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 (Hall & 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 1
Hardware and software needed to set up Wiimote IWB

Hardware	Software
Nintendo Wii Remote	Wiimote Whiteboard v1.3.1.11 or WiiTUIO or Smoothboard
Infrared pen with a momentary switch	Open Sankoré
LCD Projector	Microsoft Power Point
Personal computer running Windows XP, Vista, 7, 8, 8.1 (32 or 64bit) or Mac OS X	
Bluetooth dongle (Only when the Bluetooth is unavailable)	
A flat, white surface or	
Clip or tape	

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).

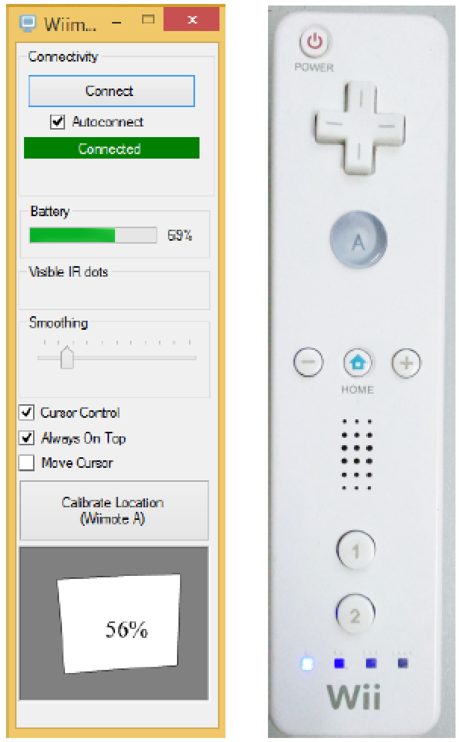

Figure 1 Connection between Wiimote and Wiimote IWB software (UPSI, 2015)

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.

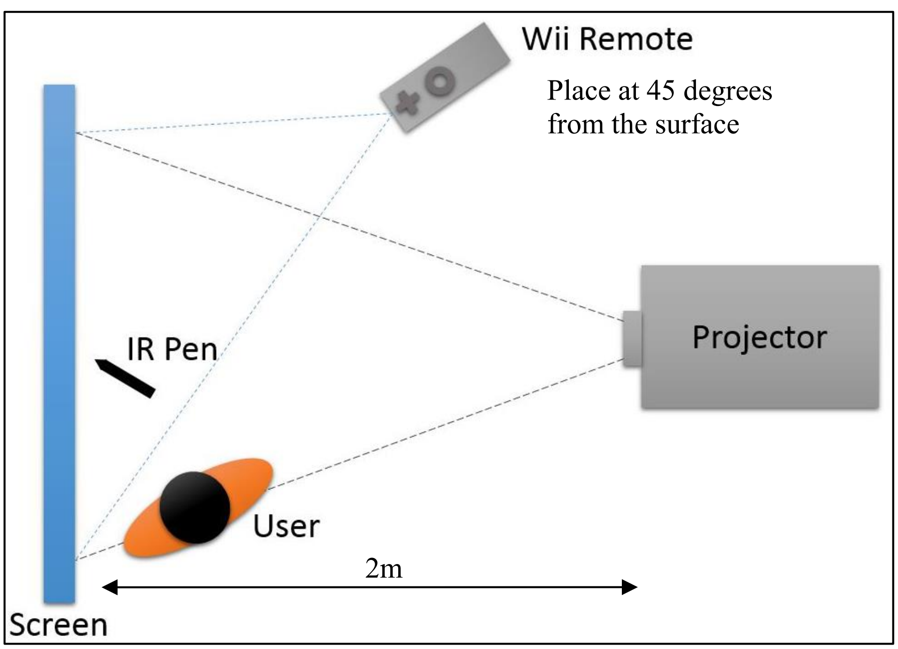

Figure 2 Position of Wiimote, screen and LCD projector (UPSI, 2015)

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.

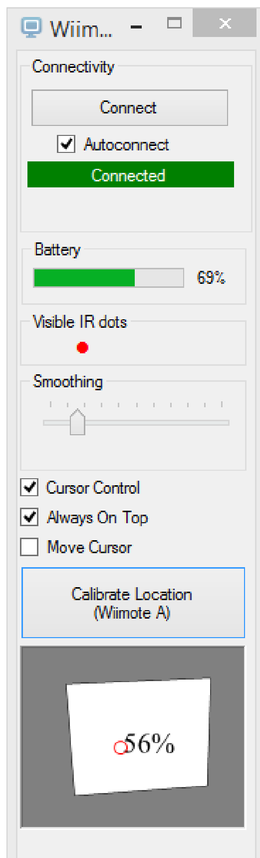

Figure 3 Red dot at the ‘Visible IR dots’ indicating connection between Wiimote and the IR pen (UPSI, 2015)

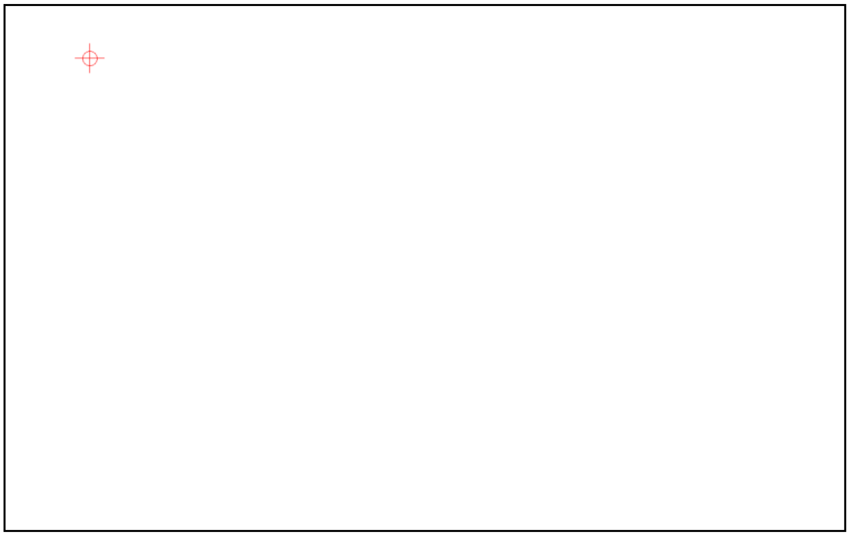

Figure 4 Red cross on the screen during the calibration step (UPSI, 2015)

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.

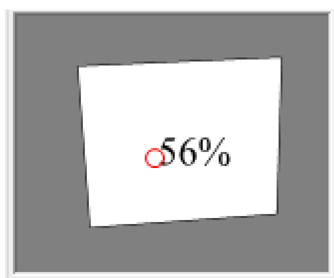

Figure 5 Calibration viewer and tracking utilization (UPSI, 2015)

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).

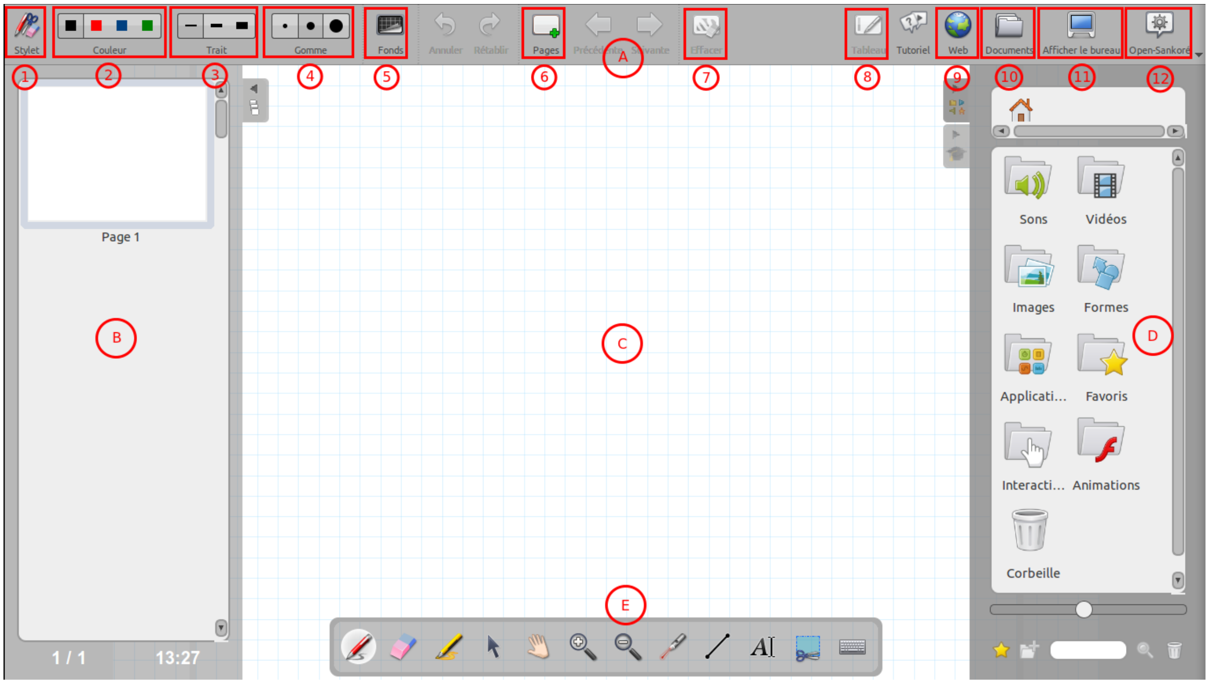

Figure 6 Open Sankoré main window (UPSI, 2015)

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.

ACKNOWLEDGEMENT

This paper is based upon research financially supported by the **Research Acculturation Grant Scheme (RAGS) under Grant no. 2013-0153-107-72.**

References

Becta (British Educational Communications and Technology Agency). (2004). Getting the most from your interactive whiteboard: A guide for primary schools. Coventry: Becta.

Becta (British Educational Communications and Technology Agency). (2008). Harnessing Technology Schools Survey 2007: Analysis and key findings. Retrieved August 3, 2015 from http://dera.ioe.ac.uk/1552/2/becta_2007_htschoolssurvey_report.pdf.

Beeland, W. D. (2002) Student engagement, visual learning and technology: can interactive whiteboards help?, Action Research Exchange, 1(1). Retrieved August 3, 2015 from http://downloads01.smarttech.com/media/research/international_research/usa/beeland_am.pdf.

Bosetti, M, Pilolli, P, Ruffoni, M. & Ronchetti, M. (2011). Interactive whiteboards based on the WiiMote: Validation on the field. Paper presented in the 14th International Conference on Interactive Collaborative Learning (ICL2011)‒11th International Conference Virtual University (vu'11). 21–23 September 2011, Piešťany, Slovakia.

Glover, D., Miller, D., Averis, D., & Door, V. (2007). The evolution of an effective pedagogy for teachers using the interactive whiteboard in mathematics and modern languages: An empirical analysis from the secondary sector. Learning, Media and Technology, 32(1), 5–20.

Hall, I., & Higgins, S. (2005). Primary school students' perceptions of interactive whiteboards. Journal of Computer Assisted Learning, 21, 102-117.

Higgins, S, Beauchamp, G & Miller, D (2007). Reviewing the literature on interactive whiteboards. Learning, Media and Technology, 3(32), 213-35.

Lee, J.C. (2007). Johnny Chung Lee > Projects > Wii. Retrieved August 4, 2015 from http://johnnylee.net/projects/wii/.

Lee, J.C. (2008). Hacking the Nintendo Wii remote. IEEE Pervasive Computing, 7(3), 39-45.

Levy, P. (2002). Interactive Whiteboards in learning and teaching in two Sheffield schools: A developmental study. Sheffield: Department of Information Studies, University of Sheffield.

Manny-Ikan, E., Dagan, O., Tikochinski, T.B. & Zorman, R. (2011). Using the Interactive White Board in Teaching and Learning – An Evaluation of the SMART CLASSROOM Pilot Project. Interdisciplinary Journal of E-Learning and Learning Objects, 7, 249-273.

Open-Sankoré. (n.d.). The Open-Sankoré software in 5 points. Retrieved 13 August, 2015 from http://open-sankore.org/en/open-sankor%C3%A9-software-5-points.

SMART Technologies Inc. (March, 2006). Interactive whiteboards and learning: Improving student learning outcomes and streamlining lesson planning. Retrieved August 3, 2015 from http://downloads01.smarttech.com/media/research/whitepapers/int_whiteboard_research_whitepaper_update.pdf

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.

Termit Kaur, R.S. & Abdul Rashid, M. (2012). Secondary students' perspectives on the use of the Interactive Whiteboard for teaching and learning of Science in Malaysia. Journal of Education and Practice, 3(7), 9-14.

Universiti Pendidikan Sultan Idris (UPSI). (2015). Improvised Interactive Instructional Tool using Wiimote Interactive Whiteboard: User Manual. Retrieved August 4, 2015 from https://bahasacina.wordpress.com/wiimote-互动式白板手册与软件/

Wong, K.T., Goh, P.S.C. & Osman, R. (2013). Affordances of interactive whiteboards and associated pedagogical practices: Perspectives of teachers of science with children aged five to six years. The Turkish Online Journal of Educational Technology, 12(1), 1-8.

About the authors

Tien Tien, Lee is a senior lecturer at Department of Chemistry, Faculty of Science and Mathematics, Sultan Idris Education University, Perak, Malaysia. She holds a doctorate degree from Universiti Kebangsaan Malaysia majoring in science education. Her research interest are multimedia module development, chemistry education and instructional technologies.

Email: lee.tt@fsmt.upsi.edu.my

Kuan Nien, Tan, Bachelor in Chinese Language with Education. Currently, he is a Master of Education (Instructional Technology) candidate in Faculty of Education and Human Development. His research is related to the effectiveness of teaching and learning Chinese language using Wiimote Interactive Whiteboard.

Email: vincenttan89@gmail.com

Kung-Teck, Wong is a senior lecturer at Faculty of Education and Human Development, Sultan Idris Education University (UPSI), Malaysia. Prior to joining UPSI, he was a senior teacher in government schools. He completed his Ph.D. from University Malaysia Sabah and Post-Doctoral at University of South Australia, Australia (UniSA). He has published extensively in local and international journals. He also serves as reviewer of several local and ISI and SCOPUS indexed journals. In the past five years he has secured many public and private research funding. Wong is interested in statistic studies and also the application of SPSS and AMOS -structural equation modelling in his writing articles and research.

Email: thomas@fppm.upsi.edu.my

Chia Ying, Lin is a senior lecturer at Department of Modern Languages, Faculty of Languages and Communication, Sultan Idris Education University, Perak, Malaysia. She received her doctorate from Beijing Normal University. Her research interest includes innovative educational technology, pedagogy and Chinese linguistics.

Email: cylin@fbk.upsi.edu.my

Wee Hoe, Tan is an associate professor at the Department of Creative Multimedia, Faculty of Art, Computing and Creative Industry, Sultan Idris Education University, Perak, Malaysia. Formally a 3D animator, he joined academia in mid-2004 to teach and develop multimedia courses in Kuala Lumpur University (UniKL). After teaching for 3.5 years, he left UniKL for Sultan Idris Education University and then pursed a PhD at University of Warwick for three years. He is interested in research related to gamification, game-based learning and validation of serious games.

Email: whtan@fskik.upsi.edu.my

Return to Table of Contents