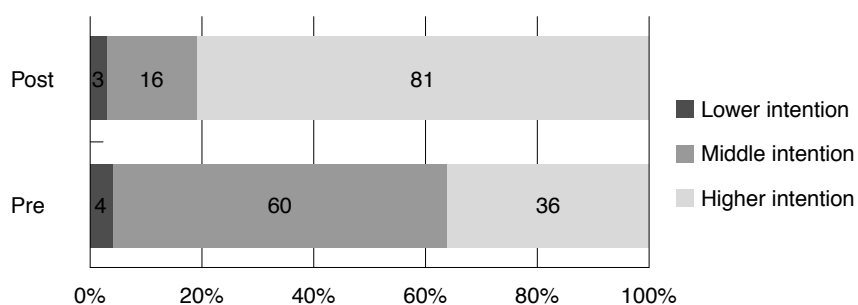
Figure 3.Each Group's Intention

According to the x^2 test for this result, the x^2 values were 42. 92, the differences among groups are statistically significant (p<. 01). The result indicates that the experimental teaching was especially effective for the middle group.

Moreover, it became clear as Table 4 that the intention of electronic whiteboard improved intentionally after the experiment teaching from the result of paired t-Test（the difference of average value）. The t-value 3. 424 is statistically significant （p<.05）. What has been demonstrated in this experimental teaching is "Understanding of Effect" of electronic whiteboard affects their intention efficiently. The result clearly shows that the examinee's motivation to use electronic whiteboard improved by experimental teaching.

Table 4. Result of Paired t-Test

N=50	Average	SD	df
Pre test	4.29	0.92	48
Post test	5.02	1.12	49

4. Concluding remarks

The purposes of this paper are to point out the Japanese comparative advantage and disadvantage those resources of using electronic whiteboard in classroom, and to investigate the effective factors to improve the pre-service teacher's intention for using electronic whiteboard. From what has been discussed above, overall, we could get the following two main findings:

（a）By diffusion of the electronic whiteboard in classroom, although in-service teachers can gain ICT media skill on job, pre-service teachers have little occasion to care for it.

（b）Effective factors to improve pre-service teacher's intention are realization of lesson diversification and understanding of their effects via electronic whiteboard.

Discussion to make international educational contributions have concentrated on the matter which Japan has already experienced issue. However, it also

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seems that it is important to positively lead and share the know-how and findings of using ICT teaching tools like electronic whiteboard board that is under practical investigation.

So the number of examinee in this research is limited, to pursue the general findings remain as a matter to be discussed further. Further research on using electronic whiteboard would clarify the strong points of teacher education with ICT in Japan. We should look more carefully into these findings because ICT skill and knowledge of pre-service primary teachers is to help them appreciate electronic whiteboard at different levels.

Acknowledgements

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【日本語要約】
　本研究の目的は，教室での電子黒板利用に関する日本の学校教育の比較優位性と劣位性を指摘した上で，電子黒板の利用意思向上に有効な要因を明らかにすることである．その為に，先ず現職教員研修の充実と教職学生の学習機会欠如を指摘した上で，次に小学校教員養成課程学生130名対象の質問紙調査を通して電子黒板利用意思向上の手掛かりを得た．その上で，同被験者50名対象の教授実験の結果，電子黒板利用効果の理解が意思向上に有効なことを明らかにした．