The Development of ICT Literacy Using E-Learning as a Tool: ASEAN Cyber University Certificate Course as a Case Study

Jutima Methaneethorn
Faculty of Education,
Lampang Rajabhat University, Thailand
j.methaneethorn@lpru.ac.th, jutimam@yahoo.com

Abstract - **Digital and ICT literacy is considered to be an importance competence for participation in Thailand digital economy and an information society. ICT has become pervasive in modern societies as a tool for supporting economic development through the creation of innovation, connecting communities, and transforming education systems. However, one of the conditions for employing the potential of ICT is the development of expertise to use ICT in effective ways. With regard to student skills in working with ICT for their learning and future career, this research seeks to investigate the development of students' ICT literacy using e-learning as a tool. The research aims to: 1) investigate students' perceptions of ICT literacy development using ACU e-learning as a tool and 2) study the results of students' ICT literacy development. The research instruments used for collecting data involved a 15 weeks lesson plan embedded with activities aiming to develop ICT literacy of students, a questionnaire, and an assignment evaluation form. The data were analyzed using population mean score and standard deviation. Work analysis was used to examine the assignments of students. Results show that students perceived the development of their ICT literacy through the use of ACU e-learning. They were able to create their works in digital environments by integrating information from the e-learning with information retrieved from the internet. And, this demonstrates the development of each component of ICT literacy.**

Keywords - **ICT Literacy, E-Learning, ASEAN Cyber University (ACU) Project, Case Study**

I. INTRODUCTION

21st century is the period of time where information and communication technology (ICT) has played a central role in major aspects of development in Thailand. ICT has essentially changed the procedures of nearly all forms of work within governance, business, industry, society, and education. As in education students have been expected to have 21st century skills such as critical thinking, collaboration and teamwork, communication including technology literacy. Technology literacy is the ability of an individual to use technology tools to access, manage, integrate, evaluate, create, and communicate information. Its definition also includes the ability to work independently and with others in an manner. Thus, technology literacy is also known as information and communication technology literacy as it covers nearly all attributes of ICT literacy.

Recently, learning and teaching in higher education has been transformed due to the rapid development of information and communication technologies (ICTs). E-learning is an example that has been extensively used in universities and institutions all over the world. E-learning has transformed the way people learn as learning can happen anywhere at any time on any devices. Even though, there is a new revolution of online learning, called MOOC (massive open online course), still, it

has been considered as being rooted from e-learning. The term e-Learning has been broadly used in education. The term has been similarly defined by many scholars. For example, Kelly and Bauer [1] view e-learning as a web-based learning which utilizes web-based communication, collaboration, knowledge transfer, and training to add values to the individuals and organizations. Engelbrecht [2] describes e-learning as the delivery of teaching materials via electronic media such as internet, intranets, extranets, satellite broadcast, audio/video tape, interactive TV, and cd-rom. Hrastinski [3] terms e-learning as learning and teaching online through network technologies and it is arguably one of the most powerful responses to the growing need for education. The benefits of e-Learning have been widely accepted in higher education. It helps facilitate learning and teaching process [4-5]. And, it also helps develop ICT literacy skills [6]. As said by Watson, et al. [7] that e-Learning will change the form of education in the 21st century.

As a researcher, I have realized the importance of ICT literacy and the potential of e-Learning in transforming education to help develop necessary skills for students in the 21st century. Thus, this action research was conducted and ASEAN Cyber University Certificate Course was selected as a case study to support online learning in higher education within ASEAN countries.

II. RELATED WORKS

Generally, the term literacy is known as the ability in writing and reading language. However, when the communication language has been changed into the form of digital media, the term is extended to cover the ability in creating, processing, and delivering information using various technology tools, and is specifically named information and communication literacy. Many research use the term ICT literacy in the same sense as media literacy and information literacy. However, it is argued that the definition of ICT literacy is different from that of media literacy and information literacy. The term ICT literacy focuses on the use of ICT as basic tools for learning whereas the term media literacy and information literacy consider ICT as one among various tools that aid learning [8].

The assessment of ICT literacy was firstly begun by Organization for Economic Co-operation and Development (OECD). OECD [9] defined the term ICT iteracy as the ability of a learner to use technology tools to access, manage, integrate, and evaluate information including creating new knowledge and communicating with others effectively. OECD described ICT literacy as being comprised of five critical components. These components are: access, manage, integrate, evaluate, and create. The definition of each component is defined in Table I.

TABLE I
FIVE COMPONENTS OF ICT LITERACY AS DESCRIBED BY OECD

Components	Definition
Access	Knowing about and knowing how to collect and/or retrieve information.
Manage	Applying an existing organization or classification scheme.
Integrate	Interpreting and representing information. It involves summarizing, comparing and contrasting.
Evaluate	Making judgements about the quality, relevance, usefulness, or efficiency of information.
Create	Generating information by adapting, applying, designing, inventing, or authoring information.

Educational Testing Service (ETS) is another organization which plays an important role in the development of ICT literacy. ETS [10] defines ICT literacy as the ability of a learner to use digital technology, communication tools, and/or computer network to exploit information appropriately. ETS explains ICT literacy, based on OECD's description, as being composed of seven components. These components are: define, access, manage, evaluate, integrate, create, and communicate. The definition of each component is defined in Table II.

TABLE II
SEVEN COMPONENTS OF ICT LITERACY AS DESCRIBED BY ETS

Components	Definition
Define	Using digital tools to identify and represent an information need.
Access	Collecting and/or retrieving information in digital environments.
Manage	Using digital tools to apply an existing organizational or classification scheme for information.
Integrate	Interpreting and representing information, such as by using digital tools to synthesize, summarize, compare, and contrast information from multiple sources.
Evaluate	Judging the degree to which digital information satisfies the needs of an information problem, including determining authority, bias, and timeliness of materials.
Create	Adapting, applying, designing, or constructing information in digital environments.
Communicate	Disseminating information relevant to a particular audience in an effective digital format.

A number of research have been conducted to study about the development of students' ICT literacy. Katz and Macklin [11] studied about the validity of a simulation-based assessment of ICT literacy skills. The goals for the assessment were to support ICT literacy instructional initiatives at colleges and universities. The study provided some evidence for the validity of the ETS ICT literacy assessment, making its use to evaluate instructional programs on ICT literacy possible.

Ivankovic et al. [12] conducted a study to determine the level of ICT literacy among students of the Faculty of Philosophy at University of Mostar in Bosnia. And, it can be concluded from the results of the study that academic institutions need to provide courses which will meet students' needs and extend their level of literacy in the information environment. As for the Faculty of Philosophy at University of Mostar, ICT courses on an institution-wide level were not provided, and more than 50% of students during their study did not have a course in which they had to deal with computer technology which showed that the faculty had not yet adapted to the changes of today's technological age. Thus, more systematic and institution-wide approaches were needed to raise the level of ICT literacy among students.

Lau and Yuen [13] conducted a study to assess the level of students' ICT literacy in 36 junior secondary schools in Hong Kong. And, it was found out that ICT literacy is correlated with information literacy, internet literacy, and computer literacy. Hence, it is necessary for educators to also focus on the development of these literacies. In addition, the study about how all these four literacies interact with each other in learning and teaching process is needed.

Kim et al. [8] studied about variables which could impact on the level of students' ICT literacy in 173 Korean elementary schools. The variables being studied included sex, individual usage of computer, school size, and the number of PCs per student. It was found out that at the individual level, female students had higher ICT literacy level than male students. Also, the satisfaction level of students in classes using ICT had a positive influence on attaining a higher level of ICT literacy. As for the school level, the number of PCs per student had a significant effect on the probability of achieving an average level of ICT literacy. In addition, the ICT literacy of schools located in urban area was higher than that in rural area.

Huang et al. [14] examined the use of learning-assistance tool on e-learning platform that employed learning-reinforcement techniques to enhance ICT literacy of elementary school students in Taiwan. The findings of research demonstrated that the learning-assistance tool could promote learners' ICT literacy and assist learners in overcoming difficulties. Besides, teacher workload was considerably reduced since appropriate feedback was automatically given to learners without teacher involvement.

Bediang et al. [5] investigated how computer literacy and the perception towards e-learning and its potential could contribute to the learning and teaching process within the academic community of Yaounde Faculty of

Medicine and Biomedical sciences. The results of study showed that most participants have a fairly good mastery of ICT. They also showed strong interests in adopting and following-up the development of e-learning, and this opened new perspectives to the faculty, located in a country with limited resources. Still, the success of its development depended on different factors such as the definition of an e-learning strategy, the implementation of concrete measures, and the adoption of a more active and participative pedagogy.

A number of research (e.g. [15-17], [7]) have been conducted to demonstrate the benefits of using technology to enhance learning and teaching process in 21st century. Examples of technology used for improving learning and teaching process are web 2.0 tools, e-learning, mobile applications, and so on. It is evident that using these technologies can also enhance essential 21st century skills of students such as technology literacy, and information literacy. Apart from these literacies which will be improved from seeing examples and practicing in classrooms, students' creativity and critical thinking skill will also be developed through the use of web 2.0 technology such as e-learning.

It can be said that e-learning is an example that has been extensively used in universities and institutions all over the world. E-learning has transformed the way people learn as learning can happen anywhere at any time on any devices. Even though, there is a new revolution of online learning, called MOOC (massive open online course), still, it has been considered as being rooted from e-learning. In fact, MOOC is seen as a combination of online learning and open educational resources [18]. The term e-learning has been widely used in education and defined by many scholars (e.g. [1-3]). Even though e-learning is generally accepted by most researchers in the field that it can be delivered by any electronic media, web technologies seem to have made e-learning more broadly accepted by academic institutions as well as business organizations [19-20].

Over recent years e-learning has gained popularity in ASEAN region. An obvious example is the establishment of ASEAN cyber university (ACU) project. The idea of establishing this project was first initiated in June 2009, at the 20th Anniversary of ASEAN – the Republic of Korea [21]. The main aim of the project is to reinforce higher education in ASEAN region by trying to utilize the power of e-learning [22]. At the beginning, the ACU project had been implemented by the South Korean Ministry of Education and Seoul Cyber University (SCU) before it was transferred to be undertaken by Korea education and research information service (KERIS). The project is ongoing, and offers certain amount of online courses effectively using its own LMS. Lampang Rajabhat University (LPRU) has established a collaboration with SCU in 2014, and has been regarded as a participating institute since then. Part of the collaboration is to promote online courses among students in order to enhance their international higher education opportunities by means of e-learning. Thus, ACU certificate program was operated at LPRU from the first semester of 2015. In this semester the study about students' perceptions of ACU e-learning was conducted to see how students perceived the usefulness of the e-learning. The results of study showed that the students had positive perceptions and attitudes towards ACU e-learning. However, the minority of students were not familiar with the concept of e-learning. They reported not to have had access to e-learning resources before. And, this caused a struggle in the implementation of the project at the initial stage. As a coordinator of the project and a researcher, the issue of the development of students' ICT literacy by means of e-learning was raised to be an action research in the second semester of 2015.

III. RESEARCH OBJECTIVES

This research aims to: 1) investigate students' perceptions of ICT literacy development using ACU e-learning as a tool and 2) study the results of students' ICT literacy development.

IV. DEFINITIONS

ICT literacy refers to the ability of an individual to use technology tools to define, access, manage, integrate, evaluate, create, and communicate information.

ACU certificate program refers to a non-degree granting program, offered by ASEAN Cyber University project, that: 1) provides a course of instruction with intended learning outcome, 2) evaluates participants' achievement of those same learning outcomes, and 3) awards a certificate to those who have taken that specific course and passed the evaluation criteria.

V. RESEARCH METHODOLOGY

A. Research Scope

This research chose to adopt the definition of ICT literacy as described by ETS to be the main notion for the investigation.

As for the ACU certificate course, The Past and Future of Korean Art was operated in the second semester of 2015. The course aims to familiarize learners to the characteristics of modern Korean culture as well as its connection to the origin. Thus, the course will lead to a better understanding towards Korean art. The course operation lasted for 15 weeks, starting from 4th January 2016 to 6th May 2016. Research population was 47 students who were studying in the Faculty of Humanities and Social Sciences.

B. Research Instruments

The research instruments consisted of a 15 weeks lesson plan embedded with activities aiming to develop ICT literacy of research participants, a questionnaire used for collecting perception data, and an evaluation form used for assessing student's assignment.

C. Data Collection and Analysis

The orientation for ACU certificate course was conducted to introduce the participants to ACU LMS (Fig. 1) and to get them registered with the system. The course was continuously run for 15 weeks and the participants had to finish a video lecture each week. The participants were asked to do self – study in their free time and the lecturer kept tracking their progress regularly. A notice board was available for the course aiming to be an online communication channel between the participants and the lecturer apart from a face – to – face appointment. Facebook community for ACU students was also suggested to the participants for networking purpose. Each participant was given two assignments. The first assignment is to create a document using an application program, MS-Word, and the content appeared on the document should be related to Korean art. Another assignment is to create a presentation using an application program, MS-Powerpoint. Similarly, the content appeared on the presentation should be in connection with Korean art.

At the end of the course a 5-Likert scale questionnaire was used to collect perception data of participants. Forty questionnaires were returned (Return rate = 85.11%). The data were analyzed using population mean score and standard deviation. Also, students' assignments were evaluated to see the development of their ICT literacy.

Fig. 1 ACU Learning Management System

VI. RESEARCH RESULTS

A. Students' Perceptions of ICT Literacy Development Using E-Learning as a Tool

Data with regards to students' perceptions of ICT literacy development through the use of ACU e-learning are summarized as shown in Table III.

TABLE III
PERCEPTIONS OF ICT LITERACY DEVELOPMENT THROUGH THE USE OF ACU E-LEARNING

Items	μ	σ	Value
1. Your ability in defining information to be appeared on the assignments.	3.5	0.6	High
Items	**μ**	**σ**	**Value**
2. Your ability in accessing information needed on ACU e-learning.	4.1	0.7	High
3. Your ability in managing information to make it more convenient when doing the assignments.	3.5	0.7	High
4. Your ability in integrating information from ACU e-learning in order to do the assignments.	3.7	0.7	High
5. Your ability in evaluating information which are suitable for the assignments.	3.7	0.6	High
6. Your ability in creating your works which contain information about Korea art.	4.0	0.7	High
7. Your ability in communicating the content of your works through layout and presentation.	4.0	0.7	High
8. ACU e-learning helps develop your online learning skill.	3.9	0.7	High
9. ACU e-learning helps develop your computer and internet literacy.	4.0	0.6	High
10. ACU e-learning helps develop your ICT literacy.	3.9	0.7	High

According to the data, it can be said that participants perceived the value of ACU e-learning as being highly helpful in developing their online learning skill. It also helped with the development of computer and internet literacy, and ICT literacy. As for 7 components of ICT literacy, the students reported to perceive the development of each component at a high level.

B. The Development of Students' ICT Literacy Using E-Learning as a Tool

The development of students' ICT literacy can be considered from the assignments which were created by the participants using MS-Word and MS-Powerpoint, and are summarized below.

From the evaluation of students' assignments which were created using MS-Word, it can be said that the participants were able to use information regarding Korean art as appeared on the e-learning to create pieces of work in the form of leaflet and document. The examples of students' works are demonstrated in Fig. 2, 3, and 4.

Fig. 2 A Leaflet Containing Information about Korean Pottery, from the E-Learning Topic of Koryo Celadon, an Earthen Jade

Fig. 3 A Leaflet Containing Information about Korean Kingdom, from the E-Learning Topic of Mural Paintings of Goguryeo, the Largest Kingdom in the Korean History

Fig. 4 A Document Containing Information about Korean Art, from the E-Learning Topic of Mural Paintings of Artworks of Silla, Hard to Reproduce with Advance Science

As for the evaluation of students' assignments which were created using MS-Powerpoint, it can also be said that the participants were able

to use information regarding Korean art as appeared on the e-learning to create pieces of work in the form of presentation. The examples of students' works are demonstrated in Fig. 5 and 6.

Fig. 5 A Presentation Containing Information about Korean Art, from the E-Learning Topic of Architecture Art of Gyeongbokgung Palace where the Kings Lived

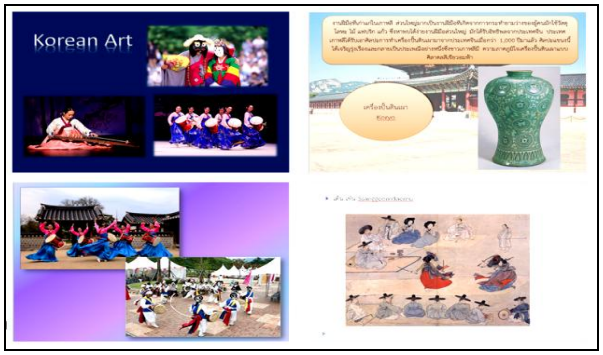

Fig. 6 A Presentation Containing Information about Korean Art, from the E-Learning Topic of Traditional Korean Dance for Expressing of Hahn and Shinmyeong, Unique Korean Sensibilities

In addition, it was found out that participants accessed the internet for more information in order to create their works. This shows the students' skill in collecting information in the digital environment which is congruent with the definition of the two ICT literacy's components, define and access. Also, it demonstrates their abilities in managing and integrating information retrieved from the internet with information received from the e-learning. And, this confirms the development of three components of ICT literacy, manage, integrate, and create.

VII. DISCUSSIONS AND CONCLUSIONS

It can be said that the aims of research were achieved. The participants perceived that their ICT literacy were developed through the use of ACU e-learning. They also reported that their computer and internet literacy including online learning skill were improved. Their perceptions of ICT literacy development correspond with the evaluation results of their assignments. The results show that the students were able to create their works in digital environments by integrating information from ACU e-learning with information retrieved from the internet. And, this also demonstrates the development of each component of ICT literacy. The outcome of this study is consistent with the work done by Lau and Yuen [13] in which they found that ICT literacy is related to information literacy, internet literacy, and computer literacy.

Thailand policy is now focusing on increasing economic value by integrating technology into every sector's development. And, for education, the emphasis is on thorough and equal of educational opportunity as can be seen from the establishment of Thai Open-Educational Resource (OER) and Massive Open Online Courses (MOOCs). Thus, the development of students' ICT literacy can be regarded as an essential issue. If one is about to claim that there is no need for such development since most students in nowadays are familiar with the use of ICT, the researcher will argue that the claim is quite naive as it seems to be based on opinion rather than evidence. Katz and Macklin [11] conducted a study aiming to compare students' ICT literacy before and after the use of simulation software, and they found a low correlation between ICT literacy and frequency of ICT usage. Thus, it can be said from their study that students who use ICT regularly do not always have good ICT literacy skill.

The contribution this manuscript makes to knowledge beyond the existing literature is that it provides evidence for the development of ICT literacy in e-learning environment which is different from the literature (e.g. [11]).

Further study can also be conducted. For example, one may want to find out about the development of ICT literacy in other digital environments apart from simulation and e-learning. Other may find the comparison of ICT literacy development in two different digital learning environments is also interesting, and so on.

REFERENCES

(Arranged in the order of citation in the same fashion as the case of Footnotes.)

[1] Kelly, T. and Bauer, D. (2004). "Managing Intellectual Capital - via E-Learning – at Cisco". C.W. Holsapple, Ed. Handbook on Knowledge Management, Berlin, Germany: Springer-Verlag, pp. 511-532.

[2] Engelbrecht, E. (2005). "Adapting to changing expectations: Postgraduate students' experience of an e-Learning tax program". Computers and Education, Vol. 45(2), pp. 217-229.

[3] Hrastinski, S. (2008). "Asynchronous and Synchronous E-learning". EDUCAUSE Quarterly, Vol. 31(4), pp. 51-55.

[4] Draves, W.A. (2013). "Advanced Teaching Online, (4th Ed.)". Wisconsin, United States: LERN Books.

[5] Bediang and et al. (2013). "Computer literacy and E-learning perception in Cameroon: the case of Yaounde Faculty of Medicine and Biomedical Sciences". BMC Medical Education, <https://bmcmededuc.biomedcentral.com/articles/10.1186/1472-6920-13-57>.

[6] Pacific Policy Research Center. "21st century skills for students and teachers, Research & Evaluation Division". Kamehameha Schools, Honolulu, Hawaii.

[7] Watson, J. and et al. (2015). "Keeping Pace with K12 Online Learning: An Annual Review of State-level Policy and Practice". <https://eric.ed.gov/?id=ED570125>.

[8] Kim, H.S., Kil, H.J., and Shin, A. (2014). "An analysis of variables affecting the ICT literacy level of Korean elementary school students". Computers & Education, Vol. 77, pp. 29-38.

[9] OECD. (2003). "Feasibility Study for the PISA ICT Literacy Assessment: Report to Network A". <https://eric.ed.gov/?id=ED504154>.

[10] ETS. (2007). "Digital Transformation: A Framework for ICT Literacy". <https://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf>.

[11] Katz, J.R. and Macklin, A.S. (2007). "Information and Communication (ICT) Literacy: Integration and Assessment in Higher Education". Journal of Systemics, Cybernetics, and informatics, Vol. 5(4), pp. 50-55.

[12] Ivankovic, A., Spiranec, S., and Miljko, D. (2013). "ICT literacy among the students of the Faculty of Philosophy". University of Mostar, Social and Behavioral Sciences, Vol. 93, pp. 684-688.

[13] Lau, W.F. and Yuen, A. (2014). "Developing and validating of a perceived ICT literacy scale for junior secondary school students: Pedagogical and educational contributions". Computers & Education, Vol. 78, pp. 1-9.

[14] Huang, C.J. and et al. (2010). "A Learning Assistance Tool for Enhancing ICT literacy of Elementary School Students". Educational Technology & Society, Vol. 13(3), pp. 126-138.

[15] Downes, S. (2005). "e-Learning 2.0". <https://elearnmag.acm.org/featured.cfm?aid=1104968>.

[16] Anderson, P. (2007). "What is Web 2.0? Ideas, technologies and implications for education". <http://www.ictliteracy.info/rf.pdf/Web2.0_research.pdf>.

[17] Walton, G. and et al. (2007). "Using online collaborative learning to enhance information literacy delivery in a Level 1 module: an evaluation". Journal of Information Literacy, Vol. 1(1), pp. 13-30.

[18] Bali, M. (2014). "MOOC Pedagogy: Glening Good Practice from Existing MOOCs". MERLOT Journal of Online Learning and Teaching, Vol. 10(1).

[19] Alavi, M. and Leidner, D. (2001). "Research commentary: Technology mediated learning-a call for greater

depth and breadth of research". Information Systems Research, Vol. 12(1), pp. 1-10.
[20] Hiltz, S.R. and Turoff, M. (2005). "Education goes digital: The evolution of online learning and the revolution in higher education". Communication of ACM, Vol. 48(10), pp. 59-64.
[21] The ASEAN University Network. (2015). <http://www.aunsec.org/aseankoreaacademic.php>.
[22] The ASEAN Cyber University Project. (2015). <http://www.aseancu.org/>.