The Study of Achievement in Metacognition and Learning Potential for Publication Design through Connectivism in Virtual Classroom for Undergraduates

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Abstract

This research aims to design a virtual classroom which is based on the concept of connectivism regarding the publication design principles, satisfaction study and achievement tests of students towards metacognition and learning potential of undergraduate students. Instruments used in the research : 1) a lesson on publication design principles including the content and teaching media through the Network Computer 2) questionnaire for opinions and suggestions of experts 3) questionnaire for opinions of learners, 4) an evaluation form for metacognition and learning potential, and 5) an evaluation of learning potential of students before and after learning. The samples used in this study were 40 first-year undergraduate students of Mass Communication Technology Faculty, Rajamangala University of Technology, studying in the second semester of 2013 academic year. The data were analyzed using the mean ($\bar{X}$), standard deviation (SD.), and T-Test. The results showed that: The satisfaction of students towards virtual classroom's design is at a high level by focusing on the ability of students to create their own knowledge using existing knowledge and enhance learning potential to be at a high level. Students learning through virtual classroom showed higher academic achievement than regular classroom with statistical significance at .05. The results of the analysis showed that students who had high score in the 4 metacognitive issues - awareness, cognitive strategy, planning, self-checking – also had high score in their learning achievement. Similar findings were also apparent with the 4 learning potential issues - learning readiness, effort, self-efficacy, worry – demonstrating that students who had high score in such issues also had high score in their learning achievement as well.

Keywords: Virtual classroom, connectivism, metacognition, learning potential, learning achievement

Introduction

The entrance of the digital age, which was brought by the development of information technology in globalization, has been rapidly advancing. At present, such advancement has become a significant factor in a daily life and has greatly contributed to the development of learning. Theories which believe that learning never ceases to happen and that learning can occur at any moment have resulted in a shift in learning through different technologies such as mobile phones, digital cameras, DVD players, computers, the Internet, etc. Most youth spend their time learning through such technologies. Learning is created through connectivity in the network where learners subsequently select from the learning resources available around them, especially in the online world, and make the learning resources meaningful for themselves.

When learners are able to manage the connectivity which is meaningful for their learning and apply such knowledge, learning is believed to have been taken place (Thanomporn Laohajaratsang, website). Applications of computer technologies and network can significantly promote learning; therefore, the new way of learning in the digital age has become a topic of interests which can lead to learners' improvement and development (Buppachart Thunhikorn. 2008). Virtual classroom aims to replicate the distinct characteristics of a normal classroom enabling users to feel familiar and in some cases even feel that virtual classroom can replace face-to-face communication. For example, an attempt has been made to achieve a similar or equal speed of a face-to-face communication using a mix of communication technologies in order to replicate a classroom which has normal classroom's existing characteristics or fits certain demands or requirements or is based on a commonly shared topic. Virtual classroom allows learners to chat or exchange their views as well as communicate with each other through various channels on the Internet such as chatting via Facebook, Twitter, MSN, etc. Within the virtual classroom, no matter where you are in the world, you are able to discuss about common topics of interests with each other in the cyberspace which can bring great advantages for classroom development like in normal classrooms.

Learning though virtual classroom is considered a great educational innovation which can help lessen educational limitations because it provides freedom and opportunity for learners to choose classes they are interested in depending on their readiness, time, location and intellectual abilities. Virtual classroom can also be organized for formal, non-formal as well as informal education which can promote lifelong learning. The main factors which are considered particularly crucial to the organization of virtual classroom are instructors and learners as learners must be curious and eager to learn. If learners have learning potential, good planning, self-control and learning strategies along with the williningness to develop themselves through practice, metacognition will then be effectively created during the process of learning which is in line with the learning objectives. Regarding the teaching and learning of publication design which entails various processes related to printing system, designers must consider the principals involved in the production as well as the application purposes according to the design objectives which will be most suitable for the users. Therefore, the instructions must focus on the end result in the production process and the real application based on user's needs. By offering an opportunity for synchronous instructions through virtual classroom, it can be a part that can affect design learning where learners are able to be connected to research for other design works or showcase their work for discussions among teachers and their peers which can bring about overall ideas and affect the design and the use of design programs. This type of learning provides a platform for opinions to be shared which can bring great benefits to the effectiveness of publication design production and create new knowledge for learners in the virtual classroom where they can synchronously and continuously be connected. In addition, it can be valuable to organizations in terms of collaborative learning where knowledge can be shared and consequently be able to help the country's future development.

Research Objectives

1. To design a virtual classroom based on the concept of connectivism regarding the publication design principles.
2. To study the learning achievement in metacognition and learning potential for publication design principles through virtual classroom of undergraduates.
3. To compare the achievement of the experimental group and control group.
4. To study the learners' satisfaction towards virtual classroom.

Scope of Research

The researcher determined the scope of the research as follows:

1. Samples were achieved through the method of sample random cluster sampling. 40 undergraduate students studying the subject of publication design principles were divided into the experimental group and control group.
2. Variables in the research are:
   2.1 Independent variable is the learning through virtual classroom
   2.2 Dependent variables are:
   2.2.1 Learning achievement
   2.2.2 Metacognition results of learners

1) Awareness
2) Cognitive strategy
3) Planning
4) Self-checking

2.2.3 Learning potential results

1) Learning readiness
2) Effort
3) Self-efficacy
4) Worry

Specific Terminologies

Virtual classroom is an online learning environment which uses a mix of online resources in the instruction based on the concept of connectivism.

Connectivism is an integration of network principles connecting to the knowledge around us, especially online, then selecting and making the learning resources meaningful for learners themselves and exchanging them with others.

Metaconition is mental knowledge and experience which learners can control including awareness, cognitive strategy, planning and self-checking while learning in virtual classroom.

Learning potential is attitude, value, and personal attribute which lead to the learning and understanding of classroom content from virtual classroom by the learners themselves. Learning potential includes learning readiness, effort, self-efficacy, and worry.

Learning achievement is the test results of publication design and scores from the questionnaire according to the evaluation standards.

Hypotheses of Research

Learning achievement of the experimental group in virtual classroom based on the concept of connectivism regarding publication design principles is higher than that of the control group.

Method of Study

Process 1: The Design of virtual classroom

In this process, the researcher divided the study into the following:

1.1 To study basic data regarding factors of virtual classroom which affect metacognition and learning potential of learners through the concept of connectivism.

1.2 To create a virtual classroom which consists of the elements as follows:

Part 1 Coloration, font size and background were designed and tested with the experimental group of 40 students.

The data were analyzed using the mean ($\bar{x}$) and standard deviation (SD.) and the results were utilized in the application of the virtual classroom.

Part 2 The virtual classroom was designed and experts were asked for their opinions and suggestions which were subsequently used in the construction of the virtual classroom. The process was as follows:

1. Virtual classroom was created on the Internet.
2. Constructional interview was conducted to achieve the opinions and suggestions of experts from different fields and the interview results were concluded and used to improve the construction of the virtual classroom.

Part 3 The process of developing the evaluation form

1. An evaluation form was developed in order to assess the appropriateness and compatibility of the virtual classroom in the teaching and learning through the concept of connectivism. Additionally, this evaluation form also aimed to discover the content validity.

Process 2: The evaluation of metacognition and potential of an individual

This process aimed to analyze the process demonstrating metacognition and learning potential of an individual. An individual can reveal behaviors which show their metacognition and learning potential in each process of the learner's activities regarding meaningfulness, major characteristics of metacognition and learning potential based on the evaluation form developed from the standards of Center for the study of Evaluation, National Center for Research on Evaluation, Standard, and Student Testing (CRESST), University of California, Los Angeles. The evaluation form consisted of 20 items aiming to evaluate metacognition with the total score of 100 points and 32 items evaluating learning potential with the total score of 160 points. The evaluation was subsequently used in the development of each aspect which is suitable for the teaching and learning for the subject of publication design principles.

The evaluation of metacognition and learning potential was designed using a five-point Likert scale for statistical analysis which is Highest = 5, High = 4, Medium = 3, Low = 2 and Lowest = 1.

Process 3: Learning achievement test

1. The samples used in this research were a classroom of 40 undergraduate students registered for the subject of publication design principles in the second semester of 2013 academic year. The samples were achieved using the method of Simple Random Sampling and were divided into 2 groups which were experimental group and control group as follows:

1.120 students were the experimental group learning through the concept of connectivism in the virtual classroom.

1.2 20 students were the control group learning through the concept of connectivism in the normal classroom.

2. Theoretical test was created consisting of 50 items and worksheets as well as design performance evaluation form were established.

3. The learning achievement of the experimental and control group was tested before and after learning and the results were analyzed and compared.

Results of data analysis The details regarding the results of the data analysis for each process are as follows:

Result 1 This is the result of the design and pattern of virtual classroom as a platform for knowledge exchange regarding publication design principles for learners based on the concept of connectivism.

The researcher designed the virtual classroom by applying software called Word Press which was created from Content Management System (CMS). This system is used to create and manage website templates and has various insert able software programs such as Web Board, website visitor counter, exhibition management system and chatrooms. In addition, it can also link to other websites and information sources on different devices such as mobile phones, tablets and iPhones. It was developed from language of PHP, Python, ASP and JSP which is open source software. The evaluation result of the samples' opinions regarding the design and application of the virtual classroom showed a mean of 3.67 which is at a high level.

Result 2 The analysis of the achievement of metacognition and learning potential of the experimental group through connectivism in virtual classroom

Table 1: The Metacognition Scores of the Experimental Group (n=20)

List	Awareness				Cognitive strategy				Planning				Self-checking				Total score	
	Lowest	Highest	$\bar{x}$	SD	Lowest	Highest	$\bar{x}$	SD	Lowest	Highest	$\bar{x}$	SD	Lowest	Highest	$\bar{x}$	SD	Lowest	Highest
Metacognition	8	20	14.55	3.66	11	20	15.30	2.72	11	19	15.35	1.92	10	20	15.95	2.75	50	79

From Table 1 It was found that the metacognition issue with the highest mean was awareness which was at 14.55, followed by self-checking with the mean of 15.59, planning at 15.35 and cognitive strategy with the lowest mean of 15.30 respectively. Regarding the total score of the 4 issues, the highest mean was at 15.54 and the highest score was at 79 while the lowest was at 50.

Table 2: The Comparison of Metacognition and Academic Scores of the Experimental Group

Metacognition	Awareness			Cognitive strategy			Planning			Self-checking		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Theoretical part	33.00	33.84	37.78	33.00	33.50	37.22	29.00	34.00	36.80	32.00	33.67	37.34
Practical part	37.00	37.00	39.33	35.00	36.50	40.11	35.00	42.50	38.60	36.00	37.56	39.00
Total	**70.00**	**70.84**	**77.11**	**68.00**	**70.00**	**77.33**	**64.00**	**76.50**	**75.40**	**68.00**	**71.23**	**76.34**

Low group has a range of the scores from 8 – 11.33
Medium group has a range of the scores from 11.34 – 15.66
High group has a range of the scores from 15.67 – 20.00

From Table 2 It showed that if learners' metacognition scores were high, the learning achievement would be high as well.

Table 3: Learning Potential of Learners in the Experimental Group through Virtual Classroom

List	**Awareness**				**Cognitive strategy**				**Planning**				**Self-checking**				**Total**	
	Lowest	Highest	$\bar{x}$	SD	Lowest	Highest	$\bar{x}$	SD	Lowest	Highest	$\bar{x}$	SD	Lowest	Highest	$\bar{x}$	SD	Lowest	Highest
potential	22	40	30.75	4.63	24	40	30.95	4.62	20	38	29.95	4.92	25	38	315	4.81	91	156

From Table 3 It was found that the learning potential issue with the highest mean was worry which was at 31.45, followed by learning readiness with the mean of 30.75, effort at 30.95 and self-efficacy with the lowest mean of 29.95 respectively. Regarding the total score of the 4 issues, the highest score was at 156 while the lowest was at 91.

Table 4: The Comparison of Learning Potential and Academic Scores of the Experimental Group

Potential	**Learning readiness**			**Effort**			**Self-efficacy**			**Worry**		
	Low	**Medium**	**High**	**Low**	**Medium**	**High**	**Low**	**Medium**	**High**	**Low**	**Medium**	**High**
Theoretical part	35.00	33.00	37.78	34.60	34.88	35.86	34.34	35.11	36.20	34.00	34.57	35.67
Practical part	37.40	37.45	39.50	3540	38.00	38.86	35.50	37.56	40.40	37.50	37.72	39.89
Total	**70.40**	**72.45**	**77.28**	**70.00**	**72.88**	**74.72**	**69.84**	**72.67**	**76.60**	**71.50**	**72.29**	**75.53**

Low group has a range of the scores from 20 – 26
Medium group has a range of the scores from 27 – 33
High group has a range of the scores from 34 - 40

From Table 4 It showed that if learners' learning potential scores were high, the learning achievement would be high as well.

Result 3 Learners' achievement before and after learning between the control group and experimental group

Table 5: The Comparison between the Achievement of the Control Group and Experimental Group through Connectivism (N=20)

Test results

	$\bar{x}$	SD	d	SD	t	df	p	
After learning (Experimental group)	35.40	5.06	4.75	6.51	3.26*	19	.004	
After learning (Control group)	30.65	4.02						

*P<0.05 means statistical significance

From Table 5 The comparison of the achievement of the experimental group and control group found that after learning the experimental group had a higher score than the control group which can be considered statistically significant at 0.005.

Result 4 The result of the learners' satisfaction towards the virtual classroom's design and application reflected the samples' opinions regarding the design of main components of the computer screen as follows: design of screen monitor with a mean of 4.03, design of information and content at 3.76, use of font and language at 4.06, use of images at 3.93, use of coloration at 3.98, use of sounds at 3.84, use of icons at 3.88, technology at 4.30, usability at 4.25 and instructional design at 4.32, all of which are considered to be at a high level.

1. Research Results

1.1 Regarding the learners' opinions towards the design of the virtual classroom through the concept of connectivism for publication design principles, the researcher concluded the opinions by ranging the means from the highest to the lowest as follows: instructional design (4.32), technology (4.30), usability (4.25), use of font and language (4.06), design features of screen monitor (4.03), use of coloration (3.98), use of images (3.93), use of icons (3.88), use of sounds (3.84) and use of information and content (3.76). It can be concluded that the means of the learners' opinions towards virtual classroom through the concept of connectivism for publication design principles are considered to be at a high level.

1.2 Regarding learning achievement, the research found that the experimental group had a higher score than the control group. That is, after learning the experimental group had a score of 35.40 whereas the control group had 30.65 with the difference of 4.75. This can be considered statistically significant at 0.005 which demonstrated that virtual classroom can enhance learning achievement of learners.

1.3 As for metacognition and learning potential:

For metacognition, it was found that the scores for the 4 metacogition issues had the high and low means with a range between 20-8. The 3 metacognition issues which received the highest means at 20 were awareness, cognitive strategy and self-checking, with a high mean of 19.75. The lowest mean at 8 was awareness, with a low mean of 10. The total high score was 76 and the total low score was 50.

For learning potential, it was found that the high and low means had a range between 40-20. The issues which received the highest scores were learning readiness and effort at 40. The mean of the four issues was 39 and the lowest was self-efficacy at 20. The mean of the four issues was 22.75 with the total high score of 156 and the total low score of 91.

The 4 issues for both metacognition and learning potential were discovered to be in the same direction regarding learning achievement. That is, learners who had high scores in metacognition and learning potential were found to have high learning achievement as well.

1.4 Learners' satisfaction towards virtual classroom's instructional design with links connecting to other sources was at the highest level ($\bar{X}$ =4.60). Regarding the design and usability, learners were satisfied with the design features of screen monitor, design of information and content, use of font and language, use of images, use of coloration, use of sounds, features, use of icons, technology, usability and instructional design at a high level.

2. Discussion

2.1 The result of learners' satisfaction towards virtual classroom through the concept of connectivism showed that learners were satisfied with the instructional design, the content structure which covered the objectives of the lesson, the lesson structure motivating learners' interests and the links connecting to other sources. The researcher believed it is because learners are allowed access for instant playback as well as reviews of any lessons and activities by themselves using their existing knowledge to research. Learning acquisition is established through interactions and information searches from different resources leading to synchronous learning and knowledge development by learners themselves. The findings were similar to the research conducted by Rita (Rita: 2008) which utilized the idea of knowledge sharing through connectivism allowing learners to be able to analyze and discuss an existing knowledge and develop it into a new knowledge via information technology network in virtual classroom or distant education. Learners also have an opportunity to search for knowledge by themselves from resources both inside and outside classrooms. Similar findings were also evident in the research of Florence Martin, Michele A.Parker, and Deborah F.Deale (2012) which studied that interactions are essential for learners' satisfaction in an online curriculum. Increasing the features of synchronous virtual classroom in an online curriculum can facilitate interactions.

In this study, interactions were found among 21 graduate students participating in Eastern United States Instructional Technology Project through virtual classroom. After questioning participants about interactions between learners, interactions between learners and instructors, and effects of instructors' different techniques on learners, it was found that chatting and webcam provide learners the ease in communicating with instructors in virtual classroom. In addition, in normal classroom, learners are able to communicate with and receive help from each other as well as instructors. If such connectivity takes place naturally creating meaningful and organized knowledge scheme, knowledge acquisition will occur more effectively. On the contrary, if connectivity occurs inaccurately or randomly, learners may not be able to acquire appropriate knowledge.

2.2 The analysis of learning achievement of learners in virtual classroom through the concept of connectivism for publication design principles found that learning achievement of learners in virtual classroom was higher than that of normal classroom's learners. The result was similar to the result found in the research conducted by Siriporn Apiwongngam (2006) who carried out a study on virtual classroom design in accordance with the constructivist approach. The research found that experts' opinions towards virtual classroom design through the constructivist approach regarding packaging design were at a high level. In addition, the mean of learners' satisfaction towards virtual classroom which was used as supplementary instructional media was high. Moreover, learners' learning achievement was high with statistical significance at 0.001. From the research, it was evident that supplementary instructional media can be used in lessons to enhance leaners' understanding and learning achievement. The instructions through virtual classroom using a mix of information technologies can be considered an educational innovation which can reduce limitations in education in the 21st century allowing learners to select class schedule and content that most interest them. Learners also have unlimited access to review content and exchange information between learners and instructors or among learners themselves by integrating the principles of complicated network. In order to manage learning in virtual classroom, instructors are required to encourage learners to analyze information through researching and different methods which can lead to learning. Moreover, learners should be allowed to search for answers themselves by connecting to knowledge. With regards to limitations of virtual classroom, although at present technologies have enabled instructors to be able to communicate with learners through numerous channels, monitor learners' class attendance, offer face-to-face communications via webcam and exchange information with learners, instructors should be mindful of the practical work assigned to learners, especially classroom assignments, so that learners cannot let someone else complete the assignments for them. Additionally, in order to develop learners' abilities in practical subjects as well as review the lessons, practical tests should be implemented by instructors themselves.

2.3 The analysis of metacognition and learning potential discovered that the scores of the 4 metacognition issues were similar with a high total of 79 out of 100. Similar result was found for the 4 learning potential issues with a mean of 30.77 and a high total of 156 out of 160. The findings corresponded with the idea that if existing knowledge of learners is solid and correct and is utilized at an appropriate time, the existing knowledge will be a strong foundation for learners to create new knowledge. Nevertheless, if the existing knowledge is passive, insufficient and inappropriately or incorrectly used in their work, it can become an intervention or obstacle in the learning of a new knowledge. Learners may have to use processes related to metacognition in order to control their own learning acquisition, evaluate the work that they are about to perform or are performing, evaluate their strengths and weaknesses, plan their own strategies, apply different knowledge and reflect on the usability of the method they have chosen. However, most learners are not aware of these processes and how to implement them. However, once learners have developed their abilities to utilize these processes, cognitive skills will be developed which will improve not only their capabilities but also their learning effectiveness as well. According to the results, the scores of both theoretical and practical parts increased which went in the same direction as those of metacognition and learning potential. It can be said that learners have gained more experience from being able to control themselves starting from when they are faced with a situation until when they are able to overcome their goal. This achievement is attained through practice and self-development in metacognition and learning potential which will lead to knowledge consistent with the concept of connectivism. That is, the need for knowledge will turn into awareness and acceptance. In addition, during the process of understanding, connectivity will take place where new concept or knowledge will be created. Regarding the application of learners' ability to utilize learning resources in a new situation, higher knowledge is required. However, connectivity will enable learners to create their own network which will make them become a factor being clearly seen in the network.

Moreover, for the analytical aspect which is the ability to classify information into parts which will lead to pattern recognition, learners must be aware of the network that they are not only the users of information but also the creators as well. They should be able to analyze what is taking place in the network and create new networks and synthesize them to be meaningful. That is, learners must synthesize and understand the existing patterns and be able to select information and incorporate it into new information or new things. With regards to the evaluation aspect, learners must be aware of the steps involved in evaluating the worth of something according to the standards which learners should proceed using tools, procedures, factors of the conditions in the network. This will encourage learners to have interactions with things based on an evaluation of metacognition and learning potential of an individual learner, resulting in continuous and systematical development which will also lead to higher learning achievement.

2.4 Regarding the result of the learners' satisfaction towards the virtual classroom's design and usability, learners showed most satisfaction towards the instructional design which is based on the concept of connectivism. Learners additionally added that they are able to use network connectivity which offer them more opportunity to consistently enhance or improve their existing knowledge. Furthermore, it provides a chance for those who would like to develop or bring their knowledge up-to-date to be able to learn via computer devices using telecommunication network available on various medias. Learners strongly agreed on the links which allow them to connect to other sources while studying using information technology. They were also satisfied with the ability to use this technology on a variety of devices and the ability to exchange knowledge with each other. On the subject of assignment submission where learners are required to display their work to their peers and instructors for opinions, the data collection process showed that learners in the normal classroom were less likely to voice their opinions or criticism on their peers' work. On the contrary, learners studying in the virtual classroom provided opinions on the work of their peers including points to improve, strengths and weaknesses which learners were able to use to improve upon their work without having to publish it first. This can reduce the cost of resources. In addition, as for the opinions on the sound insertion, the learners' satisfaction was moderate. That is because the lessons in the virtual classroom were lessons which did not require audio description but only lesson content where learners were required to search for information from different resources in order to share with each other.

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