

Personalized Mobile Learning for Digital Literacy Enhancement of Thai Youth

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Abstract— Digital literacy becomes critical nowadays for the digitalization of all countries worldwide. Thailand has been transforming into the digital society. To enter successfully into the digital community, there is the need of enhancing digital literacy for all Thai citizens especially the youths who have already blended their daily life with the internet. Like any literacies, digital literacy requires practicing. Therefore, it is necessary to design and development of training or learning course for anywhere and anytime learning. Moreover, it is challenging to provide the appropriate lesson for each person because they need the different level of digital literacy for their goal. This paper proposes the mobile learning for enhancing digital literacy of Thai youths. Through mobile application, the youth learners feel more comfortable and freedom for their learning. The preference and the performance of students are used for personalization support. The experiment is conducted with 100 primary school students in Chiang Rai province, Thailand. The comparison results of pre-test and post-test reveal that the proposed personalized mobile learning can enhance the learning efficiency of students significantly. At the same time, most of the students have satisfied with the personalization learning in the “satisfy” level.

Keywords—digital literacy; personalized learning; mobile learning;

I. INTRODUCTION

With the advance in digital technology, the concepts of smart city and society have been implemented worldwide. For the past decades, digitalization significantly changes all citizens to digital citizens. Consequently, the digital citizenships require many new literacies especially the digital literacy. Like any other countries, Thailand also aims to move towards to prosperous digital society. Therefore, there is the need to prepare its people to be ready for this digitalization.

Promoting Thai society to enter into digital society successfully is very important now as the government just releases Thailand 4.0 scheme to create sustainable, value-based economy in Thailand to drive the country towards the digital economy. Digital society will significantly affect the socio-economic development of Thai people. All Thai people have to inevitably enhance their digital literacy to obtain the equal access to benefits from digital society. However, it is challenging to improve digital literacy for different people having different ages, background

knowledge, preferences, objectives, expectation, computer skills, etc. [1].

All among necessary skills of digital literacy, the information and cyber security are the most important. It is about how to use the internet safely and how to protect the users from any cyber harm. The reports demonstrate that the security is a rapidly growing area and therefore demand the highest level of attention for the growth of digital economy [2]. Considerable research and innovation activities in information and cyber security area are in progress, especially in developed countries. Due to dynamic nature which new challenges appear every minute, the better strategies and continuous attention together with cooperation between regions and countries to address the global security challenges are urgently required. To this context, the appropriate way for cyber security awareness is needed.

Although it is challenging to provide the appropriate information and cyber security training for each people because of their different goals, it is even more challenging to convince the new generation to have this awareness. The general way to gain their attention is to use the mobile application as the primary medium. Since the youths are different in many aspects, the mobile application proposed here is expected to provide the personalization support appropriately and individually. Consequently, this paper proposes the mobile application which is designed and developed to promote Thai youths to enhance their digital literacy especially in information and cyber security issues. The personalization support is provided by employing the concept of context-aware computing [3]. The personal contexts including performance and preference contexts are mainly focused. The application is in the cloud based application so that it can be accessed anywhere and anytime.

This paper is organized as followings. Section II illustrates the literature reviews. Section III describes the research methodology. Section IV shows the results and discussion. Finally, section V represents the conclusion of this paper.

II. LITERATURE REVIEWS

This section describes related works of this paper. The primary focus will be on digital literacy, mobile learning, and personalization learning. The details are shown as followings.

A. Digital Literacy

Literacy is required for being the citizens. It is eligible in all countries that the citizen of each country will have the primary support to enhance their literacy. Traditionally, literacy is typically the ability to use and understand the written language. Currently, literacy is still as a concept that is dynamic and continues to be defined in many ways [4]. Digital literacy becomes popular after the digital transformation all over the world. It is inevitable that many advanced technologies especially digital technology have brought the paradigm shift into many countries including Thailand.

Unlike digital skills, digital literacy involves many aspects not only the ability being able to use software and electronic devices. It includes many other complicated elements. There have been many points of views proposed for digital literacy. For example, the digital literacy involves information literacy and can be considered as assimilating and accommodating the process of learning [5]. Digital literacy includes many kinds of literacy [6] such as visual literacy, reproduction literacy, branching literacy, Information literacy, socio-emotional literacy, etc. Additionally, digital literacy consists of many different elements [7] such as culture, cognition, construction, communication, confidence, creativity, critical thinking, civic. There have been the attempts to promote the digital literacy in different groups of citizens [1,4,8]. However, it is still very challenging to set the standard for learning and training digital literacy for all categories of people currently. This paper only aims to propose the way to enhance digital literacy of the group of Thai youths because they are the primary group closing to the internet and technology. This paper also offers the way to encourage them to gain more awareness through the technology that they are familiar with which is mobile technology.

B. Mobile Learning

Mobile learning (m-learning) has become popular after the emergent of mobile technology and when the mobile devices have become more affordable. At the same time, m-learning can be seen as the development of electronic learning (e-learning) and wireless technology [9]. Mobile applications have been employed for several educational purposes [10,11] such as process management, information resource/services accessing, etc. However, m-learning is the popular mobile application as it can promote anywhere and anytime learning for the learners efficiently [12, 13]. Additionally, m-learning is also well known for supporting personalized learning [14, 15] including this paper.

C. Personalized Learning

Personalized learning can be implemented both face-to-face and virtual learning. At the same time, it can be applied in any way of learning such as e-learning, m-learning and ubiquitous learning (u-learning) [16]. It involves the adaptation of the contents or learning resources for the learners. To provide the personal response appropriately, the practical assessment and feedback methods are required [17]. There are many methods used to perform student

assessments. For context-aware computing perspective, the system will be aware of changes of their user's context so that the appropriate response will be given. The preference and performance of students are typically used as the primary user contexts [18]. Consequently, this paper also employs the concept of context-aware computing to provide the appropriate personalized support for the learners by using the preference and performance contexts as the user's contexts.

III. RESEARCH METHODOLOGY

The research methodology of this paper consists of 3 main steps including mobile application development, experimentation, and data analysis as shown in Fig. 1.

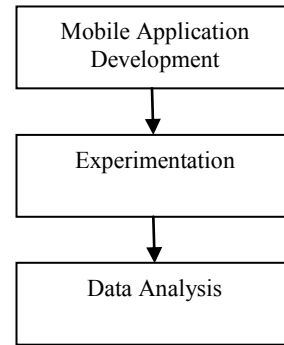


Fig. 1. Research Methodology

A. Mobile Application Development

The mobile application is the procedure by which the application programming is produced for low-control handheld gadgets, for example, individual computerized partners, or cell phones. These applications can be pre-introduced on telephones amid make, downloaded by clients from different versatile programming dissemination stages, or conveyed as web applications and utilize server-side or customer side handling (e.g., JavaScript) to give an "application-like" affair inside an Internet program.

This paper works on Agile development [19] that utilizes the self-association, obligation, adaptability, and administration. A spry strategy makes conceivable to build up an economical, amazing portable application. It likewise helps in conquering the designers by utilizing the customary application improvement techniques, for example, grouped requests of clients, consistent advancement, distinctive working frameworks, unforeseen alteration from client amid venture advancement and considerably more. The key focal point of utilizing Agile development of the mobile application is that it includes proceeds with correspondence between and inside the gathering. The consistent communication between the client and improvement group makes the procedure straightforward and adaptable. Fig. 2 represents the process of the Agile development cycle. It can be seen from Fig. 2 that project initiation phase is the input of the development process.

Analyze phase characterizes the prerequisites from item overabundance, dash build-up, client and partner feedback.

For project initiation and analysis phase, the unit testing is used to approve that every unit of the product executes as outlined. Then, the design phase is recognized. The subsidizing is set up. The introductory conditions and necessities are examined. Implement phase outlines and creates programming accordingly to characterized necessities. The accept phase coordinates and conveys the working cycle into creation. Between design and accept phases, the integration testing is used to uncover blames in the collaboration between coordinated units. Deploy phase acknowledges the input from client and partner and continues works on it into the necessities emphasis. In deploy phase, acceptance testing is used to assess the framework's consistency with the business necessities and the survey whether or not it is adequate for conveyance.

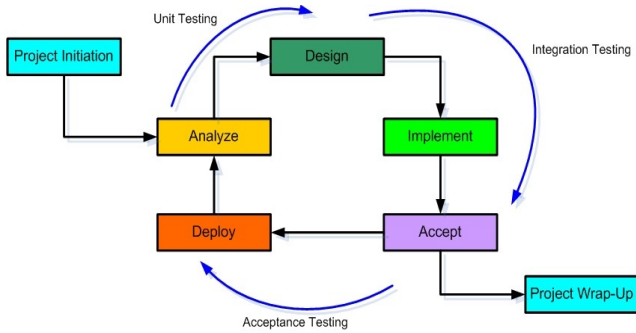


Fig. 2. The Process of the Agile Development Cycle

The developed mobile application consists of 4 main modules including interfacing, content repository, student assessment, and student feedback response modules. The interfacing module is designed to be the user-friendly interface and easy to be used on the small screen as smartphones. The content repository module is designed so that the content can be accessed and retrieved quickly. The student assessment module and feedback response module consist of a set of pre-defined rules and associated actions which are pre-designed by the human experts. The student's contexts including student preference and performance are recorded. The preference is imputed manually by the student as a part of their profile information. At the same time, the scores of each learning module are used to represent the students' performance.

B. Experimentation

In this paper, the developed mobile application is tested with 100 students from primary schools in Chiang Rai province, Thailand. They are 10-16 years old. The students are assigned to study individually though the developed m-learning. The context is mainly about information and cyber security. The students have to complete the pre-test and post-test before and after the study respectively. The enhancement of learning efficiency is analyzed by investigating the difference between scores of pre-test and post-test. The means of those scores are compared. The developed m-learning is also evaluated in term of user's satisfaction.

IV. RESULTS

A. Mobile Application Interface

The examples of interface of this developed mobile application are shown in Fig. 3.

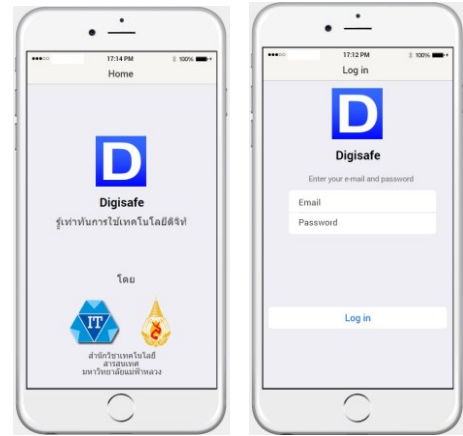


Fig. 3. Mobile Application Interface

B. Learning Enhancement Ability

The pre-test and post-test score are shown in Table I. There are 2 sets of tests provided for the students including principles of digital literacy and information and cyber security. It can be seen from Table I that the proposed m-learning can enhance both criteria significantly. However, the students can improve their knowledge about the principle of digital literacy more than the principle of information and cyber security. The reason might be the content is too complicated for the students. The future study is worth to study more whether or not this assumption is correct. Additionally, the developed m-learning is required more testing with other groups of learners and different contents to ensure the ability of learning enhancement.

TABLE I. PRE-TEST AND POST-TEST COMPARISON

Criteria	Pre-test	Post-test	%Difference
Principle of digital literacy	85.4%	94.6%	9.2%
Principle of information and cyber security	68.2%	74.6%	6.4%

C. Learning Enhancement Ability

At the end of the study, the students are asked to complete the survey questionnaire to reveal their satisfaction. The results show that most of the students (95%) have found that this developed m-learning can help them to gain knowledge quickly and easily as shown in Fig.4. Most students (92%) also have found that they can enhance their knowledge by learning through this developed m-learning as shown in fig. 5. Additionally, most of the

students (49%) have satisfied with personalized support by this developed m-learning as shown in Fig. 6. From Fig.6, there are many students have rated their satisfaction in the neutral level. The future study will be focusing on increasing the portion of satisfaction level.

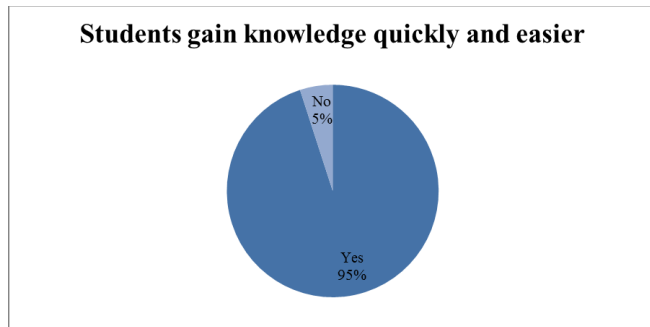


Fig. 4. Satisfaction of Gaining Knowledge

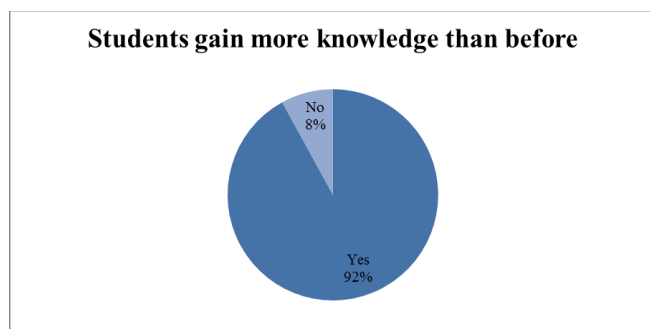


Fig. 5. Satisfaction of Knowledge Enhancement

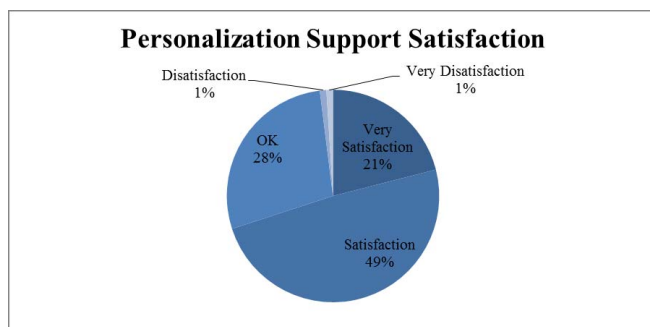


Fig. 6. Satisfaction of Personalized Learning

V. CONCLUSION

This paper presents the mobile application for enhancing digital literacy for Thai youth particular for information and cyber security aspect. The developed mobile application is tested with 100 students from primary schools in Chaing Rai province, Thailand. The result shows that the developed application can enhance the learning efficiency significantly. At the same time, most of the students have satisfied with the personalization support from this application in the “satisfy level.” The future study will mainly focus on ensuring the learning enhancement ability and improving user’s satisfaction.

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REFERENCES

- [1] Eshet-Alkalai, Yoram. "Digital literacy: A conceptual framework for survival skills in the digital era." *Journal of Educational Multimedia and Hypermedia* 13.1 (2004): 93.
- [2] Von Solms, R., & Van Niekerk, J. (2013). From information security to cyber security. *computers & security*, 38, 97-102.
- [3] Temdee, P., & Prasad, R. (2018). *Context-Aware Communication and Computing: Applications for Smart Environment*, Springer International Publishing.
- [4] Koltay, Tibor. "The media and the literacies: media literacy, information literacy, digital literacy." *Media, Culture & Society* 33.2 (2011): 211-221.
- [5] Piaget, J.: *The Origins of Intelligence in Children* (Cook, M. (trans.)). International University Press, New York (1952).
- [6] Aviram, A., & Eshet-Alkalai, Y. (2006). Towards a theory of digital literacy: three scenarios for the next steps. *European Journal of Open, Distance and E-Learning*, 9(1).
- [7] Bawden, D. (2008). Scholarship in the digital age: Information, infrastructure and the Internet. *JOURNAL OF DOCUMENTATION*, 64(4), 630-631.
- [8] Meneses, Julio, and Josep Maria Mominó. "Putting digital literacy in practice: How schools contribute to digital inclusion in the network society." *The Information Society* 26.3 (2010): 197-208.
- [9] Duncan-Howell, J. A., & Lee, K. T. (2007). *M-Learning–Innovations and Initiatives: Finding a place for mobile technologies within tertiary educational settings*. Ascilite.
- [10] Samochadin, A., Raychuk, D., Voinov, N., Ivanchenko, D., & Khmelkov, I. (2014). MDM based mobile services in universities. *International Journal of Information Technology & Computer Science (IJITCS)*, 13(2), 35-41.
- [11] Alzaza, N. S., & Yaakub, A. R. (2011). Students' awareness and requirements of mobile learning services in the higher education environment. *American Journal of Economics and Business Administration*, 3(1), 95.
- [12] Chen, Y. S., Kao, T. C., Yu, G. J., & Sheu, J. P. (2004). A mobile butterfly-watching learning system for supporting independent learning. In *Wireless and mobile technologies in education, 2004. Proceedings. The 2nd IEEE international workshop on* (pp. 11-18). IEEE.
- [13] Huang, C. S., Yang, S. J., Chiang, T. H., & Su, A. Y. (2016). Effects of situated mobile learning approach on learning motivation and performance of EFL students. *Journal of Educational Technology & Society*, 19(1), 263.
- [14] Noor, R., & Khan, F. A. (2016, August). Personalized recommendation strategies in mobile educational systems. In *Innovative Computing Technology (INTECH), 2016 Sixth International Conference on* (pp. 435-440). IEEE.
- [15] Hamada, S., Alshalabi, I. A., Elleithy, K., & Badara, I. A. (2016, April). Automated Adaptive Mobile Learning System using the Semantic WEB. In *Long Island Systems, Applications and Technology Conference (LISAT), 2016 IEEE* (pp. 1-7). IEEE.
- [16] Temdee, P. (2014). Ubiquitous learning environment: Smart learning platform with multi-agent architecture. *Wireless Personal Communications*, 76(3), 627-641.
- [17] Intayoad, W., Becker, T., & Temdee, P. Social Context-Aware Recommendation for Personalized Online Learning. *Wireless Personal Communications*, 1-17.
- [18] Temdee, P., & Prasad, R. (2018). *Context-Aware Communication and Computing: Applications for Smart Environment*, Springer International Publishing.
- [19] Crowder J. & Friess S. *Agile Project Management: Managing for Success*. Springer International Publishing, 2015, pp.27-29.