The Effects Of E-Learning Model Integrating Inquiry Based Learning And Project Based Learning To Enhance Learning Achievement And Photography Ability For Undergraduate Students

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Abstract

The purposes of the study were 1) to compare the learning achievement in the photography course using e-Learning model, 2) to examine the photography ability after learning through this e-learning model, and 3) to examine the students' opinions towards e-learning model. The samples of the study were 45 undergraduate students who studied in the faculty of Education, Silpakorn University. Moreover, there were 38 undergraduate students for an experimental expansion who studied in the school of Communication Arts, Bangkok University and enrolled in the digital photography course. The group of participants was selected by simple random sampling technique. The research instruments of the study consisted of 1) the e-learning model integrating inquiry-based learning and project-based learning, 2) an e-learning evaluation form, 3) an achievement test for the digital photography course, 4) an evaluation form for photographic communicative ability, 5) an evaluation form for photography tasks, 6) a questionnaire for the teaching and learning model and 7) an evaluation form for certifying the model. The study was designed for a 10-week experiment. Quantitative and qualitative methods were used to gather the data. To analyze the data, descriptive statistics, including frequency, percentage, mean, standard deviation, and t-test for dependent samples assessing the hypotheses were used.

The findings of the study revealed that

1) The average score of after learning with the instructional model was higher than the other, and they were significantly different at the .01 level; 2) the evaluation of students' photography ability was compounded of 2.1) the overall average score of photography ability was at high level and 2.2) the one of photography tasks was considered at high level; 3) the overall average score of the students' opinions towards inquiry-based learning and project-based learning to enhance learning achievement and photography ability for undergraduate students was at high level.

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Introduction

According to the eleventh National Economic and Social Development Plan (2012 - 2016), Thailand has been confronting an important change of both inside and outside country which leads to adapt rapidly and complicatedly. Therefore, Thailand proposes to develop people, society and economic system of the country to cope with the impacts of those changes effectively by promoting the country development based on an innovative knowledge and technology. The research and development of science and technology is a significant drive to foster the country (Office of the National Economic and Social Development Board, 2011: 1-10). In addition, the eleventh Educational Development Plan of Ministry of Education (2012 - 2016) concentrates on the people-centered development, especially creating a quality society, a society of knowledge and learning, and a reconcilable and generous society. Moreover, it still focuses on a new learning development and promotes using technology to inquire and contribute the knowledge. These expose the importance of the strong and quality society development as well as the people one in all dimensions in order to increase opportunities for people to reach the learning and learning revolution for learners (Office of the Education Council, 2010: 3-7). Moreover, these ideas are still the same as those which Thai Qualifications Framework for Higher Education in 2009 (Office of The Higher Education Standard Board, n.d.: 7-10) proposed. It said that Thai students at a tertiary level have basic knowledge and skills enough for studying effectively at a higher education level. Therefore, it shows that the country comes up with the idea to improve the learners as a learning center as well as to promote the people development in all dimensions. Furthermore, the educational management integrates several mixed-teaching and learning technology which is appropriate for learners' needs. This is beneficial for teaching and learning and consistent to Thai Qualifications Framework for Higher Education. In information technology, there are a rapid development and change which cause the comfortable and effective contact rather than the contact did in the past (Na Takuwthong, 2003). The dramatic success and growth of computer technology, internet network and communication technology lead to considerably change the ways of life, business as well as the communication of people in a society. Moreover, the research in the communication technology field revealed that popular media or tools for communication in each period would influence people's thoughts because they were the primary factors to control conceptual frameworks and perceptions of people to view the

world thoughtfully (Eid & Ward, 2009). E-learning is integrating into the educational system in order to foster and alternate for learners in the educational institute to learn. The learners in the remote areas can access e-learning lessons anywhere and anytime as well as this type of teaching and learning promotes student-centered learning approach. The learners can also control their self-paced learning. Besides, nowadays teachers at a tertiary level integrate significantly information technology and internet with teaching and learning. Using an information technology with comprehensive replacement provides this kind of technology as a primary teaching and learning aid (Sloan consortium, 2009; Laohajaratsang, 2008; Saiseesod, n.d.). The normal teaching and learning can be substituted by e-learning because there are several systems which support different learning styles such as registration, multimedia presentations, an evaluation system and the tools for communication on the website. This e-learning is appropriate for remote teaching and learning (Bangthamai, 2012a). In addition, Huseyin U.; Hüseyin B; and Nadire C. (2011) utilize a web 2.0 tool for teaching and learning in order to foster the learners comprehend the lessons better through various features of the tool on the website. This tool leads creating an online social network as well as provides the learners the opportunities to exchange information among them. The teaching and learning design of e-learning is considerably flexible and consistent with the learners' needs. This design allows the teachers create well-learning activities and learning procedures related to what the learners want. However, the teachers will achieve the learning objectives better whether there is an effective teaching and learning implementation.

The instructional model is an educational innovation which is popular for the current teachers to develop. It is also a plan for teaching and learning with a specific purpose. Moreover, it promotes inquiring and evaluating the information, knowing the problems and discovering the solution, improving learners' thoughts and creating concepts, increasing creative thinking, improving the intellectual ability (Joyce and Weil 1996: 11; Saylor and Other, 1981: 271). Göksu Idris et al. (2017) conducted the research on the content analysis of research trends in instructional design models from 1999 to 2014. It included 113 research articles which were published in 44 international Social Science Citation Index (SSCI) and Science Citation Index (SCI) journals. The elements of instructional model which each country was researched and had in common consisted of research methodology, data collection instruments, data analysis method, sampling period and data scope and systematic evaluation of factors. The research attempted to investigate the connection of the models, the relevant results as well as the model orientation. The results exposed that system-based instructional

model development influenced on well applying the instructional design model to teaching and learning process or various media. The instructional model was the design or teaching plan covering the elements, having a specific purpose which shows the relationship between those elements and systematic elements' procedures. These drove the instructional model to become the innovation for teachers to apply for teaching aids and instructional approaches and to represent it as a learning prototype.

Inquiry-based learning instruction is a learning process which provides the learners to discover, enquire, assess and research the information with several methods in order to understand and obtain the meaningful insights of knowledge. Therefore, they construct their own knowledge and apply it to the thinking process to analyze, solve the problems and foster the better learning (Peungphrayunpong, 2004: 53-54; Boonklurb and et al. 1997: 12-13). There are 5 important elements of inquiry-based learning instruction, including an engagement, an exploration, an explanation, an elaboration and an evaluation. In the engagement stage, the teachers provide fascinating situations or stories to engage the learners to observe and question. Then the learners plan design how to discover, research and practice to collect the data in the exploration stage. After gathering the data, the learners have to not only analyze and interpret the data but also summarize and present the results through various formats in the explanation stage. The results which the learners have gained at this stage might support or contradict the hypotheses, or even not be relevant to the selected topics. The elaboration stage allows the learners to connect the new knowledge to the prior one, the gathering concepts, or even to provide the accounts of other phenomena. Lastly, the learners are asked to assess what they have learned through several learning processes in the evaluation stage. They have to evaluate what knowledge the learners have obtained and how they have done because it makes the learners to get involved in the learning activity design (The institute for the Promotion of Teaching Science and Technology, 2003: 219-220; Rangubthok, 2002: 41-43). Furthermore, a project-based learning instruction is the learning activity which allows the learners to research and practice themselves based on their aptitude and interests. This learning strategy utilizes the scientific process or other ones to discover the solution depending on the topics. The teachers have to engage, suggest and provide the close consultation to the learners such as selecting the topic, researching, planning the procedures as well as presenting the results. Normally creating the project could be applied at every educational level. The teachers might assign the learners to work individually or even in a group depending on the types of the projects because certain projects might be

uncomplicated and small-scale ones meanwhile the others might be difficult and sophisticated. Department of Education (2001: 1) and Thomas J. (2000) stated that the project-based learning instruction takes a part of the researching learning which encourages the learners to focus on the problems or questions. These will drive the learners to gain the core concepts or principles as well as make them research and create the innovation by themselves. In addition, Thammetar (2014: 64) suggested integrating the project-based learning instruction to e-learning that this kind of learning strategy supports the learners to research and practice themselves based on their interests, aptitude and competences through activities related the real life. The learners have to work together as a team while the teachers have to facilitate and provide them the advice. The evaluation of this learning strategy usually is the task which encourages the learners to construct their inquiry mind, the thinking process and problem-solving skill better. It shows that the project-based learning instruction could be integrated appropriately with other learning strategies. According to the mentioned statement, Dachakupt (2008) advised the concept of the inquiry-based learning instruction that it is the interesting learning instruction and could incorporate with the project-based learning instruction using in all learning areas. This shows that the integration of the project-based and inquiry-based learning instructions will provide the learners the better learning achievement because this strategy can develop both the learning process and achievement.

Photography course is a course taught for the undergraduate students in the educational institutes and is a fundamental course for media production and communication of faculty courses. Moreover, this course still is a selective course for a general educational one in different universities. The researcher studies the learning instruction in order to improve the teaching and learning for the photography course and develop the e-learning which is involved and supports the current learning instruction for this course.

According the mentioned rational of the research, the researcher conducts the research on the effects of e-learning model integrating inquiry-based learning and project-based learning to enhance learning achievement and photography ability for undergraduate students in order to promote the learning instruction for the photography course in a bachelor level.

Research objectives

1. To compare the learning achievement in the photography course before and after using e-Learning model integrating inquiry-based learning and project-based learning to enhance learning achievement and photography ability for undergraduate students.

2. To examine the photography ability after learning through this e-learning model integrating using inquiry-based learning and project-based learning to enhance learning achievement and photography ability for undergraduate students

3. To examine students' opinions towards e-learning model integrating using inquiry-based learning and project-based learning to enhance learning achievement and photography ability for undergraduate students.

Population and samples

The population of the study was the undergraduate students who are studying in photography course through e-Learning system in the educational institutes.

There were 2 groups of the samples in the research. That is, the first group of them was an experimental group in the experimental stage while the other was an experimental group in the experimental expansion in order to compare the findings from the e-learning model as well as confirm the research hypotheses. Those participants were as follows:

1. The samples of the research were 45 undergraduate students, selected by simple random sampling technique, who studied in the faculty of Education, Silpakorn University and enrolled in the digital photography course in the second semester of 2016.

2. The samples of the research were 38 undergraduate students for an experimental expansion, selected by simple random sampling technique, who studied in the School of Communication Arts, Bangkok University and enrolled in the digital photography course in the first semester of 2017.

Variables

Independent variable was the e-learning model integrating inquiry-based learning and project-based learning.

Dependent variables consisted of the score of the learning achievement in the photography course, the score of the photography ability and the score of photography tasks.

Research instruments

1. An e-learning model integrating inquiry based learning and project based learning; the model quality was determined by ten experts with the five-point scale evaluation criteria. The overall evaluation outcome was at the highest score ($\overline{\mathbf{X}}$ = 4.94, S.D. = 0.25).

2. An e-learning evaluation form used to examine the quality of the e-learning lessons and lesson plans was assessed by five experts. It was an evaluation form with five-point scales and the result exposed that it was at the highest score ($\bar{X}$ = 4.56, S.D. = 0.49). Moreover, the efficiency of the developed e-learning lessons and construction was evaluated based on the efficiency evaluation process developed by Brahmawong (2013: 11-12). Three efficiency tests were conducted by the sample group which was compounded of 44 undergraduate students at Silpakorn University and they enrolled in course 468204: Digital Photography in the second semester of the academic year 2015. The samples were divided according to their levels of academic performance, including excellent, moderate and poor levels. The efficiency criterion (E_1/E_2) of the e-learning model was determined at 80/80. For the pilot study phase, this instrument was experimented by 3 groups of samples who were not ones in the experimental group and shared the same characteristics of those in the experimental one, including individual study – a single sample, group study – 9 samples, and field study – 32 samples. The results of efficiency test revealed as follows: 1) the efficiency scores of the individual study were 74.68/75.21; 2) those of group study were 75.74/78.15; 3) those of field study were 80.81/81.57.

3. An achievement test for the digital photography course consisted of objective and subjective tests. The objective test included 30 questions. Its IOC evaluation was assessed by three experts and the score of each question was more than 0.5. The test was conducted with 30 students who took the course. The scores of questions were analyzed to examine the difficulty (p) with the difficult score ranging from 0.20 to 0.80. The result showed that the reliability score of the test was 0.81. However, the other test consisted of two questions. Its IOC evaluation was carried out by three experts and the score of each question was more than 0.5. The difficulty score was between 0.20 and 0.80 which could be appropriately divided into 0.40 and 0.36 which was considered as a moderate level.

4. An evaluation form for photography communicative competence was created by and it was a form with four-point scales. The IOC of the created evaluation form was assessed by three experts. The IOC score for each item was over 0.5 and the Cronbach's Alpha Coefficient score was at 0.72.

5. An evaluation form for photography tasks was produced by the researcher and it was a form with five-point scales. The IOC of the evaluation form was assessed by three experts. The IOC score for each item was over 0.5 and the Cronbach's Alpha Coefficient score was at 0.73.

6. A questionnaire for the teaching and learning model was evaluated by the experts and the IOC score of the questionnaire for the students towards the e-learning instructional model was more than 0.5 for every item and the reliability score of it was 0.71.

7. An evaluation form for certifying the model was evaluated by the experts and the IOC score of the evaluation form for certifying the model was 1.00.

Research methodology

This research was an experimental research using one group pretest-posttest design in order to evaluate the learning achievement. Meanwhile, the research plan using one group posttest-only design was used to assess the photography ability. The procedures of this research were as follows:

1. The researcher contacted the lecture of the photography course in order to ask for a permission to experiment the learning instruction in the Faculty of Education, Silpakorn University for the experimental stage and in School of Communication Arts, Bangkok University for the experimental expansion.

2. The researcher made the official letter of permission to both groups of the participants in the experimental research on the learning instruction.

3. The experimental results of the learning instruction were applied to the e-learning system (https://elearning.su.ac.th /course/view.php?id=125) and the learners worked together to select the learning activities based on the given learning model and communicated through online social networking system based on the learners' need such as Line application – a private or group communication for comfortable reasons, the groups on online social network (Facebook/Foto edtech) – a online videos learning center as well as the website for creating an electronic portfolios (Wix.com).

4. The researcher gathered and summarized the data after experimenting the learning instruction. The data consisted of the learning achievement and the evaluation of the photography ability, including the evaluation of the communicative ability, the photography tasks, and the opinions towards the learning instruction.

5. The finding of the experimented learning model evaluated by the experts exposed that the model with 9 crucial steps was appropriate and the average IOC score was 1.00 for every single step. Therefore, the model was suitable and could be applied to teaching and learning.

6. In the experimental expansion, the researcher implemented the new learning management system (https://www.edmodo.com/home#/group?id=24841112) in teaching and learning for the participants in the school of Communication Arts, Bangkok University. The researcher and the learners worked together to select the learning activities based on the given learning model and the researcher assessed the results of the experiment of the learning instruction, focusing on photography ability, communicative process and photography tasks.

7. The researcher concluded the experimental results.

Results

1. The research findings in the experimental stage were as follows:

1.1 To compare the learning achievement with the pre- and post-test, the average score of the pre-test was 5.71 points while the other score was 24.33 points. The average score after learning was significantly different from the average score before learning at .01 level.

1.2. To evaluate the photography ability, there were 2 parts, including 2.1) the overall average score of the communicative ability (4 points in total) was high level. ($\bar{x}$ = 3.35, S.D. = 0.48) while the overall average score of the photography tasks (5 points in total) was in high level. ($\bar{x}$ = 4.48, S.D. = 0.57).

1.3 To evaluate the opinions towards the e-learning model integrating inquiry-based learning and project-based learning to enhance learning achievement and photography ability for undergraduate students, the average score was in high level. ($\bar{x}$ = 4.44, S.D. = 0.50).

2. The research findings in the experimental expansion were as follows:

2.1 The pre- and post-tests were used to compare before and after learning achievements of the participants. The average score of after learning with the instructional model was higher than the other, and they were significantly different at the .01 level.

2.2 The evaluation of students' photography ability was considered as high level.

2.3 The overall average score of the opinions was in high level.

Discussion/Conclusion

1. The finding of the comparison between the pre- and post-test revealed that the learning achievement after learning was higher than the one before learning. There was a statistically significant difference at .01 level because the learners could learning with the e-learning instructional model which was relevant to the differences among the learners. It caused the learners learn autonomously and reviewed the lessons whenever they wanted. Similarly, Hindes, M.A. (1999) examined the remote teaching and learning model through the website on the topic of researching online information in order to promote the learners to improve their online research skills. The finding showed that the learners' opinions were positive towards the web-based instruction and the web-based learning could help the learners to develop their computer ability. Furthermore, the web-based courses teaching had to be updated all the time because this kind instruction played the important role to improve teaching and learning as well as increase the learning achievement better. Supakiadmongkon (2014: 120) studied the effects of the e-learning model using the project-based learning instruction towards problem-solving and team-working skills of undergraduate students in the faculty of Education, Silpakorn University. The finding exposed that the learners could access the lessons anywhere and anytime as well as the learners could review the lesson frequently which the teachers provided in the system and other learning resources which they could discover. The lessons could display both visual and audio materials; as a result, the learners understood the contents better and they could access the other learning resources provided in the system all the time. Sreemod (2012) investigated the effects of the learning model using the inquiry-based learning activities towards the learning achievement and the learning retention in the science subject of the students in grade 7. The finding revealed that the learning achievement after was higher than the one before learning through this learning model as well as the learners still retained the knowledge after learning 2 weeks ago. These findings showed that the instructional design related to the contents and activities in the subject influenced on the learning objectives. Moreover, the researcher integrated the project-based learning instruction which the researcher synthesized and adjusted for the photography course. It led to the perfect learning activity design according to the learners' needs. Similarly, Thammetar (2014: 65-66) stated the procedures of the project-based learning instruction integrating to the e-learning were compounded of the preparation – the teachers plan the project framework, the topic selection – the learners study the project framework, the project

plan – the learners research and present the information to the groupmates in order to gain the knowledge for conducting the project, the project presentation and the evaluation.

2. The finding of photography ability of the undergraduate students could be explained as follows:

2.1) the average score of evaluation of the photographic communicative ability, t was in excellent. It exposed that the synthesis of the process of learning instructional model integrating the inquiry-based instruction helped the learners to develop both the theoretical and practical capability. Moreover, the learners controlled the self-directed learning and shared their knowledge with the classmates. These learning activities fostered the learners inquire the knowledge by themselves as well as they had their own methods to take the photographs. The evaluation consisted of 8 topics which were related to the inquiry-based learning instruction for the photography. These helped the researcher design the appropriate learning instruction for the photographic communicative ability. The topic with the highest score of the evaluation was the summary of the inquiry-based learning for the photography because this learning strategy could help the learning access various and related information. Furthermore, the researcher tested the effectiveness of the research instruments which were based on the designed process and they were also experimented with the participants and adjusted for the appropriateness. Iam-Khong (2016: 25-29) conducted the research on the development of the learning achievement on user requirements analysis by data flow diagram in business systems analysis and design subject for the fourth year undergraduate students of Valaya Alongkorn Rajabhat University under The Royal Patronage by inquiry-based learning approach. The finding revealed that the average score before using the learning activities integrating the inquiry-based learning instruction was 4.06 while those after learning through this model was 14.75 out of 20 points. Moreover, the average score of the learning achievement after using this model was statistically significantly higher than those before at .05 level. Cheng, Ping-Han et al (2016) was interested in conducting the research on 5E Mobile Inquiry Learning Approach for Enhancing Learning Motivation and Scientific Inquiry Ability of University Students. The finding showed that using the inquiry-based learning instruction could help the learners explore the explanation and the evaluation of this model was considered as the highest effectiveness in term of increasing learners' comprehension. In addition, the finding exposed that using the inquiry-based learning instruction with the smartphones effected positively to the learning motivation of the learners and scientific inquiry ability because it promoted the learners to access online information immediately and improve the better

learning. Similarly, Duran, Meltem and Dökme, Ilbilge (2016) researched on the effect of the inquiry-based learning approach on student's critical thinking skills for elementary students. The aim of this research study was to examine the effect of a set of the developed learning activities integrating the inquiry-based learning instruction. The finding showed that learning science and technology could support the developed inquiry-based learning activities and it impacted significantly on learners' critical thinking skills in science and technology. Besides, the researcher selected the activities related to the instructional management for a photography course in term of the appropriate technology which was apart from the content presentation through e-learning system. In other words, the researcher applied online social media such as Facebook Page to share the crucial information of photography for communication (facebook.com/thailandstreet photo). This could help the learners illustrate their photographs through this online social media as well as the experts and outsiders could provide the useful advice. It would be the important tool for the learners for informal and instant communication and the learning resources. The researcher also provided the learners additional learning resources such as a photographic learning lessons MOOC in which the leaners accesses the number of the learning activities and Youtube which provides several videos related the practices and techniques for photography. Setkhumbong (2011: 231-234) examined the effect of e-learning using collaborative learning via social media on competency of using information and communication technology of undergraduate educational students. The finding exposed that the leaners' learning achievement was higher and their information and communication technology usage ability was in excellent. The researcher experimented using the online social media through various devices in several online social platforms. It revealed that online communicative devices were beneficial and could be implemented in supporting the scaffolding learning which was relevant to the writing activities. They could be applied to the classroom project because it was suitable for exploring the knowledge or creating the product.

2.2) the photographic tasks of the learners showed that these tasks promoted the leaners' photographic fundamental skills and the electronic portfolios were also used to collect these tasks' products. It could encourage the learners to present their photographic ideas and the leaning topics liberally. The researcher designed the learning activities based on the examined teaching and learning as well as the photographic principles. Therefore, the photographic tasks were suitable to the principles of the project-based learning instruction. Also the researcher invited 3 expert lecturers to assess the leaners' photographic tasks and there were the authentic evaluation criteria, including 10 photographic topics which covered

all developed photographic topics. The finding revealed that the topic with the highest score of the evaluation was the meaning communication, the communication, the photographic viewpoints and the presentation of photography. According to the project-based learning theory as well as the teaching and learning, the experts suggested that both the teacher and the learners should collaborate to designate the projects based on the learners' needs. Moreover, there should be a process of evaluating the instruments' quality in term of a validity and a reliability in order to develop the quality of those evaluation instruments for photographic tasks based on the criteria. These criteria were considerably appropriate for the evaluation because the developmental process of the photographic tasks was consistent to the project-based learning instruction and the researcher also experimented them to assess their effectiveness based on these criteria as well. Chanman (2013: 179) investigated the effects of e-learning using project based learning towards learning achievement and collaborative behavior of undergraduate students in faculty of education, Silpakorn University. The finding showed that the students' ability to create the projects was at a good level. In addition, the researcher suggested that the project-based learning instruction provided the learners the opportunities to collaboratively learn and there were concrete procedures to help the students to systematically learn. The procedures consisted of selecting a problem, collaborating to create a plan as well as researching and achieving the solution. These process fostered the students to deeply comprehend what they had researched and helped them to improve their other capacities such as a leadership, a followership and a responsibility. Furthermore, it still drove the students to be sympathetic when their groupmates encountered certain problems and provided them a team-working experience which led to an authentic learning accomplishment. Similarly, ChangKwanYeun, Sittiwong, and Jiravarapong (2016: 20-28) conducted the research on the flipped classroom and project-based learning on general education for undergraduate students. They created the instructional procedures as follows: 1) the students are asked to study the contents in advance from several media and then conclude what they have learned and conduct a single question each; 2) the lecturer selects the project topics and discuss the contents of the instruction with the students; 3) the students question the lecturer on the contents which they have learned; 4) the students work in group on the project topic which the students as the integrators construct the knowledge based on self-directed learning through the media; 5) the students present their projects while the lecture provides the advice. Chantra, Yuangsoi, and Teeraputon (2017:114-115) conducted the research on the development of web-based instruction with project-based promoting for

teamwork for undergraduate students. There were 5 steps of the web-based instructional model integrating the project-based learning instruction to promote a teamwork as follows: 1) considering and selecting the problem; 2) planning a project; 3) implementing the project; 4) summarizing a result and 5) presenting the result. In addition, the evaluation score of the quality of the web-based instructional model integrating the project-based learning instruction to promote a teamwork was at an excellent level. Riyanti, Menul T., Erwin, Tuti N., Suriani, S. H. (2017) studied implementing project-based learning approach to graphic design course. The purpose of this study was to develop a learning model based Commercial Graphic Design Drafting project-based learning approach using a strategy in the learning product development research. The participants of the study were the undergraduate students who were studying in the fifth semester. The learning model was compounded of a system which was used to develop a commercial graphic design drafting for the products and the criteria using to assess the product design were evaluated by the experts in the design field, the teaching and learning materials field as well as the teaching aids field. Moreover, an evaluated process was the process in the product development. The finding revealed that the learning model based Commercial Graphic Design Drafting project-based learning approach promoted the students' learning achievement better and the model development was at a good level.

Furthermore, the researcher assigned the students to create the online social portfolios through wix.com which is an online social networking website for a photographic presentation being popular for the photographs today. However, the researcher designated the developmental procedures for the students, especially designing an appropriate experimental timeframe. As a result, the learning model was suitable for them. Bangthamai (2012 b : 96) examined the effect of using electronic portfolios through online social network system in a photography course for undergraduate students. The aim of the study was to investigate the effect of using electronic portfolios through online social network system in a photography course. The finding showed that the evaluation of the development of the students' electronic portfolios through the online social network was at a good level because the portfolio development was created according to the students' needs in term of selecting an online social network. The chosen system was also appropriate for the teaching and learning as well as the characteristics of the course. The crucial feature of the online social network was illustrating the picture which supported the students to use easily and there were several communicative tools which responded well to the students' learning styles. George Lorenzo and John Ittelson (2005) studied on the demonstration and evaluation of students' learning

achievement through electronic portfolios. The findings exposed that this kind of portfolios not only reflected other students' capacities but also their experiences. Moreover, it helped the students to prepare the academic documents and a readiness for working. Another finding showed that using the electronic portfolios fostered the students' learning ability and made them aware of their own skills better. These tasks were collected on the digital platform and were used as learning assessment tools in every level, including course, division, department and an educational institute.

3. The average score of opinions towards the inquiry-based learning instruction to enhance the learning achievement and the photographic ability for undergraduate students was at a good level because the researcher examined the learners' needs in the teaching and learning step. In this step, the learners were asked to fill out a questionnaire and the data was analyzed in order to gain insights of their needs on the teaching and learning better before developing the learning model. Moreover, the researcher took account of the teaching and learning theory for regular students and the characteristics of this course could encourage motivation as well as there were the learning activities fostering the learners to practice and improve their behaviors. However, the researcher experimented the effectiveness in 3 phases. This mean, the researcher interviewed the learners and observed their learning style in order to understand the learners' needs better. Therefore, the learners preferred the learning support relating to a multimedia which displayed in the smartphones, the learning resources where were nearby them as well as the design of the activities which allowed the learners to be flexible for learning. These could help the learners improve their thinking skills better.

Rungcharoeankiat (2014: 227) investigated the development of blended learning instructional model using 4 mat system to enhance analytical thinking ability of Rajabhat University students' multiple intelligences. The finding showed that the overall average score was at an excellent level. The students' opinions revealed that the learning model was appropriate for them because the model fostered the students to research and review their prior knowledge related to the new one anywhere and anytime. Moreover, they could monitor their tasks and corrected the errors by themselves. The students were more responsible for their learning after learning through this model because the inquiry-based learning instruction could encourage them to learn autonomously and appropriately. Wu, Ji-Wei; Tseng, Judy C. R.; Hwang, Gwo-Jen (2015) examined the development of an inquiry-based learning support system based on an intelligent knowledge exploration approach. In this model, the teacher provided certain advice to the students even though World Wide Web would be the

knowledge resources for them to explore with a searching tool. This model was experimented in a computer technology course for the freshmen undergraduate students. The finding exposed that the students' learning achievement and satisfaction were at an excellent level. Furthermore, using online social network encouraged the undergraduate students to encounter the outsiders and experts which could equip their ideas in more public. It led the students to evaluate their ability better.

Suggestions

2.1 The further research should design an instructional model for other courses and other practical courses.

2.2 The further research should examine teaching and learning models focusing on developing affective domain, learning behaviors in practice courses as well as creative thinking skills through technology for an instruction integrating various online learning resources.

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