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Understanding tablet computer usage among primary school students in underdeveloped areas: Students' technology experience, learning styles and attitudes

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ABSTRACT

The need to provide low-cost learning technologies such as laptops or tablet computers in developing countries with the aim to bridge the digital divide as well as addressing the uneven standards of education quality has been widely recognised by previous studies. With this aim in mind, the Thai Government has launched the "One Tablet PC Per Child" (OTPC) policy and distributed 800,000 tablet computers to grade-one students nationwide in 2012. However, there is limited empirical evidence on the effectiveness of tablet computer use in the classroom. Our study examined students' learning styles, attitudes towards tablet computer use and how these are linked to their academic performance. The study has investigated 213 grade two students in economically underprivileged regions of North Thailand. Data collection was based on questionnaires filled in by the students with the help of their teachers. Our results overall suggested that there were some key significant differences in relation to students' gender and home locations (urban vs. rural). In contrast to existing studies, both genders at this stage had similar technology experience and positive attitudes towards tablet computer use. However, we found girls had higher visual learning style ($M = 4.23, p < .032$) than boys ($M = 3.96$). Where home location was concerned, rural students had higher learning competitiveness and higher levels of anxiety towards tablet use ($M = 1.71, p < .028$) than urban students ($M = 1.33$). Additionally, we also found technology experiences, collaborative learning style and anxiety affected students' academic performance.

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1. Introduction

Global economic competitiveness has increased rapidly, therefore educational development is a major concern in many countries around the world. Especially in developing countries, improving educational standards and equality are seen to be difficult and challenging due to inadequate educational resources on a national level (school budget) and on a personal level (time available for learning) (Bahamondez, Winkler, & Schmidt, 2011). Similarly, as a result of insufficient teaching resources and academic staff in Thailand, 3243 out of 15,515 schools in Thailand failed the National Standards and Quality Assessment (NESQA) in 2008 (Lounkaew, 2013). Moreover, compared with the 65 countries participating in the Programme for International Student

Assessment (PISA) in 2012, students in Thailand scored below the average, ranked 48th in reading and science and 50th in mathematics (OECD, 2012). As part of the OTPC policy of 2012, the Ministry of Education has distributed 800,000 tablet computers which are installed with a range of learning contents. According to ESDC's (Centre for Educational Supervision Development), a pilot study on accomplishment of tablet use between 2011 and 2012 showed that students' learning abilities have improved in the areas of listening, speaking and reading (ESDC, 2013). However, current learning provision on the tablet computer is lacking interactivity. In most cases, children learn contents passively by watching teaching video clips or listening to audio clips through learning applications and websites presented on the tablet (Viriyapong & Harfield, 2013). It appears that the OTPC project in Thailand may repeat the lack of success of "One Laptop Per Child" project, a well-known prior project which deployed low cost laptop computers to students in many developing countries (Cristia, Ibararán, Cueto, Santiago, & Severín, 2012; Warschauer & Ames, 2010). With the ultimate aim of preventing this possible failure and addressing the improvement in education in underdevelopment areas, our

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research team and Mae Fah Luang University (located in the northernmost part of Thailand) carried out a study to understand the current situation of tablet computer use in Thai schools. The study was carried out to investigate how students and teachers currently use tablet computers in the classroom, to determine how well tablet computers support learning. An in-depth understanding of these issues will enable us to identify how a tablet-based learning system can be best designed to support learning. The objectives of this study are:

- To establish if there are significant differences in technology experience, learning styles and attitudes towards tablet computer usage between boys and girls (6–9 year olds).
- To examine if there are significant differences in technology experience, learning styles and attitudes towards tablet computer usage when compared with students' home location (urban/rural).
- To investigate which types of students (excellent, average and weak learner) benefit the most from tablet computer usage.

The paper is structured as following: firstly, we review several case studies in the areas of Information and Communication Technology for Development (ICT4D), mobile learning and tablet computer in education. Then the methodology and data collections will be explained before preliminary research study results are presented. Finally, results will be interpreted in the discussion section. Limitations of the study, future directions and in-depth analysis will be concluded at the end.

2. Literature review

As this study was conducted in Thailand, therefore both the background and current situation of Thai education are reviewed. We then explore how ICT is utilised in the fields of education settings, case studies of mobile and tablet computer in education and the reason why we need to better understand the learners.

2.1. Basic education and unequal educational standards in Thailand

Education for all children in Thailand is a right which is provided by the Thai Government through the Ministry of Education. All children are able to receive standard education equally including minority children (non-Thai) who live in Thailand. To address the rapid economic and social growth and with the goal to improve the quality of education provision for all students, the National Education Act (1999s) and basic education core curriculum (2008s) were provided by the Thai Government. Key elements included are the provision of 12 years (previously 9 years) of free compulsory education, provision of a new learning pedagogy model (learner-centred model) and the promotion of students' and teachers' learning by utilising ICT. However, more than a decade following the introduction of education improvement by Thai Government, many indicators showed continuous weaknesses (Fry & Bi, 2013). According to The Global Competitiveness report in 2013, the quality of primary education in Thailand was ranked 86th out of 148 countries (World Economic Forum, 2013). Underperformance of primary and secondary schools was evident, particularly in remote areas where they are facing problems with a lack of learning materials and a shortage of qualified teachers, especially in the core subjects (Mathematics, Science and English) (Atagi, 2011). Consequently, the Programme for International Student Assessment (PISA) in 2012 reported that Thai students' performance in Mathematics was below average (50th) when compared to other 65 countries e.g. Singapore (2nd) and Vietnam (17th). Additionally, results indicated serious inequality between city and rural students; 49.7% of

rural students had low achievement scores in Mathematics and only 2.6% of high scores were found in top performer's students. Systematic research of Lounkaew (2013) confirmed that shortage of learning materials (including computers) affected students' performance in rural areas. The average number of students per computer in primary school is 14 (Porntipsatien, Kanthamanon, & Funilkul, 2013). Therefore, improving educational quality and bridging the gap of education disparity are high priorities.

2.2. ICT4D

According to Heeks (2008), since 1956, the idea of adopting Information Communication Technology (ICT) for the purposes of social, political, economic and education development in developing countries was recognised and called ICT4D (Information and Communication Technology for Development). The history of ICT4D can be divided into three generations. In the first generation, ICT4D 0.0, ICT was used only by the government and business sectors. The next generation, ICT4D 1.0, increased the use of ICT to tackle poverty and targeted the improvement of health, education, gender equality and environment. Presently, we are on the third generation of ICT4D 2.0: the implementation, by the use of low cost technologies and devices such as tablets, laptops and web 2.0 (Heeks, 2008). The 2012 "One Laptop Per Child" OLPC program was introduced by two non-profit organisations in the USA (Cristia et al., 2012). XO laptops, a low cost laptop computer (targeted price at \$100 USD) were built to provide multimedia, collaborative UI and educational software (Yeh, Gregory, & Ritter, 2010). Approximately two million units were distributed and implemented in developing countries around the world such as Uruguay, Peru, Mexico, Ethiopia, Cambodia, Brazil and India (Kraemer, Dedrick, & Sharma, 2009). Indeed, the results from a large scale pilot evaluation in 319 schools in Peru showed that the program increased the ratio of students per computer from 0.12 to 1.18. Additionally, students gained more ability to use general software (word processor) and access to the internet (Cristia et al., 2012).

Beyond the use of laptop computers in education, the delivery of education through mobile devices such as the mobile phone and tablet computer is dramatically increased. In 2014 alone, mobile broadband subscriptions have grown almost five times faster than six years earlier (will reach 2.3 billion worldwide) and the growth rates in developing countries are projected to be twice as high as in developed countries (International Telecommunication Union, 2014). Rural areas of the developing world now have better opportunities to use technology through mobile devices. There are several reasons that mobile devices can empower the communication and interaction between teachers and learners in underdeveloped areas. These include high rates of penetration, ownership, portability and information deliverability (Valk, Rashid, & Elder, 2010).

2.3. Mobile learning with tablet computers

The global tablet computer market is growing rapidly as a result of the core competence of portability and the introduction of touch interfaces (ease of use, more intuitive and more customisable than keyboards and mice) (Nichols, 2007). According to IDC research, tablet computers dominate the desktop PC market with 180.9 million shipments compared to 134.4 million shipments of desktop PCs (IDC, 2013). Gartner also predicted that in 2015 tablet computers will achieved 349.1 million units of worldwide sales compared to 263 million units of desktop computers (Gartner, 2014). This trend persuades educators, researchers and policy makers around the world to adopt tablet computers into their areas of interest.

After Microsoft introduced a tablet PCs with stylus technology in 2002 where users can interact directly with software applications

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