A Study of Whiteboard to improve teaching in primary schools

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Abstract: In the beginning of the twenty-first century, the rapid development of Information and Communication Technology (ICT), Taiwan starting in 2006, the focus style on a trial basis in 2009 and installed in a large number of whiteboards in primary schools. A result of an Interactive whiteboard (IWB) is applied in the classroom teaching activities in the new technology. Therefore, this study focuses on the interactive whiteboard elementary school in Kaohsiung County.

Keyword: Whiteboard, Information and Communication Technology (ICT)

1. Preface
In Bashibanian expanding domestic demand from the program in 1999,grant county and city infrastructure set up ICT education and gradual completion of the national primary and secondary schools computer lab and Internet Republic of China Ministry of Education Jiushiwunian "IT education infrastructure" programs in 2006, the "e-learning environment” building cities and counties”, the main contents are construction of information technology on campus, broadband Internet access and other information-based environment, enriching the digital content, learning and teaching resources so that is no longer just paper and textbooks, but the sharing of resources. To improve the teaching and learning environment, it can encourage teachers to create new teaching models and information readily available in the learning context.

Ministry of Education White Paper on primary and secondary Education[1] mentioned that to enhance the national teaching equipment national primary and secondary schools in the country will set up a large number of e-specialist. The equipment to teachers in the teaching process would have a change and an impact on students’ learning.

Therefore, this study will explore the Technology Acceptance Model that teachers and students have to upgrade through the interactive whiteboard teaching. After Whiteboard and related equipment of high-tech products were using in the classroom, the teacher has brought a great impact on traditional teaching. How to use this technology into the teaching aids and let equipment get the most important function and benefit. It is worthy of being looked at education.

Therefore, this study is to investigate the process of teaching that teachers use the whiteboard in the situation and find the difficulties encountered and solve their problems. In sum, the appropriate teaching strategies and methods put forward for Whiteboard teaching of the proposals. In order to reduce the time to re-exploration, it promotes the use of schools for future reference.
2 Literature Review
2.1 Technology Acceptance Model

Technology Acceptance Model (TAM) is Fred Davis’ PhD thesis. It is based on the theory developed out of Theory of Reasoned Action (TRA), Cost-Benefit Theory, etc. To explain the computer system to accept the intent would be the impact of dimensions according to Perceived Usefulness and Perceived Ease of Use. The aim is to develop a means of interpretation, evaluation and prediction of users of new information technology system to accept a tool[2] [3].

In recent years, TAM has also been subject to research scholars and practitioners to have widely confirmed in a variety of scientific and technological fields, follow-up inspection, application. Many research results indicate that TAM is a cross-time, scenario, race, and technology between the stability of the tool[4] [5] [6] [7]. Researchers point of view of various dimensions and external variables selection may affect the research results.

However, the TAM model to explain a certain range of dimensions will not be able to reach the significance of statistics among them. The TAM model predictive power of different is for different IT systems and different user types.

TAM related research found the relationship between dimensions and external variables: Table 1.

<table>
<thead>
<tr>
<th>Researchers</th>
<th>statistically significant relationship between the path of TAM</th>
<th>External variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davis[8]</td>
<td>Perceived ease of use cognitive usefulness, perceived usefulness of the use of attitude, perceived ease of use the use of attitude, the attitude toward the actual use, perceived usefulness of the actual use of</td>
<td>(None)</td>
</tr>
<tr>
<td>Davis[9]</td>
<td>Perceived ease of use cognitive usefulness, perceived usefulness of the use of attitude, perceived ease of use the use of attitude, the attitude toward the actual use, perceived usefulness of the actual use of</td>
<td></td>
</tr>
<tr>
<td>Mathieso n[10]</td>
<td>Perceived ease of use cognitive usefulness, perceived usefulness of the use of attitude, perceived ease of use using the approach of cognitive behavior will be useful to use the wishes of the attitude behavior</td>
<td></td>
</tr>
<tr>
<td>Taylor and Todd[11][12]</td>
<td>Perceived ease of use cognitive usefulness, perceived usefulness of the use of attitude, perceived ease of use the use of attitude, perceived usefulness, sex will, will conduct the actual use of</td>
<td>The impact of experience</td>
</tr>
<tr>
<td>Venkates h and Davis[13]</td>
<td>Perceived ease of use cognitive usefulness, perceived usefulness of the use of attitude, perceived usefulness, sex wishes sex wishes of perceived ease of use</td>
<td></td>
</tr>
<tr>
<td>Jackson et al.[13]</td>
<td>Ease of use, the use of cognitive attitudes, perceived ease of use sex wishes</td>
<td>Situational association, itself association, previously used to change the argument</td>
</tr>
<tr>
<td>Agarwal and Prasad[14]</td>
<td>Perceived ease of use cognitive usefulness, perceived usefulness of the use of attitude, perceived ease of use the use of attitude, the attitude toward the actual use, perceived usefulness of the actual use of</td>
<td>IT-related roles, job tenure, educational level, previous use of</td>
</tr>
<tr>
<td>Lucas and Spitter[15]</td>
<td>Perceived usefulness, perceived ease of use of</td>
<td>Subjective quality of cognitive</td>
</tr>
<tr>
<td>Karahanna et</td>
<td>Use of perceived usefulness, attitude,</td>
<td>Compatibilit y, trainable,</td>
</tr>
</tbody>
</table>
perceived ease of use, the use of attitude and willingness to use, attitude and behaviors

Use of perceived usefulness, attitude, the attitude toward acts of will, will conduct the actual use of

Perceived ease of use cognitive usefulness, perceived usefulness, use of attitude and willingness to use, attitude and behaviors, cognitive usefulness of the actual use of

Gender, experience, sex wishes sex wishes of perceived ease of use

Table 1 Source: Journal of Di Shijuan the first phase of e-commerce 2008.03 (p179-180)

Whether predicted to explain or to model structure, TAM model in the "technological information acceptable" topics are given considerable support. Therefore, TAM to study the structure of the teaching the use of whiteboard in the usefulness of cognitive awareness and ease of use will it affect the behavior and the attitude toward its use.

2.2 Whiteboard History

2.2.1 Whiteboard definitions

Teaching media specialist Kozma[20] that modern society is media-oriented (Mediated) the social, people searching for information, absorption, retrieval, comparison, analysis are all required to be done through the media. The interactive whiteboard is that the media into the teaching and learning environment. Whiteboard with the computer through the inter-connection, writing the contents of the whiteboard on the number of bits of it, may be kept. And teachers are free to operate on a variety of applications in the whiteboard software and hardware. So teachers and students in the media and information increase their interaction with each other[21].

The whiteboards used in classrooms presented by the way shown in Figure 1

![Whiteboard Image](image_url)

Figure 1 Source: Quoted from Chen Huibang[22]. An interactive whiteboard into the status of classroom teaching and thinking. Information contained in the Global Chinese Education and Innovation Forum

2.2.2 Whiteboard Types

Currently a whiteboard is used by the third generation, first-and second-generation are used less. According to structure, technology and features of classification can be divided into infrared sensors, Pressure touch sensing, electromagnetic tracking sensors as well as the four types of ultrasonic sensors. Table 2 Interactive whiteboard sensor technology comparison table (Table 2)

<table>
<thead>
<tr>
<th>Sensing</th>
<th>Induction framework</th>
<th>Technical Principle</th>
<th>Writing Media</th>
<th>Principle of operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrared</td>
<td>In the whiteboard multiple infrared sensors around the device, horizontal and vertical scanning</td>
<td>Used with the LCD screen, similar to the concept of plane location, sensors and sensor</td>
<td>Stylus, fingers, or any items that cannot penetrate</td>
<td>The use of the media stopped writing horizontally and vertically infrared can get X, Y anchor</td>
</tr>
</tbody>
</table>

Table 2 Interactive whiteboard sensor technology comparison table
In this study, the Kaohsiung County government purchased the infrared whiteboard as a teaching tool for the main research, the remaining three are no longer within the scope of this study.

### 2.3 Interactive whiteboard into teaching

#### 2.3-1 Interactive whiteboard in teaching the application

Chen Huibang’s[22] research: the classroom use of interactive whiteboard application level as described below:

1. To replace the traditional blackboard presentation or teaching rendering capabilities: interactive whiteboard can be used as a whiteboard to explain or through the PC and the projector will be projected on it teaching material. It is equivalent to touch-screen.

2. Teachers lead media platform: teachers control an interactive whiteboard to open media-related learning information to explain.

3. Teachers as the main display the software: teachers use the software, such as images, dynamic and the database of teaching materials or teaching the game in an interactive whiteboard.

4. Interactive learning platform for students and teachers: teachers use interactive whiteboards in the software functions, such as: curtain, spotlight, hyperlinks, shortcuts, components and boxes, writing recognition or voice recognition, etc., or a database of teaching material. Even interactive activities through the internet to gather relevant teaching resources designed to meet the teaching.

#### 2.3.1.2 Features used in teaching

<table>
<thead>
<tr>
<th>Pressure Touch</th>
<th>Known as the resistive sensor mainly by a group of ITO coupled with enhanced grinding formed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The upper and lower electrode using pressure-conduction measured through the control panel voltage change to calculate the location of contact points.</td>
</tr>
<tr>
<td>Stylus or fingers</td>
<td>When writing to the media contacts Whiteboard Pressure will make contact between two conductive film layers and produce electronic signals, contains X, contains Y</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>In the whiteboard to place two ultrasonic receivers must be compatible with the transmitter signal can be issued. (Usually stylus)</td>
</tr>
<tr>
<td></td>
<td>From the ultrasonic transmitter and two receivers to be the signal strength of the relationship between the relative position of 3 o’clock position.</td>
</tr>
<tr>
<td>Special pen</td>
<td>Transmitter contact with an object, it will result in attenuation due to absorption of ultrasound, when signal strength and bit movement is different from that,</td>
</tr>
<tr>
<td></td>
<td>Table 2 Source: iTHome Computer special issue 34, 2009.08.20</td>
</tr>
<tr>
<td></td>
<td>In this study, the Kaohsiung County government purchased the infrared whiteboard as a teaching tool for the main research, the remaining three are no longer within the scope of this study.</td>
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2.3.1.2 Features used in teaching
Lin Jian-Zhong, Wu-induced dimensional[23] In the interactive whiteboard in primary teaching of the interactive whiteboard that has the following features:

1. Page: All have an interactive whiteboard for teachers to create teaching component of the region or a blank page. One of the biggest features is the use of the page after preserved for re-use.
2. Pen and Highlighter: Pen and Highlighter provide a user to directly write on the interactive whiteboard. And the different colors of pens can be used to place emphasis on the teaching process.
3. Interactive activities: Interactive whiteboard software allows teachers and students to find interesting teaching resources.
4. Module or background: Interactive software will provide some background or modules to save time for teachers to draw pictures.
5. Graphics: Some interactive whiteboard software provides a useful in math or science graphics, so that teachers can easily explain some of the demonstration materials unit.

2.3.1.3 Interactive whiteboard teaching to enhance students learning ability

Kozma's argument considers the teaching media in teaching with the following features:
1. Teaching specific
2. Standardization
3. Aroused interest in learning
4. Increased to study the impression
5. To save teaching time

The study of British and Australian also finds that after the installation of an interactive whiteboard in the classroom, students can use more natural way of learning-related information technology equipment without teaching[24]. Research has also pointed out that the Interactive whiteboard can clarify the large panel images. Students can clearly observe the teachers in the process of operation of a variety of teaching activities and methods to reduce teachers and students moving interference in the classroom. The page can be re-used, but also to reduce repeat the instructions and writing waste.

To sum up in the teaching process that teachers can make full use of interactive whiteboard, the students have a positive demonstration effect. The use of interactive whiteboard can increase student interest in the use of IT equipment, and opportunities for enhancing students media literacy and the ability to absolutely have a positive impact.

2.3.2 Related to teaching theory

A result of whiteboard and computer and Internet-phase combination belongs to a kind of digital teaching. Digital teaching learning theory has the following three ways:
1. Constructivism

Constructivism stands the active construction of individual mental for "knowledge". By the external environment (social, cultural, linguistic, interpersonal, etc.) formed by the interaction of the course. Individuals based on their prior knowledge and had had the experience with the environment through assimilation, accommodation, the organization and thus the formation of new knowledge or new personal intelligence[25] [26] [27] [28].

The constructivist argument used in digital teaching and learning has the following three characteristics:

a. Knowledge is active learning through learner and constructed by self-organizing system. The learners can choose a subject and decide on the process of learning.

b. Knowledge structure is the base schema of the link to the network formed. In order to cognitive internalization or diversification, learners should be allowed to have an independent judge with an opportunity to use logical thinking ability.

c. Learning is based on old knowledge-based, and gradually absorbs new knowledge. It builds layer upon layer encountered conflict with both old and new knowledge. It will repeatedly test and compare the difference between the old and new. Finally, the integration of old and new knowledge will be to achieve learning results.

2. Situated Instruction Theory:

The main argument is that situational teaching the individual must be kept out of situations where the knowledge, activities or community groups. Through observation, imitation, and a series of participation, continuous testing, exploration, operation, reflection and the amendment in the process gradually come to understand the significance of knowledge or skills[25] [29].

The argument has the following points:

a. Diverse comprehensive intelligence
b. Authentic tasks
c. Professional cognitive apprenticeship  
d. Technological anchored instruction  
e. Seamless assessment  
f. Collaborative social interaction  
g. Assistant role of teachers  

3. Gestalt Psychology  

Gestalt Psychology mainly discusses the visual perception of human reactions and perception between the learning relationship. It attentions to the overall organization of the cognitive process and opposes to the sense of segmentation studies. It stresses the integrity of experience and behavior. The human visual perception for an Organization through the perceptual system presented the form. It is not a separate part of the assembly to be formed[30].  

Argument based on Gestalt theory, visual understanding of the learner's learning is very important. The teaching of digital rendering and design of human-machine interfaces such as: text, sound, animation, graphics, color, light and shade combination of learning have a very significant impact. Make good use of the principle of Gestalt psychology will enhancement of learning effectiveness. There should be good helpful. The design should be based on humanity, respect for learners, easy to learn and easy to use as the supreme guiding principle. The design elements are as follows:  
a. When graphics and background are more different, they could bring out the perception of the object. Therefore, to determine the background will not hinder the presentation of graphics.  
b. Using simple graphs, charts to render the concept or import of knowledge and avoids the whole presentation of language.  
c. To increase the effectiveness of learning can be voice, video, pictures, text or cross with the use. You can also moderate the use of color, animation, flash to attract attention, but to avoid excessive media technology so unoriginal.  
d. To be associated with the unit or element in place, learners can be classified into the same element, rather than as elements of different categories.  
e. If the concept is complex, it should be implemented progressively from simple fan in order to design the course.  

Based on the above three kinds of learning theory, Gestalt psychology is closer to the whiteboard presented visual learning. Interactive whiteboard will help to build the effectiveness of learning and long-term memory in the classroom. To sum up with the whiteboard in Kaohsiung County in 2009 build a comprehensive primary and secondary schools in various countries, it is necessary from the perspective of the concept of substantially more for a larger sample in order to provide a reference for further decision-making units. This study investigated is divided into a large school, medium schools, small schools for whiteboard teaching status of implementation of the school.  

3. Found  

According to the literature to explore the process of discovery whiteboard teaching on students learning motivation, to increase teaching efficiency and learning outcomes have been improved greatly. The ability of information to students also has positive effect. Whether the teachers are willing to change their existing mode of teaching, one of the keys is also an important. Although the literature mentioned whiteboard can increase their motivation to learn, but the student's academic achievements did not necessarily improve the trend. Interactive whiteboard to improve students information and communication technology (ICT) literacy and ability to have its positive impact, but it can improve "information capacity indicators" is an question. 

Goodson[31] and Armstrong et al.[32] of the study indicated that Teacher is an interactive whiteboard or other ICT hardware and software agents. When an interactive whiteboard is into the classroom, the continuing professional development for teachers to do the training may be the key. . In the professional development process, the training methods in accordance with the principles of design Bransford, teachers can learn how to correctly use an interactive whiteboard teaching methods. When teachers learn to use methods, the attitudes of teachers and whether there is sufficient teaching preparation will lead to "Interactive" in teaching activities flexible use of one of the keys.  

After the installation of whiteboards is in the classroom, teaching beliefs of teachers within and teaching style of teachers are affecting the learning effectiveness and learning. Therefore, Kaohsiung County, elementary school teachers to explore the use of the current situation is a necessary.
The results can be related to educational institutions for reference

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