Editor’s Note: There have been many adaptations of the blackboard – more recently whiteboard - to enhance “chalk-talk” with colored pens, audiovisual media, television, interactive multi-media and computer generated displays. A “light” pen, programming capabilities and remote control add further flexibility for the creative teacher.

The potential of Wiimote Interactive Whiteboard as a teaching and learning aid
Tien Tien Lee, Kuan Nien Tan, Kung-Teck Wong, Chia Ying Lin, Wee Hoe Tan
Malaysia

Abstract

Studies showed that interactive whiteboard enhanced students’ learning and supported teachers’ teaching. Students were found to be more engaged, motivated and enjoy learning with interactive whiteboard. However, problems and issues in using interactive whiteboard such as installing cost, technical problem, classroom setting and users’ skills were also being reported in the studies. Hence, Wiimote Interactive Whiteboard is suggested as an alternative to interactive whiteboard to be used in the teaching and learning process. It is hoped that Wiimote Interactive Whiteboard can be useful teaching and learning aids in the classroom.

Keywords: Wiimote, interactive whiteboard, teaching and learning aid

Introduction

The Interactive Whiteboard (IWB) is a technology made up of a computer connected to both a projector and a touch-sensitive board that presents the contents projected from the computer, allows users to interact directly with applications without having to be physically at the computer (Levy, 2002; Manny-Ikan, Dagan, Tikochinski & Zorman, 2011; Termit Kaur & Abdul Rashid, 2012). This technology had been widely used in the education from primary to tertiary level in United Kingdom, Australia, United States, Mexico, Italy and Britain, (BECTA, 2008; Hall & Higgins, 2005; Higgins, Beauchamp, & Miller, 2007; Manny-Ikan et al., 2011). Some significant advantages of IWB reported in the previous studies were that it motivates students to learn, encourages involvements and participations, engages students in the teaching and learning process and meets the needs of students with different learning styles and special needs (BECTA, 2004; Beeland, 2002; Hall & Higgins, 2005; Levy, 2002; SMART Technologies Inc., 2006; Termit Kaur & Abdul Rashid, 2012).

Despite the advantages, the use of IWBs encountered some challenges mainly in the installation cost, technical difficulties, classroom setting, teachers’ knowledge and skills (Hill & Higgins, 2005; Levy, 2002; Wong, Goh & Osman, 2013). As solution, IWB based on the Wiimote is invented (Lee, 2007; Bosetti, Pilolli, Ruffoni & Ronchetti, 2011).

IWB based on the Wiimote

Wiimote is a component of Nintendo video game technology which acts as a gaming controller hold in hand by the player. It contains a 3-axis accelerometer, an infrared (IR) camera, a speaker, a vibration motor and Bluetooth connectivity (Lee, 2008). Wiimote IWB is a low cost IWB that uses a Wiimote controller as an infrared pen receiver. It allows users to interact with the contents on the screen using the infrared (IR) pen. The infrared camera at the tip of Wiimote will track infrared light emitted from the infrared pen, and send the mouse trigger and coordination of cursor to the computer via Bluetooth connection.
How it works?

The Wiimote has to put in a fixed position so that the infrared camera can “see” the projected computer screen. The user holds a pen with an infrared LED on its tip. The Wiimote tracks and tells the position of the infrared light to the computer via Bluetooth connection, and software loaded on a computer to calibrate and to receive signal. The position of the infrared light is then used to position the mouse cursor on the screen. Hence, the pen will act as the mouse, and the interaction between the user and the computer occurs by moving the pen. Since the Wiimote can track up to 4 infrared lights simultaneously, the IWB can actually become a multi-touch IWB simply by using multiple infrared pens. Wiimote Interactive Whiteboard is working on any flat surface (UPSI, 2015).

**Tools needed**

Some tools are needed to set up Wiimote IWB as stated in Table 1.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Hardware and software needed to set up Wiimote IWB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Software</td>
</tr>
<tr>
<td>Nintendo Wii Remote</td>
<td>Wiimote Whiteboard v1.3.1.11 or WiiTUIO or Smoothboard</td>
</tr>
<tr>
<td>Infrared pen with a momentary switch</td>
<td>Open Sankoré</td>
</tr>
<tr>
<td>LCD Projector</td>
<td>Microsoft Power Point</td>
</tr>
<tr>
<td>Personal computer running Windows XP, Vista, 7, 8, 8.1 (32 or 64bit) or Mac OS X</td>
<td></td>
</tr>
<tr>
<td>Bluetooth dongle (Only when the Bluetooth is unavailable)</td>
<td></td>
</tr>
<tr>
<td>A flat, white surface or Clip or tape</td>
<td></td>
</tr>
</tbody>
</table>

**Wiimote set up procedure**

First of all, the user has to install the Wiimote IWB software (v1.3.1.11) from the open source. When the software is installed, the user needs to connect the Wiimote to the computer. This can be done by pressing the red Sync button inside the Wiimote with the Wiimote IWB software is opened. The Wiimote IWB software will show a green status written ‘Connected’ if the Wiimote is paired with the computer (Figure 1 left). At this point, one of the four LED indicators on the Wiimote will lit up (Figure 1 right).
Next, the user has to place the Wiimote facing the projector screen at about 45 degrees from the surface where it is located. Make sure that the Wiimote can ‘see’ the entire screen. The maximum distance between projector screen and the Wiimote is 2 m. The layout of the position of Wiimote, screen and LCD projector is shown in Figure 2.
Wiimote IWB v1.3.1.11 is the software to connect and calibrate Wiimote. It receives infrared coordination tracked by the Wiimote and then turns it into the coordination of mouse cursor on the computer screen. So, the calibration step has to be done each time placing or changing the position of the Wiimote. Before the calibration, the user has to make sure that the infrared light from the pen is sensed by the Wiimote. This can be done by pressing the tip of the infrared pen on the screen. If there is a red dot appears at the ‘Visible IR dots’ (Figure 3), means that the Wiimote can receive the infrared light from the pen. Then, the user has to click the ‘calibration location’ button or press the A button on Wiimote to start the calibration procedure. A red cross will then appear on the screen (Figure 4). The user needs to press the tip of the IR pen on the red cross. Repeat this step for the following three red crosses appeared on the screen. After the calibration has been done, the ‘move cursor’ box will be checked.

![Wiimote Calibration Interface](image-url)

**Figure 3** Red dot at the ‘Visible IR dots’ indicating connection between Wiimote and the IR pen (UPSI, 2015)
Once the calibration is done, a white colour square box will be appeared in the Calibration Viewer and the Tracking Utilization. The white colour square box should be inside the grey area. The box indicates the size of the screen. The Tracking Utilization should be more than 30% (Figure 5). This value needs to be increased if the screen is larger. If the white square box is not placed within the grey area and the tracking utilization is less than 30%, repeat the calibration step.

**Figure 5 Calibration viewer and tracking utilization (UPSI, 2015)**

**Installing IWB software**

When the Wiimote is set up, the user has to install the IWB software. An open source software, Open Sankoré is suggested. It is developed by DIENA based in France, compatible with any display and pointing device (UPSI, 2015). It is an ergonomic and universal program dedicated to education, open-source, scalable and free, much more than just software (Open-Sankoré, n.d.). The software enables the users to manipulate text and diagrams, access to internet, add page to the scenario, show table, view document browser, and create digital lesson activities with multimedia in the Open Sankoré main window (Figure 6).
Advantages of Wiimote IWB

Interactive whiteboard was reported to be a useful tool to enhance teaching and support learning due to its flexibility and versatility, multimedia presentation, efficiency, supporting planning and the development of resources, modeling ICT skills, interactivity and participation in lessons (Smith, Higgins, Wall & Miller, 2005). All the mentioned benefits of IWB can be found in Wiimote IWB by using the Open Sankoré software.

In terms of flexibility, Wiimote IWB can be used in any room provided the surface for the projector screen is flat. The user just needs to bring along the Wiimote, projector, IR pen and laptop. Any wall of the classroom can be the projector screen. In contrast, IWB needs to have the bulky whiteboard which is difficult to move around. Some schools installed the IWB on the wall making it static and this will become a constraint for short students (Wong, Goh & Osman, 2013). Besides that, some IWBs were not placed in front of the classroom due to the location of the power outlet (Hall & Higgins, 2005; Wong, Goh & Osman, 2013). Students complained that they cannot see the board very well. Visibility of the IWB also reported to be a major problem in using IWB in the classrooms (Hall & Higgins, 2005; Wong, Goh & Osman, 2013). Blinds need to be installed in the classrooms to block the sunlight and reduce the reflection of the lights on the board. Reflection issue can be solved by using Wiimote IWB as the projector screen will be any wall in the classroom. The concrete wall is not as bright and as smooth as the IWB. Hence the reflection of the sunlight on the projector screen (wall) is minimum compared to IWB.

Wiimote IWB has the similar versatility functions to IWB. The applications offered by IWB such as using web-based resources in whole-class teaching, showing video clips to help explain concepts, demonstrating a piece of software, presenting students’ work to the rest of the class, creating digital flipcharts, manipulating text and practicing handwriting, saving notes written on the board for future use, quick and seamless revision (Hall & Higgins, 2005; SMART Technologies Inc., 2006), drag and drop, hide and reveal, highlighting, animation, storage and recall, feedback (Glover, Miller, Averis & Door, 2007) can be done by Wiimote IWB.
Wiimote IWB enables the users to design and edit the text, audio, visual, graphic, simulation and animation. The users can type or even write on the projector screen using free hand with the help of IR pen. This is good for the small kids who just start to learn writing. Audio, graphics, animation and video can be accessed easily by using the web browser. The users may worry about the copyright issue. Bosetti, Pilolli, Ruffoni and Ronchetti (2011) suggested that the learning objects which obtained from the web only shared locally, closing them in a Learning Managing System (LMS). So, the copyright issue is solved.

Wiimote IWB provides interactivity and participation in the classroom as the IWB do. Teachers can have students come over to the projector screen to drag and drop the answers, match the correct diagrams, identify the errors on the text, play games and many more. The big projector screen enables the whole classroom members to see what is happening and they get involved along the lesson. The IR pen is equivalent to the mouse of the computer, hence the use of IR pen needs some practice to gather experience and to make it looks natural while using it. Users have to make sure that their bodies do not block the Wiimote so that it can track the infrared light emitted from the pen.

Almost all functions provided by IWB can be done by using Wiimote IWB. The most important issue is the cost of installing Wiimote IWB is much cheaper than the traditional IWB. Installing an industrial IWB needs more than 1000 € compared to only 50 € for Wiimote IWB (Bosetti et al., 2011). In Malaysia, the cost of setting up an e-classroom containing a desktop computer, a LCD projector and an interactive whiteboard is approximately more than RM 8000, about half of the cost is just to purchase the IWB. Hence, Wiimote IWB is a better alternative for the schools which are facing financial problems in developing e-classrooms.

**Conclusions**

As conclusion, no doubt that IWB has positive impacts on students’ learning and motivation. Students who learn in the IWB classroom were found to be more motivated and enjoy the lessons. However, several challenges and problems of using IWB were identified, namely classroom setting, visibility of the board, technical support and teachers and students’ skills. Wiimote IWB was invented as an alternative for the current IWB since it offers the similar functions as IWB with a lower cost. Study had been carried out and the results showed that the Wiimote IWB roughly equivalent to their industrial counterparts (Bosetti et al., 2011). Hence, we highly recommend the use of Wiimote IWB in Malaysia’s classroom especially those schools with limited funds in developing e-classrooms.

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