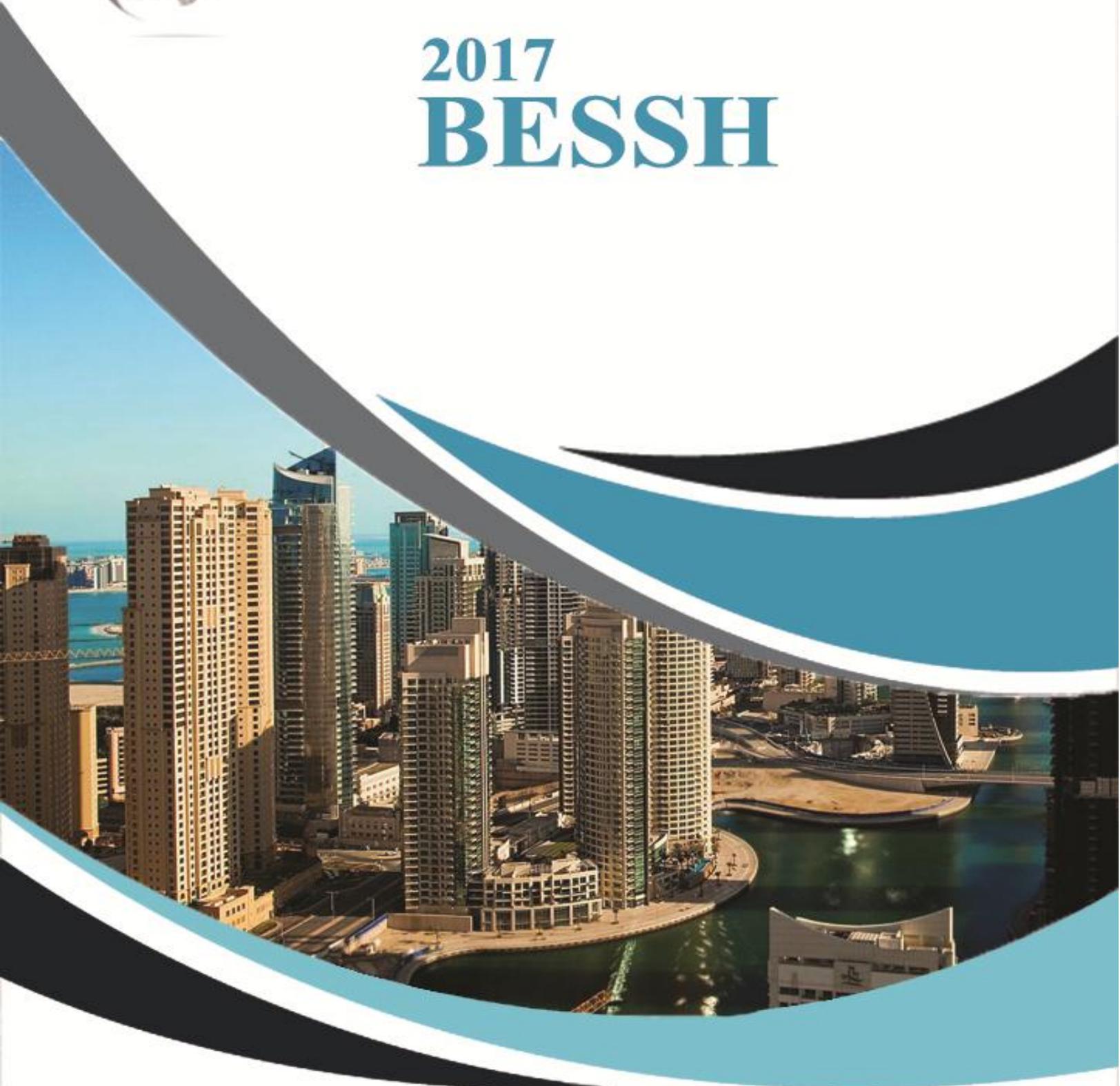




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BESSH-2017

**International Conference on  
“Business Economic, Social Science & Humanities”  
(BESSH-2017), Osaka, Japan**

# **Book of Full Paper Proceedings**

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**Dr. Malika Ait Nasser**

International Conference on “Business Economic, Social Science & Humanities” serves as platform that aims to help the scholarly community across nations to explore the critical role of multidisciplinary innovations for sustainability and growth of human societies. This conference provides opportunity to the academicians, practitioners, scientists, and scholars from across various disciplines to discuss avenues for interdisciplinary innovations and identify effective ways to address the challenges faced by our societies globally. The research ideas and studies that we received for this conference are very promising, unique, and impactful. I believe these studies have the potential to address key challenges in various sub-domains of social sciences and applied sciences.

I am really thankful to our honorable scientific and review committee for spending much of their time in reviewing the papers for this event. I am also thankful to all the participants for being here with us to create an environment of knowledge sharing and learning. We the scholars of this world belong to the elite educated class of this society and we owe a lot to return back to this society. Let’s break all the discriminating barriers and get free from all minor affiliations. Let’s contribute even a little or single step for betterment of society and welfare of humanity to bring prosperity, peace and harmony in this world. Stay blessed.

Thank you.

**Malika Ait Nasser**

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Watcharee Sangboonraung, Parama Kwangmuang

**BESSH-17**

**The Development of Learning Innovation to Enhance Knowledge Construction and Critical Thinking for Undergraduate Student**

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**Abstract**

The purpose of this research was to develop learning innovation to enhance knowledge construction and critical thinking for undergraduate student. Research design was product and tool research. Several methods were used as document analysis and survey. The target groups of this study comprised 1) 5 experts to review the assessment of learning innovation's efficiency to enhance knowledge construction critical thinking for undergraduate student, and 2) 28 third-year students who studied in the course of design of on-line lessons. The procedures were as follows: 1) to examine and analyze the principles and theories, 2) to explore the context concerning knowledge construction and critical thinking of learners, and 3) to synthesize the theoretical framework and the designing framework of the learning innovation to enhance knowledge construction and critical thinking for undergraduate student. The findings shown that the learning innovation to enhance knowledge construction and critical thinking for higher education comprised 7 components as follows: 1) problem base, 2) learning resource, 3) scaffolding, 4) collaborative learning, 5) coaching, 6) Center for enhance critical thinking, and 7) related case

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*Keywords—* Knowledge Construction, Critical Thinking, Learning Innovation

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**Introduction**

Learning in the 21<sup>st</sup> Century in universities nowadays is affected by the high increasing of technology. Instruction tends to focus on the learning environment which is relevance to constructionism. Learning activities can occur anywhere. Primary learning objectives of a subject has changed to focus on setting a learning environment that increase students' performances. Among these changes, students are expected to construct their own value of understanding both inside and outside classrooms (Keefe, 2007).

In Thailand school environment observation from all over the country which consisted of 2,508 teachers about Thailand education in the views of teachers found that 30.36% of the teachers thought Thai students lack of critical thinking skill (Suan Dusit University, 2013). Moreover, students these days are raised in the digital environment, for example, communication technology, internet, laptop, and smart and portable devices, that makes their life more comfortable (Paitoon Srifa, 2012). Thus, learning instruction should facilitate hands-on activities through the usage of suitable technology (Smaldino, Lowther, & Russell, 2012).

In order to develop the learning innovation, the development should enhance students' knowledge construction process, support critical thinking not merely remembering. Importantly, the instruction must focus on situating cognitive experiences which make the learning more meaningful than only lecturing and remembering. Textbook facts may cause decontextualization of learning that students are not be able to apply knowledge into real life problems efficiently (Jonassen & Henning, 1999; White, 1993; Sumalee, 2014). This research aims to develop innovative learning to promote constructionism and critical thinking for undergraduate students preparing the students to face changes in the future, also to get the guideline to develop innovative learning and promote students' critical thinking skill. Then, the students will be able to adapt themselves through the shift of technology and learn life-long.

**Research purpose**

To develop the learning innovation to enhance knowledge construction and critical thinking for undergraduate student.

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## Research Method

The Developmental Research Type 1 was applied (modified from Richey's and Klein's, 2007) comprising 3 processes: 1) Design Process, 2) Development Process, and 3) Evaluation Process. Several methods were used as document analysis and survey.

## Target Group

- 1) 5 experts to review the assessment of learning innovation's efficiency to enhance knowledge construction and critical thinking for undergraduate student.
- 2) 28 third-year students who studied in the course of design of on-line lessons

## Research Scope

The scope of this research is to develop the learning innovation to enhance knowledge construction and critical thinking for undergraduate student. The theories used are as follows; 1) knowledge construction used as following 2 kinds: (1) Cognitive constructivism based on Jean Piaget (1965), and (2) Social Constructivism based on Lev Vygotsky (1925/1971) 2) The theory critical thinking bases on Ennis (2002) consisted of 5 process which are: 1) Elementary clarification 2) Basis for the decision 3) Basis for the inference 4) Advance clarification and 5) Supposition and integration.

## Research Instruments

The instruments used of in this study were 3 kinds as following details:

- 1) The document examination and analysis recording form. The scope of document analysis regarding with constructivist theories, critical thinking, and media theory.
- 2) The record form for synthesis of the designing framework of cognitive innovation to enhance knowledge construction and critical thinking for undergraduate student.
- 3) The expert review record form for evaluation of the Designing framework. The framework of this instrument consists of 3 major issues which are: 1) Content, 2) Multimedia, and 3) Design of the learning innovation to enhance knowledge construction and critical thinking for higher education

## Data Collection and Analysis

Data of the two processes were collected and analyzed as follows:

### 1. Design and Development Process

- 1.1 Literature review was performed to study and analyze the principles, theories, and related research in learning innovation to enhance knowledge construction and critical thinking for undergraduate student. The relevant theories studied included cognitive-related theories such as the information processing theory and Constructivist Theory. Multimedia symbol system was also included as the basis for our study, and the data was recorded in the document- checklist for analysis and interpretation.
- 1.2 Theoretical framework was synthesized from review of related theories and research from Number 1. There were 4 aspects synthesized: 1) psychological learning base, 2) pedagogical base, 3) content base, and 4) technological base.
- 1.3 Contextual study involved the course of design of on-line lessons. It comprised teacher's instruction. The data was collected by a survey of real context of instruction at third-year students who studied in the course of design of on-line lessons, teachers, and students, where knowledge construction and critical thinking were emphasized. The data was finally analyzed, concluded, and interpreted, together with the data obtained from in-depth interview.
- 1.4 The designing framework was based on the theoretical framework and contextual study.
- 1.5 The cognitive innovation was synthesized according to the designing framework in Number 1.4.
- 1.6 The designing framework and learning innovation components were examined, criticized, evaluated by experts; then improved and modified accordingly.

### 2. Evaluation Process

- 2.1 The learning innovation to enhance knowledge construction and critical thinking for undergraduate student was constructed from the synthesis of learning innovation components.
- 2.2 The learning innovation to enhance knowledge construction and critical thinking for undergraduate student were reviewed by experts in the aspects of: 1) content, 2) multimedia, and 3) the design that enhances knowledge construction and critical thinking for undergraduate student. It was then adjusted according to experts' suggestion before being analyzed and interpreted.

2.3 The learning innovation to enhance knowledge construction and critical thinking for undergraduate student was experimented on its efficiency in terms of the appropriate number of students per group, instruction process, and students' attitudes towards the innovation through observation, survey, and in-depth interview. The data was again analyzed and interpreted.

### Research Findings

#### 1. The design and development of learning innovation to enhance knowledge construction and critical thinking for undergraduate student.

Synthesis of the designing framework based on the theoretical framework prior to implementation in the design involved the following: 1) problem base, 2) learning resource, 3) scaffolding, 4) collaborative learning, 5) coaching, 6) Center for enhance critical thinking, and 7) related case, shown in Figure 1.



Figure 1 : The component of learning innovation to enhance knowledge construction and critical thinking for undergraduate student

#### Problem base:

Context enabling was conducted in accordance with Piaget's Constructivism which is based on cognitive development. It is believed that knowledge is derived from experiences, knowledge construction process, or action. An imbalance situation was designed where there was a cognitive conflict. With this basis, the researchers designed the problem base where authentic and real-world contexts were enabled, based on the Situated Learning principle so that learners could link new knowledge with their former experiences or knowledge (Jonassen, 1991).

*Learning resource:* is the source of data, content, information used by learners to solve the problems they confront. Learning resource contains various items learners can work out for the discovery. Design of Learning resource is based on the SOI Model which enables understanding and activation of cognitive processes that take place in learners' brain while they are learning and selecting related information (Mayer, 1996). The acronym SOI stands for 'select', 'organize', and 'integrate'. This is used with the theory of information processing. In designing the design bank, we presented information with a concept map showing relationships among all content, using graphic and moving pictures to present important content. For example, colors, sizes, underlining, and sounds were used to stimulate learners to select relevant information (S: select). Besides, Learning resource shows organization of information designed in the form of charts and maps for organization (O: organize) and presentation of pictures to let learners see the real world that might link to their former knowledge (I: integrate).

#### Scaffolding:

In order to support learners when they do their activities, scaffolding becomes very useful. Scaffolding presents or provides conceptual framework that assists learners in their work more than supporting learners in their capacity. According to Vygotsky's Social Constructivism related to the Zone of Proximal Development, learners who are above this zone can assist themselves while learners lower than this zone cannot. The latter can be assisted by scaffolding

(Vygotsky, 1971). The scaffolding consisted of 1) Conceptual scaffolding 2) Metacognitive scaffolding 3) Procedural scaffolding 4) Strategic scaffolding (Hannafin et al, 1999).

*Collaborative learning:*

This center promotes learners in doing collaborative activities. It is again based on Vygotsky's Social Constructivist, which states that, "Learners are able to construct knowledge through social interaction with others." Therefore, design of the Collaborative Learning emphasized missions where learners collaborated in problem solving. They exchanged knowledge and experiences among peers, or with teachers and experts to elaborate their concepts. Here, the Facebook social network was used for the activities.

*Coaching:*

Coaching was the component mainly to help the students to be able to do complex tasks with two models as observable process model and expert practicing model including cognitive process which invisible. Coaching helped them to learn the correct procedures, its own reasons with the explanations based on cognitive apprenticeship of Collins et al (1991) was used as a principle to shift them from being novice to expert. so this component was designed in accordance with this principle by setting the teacher to analyze student's feedback, and guide them in learning process. The researchers design this coaching as in the classroom and online where they could raise a question to the expert all the time

*Center for enhance critical thinking:*

the research team designed the innovation to create the problem situation in authentic context, to practice their critical thinking skills, and to collaborate them on critical thinking. The critical thinking of Ennis (2002) was applied as process: 1) Elementary clarification 2) Basis for the decision 3) Basis for the inference 4) Advance clarification and 5) Supposition and integration.

*Related case:* based on constructivist learning environments (CLEs) (Jonassen, 1999). The important principle was to design to relate the experiences closed to problem which the students could refer and connect to their prior experience. The related case was design based on the theory of cognitive flexibility which designed and presented in various context in many complex levels embedded in information. So, in this case, the designing was well designed in cases related such as Fish Housing- the students could study this information and use to solve the problems about Life and its habitat relations. This would help them to think and solve other problems in the similar situation. This presented in terms of case samples, solution methods, and reasons.

*The evaluation of learning innovation's efficiency to enhance knowledge construction critical thinking for undergraduate student*

In this study, we found that the design and development of the learning innovation to enhance knowledge construction and critical thinking for higher education correlated to the principles and theories on which it was based. Constructivist's Theory enhances knowledge construction and information processing that supports memory register. Evaluative evidences were found in the following components:

*Content:*

The information content was clear, appropriate and holistic, thus facilitating learners' searching of knowledge. The language use was suitable for learners and easy to understand. The design of lexical-based statements and presentation of contents took multiple forms, for example, letters were highlighted with colors, moving pictures were used and the problem-based learning correlated to the content to study. Learners were encouraged to construct knowledge and on their own. The situations were planned to be similar to the true instructional problems. The researchers took into consideration experts' suggestions to improve the use of language so that it was more formal and organized appropriately for ease of study.

*Multimedia:*

This was found to be appropriate and interesting owing to still and moving animation with background sounds. Presentation of contents was efficient and the contents were organized in suitable categories so that students could click to select the content they wanted. The sizes were suitable, but the font colors should be improved for ease of reading. Statements were colourful, pictures and sounds were able to draw attention. Design was consistent with signposts that enabled conveyance of required information. Usage was simple. Links could be made for sentences or pictures, allowing efficient access to information. Design encouraged learners to act and utilize multimedia to the utmost extent. It supported collaborative learning and working in groups. Learners were encouraged to practice analyzing and practicing. Design of each mission encouraged all learners to participate in working and solving problems. It opened a chance for learners to learn independently and select what each wanted to learn by doing any mission first. Group work allowed collaborative learning where learners exchanged ideas. Learners were encouraged to enthusiastically learn on their own from real practice. Hence, they were able to construct knowledge and develop their thinking skills. The multimedia enabled learners to learn at anytime and anywhere they wanted.

*Design of the learning innovation to enhance knowledge construction and critical thinking for higher education:*

It was found that the innovation supported learning and group work. Everyone participated in working and decision making for problem solution. Learners learned independently and selected an item to study according to their interest. The learning atmosphere was suitable. Collaborative learning allowed exchanges of ideas. Learners could learn anytime and anywhere. There were tools for learners that assisted them to understand what they learned profoundly. Scaffolding and coaching supported learners to think and solve their problem. And regards the expert's assessment, the consistency between the theory and theoretical and designing framework was found.

Conclusion and Discussion

In the design and development of the learning innovation to enhance knowledge construction and critical thinking for undergraduate student comprised 7 components as follows: 1) problem base, 2) learning resource, 3) scaffolding, 4) collaborative learning, 5) coaching, 6) Center for enhance critical thinking, and 7) related case. The reason why such elements were included in the innovation may be because the design and development of 'constructivist learning innovation to enhance critical thinking for higher education was based on ID theory. The ID theory was originally taken from constructivist theory which focuses on the knowledge construction and critical thinking based on Ennis (2002). This study applied theories and critical thinking which emphasized all of 5 process: 1) Elementary clarification 2) Basis for the decision 3) Basis for the inference 4) Advance clarification and 5) Supposition and integration. as the bases for the instructional design. Our findings correlated to studies by Hongsunee Uarattanaraksa et al, (2012) and Petchtone, Puangtong and Chaijaroen, Sumalee (2012) Relevant theories, including the Constructivism, Cognitivism, principles and other theories on learners traits needed to be developed were incorporated in the design together with multimedia. The multimedia characteristics and the symbol system that enhances knowledge construction and critical thinking were taken into consideration. The said studies were different from our research which emphasized the design of innovation that enhances knowledge construction and critical thinking for higher education using the Theoretical Framework consisting of 1) psychological learning base, 2) pedagogical base, 3) content base, and 4) technological base. It was also found that the learning innovation examined by experts in terms of quality and the evaluation of usage should have 3 members per group for effective collaborative learning.

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**BESSH-17**

**The Design and Development of Constructivist Learning Innovation to Enhance Creative Thinking in 21<sup>st</sup> Century Learning for Higher Education**

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Abstract

The student learning in higher education lacking creative thinking. Because of the instruction support the learners' knowledge construction did not appear in the actual classroom. Which will affect to learn in higher education. the study aimed to design and development of constructivist learning innovation enhance creative thinking in 21<sup>st</sup> century learning for higher education. Research design is product & tool research. Several methods used were document analysis, survey, and experimental research. The target group of this study were 5 experts review for assessment the efficiency of constructivist learning innovation enhance creative thinking in 21<sup>st</sup> century learning for higher education and 28 third -year students who studied in educational innovation and information technology course. The procedures were as follows: 1) Examining and analyzing the principles and theories. 2) Exploring the instructional context concerning about instructional design and learning environments. 3) Synthesizing a framework of the constructivist learning innovation enhance creative thinking in 21<sup>st</sup> century learning for higher education. 4) Designing and developing the constructivist learning innovation based on the mentioned framework. 5) Evaluating the efficiency of the constructivist learning innovation enhance creative thinking in 21<sup>st</sup> century learning for higher education. The results were revealed that: the synthesis of the designing framework based on theoretical framework which then put into practicing comprised of 7 components as the following: 1) Problem base, 2) Learning resource, 3) Cognitive tool, 4) collaborative, 5) Scaffolding, 6) Coaching, and 7) The center of creative thinking; and reviewed the effectiveness by experts in the evaluation process as follows: 1) The effectiveness evaluation of cognitive innovation to enhance learners' creative thinking, 2) product assessment, 3) contextual utilization assessment, 4) learner's opinions assessment, 5) Assessment of learners' cognitive ability, and 6) assessment of learning achievement. It was found that the learning innovation is effective in several aspects: to enhance the learner's creative thinking, help the learners provide the opportunity in learning depend on their need and encourage them to think by themselves.

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*Keywords*— Constructivist Learning Environment, Creative Thinking, Thinking in 21<sup>st</sup> Century Learning, Learning in Higher Education

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Introduction

The development of human resource in higher education is really important to the development of the country because the human resource production is the key for the preparation of working-age and career. It requires higher skills for the competition among complex and economic societies. As that so, the creative thinking is needed for learners who are able to innovate the useful innovations for the country. Moreover, the government policies as to enhance Thailand to become the knowledge and creative Thailand hence drive us to live in knowledge and creative society which full of competition and growth. This causes from the two important objectives as 1) becoming the center of creative Industry in ASEAN and 2) increasing creative economic value from 12 percent of GDP to 20 percent in 2012.

However, such development has not been reached due to the low quality of Thai student's thinking process. This showed in the recent two assessments of the learning quality from The Office for National Education Standards and Quality Assessment that such quality was not in the standard level especially. This found in the assessment of students that most of them were out of the standard especially in Standard4 Thinking, Standard5 Learning achievement, Standard6 Self- Learning Discovery. Regards the assessment of teachers and instructional design, it was found that most were not in standard level in Standard9 and 12 Instructional design based on learner-centered and practicing of thinking, facing with situations, and knowledge construction (Office of the Education Council, 2010)

Hence, the way to design instruction to consistent with the current knowledge society is not only to transmit knowledge which not enough for creative thinking but to construct knowledge by students themselves for the innovative construction in 21<sup>st</sup> learning century. The learning paradigm has to be shifted from Teaching to Learning which most weighed on the learners. The instructional design must enhance the learners to learn naturally and efficiently in order to construct knowledge by using technology for life-long learning (Sumalee Chaijaroen, 2003). In

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according to this, the creative thinking is the complex thinking process comprised cognitive components that integrated with theories of learning, pedagogy, technology, media symbol system, and context to become theoretical framework used in designing and enhancing the desired characteristics as creative thinking ability and life-long learning. Such integration between theories and pedagogies as Cognitivism which mainly fosters the learners to construct knowledge and creative thinking in real context including media attribute, media symbol system, technology. The Constructivist also fosters the learners to construct knowledge by themselves by the way of their cognitive processes via the connection of the new and prior knowledge through schema. This believes that the learners construct their knowledge by themselves and the teacher cannot adjust their cognition. However, the teacher can design learning environment to enhance knowledge construction, creative thinking, and thinking process in rich environment as a complex problem and authentic problem which they can think and solve the problems by themselves. As that so, this research is the integration of theories and pedagogy, creative thinking, and authenticity for such knowledge construction.

As mentioned above, this research aimed to develop the guideline for educational research which based on pedagogy from theories to practice which emphasizes on the study of cognitive process. This is for the designing and development of cognitive innovation based on Cognitive theory which highlights on the study and enhancement of cognitive process. So, the researcher realizes its importance and necessary of the development of the learning innovation to enhance creative thinking in the 21<sup>st</sup> century learning for the graduate students. This based on the development of theoretical framework concerning the studies and research related to knowledge construction and creative thinking, and then designed and developed the constructivist learning innovation to enhance creative thinking which is higher –order thinking belongs to cognitive process. The findings will be used to develop learner’s quality to have the ability or cognitive ability to think creatively and then influences to the development of human intellectual capital which is the key for AEC, 21<sup>st</sup> century learning , and the competition and collaboration in world society then.

#### Research Objective

To design and develop constructivist learning innovation to enhance creative thinking in 21th century learning for higher education.

#### Research Methodology

Methodology used in this research are ‘Developmental Research’ (adapted from Richey and Klein, 2007) which composed of two steps: 1) process and development and 2) evaluation.

#### Study Sample

Study samples included in the study are categorized into two groups:

- 1) Design and Development Process comprised 3 specialists in design of and evaluation of constructivist learning innovation design, 3 specialists in evaluating efficacy of the constructivist-based learning innovation in three aspects: content, media, and design.
- 2) Evaluation Process comprised 28 third-year students who studied in course of educational innovation and information technology.

#### Data Collection and Analysis

Data collection and analysis were done in the following 2 main processes:

#### Design and Development Process

- 1) *Review of Literature*: Study and analyze principles, theories, and related studies on the design of constructivist learning innovation to enhance creative thinking in 21th century learning for higher education by investigating into theories related to learning theory; for example, constructivist theory (Piaget, 1965; Vygotsky, 1971; Hannafin et al, 1999), cognitive theory (Klausmeier, 1985; Mayer et al, 1996; Guilford,1967) and theories of media attributes media symbol on network (Salomon & Clark, 1977). The collected information was then used as fundamental of the study and conduction of the record on paper checking, data analysis through interpretation and analyzing description.
- 2) *Synthesis of Theoretical Framework*: Review, study, and analyze theories and related studies stated in 1) as well as keeping record in the synthesis record of conceptual framework and data analysis through interpretation and analyzed descriptions within 5 respects: 1) context-based, 2) psychological-based, 3) pedagogical-based, and 4) technological-based.
- 3) *Contextual study*: Study into educational policies and subject learning management condition comprised of pedagogy of which method focused on knowledge construction. Data were collected though observation of context and in-depth interview about pedagogy management in higher education in views of learners and

instructors whose teaching method focuses on establishment of knowledge. Collected data were then analyzed by interpretation and analyzing description.

- 4) Synthesis of Designing Framework: Synthesis was done on the basis of theoretical framework and contextual study as well as record of conceptual framework synthesis, data analysis through interpretation and analyzing description. From the synthesis, it was found that conceptual framework design of constructivist learning innovation are composed of 1. Intellectual structure simulation, 2. Support on intellectual structure equilibrium, 3. Promotion of intellectual structure expansion, and 4. Support of the adjustment of intellectual structure equilibrium.
- 5) Synthesize the composition of constructivist learning innovation to enhance creative thinking for higher education based on the conceptual framework design which focuses on knowledge construction and creative thinking. Theories, which were applied into actual practice, are composed of: 1) Problem base, 2) Learning resource, 3) Cognitive tool, 4) collaborative, 5) Scaffolding, 6) Coaching, and 7) The center of creative thinking.
- 6) Specialist evaluates and revises the design of conceptual framework and composition of constructivist learning innovation.
- 7) Specialists check correlation between the design of conceptual framework and composition of constructivist learning innovation, then comment, evaluate and give recommendations. Author revised the conceptual framework and learning innovation.
- 8) Conduct constructivist learning innovation to enhance knowledge construction for higher education on the basis of conceptual designing framework and composition of constructivist learning innovation design.
- 9) Bring the constructivist learning innovation to enhance creative thinking in 21st century learning for higher education for 'peer review' and evaluation. Evaluation form for specialist to determine constructivist learning innovation's quality was used to analyze data through interpretation and analyzing description. Authors then revised learning innovation as recommended.
- 10) Bring constructivist learning innovation to enhance creative thinking in 21st century learning for higher education for 'expert review' in three respects: 1) content, 2) media, and 3) design by using evaluation form for specialist to determine constructivist learning innovation's quality. The data were then analyzed through interpretation and learning innovation were revised as recommended.
- 11) Test the conducted constructivist learning innovation in order to look into: the context where the innovation was used, students who learn by using the highest potential constructivist learning innovation, and learning management process with the help of intellectual innovation that was used to promote learner information codification. The experiment also looks into learners' views towards constructivist learning innovation by using observation form to observe the use of the innovation and interview about the context where the innovation was used. Collected data were then analyzed through interpretation and analyzing description.

#### *Evaluation Process*

Author bring constructivist learning innovation to specialist for inspection and review of quality. After the innovation is qualified, it was tested with non-target-group students to study the context where the innovation was used. Thereafter, the innovation was tested with the study target group within the real context where investigation into intellectual process was conducted by looking into: 1) creative thinking of learners in constructivist learning innovation context of which result retrieved from learners' interview protocol analysis and summarized based on principle adapted from Piaget's theory; 2) learners' academic achievement of which results retrieved descriptive statistic; for instance, average value, standard deviation and percentage; 3) learners' views towards constructivist learning innovation of which results retrieved from data analysis through interpretation and descriptive analysis.

#### **Study Results**

This study is aimed to design and develop 'constructivist learning innovation to enhance creative thinking in 21st century learning for higher education' of which data were collected and analyzed by the author. To make the results presentable and can be easily understood, the results will be presented under two main experimental processes: 1) design and development process and 2) evaluation process as can be seen in the following details:

#### *Design and Development Process*

In designing and developing of 'constructivist learning innovation to enhance creative thinking in 21st century learning for higher education' based on designing framework—which composed of: 1) intellectual structure stimuli, 2) intellectual structure's equilibrium adjustment support, 3) promotion of intellectual structure growth, and 4)

intellectual balance adjustment support with expert evaluation (expert reviewer) to validate theoretical validity used as fundamental guideline in designing innovation, it was found that designing framework is theoretical valid as presented in figure 1. Such theories were then applied in actual practice of which design has the following main components: 1) Problem base, 2) Learning resource, 3) Cognitive tool, 4) collaborative, 5) Scaffolding, 6) Coaching, and 7) The center of creative thinking as presented in the following details.

*Problem base* was designed base on ‘Cognitive Constructivism’ based on Jean Piaget’s theory. The concept of the theory is that learners are the ones who construct knowledge through practice (Piaget, 1965). Piaget believes that if learners are stimulated with problems that cause ‘cognitive conflict’ and ‘intellectual disequilibrium’, learners will attempt to adjust his cognitive structure to enter ‘equilibrium’ state through ‘assimilation’ or ‘intellectual accommodation’. From the said principle and theory, the author translated the theory into practice by designing conflicting situation by applying ‘enabling context’ principle of which context was actually authentic—presenting problems that are related to actual context of a certain situation—so as to make learners able to relate those to his/her existing knowledge or past experiences (Hannafin et al, 1999) as presented in figure 2.



Figure 2: Problem base and learning tasks about the meaning and The meaning and definition of the research.



Figure 3: Learning resource

*Learning resource*, where all information is accumulated, is where learner will learn to solve problems by themselves. During the learning process that focuses on learners’ knowledge construction and creative thinking, different source of information will be provided so they can find the answer to the problem. The innovation was designed in accord to information processing (Klausmeier, 1985). Also, in designing the content, mind mapping of all the contents was used as well as graphics and motion to show the changes that happen in different objects. For the part of contents that are important, color, font size, and underlining were used. Also, concepts were used in information design to show relation among different information. Nevertheless, the most important thing is that learning resource must have enough information provided that can be used for problem solving (Mayer et al, 1996). The design will need to allow in looking for answer from different sources of information in order to solve the problem given in an assigned task (Salomon & Clark, 1977). Therefore, information design for learning resource should consist: 1) presentation of information using mind mapping to show the relationship among different information, 2) use of graphics and motion to show changes taking place in objects, 3) emphasis of key information by using color, font size, and underlining, 4) use of conceptual model that presents relation of concepts and 5) categorization of information in different levels.



Figure 4: Cognitive tool



Figure 5: Collaborative

*Cognitive tool.* Cognitive tool was a tool to help the students to construct their knowledge based on Hannafin (1999) and Jonassen (1991) which hold the cognitive tools designing based on constructivist and cognitivism theory. The cognitive tool was designed under the advantages of computer competency which able to help them to process information. The tool consisted of 2 tools consist of; 1) Seeking tool: supported them to search related information, addressed information site by Search engines as Google and 2) Organizing tool: help them to organize related information and to connect related concepts via information organization as external link

*Collaborative* is an element in promoting students to exchange their experiences with others to broaden one’s perspective and work as a team to solve problem base on the cultural, social, and historical (Vygotsky, 1971). It promotes learners to reflect on one’s thought as well as offers chances for both instructor and learners to express ones’ idea to others. The author used social network—Facebook—as a center for information exchange; this will allow learners to express themselves and exchange views and perspective with the classmates, instructor, and specialists during learning process.

*Scaffolding* is the element that helps balance intellectual structure by promoting information codification and attentive environment. This concept was taken from Lev Vygotsky’s theory that believes that “social interaction holds a pertinent role in constructivist development” (Vygotsky, 1971). The concept in developing a constructivist learner who has limited development process or whose development is below the ‘zone of proximal development’, the learners must be supported by the use of ‘scaffolding’. Scaffolding will focus on learners’ practice rather than the innovation itself—this include both administered to instructor and learners. This kind of provided support will emphasize more on presentation support and provision of concepts that promote learners’ learning and practice than learners’ ability (Hannafin et al,1999). Such support can be divided into 4 bases: 1) conceptual scaffolding, 2) Metacognitive scaffolding, 3) Procedural scaffolding, and 4) Strategic scaffolding.



Figure 6: Scaffolding



Figure 7: Coaching

*Coaching* is the element where teacher transfers knowledge and acts as coach to assist learners as well as provide suggestions to students. ‘Coaching’ will practice students by providing knowledge in terms of critical thinking to students (Collins et al, 1991). Students will then learn to build on their specialization from the beginning. In each step of the practice, students will improve their skills by practicing. A good coach will know how to motivate students as well as analyze learning process of students and provide feedback including recommendations on ways of learning

and practicing based on cognitive apprenticeship. This will give students reflection and will enable student to talk about what they have learned.

*The center of creative thinking* is learning activities to encourage students to practice in creative thinking. This is a process that will encourage students to practice creativity. Based on the basic principles of creativity Guilford (1967). The idea consists of four sub-categories: 1) Fluency – the number of alternative uses you can think of, 2) Originality: how unusual those uses are – evidence of ‘thinking different, 3) Flexibility: the range of ideas, in different domains and categories, and 4) Elaboration: level of detail and development of the idea. The researcher convert theory into practice by designing the center of creative thinking consists of 4 room as following: 1) Fluency room 2) Originality room 3) Flexibility room and 4) Elaboration room:



Figure 8: The center of creative thinking

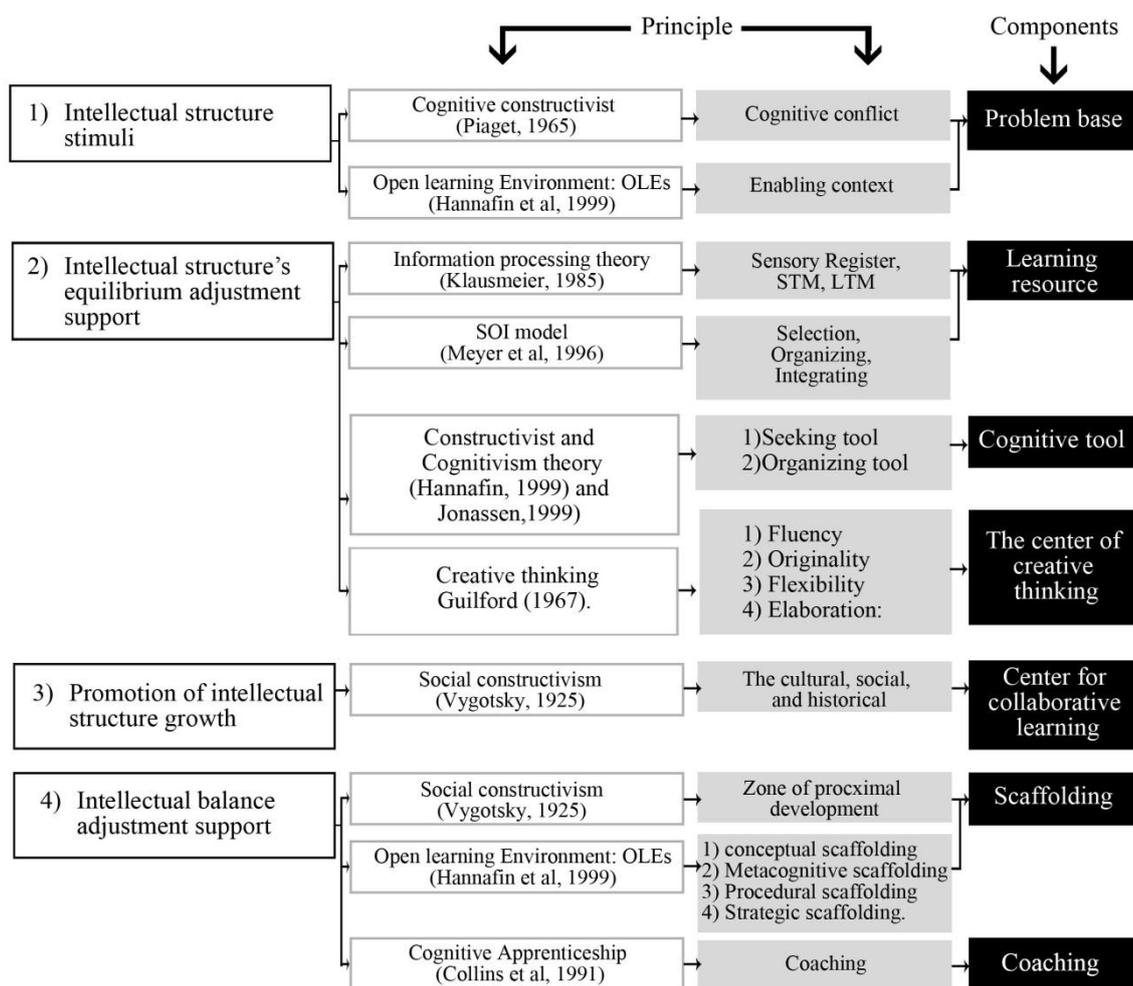


Figure 1: The designing framework of constructivist learning innovation to enhance creative thinking in 21st century learning for higher education

**Evaluation Process**

For evaluation process, ‘constructivist learning innovation to enhance creative thinking in 21st century learning for higher education’ comprised 1) product assessment, 2) contextual utilization assessment, 3) learner’s opinions assessment, 4) assessment of learners’ cognitive ability, and 5) assessment of learning achievement as in the following details (Chaijaroen Sumalee, 2016; Baker & O’Neil, 1994).

*Product Assessment* is quality inspection standard of information-codified intellectual innovation design for specialist. The assessment looks at innovation design. Results revealed that the conducted innovation is theoretically valid in terms of overall design, conceptual framework design and design of the 5 elements composed of 1) Problem base, 2) Learning resource, 3) Cognitive tool, 4) collaborative, 5) Scaffolding, 6) Coaching, and 7) The center of creative thinking. In design each element on the concept of constructivist, it was found that every element clearly correlates with the used fundamental theory.

*Contextual Utilization Assessment:* The study results revealed that a suitable number of people within a group should not exceed 3 people. With this group size, everyone is able to help each other and work effectively.

*Learner’s Opinion Assessment* is the study that looks into learner’s opinion towards intellectual innovation used for codifying information. Results of the assessment were retrieved from questionnaires designed by author and interview with learners. Results can be divided into 3 spectrums: 1) content: It was found that provided learning resource is sufficient, has clear examples, can be easily understood; 2) media: it was found that media used in network can be accessed from within and outside of the class anywhere and anytime. With available devices such as computers, tablets, or smartphones, everyone can get an access to the media; and 3) design: it was revealed that every element used in the information-codified intellectual innovation is suitable.

*Assessment of Learners' Cognitive Ability:* The study evaluated learners' intellectual assessment through interview. It was found that learners were able to creative thinking that is similar to the elements consisted in constructivist learning innovation. The learners' cognitive processes comprised of the interview' result of creative thinking revealed that the students show creative thinking ability based on Guilford's framework including: 1) Fluency, 2) Flexibility, 3) Originality, and 4) Elaboration.

*Assessment of Learning Achievement:* It was found that Average T Score of 28 fourth-year students who studied in course of educational innovation and information technology before and after learning the course has significant implication. Average T Score after the course ( $\bar{x} = 25.29$ , S.D. = 1.01) increased when compared to the pre-course Average T Score ( $\bar{x} = 9.07$ , S.D. = 1.06). Of overall 100% students, 70% passed the minimum requirement set by the school.

#### Summary and Discussion of the Study

From designing and developing learning innovation, it was found that learning innovation composed of 7 elements: 1) Problem base, 2) Learning resource, 3) Cognitive tool, 4) collaborative, 5) Scaffolding, 6) Coaching, and 7) The center of creative thinking. The reason why such elements were included in the innovation may be because the design and development of 'constructivist learning innovation to enhance creative thinking in 21st century learning for higher education' was based on ID theory. The ID theory was originally taken from constructivist theory which focuses on the knowledge construction and creative thinking based on Guilford (1967) both contain four sub-categories: 1) Fluency 2) Originality 3) Flexibility and 4) Elaboration. The design of this principle has led the creative into practice to the mission design of innovative learning cognitive states. It also found that the intellectual innovation. Those enhance creativity and academic achievement of students. Moreover, learners along with network media design of which traits and symbolic system are linked to multi-dimensional information—hyperlink, hypertext, hypermedia. For this reason, learners were quite satisfied since they were opened to learn on their own preference as well as allowing them to construct their own knowledge. The results are also consistent with Chaijaroen Sumalee et al's study, of which conduction of innovation was also based on constructivist theory, in that the innovation can effectively enhance creative thinking in learners Chaijaroen Sumalee et al (2012) Study was also aligned with the study conducted by Yampinij Sakesun & Chaijaroen Sumalee (2012); Deejring, Kwanjai., & Chaijaroen, Sumalee. (2012); Kanjak, Isara., & Chaijaroen, Sumalee. (2012); Samat, Charuni., & Chaijaroen, Sumalee. (2012) that was created on constructivist theory in terms of the innovation's design and development and network media which can very well promote and expand thinking of the learners.

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**BESSH-17**

**The Virtual Community Learning Model to Promote Creativity and Innovation Skills:  
Computer Students in Higher Education**

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Abstract

Learning in the 21st century is a strategic approach to learning management. Creativity and innovation is one of the skills needed. This skill establishes a framework that focuses on students' outcomes, including using a variety of ideas gained from brainstorming, creating new ideas, analyzing and evaluating their own ideas in order to improve and enhance their creativity. It is a way of collaborating with others constructively; communicating new ideas together and opening to new perspectives, as well as the "virtual community" learning support system. The distinctive points of this system are about social interaction and development of a learning model by applying technology capability in parallel with the choice of learning approaches that focus on constructionism. This research aims to 1) study the context of learning that promotes creativity and innovation, 2) study experts' opinions on learning management that enhances creativity and innovation, and 3) synthesize the extracted data as components of a virtual community learning model that encourages creativity and innovation skills. This research is a research and development consisted of three data collecting phases. In phase 1, the learning context that promotes creativity and innovation was studied by using questionnaires to ask opinions from the students. The target student group is 277 computer major students, year 1-4, from the Faculty of Education in Nakhon Phanom University. In phase 2, the opinions given by 9 experts on learning management that enhances creativity and innovation was studied by using purposive sampling. Lastly, in phase 3, the extracted data as components of the model was synthesized by using synthesis document and synthesize data in phase 1 and 2. The results then were summarized into frequency of each component with a descriptive explanation. Then the assessment was conducted by five qualified experts to find consistency and appropriateness. The results are as follows: 1) Computer major students understand the context of learning the encourages creativity and innovation at the medium level ( $= 3.61$ , S.D. = 0.91) and see the importance of a learning process that promotes creativity and innovation at a high level ( $= 4.14$ , S.D. = 0.48) 2) The experts' opinion about the current problems is that the students do not understand innovation and analyzing thinking which result in a non-creative innovation production. The experts see that teachers should provide students a process which they can express their needs in producing the work they are interested or skilled at. The thinking process should be emphasized in designing the work. The students should be able to practice in every process of designing. This will enhance a self-management learning, researching, analyzing and synthesizing data. In addition, a space to present the students' work should be provided so they can together discuss about the results and summarize them into a new set of knowledge, 3) The virtual community learning model that enhances creativity and innovation consists of three elements, as follows (1) Thinking (Originality Thinking, Fluency Thinking, Flexibility Thinking, Elaboration Thinking) (2) Practice (Imitating, Patterning, Learning a Technique, Practicing a skill) and (3) Perform (Illustrating & Principle, Performing Creative Work). The experts evaluated the learning model concluded that element, process, and activity were suitable and could be brought to virtual use.

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*Keywords*— Learning Model, Virtual Community, Creativity And Innovation, Creative Thinking Skills

Introduction

The sustainable way to develop the country is to focus on national resources improvement and reinforce the national resources to be enough to push the development process forward. National resources especially human resource is needed to be focused and prepared for the change of world in 21<sup>st</sup> century. The strengthening environmental factors which help to improve social structure and quality of people in institutional aspect could be an immune for future changes (Office of The National Economic and Development Board 2011). Preparation for instruction in the current decade has changed in order to be up to date. There is 3Rs which is a target skills people must acquire; there are as follow: Reading, Writing, and Arithmetic. Also, Information, media & Technology Skills, Learning & Innovation Skills, are needed for learners. Learning & Innovation skills include 4Cs which are as follow: Critical Thinking, Communication, Collaboration, Creativity, all these skills are an indicator for learner's quality in 21<sup>st</sup> century (Shaiwatna Kupratakul 2012). Creativity and innovation skills are important for educational improvement in 21<sup>st</sup> century. (McGregor,2007) Successful organizations around the world focus on creative thinking and innovation of their personnel and creativity is involved in every activity and work.

The current problem of instruction has not solved yet, this could be seen from quality of learner which has not reached a satisfactory criteria. International Institute for Management Development ranks quality of Thai's education

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in 46<sup>th</sup> from 60 countries (PISA of Thailand, Institute for the Promotion of Teaching Science and Technology 2011). The result from evaluation indicates that Thailand is subpar. Bangkok University Research Center has done a survey from 994 people and the survey shows 98.0 percent of people believe creativity is important for improvement of Thailand. In Addition, university, school, family, need to take part in the improvement of creative thinking and concrete the idea into actual form. According to the meeting of Quality Learning Foundation2015 and The international conference of development of youth's critical and creative thinking, "it is shocking that the current educational system has been lacked of critical thinking training equipment, also creativity which is the skill allow which makes people to be critical thinker . Creative society, thinkers believe that human creativity is the heart of all innovation, and the creativity has a direct impact on self-respect of every individual. Human has passed information age and now it is a prime time of "knowledge society "at the meantime, it begins to see the light the "next age" which is shining at the horizon( Visa Sortargoan 2016). Learning in current era is unlimited learning; therefore, teacher plays an important role as an educator along with a person who can give advice and care to learners. Preparation for instruction in nowadays requires using of information technology because of most of information and news which are used in the class involves technology. Thus, instructional process of teacher and learning process of learner need a change by adjusting a form of information to be suitable for activities in order to stimulate learning process. Role of teacher in the IT era is to support learner to use instructional media with well ordered. Learner must get knowledge by themselves and they must have true understanding of relationship between information and researching process. Learner must know how to pick out information from tons of information sources and they have to use information for maximum benefit. Moreover, there is progress in information technology and many countries have focused on this technology especially computer technology and telecommunication technology. People have changed along with the progress of information technology. In developed countries, people are using cell phones primarily to access what they want on the Internet. Internet structure and design in this era must design appropriately in order to deliver information faster, this has impact in many aspects on society. In education system, information technology helps to improve education system in innovation and information technology becomes an important tool for learning. There is increase in choosing courses based on student interests, the majority of students will be participating; especially, there is use of virtual classes in the instructional process. This makes learner group together in order to share their interest, skills, and expertise. When there is a lot of progress in information technology, virtual learning model has changed into many forms especially the technology called Augmented Reality Technology (Wiwat Mesuwan, 2012). Therefore, providing education in 21<sup>st</sup> century requires a change in perspective from the traditional paradigm into new paradigm which student and the real world are center of the learning process. Learning will be more than obtaining knowledge in a simple way, but turn into learning which focuses on improvement of skills, and attitude. Creativity and innovation are specified as requirement skills which support learner to have creative thinking and to have innovation that benefit to their profession. Learning process is needed to be focused on information technology which fosters learning to be easier. This is suitable for learning environmental in the this age and this study seek for learning model in which virtual community is focused, learning model which supports creativity and innovation in undergraduate level.

#### Research Objectives

1. Study context of learning skills which stimulate creativity and innovation skill
2. Study opinion of experts in preparation for learning which stimulates creativity and innovation skill
3. To synthesize element of a virtual learning community model which stimulates creativity and innovation skill

#### Research Methodology

This research is a research and development. The research is divided into three phases.

The first phase of the research is to study context of learning skill which stimulates creativity and innovation skill by using questionnaire for 227 students from faculty of education, computer major, year1-4. The analysis is as follow.

Table 1:

##### Phase I

Process	$\bar{X}$	S.D.	Level of Opinion
1. What level do you understand instruction and learning which promote creativity and innovation			
-Stimulate learner's interest and asking questions.	3.41	0.81	Fair
-Stimulate learner to analyze, research ,and seek for answer	3.51	0.92	Fair
- Students have trained imitated learning operation which helps improve the skill.	3.61	1.02	Fair
-Having thinking skill(Originality, Fluently thinking, Flexible thinking, Elaborative thinking)	3.62	0.80	Fair
-Practice which promote creativity and innovation	3.51	0.81	Fair

-Promote self-learning	3.51	0.78	Fair
-Opportunity for learner to research consistently	3.30	0.75	Fair
-Promote for knowledge sharing	3.20	0.91	Fair
-Overview of understanding in learning which promote creativity and innovation	3.60	0.91	Fair
2. What level of important do you see in learning process which promotes creativity and innovation skill?			
-Building confidence	3.31	0.64	Fair
-Support	3.31	0.92	Fair
-Opportunity for learner with different idea	3.51	0.80	Fair
-Curiosity	3.41	0.80	Fair
-Opportunity for new experience and information	3.42	0.66	Fair
-Observant	3.42	0.60	Fair
-Coming up with new idea	3.22	0.80	Fair
- What level of important do you see in learning which promote creativity and innovation skill?	4.14	0.48	High

The second phase of the research is to study opinion from experts in preparation for instruction which promote creativity and innovation skill by using purposive sampling of nine experts. The researcher is the interviewer and the person who record the voice. The result is showed as frequency figure of each issue base on conformability of information for the experts.

Table 2:  
Phase II

Issue	Frequency
Current situation of the problem in the learning management in computer major	
Student have no understanding of innovation	9
Student have no creativity, this has an impact on production new thing	9
Having no analysis	7
Format or methods in learning management which affects to learning result most effectively.	
Allow student to create the work in which they are interested; focus on thinking process in the design of the work.	9
Share knowledge between learner and instructor	9
Set up an issue to stimulate learner's doubts in order to search for answer along with set up guideline to produce their own work.	7
Encourage activity which causes brainstorming and knowledge sharing along with set up guideline for working in order to use experience from learning to solve problems	6
Using of social community or virtual community model for preparation for learning	
Use for communication, set up meeting ,and to give a work	8
Using of social and virtual community is an easy and comfortable way to communicate with teachers	8
In case of demanding to use online media, which activity are needed to include in online system.	
Participation in the discussion	9
Participation in the class base on given role and social process	9
Asking question in order to stimulate the interest	8
Have an obvious evaluation prior to learning in order to have the same understanding. Preparation of learner for researching and working.	8
Have timetable for activity attendance and assignment	7
Practice in simulate situation through online network	6
Suggestion for preparation for learning by using of virtual community	
Have a space to evaluate the work for all learners and share opinion for improvement.	8
Have a space where student can easily access and communicate among each other; online community such as Facebook, Google+	8
Sharing of experience, problem in working and producing in order to be a guideline for others in group.	8
Add content by linking to other related websites	7
There are links to contract experts in order to ask for information which is easily, fast,	6

accessible	
	6
Activity which has an impact on creativity and innovation skill.	
Self-knowledge management, Research, Analysis, Synthesis	9
Have a stage for sharing opinion in order to improve the work of both learner and instructor	9
Practice of skill improvement	8
There should be a stage for sharing knowledge with people from outside institute	6
Suggestion for improvement of virtual community learning which stimulate creativity and innovation	
Give opportunity for student to group together with their interest topic and set up an issue. Student could choose to go into a group base on the interest and skill.	9
Each and every group has to set up the new and unexpected issue in order to gain attention	9
Focus on production procedure. Evaluation is needed to clarified in order to improve the work according to the process	9
Learner has to share and present the knowledge they have learnt in any form such as video clip or multimedia	8
Having a space to share knowledge and experience from working is needed in order for people to solve problems together and they could classify and analyze information for improvement of their work	8
Present the work in the role of teacher in order for other people to understand how to produce the work	7
Learner able to give suggestion to other learner in another group.	6
Gaining knowledge from real experience and interview teacher are needed for preparation for solving problems	6

The third phase of the research is to synthesize information and use the information as component of the model. There is a main issue from information synthetic of a situation of learning management in higher education. Learner has lacked of creativity and innovation skill which is the main problem in Thai educational system. Thai educational system requires improvement in creativity and innovation in order to prepare for educational changes and competitions in 21<sup>st</sup> century; also the problem has an impact on the future of labor market. The secondary problem is learner lacked of critical thinking. The other problem, most of teaching and learning is mainly lecture, followed by the problem of class room which is not suitable for learning and teaching in 21<sup>st</sup> century. Learning by focusing on the real practice of learner, followed by learning project and cooperative learning are the proficiency way for learning in bachelor degree. The evaluation of activities shows that the result of the work should be evaluated by the result of synthesis from component of virtual community learning model which stimulates creativity and innovation skill. There are as follow: (1) Thinking (Originality Thinking, Fluency Thinking, Flexibility Thinking, Elaboration Thinking) (2) Practice (Imitating, Patterning, Learning a Technique, Practicing a skill) (3) Perform (Illustrating & Principle, Performing Creative Work)

Table 3:  
Phase III

	Joan M. Leonard (1972)	Guilford, J. P. (1967)	Amabile (1997)	Wallus (1926)	Michelle (2011)	Prean Chaisron (1987)
Thinking						
Originality Thinking		/		/		
Fluency Thinking		/			/	
Flexibility Thinking		/				
Elaboration Thinking		/				
Practice						
Imitating					/	/
Patterning				/		/
Learning a Technique	/		/		/	
Practicing a skill	/		/			

Perform						
Illustrating & Principle	/		/		/	
Performing Creative Work	/		/			

The draft of the model is brought for suitability and possibility assessment. Conformity and suitability assessment are done by two experts in the field of internet preparation for instruction, two expert in the field of creativity and innovation, and one expert in the field of instructional design, there are five experts. Concluded to be frequency of each element.

### Research Result

There are three phases of result according to duration of the research which are

- 1.The context of learning which stimulates creativity and innovation skill. There is significant issue in the situation of learning management in bachelor degree. Learner has lacked of creativity and innovation skills which are the main problem in Thai educational system. Thai educational system requires improvement in creativity and innovation in order to prepare for educational changes and competitions in 21<sup>st</sup> century; also the problem has an impact on the future of labor market. Learning by focus on the real practice of learner, followed by learning project and cooperative learning are the proficiency way for learning in bachelor degree. The evaluation of activities shows that the result of the work should be evaluated by quality of the work which results in learner to have creativity (Initiative thinking, fluent thinking, Flexible thinking, and delicate thinking). Practice and imitation contribute to learner’s creativity and innovation. From the result the study of learning context which stimulates creativity and innovation skills of the student by using questionnaire shows that student in computer major have a fair understanding in learning context which stimulates creativity and innovation skills(= 3.61, S.D. = 0.91)and the students have high understanding of the significant of learning which focus on creativity and innovation stimulant (=4.14, S.D. = 0.48)
- The opinion of experts for the situation of learning management which stimulates creativity and innovation skills. The experts think the current problem is student have no understanding of innovation, analysis, creativity which result in the production of non-creative innovation. Experts suggest the teacher should provide a process which students could express their desires and interests in the production of the work and the process of thinking and design are needed to be focused. Practice in every design process helps student to manually obtain analysis, synthesis, searching, and knowledge management. Also, teacher should provide a space of presentation and discussion in order to get conclusion and turn it into new knowledge.
- Component of the model, component of the virtual learning model which stimulates creativity and innovation has three elements which are
  - Thinking is the process which allows learner to practice their creativity which includes:
    - Originality, an idea has to differ from the idea in the past ; the idea is new
    - Fluency Thinking
      - Word Fluency is a beneficial way of using word without a copy from others.
      - Associational Fluency is the ability to rapidly produce a series of original.
      - Expressional Fluency is the ability to rapidly express original into picture.
      - Ideational Fluency is the ability to rapidly produce idea for solving problems when problems occur instantly.
    - Flexibility thinking is having freedom of thinking
    - Elaboration thinking is having beautifulness, quality, and carefulness thought and the idea can be proficiently applied in every aspect.
    - Practice is a process of doing in order to obtain skill.
    - Imitating is a step by step of doing which focus on imitation of a model. There is an assist in the imitation process.
    - Patterning is self-doing by instructor review a guideline or procedure to the learner at first then the learner will practice by trial and error.
    - Learning a Technique is the instructor demonstrates a specific technique to the learner and the learner will have practice by themselves afterword.
    - Practicing a Skill is a practice which gives terms and time condition to the learner in order to be able to create the work according to the terms and condition; for instance, reduce the time in the work design in order to practice skill of using equipment in the operation.
    - Perform is process of designing the piece of work consist of
    - Illustrating and Principle are the extension on what was practiced and turning what was practiced into actual thing from student’s idea with well-prepared.
    - Performing Creative Work is the last process of the practice from what learner have learnt and using many different methods. There is an addition of learner’s own opinion into the work. There is a use of experience from

a trial and error to create the work which has more than two purposes. In this process, learner will use what they have practiced in the real operation and they will be able to improve their own skills.

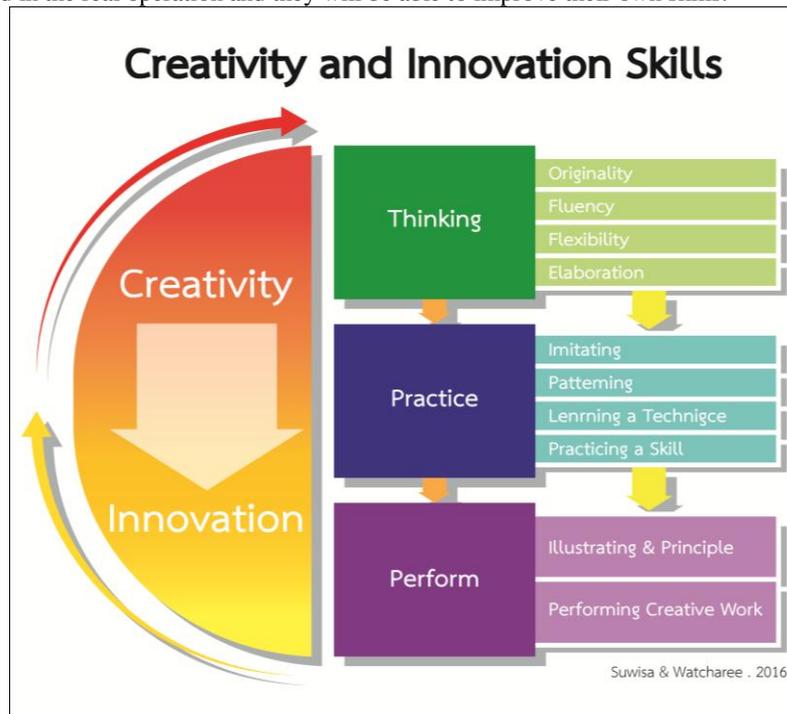


Figure 1: Creativity and Innovation Skills

#### Discussion

Context of learning which promotes creativity and innovation skill. There is significant issue in the situation of learning management in higher degree. Learner has lack of creativity and innovation skill which is the main problem in Thai educational system. Thai educational system requires improvement in creativity and innovation in order to prepare for educational changes and competitions in Thai and foreign labor market in 21<sup>st</sup> century conform to Noawanit Songkram.(2013) which presented the idea of creativity and innovation promotability in higher education. Learner must be enthusiastic to present a creative work along with bring a current and future technology to integrate with learning; to be a guideline for learner’s improvement conform to Karakas and Kavas(2008). They have found that creativity and integration thinking in 21<sup>st</sup> century, participation of learner, flexibility in working, and inspiration are a significant factors for creative thinking from the study of learning context which promote creativity and innovation skill.

Research studies indicate that useful and genuine creativity rarely appears in the form of sudden flashes. Creative Ideas that come to conscious awareness have been incubating for some time. There are four basic stages in the creative problem- solving process. (Wallua.1926) Creative thinking skills determine how flexibly and imag-inatively people approach problems. Expertise is in a word knowledge technical procedural and intellectual.(Amman.2010) Creative related skills domain related skills and task motivation could be included in person profile. (Amabile.1983) An extension of Graham Wallas's model of the creative process is presented. Wallas's stages of preparation, Incubation, Illumination and Verification are reviewed, extended and integrated with the present model. Periods of Problem-Solving, Incubation and Growth are established with specific points of Initial Idea Inception, Creative Frustration and Illumination. The idea that a specific point of creative frustration occurring within the creative process is introduced. Responses to the Point of Creative Frustration are proposed: Denial, Rationalization, Acceptance of Stagnation and New Growth. The significance of the extended model is discussed.(David.1992) Litchfield (2015) to examine the role of individual perspective-taking and team creative environment in the association between individual creativity and organizational innovation. Adopting an interactionist perspective, we find that the link between individual creativity and organizational innovation is most clearly strengthened when individual perspective-taking and team creative environment are both high. Neither individual perspective-taking nor team creative environment alone moderated the relationship between creativity and innovation. Wyke, Rebecca Martha C. (2013) study to Teaching Creativity and Innovation in Higher Education Also evident is that the constructivist learning environment and the pedagogies employed in teaching the program, including hands-on and collective learning, critical thinking and problem-based learning, and formative assessment, contribute to a feeling of confidence in the mastery of the skills and results in deep learning by the students. Through the experience, students are empowered with a creative capacity and an ability to innovate, as well as with skills in communication, collaboration, critical thinking and

problem-solving. Ogeh (2015) study to focused on creativity and innovation in open and distance education as a paradigm for human development in the twenty first century for nation-building in Nigeria and find that the opinion in the Nigerian economy must be transformed to meet the global challenge in this 21st century, she must invest in her human capital and this must take place not only in the formal and informal way of education but must be backed with innovations and creativity that makes learning very interesting and as fun, thereby making a greater percentage of the population to acquire numeracy in order to improve their contribution to the Nigerian economy for nation-building in this 21st century.

#### Suggestions

- Suggestion on bringing a virtual community learning model which promote creativity and innovation skill.
- Learner's role in the model is significant for instructor to initially give understanding and preparation for attitude adjustment to the learner.
- Instructor should have a plan for the using of the model by consideration of content and appropriateness. The instructor should arrange content order to be obvious and flexible. In practice, the model may need to adjust some part in order to conform to idea and practice of learner.
- The recommendations of the study
- The study of virtual community learning model which promote thinking skills is suggested to acquire. There should be a study of learner's interest. This is an interesting point about internal needs which could promote proficiency of virtual community learning process.
- There should be a study of innovative educational improvement system which is up to date and appropriate for the environment of modern society in order to promote educational innovation and thinking process.

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## BESSH-17

**The Framework of Learning Innovation to Enhance Knowledge Construction and Scientific Thinking for Students in Basic Education**Jittima Thisuwan<sup>1\*</sup>, Kanjanawadee Prasittisa<sup>2</sup>, Parama Kwangmuang<sup>3</sup><sup>1, 2, 3</sup>*Nakhon Phanom University, Thailand*

## Abstract

The purpose of this research was to synthesized the framework of learning innovation framework to enhance knowledge construction and scientific thinking for students in basic education. Research designs of this study were document analysis and survey. The target group was the three experts reviewed document, theoretical and design framework. The data were collected by qualitative method and analyzed using summary interpreting. The results show that: the synthesis of learning innovation framework to enrich knowledge construction and scientific thinking for pupils in basic education were the theatrical framework consist of tree foundation bases as the following; (1) context base, (2) psychological and pedagogies base, and (3) technological and media theory base. The designing framework consisted of four foundation bases as the following; (1) to activate the cognitive structure innovation, enhancement knowledge construction, and scientific thinking; (2) to support an adjustment of conflict cognitive innovation and enhance knowledge construction and scientific thinking; (3) to provide the cognitive structure and innovation to enhance knowledge construction and scientific thinking; and (4) to assist the enlargement knowledge construction and scientific thinking. The foundation bases consist of seven essential elements as following; this framework was reviewed and evaluated by experts which assume that effective and implementable on knowledge construction and scientific thinking.

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*Keywords*— Learning Innovation, Knowledge Construction, *Scientific Thinking*, Theoretical Framework, Designing Framework

## Introduction

Thailand is facing a rapid change in information technology and telecommunications. Thus, there is a flux of foreign cultures into Thailand. The country faced the problem of a crisis of morals, values, and behavior change. Moreover, both scientific and technological development situations in Thailand is at its low level. If technology on the internet network is practically used for learning and teaching as a smart tool, learners will be motivated to intelligently learn and effectively use technology by creating a learning environment that promotes learning. Thus, it will affect everyone in society to learn anywhere and anytime and help Thailand to become a society of learning. Also, it conforms to the learning that is mainly focused on learners and serves different needs. The kind of learning will help the country to wisely adapt to the learning society, and be consistent with, National Education Act B.E. 2542 (1999) and amendments (Third National Education Act B.E. 2553 (2010). It gives out the importance of human development in the country, determines educational management principles which concentrate on learners the most. Besides, there is the need of promoting the development of natural knowledge and fulfilling ability and potential and learning management. Hence, learners can get to practice skills, thinking processes, management, ways to handle situations, and how to apply knowledge to prevent and solve problems. Learning management following such guidelines requires a change of learning management by holding learning activities that engage students and emphasize the development of thinking processes, planning, practicing, researching, collecting information in different ways from a variety of sources of learning. Students should monitor data analysis and have mutual interactions.

Furthermore, in scientific learning, teachers should focus on motivating students to mostly learn and discover answers themselves. Learning occurs through the process of creating knowledge. As Kuhn (1962) suggested new ideas about the nature of science that it is the knowledge that is made up of an assortment of humans and of society and scientific knowledge is occurred from the knowledge of ones happened under conditions, and social contexts of their lives. Humans use the process called a scientific inquiry, solutions, and information searching to create new knowledge more likely all the time. Scientific knowledge must be explained and verified to be used as references to support or disprove information from a new discovery or even the same old data can cause conflicts. If scientists

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interpret by different concepts or methods, scientific knowledge can probably change (Saman, 2012). So, the concept of teaching and learning science, according to the Basic Education Core Curriculum, 2000 (Revised Edition in 2008), thus is set for a link to the curriculum content and process concepts that are universal. There should be the flexibility to meet a variety of students' different interests and skills. It encourages all students to develop their thinking process, the discovery of knowledge, problem solving, experiments in a laboratory, studying from learning sources, and also the exchange of experiences while participating in activities. Students will be able to search for knowledge, solve problems, develop higher-order thinking, and invent creative knowledge. It is found that to encourage students to learn science, students must be able to use scientific thinking processes which are the cognitive processes to solve problems by thinking rationally in solving scientific problems, and so on.

From the reasons and the importance mentioned above, the teaching of science would motivate students to learn and there would be intellectual, thinking development which includes ways to think rationally, and think and analyze, have important skills in searching for knowledge, solve problems systematically, and make decisions using a variety of data and verifiable testimonies. Moreover, students would have good abilities, be up-to-date with scientific and technological developments, keep pace with changes in science and technology, and be the people who are constantly creating new knowledge.

For that reason, it is necessary to develop a curriculum that promotes scientific thinking and knowledge of the students. Researchers realized the importance and necessity of developing learning innovation to enhance knowledge construction and scientific thinking for students in basic education, based on the development of the synthesis of the theoretical framework, which is from studying related theories and research, into the concept of designing framework and a synthetic component of the next innovation. This is to promote scientific thinking to come up with students by using it as a fundamental for the design of learning Innovation to promote scientific thinking that can be applied to computer technology media which is like a cognitive friend of learners later.

#### Objectives

To synthesize the theoretical framework and designing framework for the learning innovation to enhance knowledge construction and scientific thinking for students in basic education.

#### Research Methodology

This research employed various research types as document analysis and survey by using qualitative data collection.

##### - *Target group*

The three experts for examining of document analysis and designing framework for the learning innovation to enhance knowledge construction and scientific thinking for students in basic education.

##### - *Research instruments*

The instruments used to collect data were 1) the record form of verifying and document analyzing, 2) the recording form of theoretical framework synthesis, 3) the recording form of designing framework synthesis, and 4) the expert assessment form for the designing framework of the learning innovation to enhance knowledge construction and scientific thinking for students in basic education.

##### - *Data collection*

The data was collected by the following:

1. Literature review: studied and analyzed the theories and principles of those designing on learning innovation to enhance knowledge construction and scientific thinking for students in basic education which based on SOI model (Mayer, 1996), cognitive apprenticeship (Collins, Brown, and Holum, 1991) to enhance scientific thinking, constructivism to construct knowledge (Piaget, 1965; Vygotsky, 1971; Hannafin, 1999), and media attribute and media symbol system of multimedia to be used as the fundamental and recorded in the record form.
2. Synthesized the theoretical framework from the literature review in the above-studied areas in no. 1 which synthesized into (1) context base, (2) psychological and pedagogies base, and (3) technological and media theory base by using the recording form of theoretical framework synthesis and proposed to the expert to examine.
3. Synthesized the designing framework based on the theoretical framework which emphasized on knowledge construction and scientific thinking for students in basic education.
4. Synthesized the components of learning innovation based on the designing framework in no. 3.
5. Both designing framework and learning innovation components were proposed to the experts to examine the consistency for both by criticizing and evaluating for the assessment results to be used to improve the innovation.

##### - *Data collection*

The researcher will analyze the data by synthesis theoretical and designing frameworks, analyze the data by analysis in descriptive analysis and interpreting.

## Results

The results of the conceptual framework of the learning innovation to enhance knowledge construction and scientific thinking for students in basic education comprised theoretical and designing frameworks as the following:

- (1) The theoretical framework of the learning innovation to enhance knowledge construction and scientific thinking for students in basic education.

The study of theories and principles of the learning innovation to enhance knowledge construction and scientific thinking for students in basic education to be used in the synthesis of theoretical and designing frameworks was found three important bases as

- 1.1) Contextual base: the researcher studied with five school directors, one-four of teachers responsible for instruction of the science learning substance for grades seven through nine, and the respective student bodies within those classes under the office of secondary educational service area 22 by surveying and interviewing towards learning which enhance knowledge construction and scientific thinking in the topic of learning experience group, instructional design, and learning which enhance knowledge construction and scientific thinking. This was revealed that most schools handled with junior high school, implemented in an academic following implementation annual plan to encourage and promote educational projects such as exhibitions of academic outcomes and projects of learning and instructional design based on the student-centered. For learning in the scientific area, there were the uses of demonstrations and excursions, discovery learning, group learning, and experiments, but lacked materials and equipment used in scientific experiments. The most teaching style used was lecturing which there was no instructional design that promoted knowledge construction and scientific thinking in school implementation plan. Also, lecturing was the way of rote learning which focused on content to only memorize. But for the students' learning activities that promote knowledge construction and scientific thinking was not clearly shown. Regards the above results, the research then used to design the learning innovation following the framework of knowledge construction and scientific thinking for each innovation components.
- 1.2) Psychological and pedagogies base: the psychological base based on two important theories as 1) constructivist to enhance knowledge construction and 2) cognitivism to enhance scientific thinking which both mainly aimed to enhance the learners to have knowledge construction and scientific thinking. Also, the pedagogies base as constructivist learning models based on 1) open learning environments (Hannafin, 1999), 2) SOI model (Mayer, 1996), and 3) cognitive apprenticeship (Collins *et al.*, 1991).
- 1.3) Technological and media theory base: the designing and developing of learning innovation was studied by the researcher through multimedia learning media symbol system as the fundamental for designing and developing of learning innovation.

Therefore, this study was recognized the importance of the development of innovative learning by using principle in a learning process that promotes human cognitive process integrated with information processing theory, media attributes as shown the relationship among above five fundamental bases in below theoretical framework in Figure 1.

- (2) The designing framework of the learning innovation to enhance knowledge construction and scientific thinking for students in basic education.

The theoretical framework was used as a fundamental to synthesize the designing framework for the learning innovation from theories to practices into four learning innovation components to enhance knowledge construction and scientific thinking as the following:

- 2.1) To activate the cognitive structure innovation, enhancement knowledge construction, and scientific thinking. This based on constructivism and cognitivism theories to provoke the learners to have a cognitive conflict by problems into externally imposed by presenting the problems in authentic and related situations to make them be able to connect or refer to their own prior experiences. This was design as problem base with tasks to enhance knowledge construction and scientific thinking based on constructivism (Piaget, 1965; Vygotsky, 1971; Hannafin, 1999, Jonassen, 1991) and scientific thinking of Kuhn (2004). It consisted of 1) inquiry, 2) analysis, 3) inference, and 4) argument. Thus, the synthesis of designing framework in the designing of the learning innovation to enhance knowledge construction and scientific thinking for students in basic education was created problem base or hereby called "case study center".
- 2.2) To support an adjustment of conflict cognitive innovation and enhance knowledge construction and scientific thinking. Once the learners had been encouraged by the procedures of schema and cognitive conflict through problem-based and learning tasks, they then attempted to have cognitive structuring or get into equilibrium to construct a new knowledge. To support an adjustment of their cognitive structuring to make them discover information and answers and then construct knowledge and scientific thinking, the researchers assigned the students to start the study from case study center which the center was similar to the content and the center motivated the learner's cognitive disequilibrium. And the tasks to promote scientific thinking influenced them to have internal motivation to make discovery learning to adjust their conflict cognitively via resource center. As that so, the researcher's designed resource center that full of resources and information they could use to solve problems in case study center they confronted firstly. SOI model (Mayer, 1996) in constructivist theory was used

to design and categorized such information into groups in order them to be able to integrate knowledge successfully.

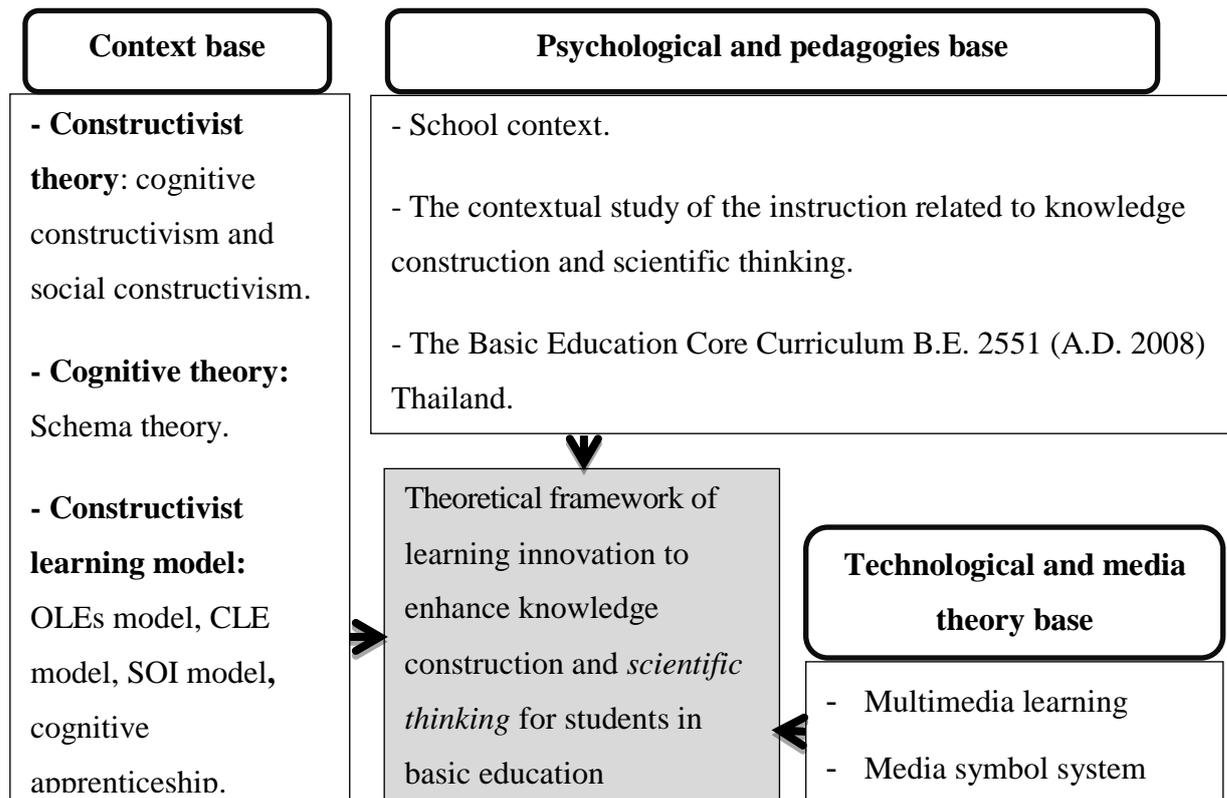


Figure 1: Theoretical framework of learning innovation to enhance knowledge construction and scientific thinking for students in basic education.

- 2.3) To provide the cognitive structure and innovation to enhance knowledge construction and scientific thinking. Regards knowledge construction based on constructivist, it highlights on personal knowledge construction which its process could produce limited knowledge, incomplete and misunderstandable knowledge. The learners might not be able to construct knowledge by themselves. The collaborative problem solving was used to help them to adjust their cognition restructuring which based on social constructivism (Vygotsky, 1925). Hence, the designing was aimed to enhance the learners to have collaboration with social interaction or groups by using concepts sharing which reduced or fixed the misunderstanding. Also, it enhanced them to have multiple perspectives. It required having knowledge sharing component to enhance them to have collaborative. Furthermore, the understanding of each problem was the way to evoke their experience for such problem and construct its problem patterns. Some students who lacked experience would face the difficulties to solve the problem (Jonassen, 1991). So, the component of cognitive innovation design hence was opened for them to access the experiences related to the problem which they could refer or connect to their own contexts. The related cases helped them to learn and apply for solving a new problem that likes the cases. This was designed to have problem solving and explanations of such solving with reasons in “Related case center” according to the principle of constructivist learning environment model (CLEs) (Jonassen, 1991). In addition, scientific thinking was the skill required both theories and evidence to work together, which relies on self-regulation for finding answers, discovery learning, data analysis, opinion conclusion, and reasoning supporting both themselves and others in order to have an understanding and scientific conceptual thinking. This was really important for the learner’s development to have a mental model in what they were learning which led them make the relationship with their own theories and adjust such theories by themselves. It required discovery learning, analytical thinking, reasoning and considering, all for making a decision especially in scientific learning. The scientific learning importantly called for the studying on natural truth, new discovery, and scientific learning development which led to the designing of “lab center” component based on Kuhn (2004). This comprised 1) inquiry, 2) analysis, 3) inference, and 4) argument as fundamentals for scientific learning development and discovery learning.
- 2.4) To assist the enlargement of knowledge construction and scientific thinking based on Vygotsky (1925). This believes the restrictions on the development or called zone of proximal development that if the learners were under the zone they must be assisted in learning as a guidance and support of the cognitive restructuring and enhancing of knowledge construction and scientific thinking (Hannafin, 1999). Therefore, the synthesis of designing framework for the learning innovation to enhance knowledge construction and scientific thinking for

students in basic education from theories to practice was designed as “scaffolding center” component which consisted of 1) conceptual scaffolding to help the learners to have conceptual thinking and to guide or give a hint for them in order to be able to access learning resources or other learning materials; the researcher designed the connections to show each topic relationship by summarizing and presenting in charts which helped them to easily remember the key content, 2) metacognitive scaffolding to support their learning processes by guiding them how to think while learning, providing them the thinking procedures to be used to solve problems with learning resources and possible strategies in forms of a guideline in order them to be able to have self-direct and self-regulation to assess each learner’s solving processes, 3) procedural scaffolding was scaffolding used to guide them how to use learning resources and materials concerning its characters and working system, and 4) strategic scaffolding to provide them an alternative which possibly useful to support analytical thinking, strategic planning, and strategic thinking while learning; this mainly on the distinguishing of required information, provided-resource evaluation, and connection of prior and new knowledge by designing on problem solving and graphic of problem solving processes to keep them out of misunderstand through self-knowledge construction. Also, cognitive apprenticeship (Collins *et al.*, 1991) assisted the learners to have the ability to work with complex cognitive tasks by expert models and unobvious cognitive processes. Thus, the synthesis of designing framework in learning innovation to enhance knowledge construction and scientific thinking for students in basic education from theories to practices was designed as “consult center” component. The good practicing must offer the learners to confront the demonstration or expert sample with explanations especially in scientific learning which required practicing with guideline and coaching. This could help them to know how to do, and more importantly, coaching supported the monitoring and mentoring learners to have the right understanding.

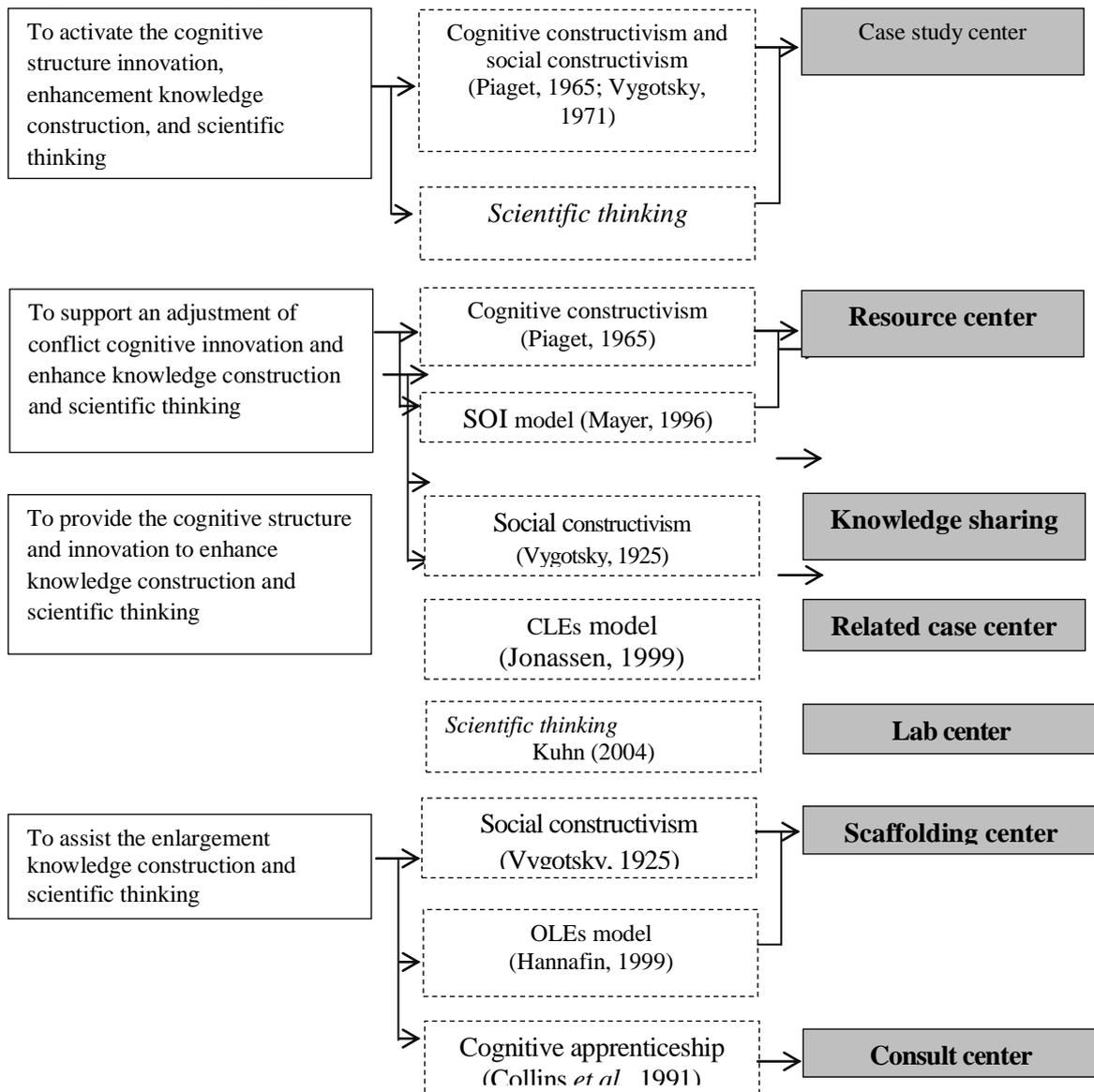


Figure 2: Designing framework of learning innovation to enhance knowledge construction and scientific thinking

The theoretical framework was synthesized to designing framework as theories to practices as shown in Figure 2. for students in basic education.

The synthesis of designing framework based on theoretical framework resulted in the seven components as 1) case study center, 2) resource center, 3) scaffolding center, 4) related case center, 5) lab center, 6) knowledge sharing, and 7) consult center as shown in Figure 3.

(3) The evaluation of designing framework of the Learning Innovation to enhance knowledge construction and scientific thinking for students in basic education expert reviewer to examine the theoretical validity in designing was found that the experts viewed that there was theoretical validity used in designing framework which consisted of 1) context base, 2) psychological and pedagogies base, and 3) technological and media theory base. Each learning innovation components was designed based on theories and found the consistency between theories and designs obviously and completely.



Figure 3: The element of learning innovation to enhance knowledge construction and scientific thinking for students in basic education.

#### Discussion & Conclusion

The synthesis of learning innovation framework to enrich knowledge construction and scientific thinking for pupils in basic education were the theatrical framework consist of tree foundation bases as the following; 1) context base, 2) psychological and pedagogies base, and 3) technological and media theory base. The designing framework consisted of four foundation bases as the following; 1) to activate the cognitive structure innovation, enhancement knowledge construction, and scientific thinking; 2) to support an adjustment of conflict cognitive innovation and enhance knowledge construction and scientific thinking; 3) to provide the cognitive structure and innovation to enhance knowledge construction and scientific thinking; and 4) to assist the enlargement knowledge construction and scientific thinking. The foundation bases consist of seven essential elements as following; 1) case study center, 2) resource center, 3) scaffolding center, 4) related case center, 5) lab center, 6) knowledge Sharing, and 7) consult center. This framework was reviewed and evaluated by experts which assume that effective and implementable on knowledge construction and scientific thinking. The research findings consistent with the study of Kwangmuang *et al.* (2012) which studied on the framework for development of cognitive innovation to enhance knowledge construction and memory process, the study of Khanla-ong *et al.* (2012) about the designing framework of multimedia learning environment to enhance problem solving transfer, and the research of Gamlunglert *et al.* (2012) who conducted on the scientific thinking of the learner's learning with knowledge construction model enhancing scientific thinking. This study was different to the above studies in terms of focusing on the design and development of learning innovation to enhance knowledge construction and scientific thinking for students in basic education based on theoretical framework components as 1) context base, 2) psychological and pedagogies base, and 3) technological and media

theory base. Furthermore, it was found that this learning innovation was developed and examined the designing quality by the expert in all three subjects as content, multimedia, and designing.

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**BESSH-17**

**A Comparative Study of Web Design Course between Learning with Self-Directed Learning and Traditional Learning of Undergraduate Students**

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Abstract

The purposes of this research study were: 1) to compare studying of Web Design course between learning with self-directed learning and traditional learning of undergraduate students 2) to study the students satisfaction toward a self-directed learning and 3) to study of attributes of self-directed learning of undergraduate students. The subject were 80 student who were enrolled the 30113316 Web Design course, during the 1<sup>st</sup> semester of the academic year 2015, the Department of Computer Education, Faculty of Liberal Arts and Sciences, Nakhon Phanom University. Two classes were assigned to the experimental group (n=30) and control group (n=30) by simple random sampling. Data were analyzed by using mean, standard deviation, and t-test statistics. The research finding were as follows: The learning achievement of students who learn with a self-directed learning was higher than a traditional learning at .05 level of significance. The students who were learn by self-directed learning had high level positive satisfaction. The characteristics of self-directed learning of undergraduate students were 1) creativity thinking 2) love of learning 3) Self-concept as an effective learner and 4) Initiative and independence in learning.

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*Keywords*— Self-Directed Learning, Traditional Learning, Creativity Thinking, Originality Thinking, Undergraduate Students

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Introduction

Accommodating learning activities with self-construct the knowledge for learners, especially from the internet, brings to finding answers and solution. In the meantime, the self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their own learning will depend on their attitude, abilities and personality characteristics. (1) According to Knowles, 1975 (2) Self-directed learning is defined as a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes with or without helping from others, nowadays society changes its trend which makes higher education change their teaching method. Changing from teacher-centered approach to student-centered approach, setting up teaching and learning process to make an active class. Therefore, learners can continue to acquire knowledge after the lessons. The eight-factors of self-directed learning that cited by Guglielmino (3): Openness to learning opportunities, Self-concept as an effective learner, Initiative and independence in learning, Informed acceptance of responsibility for one's own learning, Love of learning, Creativity, Positive orientation to the future and Ability to use study skills and problem-solving skills. Therefore, educational methodologies should be adjusted to fulfill for the best learning. From the traditional teaching and learning to e-learning

Technology which has been passed through many network systems is being used in Thai education with new paradigm of teaching and learning development for efficiency and effectiveness (4).

The teaching and learning in Computer Education program, along with lecturing method in teaching, instructors have to set up activities that focuses on student-centered learning. The instructors have been trying to set a classroom climate that creates opportunities for self-learning. There are more several of learning which transfer to new and prior knowledge. Moreover, instructors are helping and facilitating for learners. I as Reacher and instructor in Computer Education program realizing the importance of learning management student-centered classroom, let the students improve learning with themselves lead to the interest of studying self-directed learning, comparing with traditional learning, studying of satisfaction of learners and characteristics of self-directed learning.

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### Objective

- Comparing the results of learning Web Design course between self-directed learning and traditional learning of undergraduate students.
- Studying of students' satisfaction from self-directed learning.
- Studying characteristics of self-directed learning.

### Population and Samples

Using population of undergraduate's student of Computer Education program, Faculty of Liberal Arts and Sciences Nakhon Phanom University.

Using samples of third-year students who registered in Web Design course with 30 students for experimental group (Self-directed learning group) and 30 students for controlled group (traditional learning group) by simple random sampling.

### Method

This research is an Experimental Research which using randomized control group pre-test and post-test design (5).

**Table 1:**  
*Randomized control group pre-test and post-test design*

		Time		
		Pre-Test		Post-Test
Experimental group	Random	O <sub>1</sub>	x	O <sub>2</sub>
Control Group	Random	O <sub>3</sub>		O <sub>4</sub>

### Measurements

- Self-directed learning study plan
- Achievement Test of Web Design
- Questionnaires of students' satisfaction with self-directed learning
- Characteristics evaluation form self-directed learning

### Data Collection

The researcher collected the data from samplings and checked the result of achievement test from the pre-test of the experimental group and controlled group, setting up activities and explaining steps with conditions 30 students for experimental group (Self-directed learning group) and 30 students for controlled group (traditional learning group). After the students had finished with their lessons, post-test and questionnaire of satisfaction, evaluations of self-directed learning were given

### Data Analysis

- Using t-test for comparing the achievement of self-directed learning.
- Analyzing of satisfaction of students with self-directed learning along with basic of statistics, such as average and standard deviation.
- Analyzing of characteristics of self-directed learning with basic of statistics and standard deviation.

### Results

The learning achievement of students who learn with a self-directed learning was higher than a traditional learning at .05 level of significance.

The students who were learn by self-directed learning had high level positive satisfaction ( $\bar{X} = 4.45$ , S.D. = 0.64).

The characteristics of self-directed learning of undergraduate students were 1) creativity thinking ( $\bar{X} = 3.82$ , S.D. = 0.42) 2) love of learning ( $\bar{X} = 4.02$ , S.D. = 0.38) 3) Self-concept as an effective learner ( $\bar{X} = 3.95$ , S.D. = 0.33) and 4) Initiative and independence in learning ( $\bar{X} = 3.78$ , S.D. = 0.45).

#### Conclusion and Discussion

The result of learning with self-direct learning comparing between pre-test and post-test is higher than normal learning with .05 level of significance. The result shows that learning with self-direct learning is higher than traditional learning because of the activities from web-based learning through the unlimited of characteristics of internet network connections.

This can create the foundation of the knowledge and elaborate thoughts of learners with openness of online instructions via the Internet (6). From the research, it showed that students had responsibility to learn and participate in self-direct learning by themselves.

This fact is related to Knowles' idea, he stated that self-direct learning activity would show a very clear result if there were supported learning environment (2). Therefore, there are choices and selections of activities provided for students to select upon their interests. This support and motivate students to learn. There are steps and plans in self-direct learning which relates to Taylor. According to Taylor, view problems as challenges, desire change, and enjoy learning. (7) Taylor also found them to be motivated and persistent, independent, self-disciplined, self-confident and goal-oriented. In addition, it is a great tool to develop skills for students, and it will lead them to be a long-term learner which is very important for self-direct learning (8)

The result of satisfaction of students with self-direct learning was high level from four criteria which are instructor satisfaction, learning process, student satisfaction and learning sites. The result shows that learners could select their own learning upon their interests, and instructors gave a very useful advice. Moreover, learners could select their upcoming lessons. Learners could set their goals, plans and learning sites by themselves. In addition, the environment supported self-directed learning, so students could study by themselves directly and immediately. Angsuwotai, N. (9) found that most of comments from learners are highly satisfied in all criteria with the teaching of instructors, and the highest point is advising useful information for self-directed learning. Therefore, the role of instructors is suitable as advisor, and student's role is self-learner and performer.

The characteristics of self-directed learning activities were: 1) creativity thinking 2) love of learning 3) Self-concept as an effective learner and 4) Initiative and independence in learning. Skager (10) the self-directed learning component of the PRO Model emphasizes the teaching-learning transaction in which the student assumes the primary responsibility for planning, implementing, and evaluating the learning experience with the teacher facilitating the process. The learner self-direction component, on the other hand, refers to the characteristics of individuals that contribute toward their taking personal responsibility for their own learning. The combination of the teaching-learning transaction and personality characteristics of the learner contributes to the outcome of self-direction in learning (11).

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**BESSH-17**

**The Study of School Context Related to Knowledge Construction and Scientific Thinking in Junior High School, Secondary Educational Service Area 22, Thailand**

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Abstract

This research determined to study school context related to knowledge construction and scientific thinking. The target group was drawn from five junior high schools under the office of secondary educational service area 22. The target group consisted of the five school directors, a total of fifteen teachers responsible for instruction of the science learning substance for grades seven through nine, and the respective student bodies within those classes. The study employed the collection of qualitative data as its method for survey research. The research instruments included the following: initially, a questionnaire for the general school context; secondly, a questionnaire for the school directors' opinions; thirdly, a questionnaire for the teachers' opinions; fourth, a questionnaire for the student' opinions toward the instruction to knowledge construction and scientific thinking; fifth, how students construct scientific thinking and finally, actual classroom observations. Analytical description, interpretation, and summarization were employed to analyze data. Results from this analysis revealed the following; (1) For the study of school context, it was initiated that almost of all schools offered teaching from secondary school level by annual action plan for supporting and promoting the educational management such as the development of student-centered teaching and learning process. The instructional methods in Science learning substance consisted of the inquiry approach, field trip, demonstration, and experimentation. Lecture was found to be the most widely used method of instruction. In order to, the instructional method of experimentation lacked materials and equipment, contributing to diminishment in its relation to knowledge construction and scientific thinking within the actual classroom; (2) The study revealed that there was none of any project on school's action plans for knowledge construction and scientific thinking in target school. Some teachers reviewed misconception of knowledge construction and scientific thinking, their instructions followed curriculum and lesson plans and also focus on lecture-based teaching. However, instructional activities to enhance learner's knowledge construction and scientific thinking for them were not clear.

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*Keywords*— Context Learning, Knowledge Construction, Scientific Thinking, Secondary School Level

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Introduction

The main goal of the educational reform in two decades (B.E. 2552-2561) (on 2nd Round Education Reform (2552-2561)) was to improve the education quality and increase the educational opportunity for learning thoroughly of Thai student. In addition, it was to encourage the participation of all sectors of administration and management of education according to the National Education Act B.E 2542 (1999) and Amendments (Third National Education Act. B.E. 2553 (2010). The Ministry of Education announced the implementation of the Basic Education Core Curriculum B.E. 2551 (A.D. 2008), which supported as the core curriculum for national education at the basic level. The following goals had to develop the learners in all wisdom and the necessary skills, which is potentiality for further education and livelihood. The principle of this curriculum was emphasized as based on learners who can learn and develop themselves to their highest potentiality. Moreover, the learners' performant was defined as who had an ability for analytical, synthetic, constructive, critical and systematic thinking, resulting in bodies of knowledge creation or information for sensible decision-making regarding oneself and society (The Basic Education Core Curriculum. B.E. 2551 (A.D. 2008). The profit of educational reform is intended personal development for human being perfection, prosperous life and to keep up with the world changing.

Thus, the paradigm shift is necessary for learning management methods including technology and educational innovation and instruction media in order to comply with the change. About the shift from previous instruction media to learning media and innovations for learning to produce learning in students who can be searching for knowledge and self-construction learning. It not only purpose to make pupil's ability to remember of knowledge, but also aims to develop desired characteristics of Thai societies. The basic of media design have to consider in all learning theory, learning methods and aspect media that needed to make lifelong learning community in Thai citizen who had a competitive ability and creative collaboration in the world community. Thus, learning media and innovations should

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be able to support and develop cognitive processes themselves to their highest potentiality (Gamlanglert and Chaijaroen, 2011). In addition, teachers had an important role in pupils well learning by creating the learning environment that makes an effectiveness in learning. It can be seen that learner-centered approach is independent, self-constructivist and action learning regarding the constructivism (Bandura, 1991). This approach was designed by a combination of media and methods which base on the constructivism theory.

However, the information technology changes, but the Ordinary National Educational test (O-Net) in science subject of all Grade 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> students have the low score (The National Institute of Educational Testing Service, 2015), owing to the development of science and technology did not receive much attention in the national development plan. So, web-based technologies can be used as an intellectual approach for raising of acquisition of knowledge in learner (Song, Singleton, Hill, and Koh, 2004) that have the potential to transform into knowledge-based society in Thailand.

There are no clear evidences on school context which related to knowledge construction and scientific thinking using for the innovative design of learning in basic education. So, it's necessary to study in the school context and social factors which related to knowledge construction and scientific thinking. That's the important basis for design and development of learning innovation to enhance knowledge construction and scientific thinking for students in basic education.

### Objective

To study school context related to knowledge construction and scientific thinking in secondary school.

### Methodology

#### *Target group*

The target group in this work are as follow five school directors, a total of eighteen teachers responsible for instruction of the science learning substance for grades seven through nine, and the respective student bodies within those classes.

#### *Study Design*

The study employed the collection of qualitative data as its method for survey research.

#### *Research instruments*

- A questionnaire for the general school context
- A questionnaire for the school directors' opinions
- A questionnaire for the teachers' opinions
- A questionnaire for the student' opinions toward the instruction to knowledge construction and scientific thinking.
- Actual classroom observations.

### Data Collection and Analysis

The researchers were conducted by collecting data on a study in the context of learning about the promotion of knowledge and scientific thinking and learning science.

- General school context's data were collected and analyzed by interview of school directors and teachers, as well as school's implementation plans, learning plans, and the report of external quality assurance.
- Teacher's data were collected and analyzed by a questionnaire and in-depth interview which questions for the study of learning and teaching that focuses on the creation of knowledge and scientific thinking, are as follows: the method of teaching media and learning resources used in the study promoted by school directors.
- Student's data were collected for grades 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> by a questionnaire of the study of learning and teaching that focuses on the creation of knowledge and scientific thinking.
- The researchers were observed and collected data by teaching observation log and recording videos from an actual scientific classroom for grades 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup>.

### Results

#### *School Contexts*

The study of general documents of the schools such as school's curriculum of basic education, reports of quality assessment outside of school, action plans, and interviews to the school directors and teachers of all departments revealed the following findings:

The five target schools where this survey was undertaken were institutes under the Office of Basic Education Committee (OBEC), which offered classes from early childhood to grade 9. The number of the students was 128 in early childhood classes (Kindergarten 1 -2), 361 in primary level (Pratom 1 – 6), of which 35 were students with special needs, and 792 in junior secondary level (Mattayom 1 – 3), totaling 792 students and 110 teachers.

#### *Academic Activities*

The schools had undertaken the annual academic action plans to support and promote educational management as follows:

The schools had undertaken the annual academic action plans to support and promote educational management as follows:

1. Buddhist-oriented School Project
2. Model School in Instructional Management on the Principles of Sufficiency Economy Project
3. Early Childhood Learning Development Project
4. Development of Living Library Project
5. Healthy School Project
6. Drug-free White School Project
7. Students' Academic Skills Contests Project
8. Cooperative Extra Classes Project
9. Development of Learning Centers on the Principles of Sufficiency Economy Project
10. Development of Media, Innovations, and Technology for Education
11. Development of Learner-centered Instructional Management
12. Improving Thai Reading and Writing Skills
13. Curriculum Development
14. Learner Development Activities
15. Academic Excellence Contests
16. Learning Assessment and Evaluation
17. "One-word-a day" Thai and English Vocabulary Improvement
18. Library for Learning
19. Music, Arts, and Thai Classical Dance Activities
20. Development of Learning Centers
21. Library Work Project
22. Learners Development Project
23. Study Performance Enhancement Project
24. Learning Assessment and Evaluation Project
25. Narcotics Resolution and Anti-drug Campaign
26. School Cooperative Shop
27. Health Week Project
28. Academic Week Project
29. Students Excursion Project
30. Community Relation Network-forming Project

The results of the second round of quality assessment by the Office for Education Standards and Quality Assessment (B. E. 2549 – 2553) on 3 aspects: school administrators, teachers, and learners, respectively, are as follows. Firstly, regarding the administrators, Standard 10 was achieved. The assessment showed that the administrators had satisfactory leadership skills and abilities in administration. Similarly, the target schools satisfied Standard 11; the administrative organization/ structure and management of the school were considered systematic and having the capability of achieving educational goals. With reference to Standard 12, which investigates academic activities and learner-centered teaching approach, the target schools achieved this standard. Regarding Standard 13, the schools were considered to provide suitable curricular to their students and the local contexts; and their instruction promoted learning. In addition, the assessment on the basis of criteria demonstrated that the schools were in "good" level and "very good" level on the basis of institution-based assessment.

Secondly, in terms of the teachers, the assessment on Standard 8 regarding the qualifications of the teachers showed that the teachers at the target schools had related qualifications and knowledge to the assigned duties; and the number of the teachers was sufficient. Similarly, regarding Standard 9, the teachers were capable of conducting effective instructional management as well as cooperating with the community in developing efficient learner-centered instruction. The results of the criteria-based assessment on both standards were in "good" level, and "very good" level in institution-based assessment.

Finally, in the aspect of the students, the assessment of Standard 1 found that the students had morals, ethics, and desired core values. Concerning Standard 6, the students were considered to possess the skills in acquiring knowledge by themselves, to love learning, and to continuously improve themselves. With regards to Standard 7, the students had good skills in working and liked working. Moreover, they were able to work with other people and had positive

attitudes towards honest careers. Both, criteria-based and institution-based assessment on Standard 7 showed that the students were in “good” level. As for Standard 2, the students had good level of health habits, physical health, and mental health. Likewise, assessment on Standard 3 concerning esthetics and characters in terms of arts, music, and sports showed that the students were in “good” level. While in Standard 4, the students were considered to have good level of analytical, synthetic, discretionary, creative, careful, and visionary thinking. Next, assessment on Standard 5 proved that the students had acquired knowledge and necessary skills as prescribed in the curricular. The results were rated to be in “good” level by criteria-based assessment, and “very good” level by intuition-based assessment. A noticeable finding in the assessment of Standard 4, Indicator 4.1, suggested that the students possessed good analytical, synthetic, systematic, and holistic thinking skills. Also, findings of assessment on Standard 5, Indicator 5.3, and Standard 6, Indicator 6.3, of Learning Strand of Science suggested that the students were capable of making use of the school library, learning resources, and other types of learning media inside and outside of schools; and the aforementioned standards and indicators were in “fair” level.

### Learning Context

#### *Information about Teachers in Learning Strand of Science*

There were 18 teachers in the learning strand of science, who held a bachelor’s degree in science education (B. Ed.).

General instructional methods were lecture, experiments, and demonstration. The most frequently used methods were lecture and experiments.

#### *Information about Learning Resources*

The target schools had altogether 5 libraries, where students were allowed to conduct self-study and research. However, there were not enough books for them, especially books related to the area of science.

The learning resources and local wisdom and environment within the schools consisted temples, forest parks, vegetable gardens, rice fields, wild boars, sweet gourd stands, swamps, gardens, and school front grounds. The local wisdom resources included 1) gold leaf making, 2) vetiver grass roof making, in which skills were handed down from students’ parents, not yet included in the lessons, 3) bamboo saving box making, and 4) coconut leaf stalk broom making, skills passed down from parents, not yet included in the lessons.

The equipment and tools of the schools were 5 scientific laboratories and 5 computer laboratories.

#### *The study on learning management of the teachers*

In terms of learning management, the researchers studied the schools’ teaching and learning plans, classroom observation, real classroom teaching. The findings are presented below.

The study on the school contexts revealed that most classes were carried out using lecture-based instruction, in which the teachers were main providers of knowledge and information, in spite of occasional use of experiments. Learning resources inside schools and communities, including employment of local wisdom, were mainly provided by inviting guests to share their experiences and provide bodies of knowledge, especially folk music. However, no instruction in relation to promotion or integration of sufficiency economy topic, which included 1) reasonability 2) being sufficient 3) building up immunity on the conditions of knowledge and morals was observed. Moreover, no instruction regarding the promotion of the 8 principle ethics: 1) diligence 2) being economic 3) honesty 4) disciplines 5) politeness 6) cleanliness 7) harmony and 8) generosity was observed. In addition, the instruction that supported the 5 basic Thai values, namely, 1) self-dependence, diligence, and responsibility; 2) frugality and money-saving habits; 3) self-discipline and obedience to laws, regulations, and culture; 4) obedience to religious principles and morals; and 5) loyalty to the nation, its religion, and the monarchy were not observed. In these regards, the study discovered that some instructional activities promoted and integrated the contents related to sufficiency economy. However, no learning activities with the integration of the contents of basic morals and Thai core values were found.



Figure 1: Authentic learning context of schools

All in all, some teachers might possible have integrated contents regarding local wisdoms in their instructional management with partial promotion of basic morals to the learners. However, no assimilation of the contents related to the principles of sufficiency economy as well as the development of learning innovation that integrated sufficiency economy, morals, and Thai core values was observed.

On the basis of the aforementioned reasons, the researcher was aware of the importance of collecting relevant local wisdoms and the taxonomy of sufficiency economy. Consequently, she designed and developed learning innovation that integrated sufficiency economy, 8 basic morals, and 5 basic Thai values to enhance learning efficiency of the students in the future.

#### Discussion & Conclusion

Based on the study of the school contexts, most schools offered classes from early childhood to grade 12<sup>th</sup> students and performed academic managements in accordance with their annual action plan to support and promote learning activities such as academic exhibition project and Thai culture promotion and preservation project. The learning activities were undertaken through learner-centered approach. In terms of instructional management for science classes, most teaching and learning activities were carried out using grouping, lecture, experiment, and demonstration techniques. Of all the aforementioned techniques, lecture was the most frequently used one. Referring to teaching and learning management of the teachers of science subjects, no learning activities to promote knowledge construction and scientific thinking were observed. However, the study found partial integration or provision of knowledge construction and scientific thinking in their related action plans. In addition, no observation of the development of learning innovation related to instructional management that promoted knowledge construction and scientific thinking was reported. Furthermore, the study on instructional management that promoted knowledge construction and scientific thinking revealed that most of school administrators adopted the national policy by incorporating school policy into the action plan. Besides, they also built up a working mechanism to promote their staff members to recognize the importance of integrating knowledge construction and scientific thinking to their entire school work systems for sustainable development. The survey also discovered that a number of teachers had good understanding about the principles or methods of instructional management in relation to knowledge construction and scientific thinking as basics to the design and development of learning innovation for promotion of knowledge construction and scientific thinking. Nevertheless, the majority of the teachers were found to have misconception of knowledge construction enhancing scientific thinking. This is possibly because creating such way of thinking and knowledge construction is a challenging task by nature, hence the difficulty in designing and developing learning innovation to correspond. This was consistent with the study of Chaijaroen et al. (2013), Metwalee (2015) and Saman (2012) which reported that most of instructional management was primarily in a teacher-centered fashion, in which students were put to rote learning. Such teaching and learning activities did not promote learners' higher-

order, and holistic thinking. Moreover, they did not promote knowledge construction enhancing scientific thinking of the learners. The findings of the present study will be foundation to the design of learning innovation to promote learner's knowledge construction and scientific thinking. This will consequently lead to the further development of effective instructional management.

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**BESSH-17**

**The Factors Affecting English Speaking Skill of First Year Engineering Undergraduate Students at That Phanom College, Nakhon Phanom University**

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Abstract

This research aimed to study the factors affecting English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University, Thailand. The study focused on five aspects: attitude of learning English, motivation of enhancing English, opportunity to use English, personality of using English, and management in teaching and learning English. The subjects of the study were 21 first year engineering graduate students studying during the first semester of the academic year of 2016 at That Phanom College, Nakhon Phanom University. They were all students of first year of field. The instruments for collecting data were oral situational test and questionnaire which these instruments were developed by the researcher. The statistics used for analyzing data were frequency, percentage, mean, standard deviation. The result of this study found that the mean score of English speaking skill of the population was at low level, and the factors affecting English speaking skill of these undergraduate students were opportunity to use English skill, personality of using English skill, and management in teaching and learning English. As attitude of learning English, motivation of enhancing English skill, they were not the factors affecting their English speaking skill. For the data from part of open ended questions in questionnaires, the most of students specified that inadequate knowledge about vocabulary, less opportunity in speaking English, excitement when speaking English and anxiety about the correction of using vocabulary and grammar were their main problems affecting English speaking skill.

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*Keywords*— Factors, English Speaking Skill, Engineering Undergraduate Students

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Introduction

Nowadays, it is extensively known that English is an international language of the world. Numerous people use English as a national language, and other people in many countries use English as a second language or an official language. This language is used in various sections such as education, business, and international negotiation etc. Numerous information and textbook are printed in English as well. From all of English skills, speaking is a crucial skill because this skill is use for communication especially in learning process and daily life of people. It is oral communication, the speaker uses speaking skill to share an idea and emotion including inform any information to the listener (Ur, 1996). The people who can communicate in English will have more advantage than the others who cannot communicate in English because they are able to communicate with other people worldwide.

For Thailand, the people have problem in all English skill, which speaking is one of that. From the report of the EF English Proficiency Index, Thailand was ranked in 48<sup>th</sup> out of 63 countries (English Proficiency Index, 2013). This country obtained only 44.4%. This means that Thai people' English communication ability was inefficient. There were numerous researches and reports specifying about inefficiency of Thai people' English communication ability. For instance, a director of the Academic Training Section of the Tourist Authority of Thailand mentioned that most of Thai students and Thai people are inefficient in English communication. It is very essential an important for learning and performance in present (The Nation, 2013).

From reviewing Ur's concept, there are factors affecting speaking in English such as motivation for learning English, opportunity to use English, and environment for using English etc. According to Biyaem (1997) the student cannot communicate in English effectively because they lack of confidence to speak and also lack of opportunity to use English in daily life.

From stated reasons, the researcher was interested to find out the factor affecting English speaking skill of first year engineering undergraduate students at That phanom College, Nakhon Phanom University. The result of this research is useful for perceiving, improving, and developing the students' English speaking skill.

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### Research Questions

1. What was the level of English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University?
2. Which factors affected English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University?

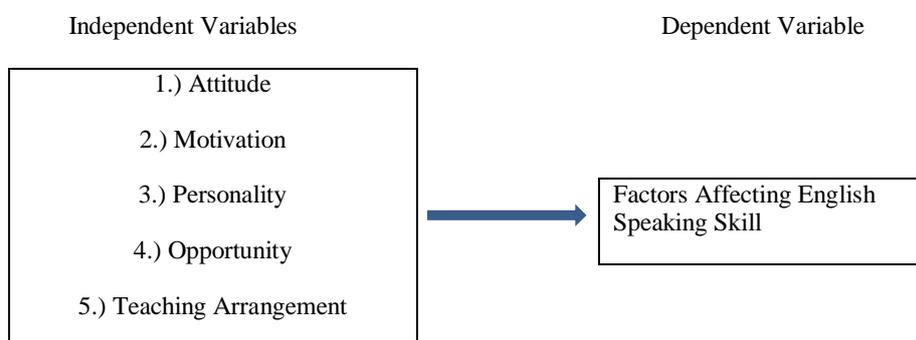
### Purposes of the study

1. To investigate the level of English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University
2. To investigate the factors affecting English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University

### Scope of the study

1. This research investigated English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University
2. This research investigate the factors affecting English speaking skill of first year Engineering undergraduate students at That Phanom College, Nakhon Phanom University
3. The subjects of this research were first year engineering undergraduate students at That Phanom College, Nakhon Phanom University
4. The duration of this research was conducted during August – November 2016.

### Framework of Research



### Literature Review

There are various concepts related to the factor affecting English speaking skill as follow: Attitude, motivation, personality, opportunity to use English, and management in teaching and learning English skill.

#### *Attitude*

According Rubin & Thomson (1994), they defined that attitude related to success in many things, one of that is success in learning a language. Positive attitude enable a learner to achieve his or her goal because there is relation between attitude and interest. On the other hand, terrible attitude is a main obstacle in leaning a language (Littlewood, 1983).

#### *Motivation*

Oxford & Shearin (1994), motivation is crucial part of learning a language. Motivation can be categorized into 2 types: intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to motivation related to an activity the people are satisfied or would like to do it. As extrinsic motivation, it refers to an action or instrument that encourages and challenges a person to do something.

#### *Personality*

Personality concerns to learning a language, it is a factor leading to an achievement. Confidence and willingness are the main of learning a language. A learner who is shy or worries while using a language, this person cannot effectively use it. Willingness is a part of personality, a person who has willingness to do something, he or she will gain a better result than doing anything without willingness (Rubin & Thompson, 1994).

*Opportunity to use English*

Lubega (1979) mentions that one of the most important factor affecting learning and using a language is opportunity to use that language. Amount of time of using English in both formal and informal situations influences acquisition. Many opportunities to use English lead to imitation and skill of using the skill (Harmer, 1991).

*Management in teaching and learning English*

For this factor, it includes technique of teacher, activity, and equipment. From these three things, the teacher is the most important factor for teaching and learning a language because a teacher which is skillful in using and teaching English will design activity and use equipment effectively for training the students' English skill.

## Research Methodology

*Subjects of the study*

The subjects of this research were 20 first year engineering undergraduate students studying in second semester of academic year of 2016 at That Phanom College, Nakhon Phanom University. They were the students of energy technology program.

*Research Instruments*

The data of this research was collected by using test and questionnaire. These instruments were designed and developed by the researcher as follows:

1. Oral situational test, it consists of 10 situations. 21 first year engineering undergraduate students were individually tested in each situation of the test through interview. The researcher interviewed these undergraduate students about speaking English in 10 situations, they were asked to respond as if they were speaking with an imagined interlocutor. The assessment focused on the ability of using English for speaking appropriately in various situations. The criterion of assessment consists of using vocabulary, pronunciation, grammar, and fluency in speaking English. These responses were recorded through tape recorder and assessed later by using score as 1 - 20 in each situation of the test as follows:

2.

0 - 4 = Very Poor level

5 - 9 = Poor level

10 - 13 = Fair level

14 - 17 = Good level

18 - 20 = Excellent level

The purpose of this assessment was to investigate first year engineering undergraduate students' ability in speaking English correctly and appropriately in various situations.

3. Questionnaire about the factors affecting English speaking skill, the researcher distributed the questionnaires to 21 first year engineering undergraduate students to investigate the factors affecting English speaking skill of these undergraduate students. They were asked to give their opinions about the factors affecting English speaking skill. These responses were assessed through rating scales as 1, 2, 3, 4, and 5 as follows:

1 = Very low

2 = Low level

3 = Moderate level

4 = High level

5 = Highest level

The researcher asked the students to give their responses to each question of the questionnaires.

The questionnaire was initially done by the researcher, and then the researcher distributed the questionnaire to 3 specialists in order to inspect the validity through index of items objective congruence (IOC). The formula of calculation is specified as follow:

$$IOC = \frac{\sum R}{N}$$

IOC is the consistency between the objective and the question in questionnaire

$\sum R$  is the total score from all specialists

N is the number of specialists

As the value of an evaluation, it is specified as follow:

+ 1 means that the question of questionnaire has validity

0 means that the question of questionnaire has uncertainty of validity

- 1 means that the question of questionnaire has not validity

The score of each question of questionnaire that is evaluated through index of item objective congruence (IOC) should be between 0.50 – 1.00. After inspecting the content validity of each question in questionnaire from 3 specialists through this method, the result showed that the scores of the questions in questionnaire were between 0.60 – 1.00. It means that each question of questionnaire is suitable to be used in the study.

For the testing reliability of the questionnaire, questionnaire tryout was used for testing with the different group of students. Cronbach's Alpha Coefficient was used for analysis. The confidence should be at least 0.70. After testing reliability of the questionnaire by using this method, the result showed that the value of reliability of the questionnaire was 0.98. This means that the questionnaire is suitable to be used for this research.

#### Data Analysis

The statistics used for analyzing data were frequency, percentage, mean, and standard deviation. The Statistical Package of Social Science (SPSS), version 16.0 for window was used for statistical analysis.

#### Results of the Study

The purposes of this research were to investigate English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University and to investigate the factors affecting their English speaking skill. The results of this study were found as follows:

1. The level of English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University

Table 1:

*The level of English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University*

No.	Situations of Speaking in English (N = 21)	Average Points (20 points for each)	Percentages (%)	Levels
1.	Greeting and Self Introduction	8.90	44.50	Poor
2.	Describing Study or Work and Favorite Activity	5.33	26.65	Poor
3.	Buying Goods and Service	5.47	27.35	Poor
4.	Giving Opinion and Suggestion	5.52	27.60	Poor
5.	Invitation	7.76	38.80	Poor
6.	Situation in the Past	6.61	33.05	Poor
7.	Situation in the Future	7.95	39.75	Poor
8.	Asking and Giving Direction	7.28	36.40	Poor
9.	In the Restaurant	7.09	35.45	Poor
10.	Date and Time	8.95	44.75	Poor
Total		7.09	35.45	Poor

From table 1, it indicated that averagely the level of English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University was at low level, average point of English speaking test was 7.09 out of 20 (35.45%). The lowest average point of English speaking test was the situation of describing study or work and favorite activity, 5.33 out of 20 (26.65%), and the highest average point of English speaking test was the situation of date and time, 8.97 out of 20 (44.75%). However, this highest average point was at low level because it was lower than half of full score.

2. The factors affecting English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University

From table 2, the result of overall students' points of view was at low level ( $\bar{x} = 2.53$ ). the details are showed as follows: the students' attitude of learning English was at moderate level ( $\bar{x} = 2.87$ ), the students' motivation of enhancing English skill was at moderate level ( $\bar{x} = 2.71$ ), the students' opportunity to use English was at low level ( $\bar{x} = 2.35$ ), the students' personality of using English was at low level ( $\bar{x} = 2.27$ ), and the proficiency of management in teaching and learning English was at low level ( $\bar{x} = 2.44$ ).

Table 2:

*The point of view of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University towards the factors affecting English speaking skill*

No	Factors Affecting English Speaking Skill	N = 21		
		Mean ( $\bar{x}$ )	Standard Deviation (SD.)	Frequency Levels
1.	Attitude of Learning English	2.87	0.681	Moderate
2.	Motivation of Enhancing English Skill	2.71	0.633	Moderate
3.	Opportunity to Use English Skill	2.35	0.699	Low
4.	Personality of Using English Skill	2.27	0.650	Low
5.	Management in Teaching and Learning English	2.44	0.647	Low
Total		2.53	0.662	Low

From the result above, it indicates the factors affecting English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University. The factors affecting these students' English speaking skill consist of 3 factors from all 5 factors as follows:

#### *Opportunity to Use English Skill*

Opportunity to use English skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University was averagely at low level ( $\bar{x} = 2.35$ ). The factor about the opportunity to use English skill affecting their English speaking skill were (1.) opportunity for communication in English with friends and the others in daily life and (2.) opportunity for communication in English with the native speaker.

#### *Personality of Using English skill*

Personality of using English skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University was averagely at low level ( $\bar{x} = 2.27$ ). The factor about the personality of using English skill affecting their English speaking skill were (1.) attempt to learning English, (2.) attempt to communicate in English, (3) excitement when speaking English, and (4) anxiety about the correction of using vocabulary and grammar when speaking English.

#### *Management in Teaching and Learning English*

Management in teaching and learning English of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University was averagely at low level ( $\bar{x} = 2.44$ ). The factor about the management in teaching and learning English affecting their English speaking skill were (1.) study with the native speaker, (2.) activity for communication in English outside the classroom, and (3.) teaching technique for easy understanding, grammar emphasis in teaching and learning English.

As the result from the open ended question in questionnaires, it shows that the most of students indicated that inadequate knowledge about vocabulary, less opportunity in speaking English, excitement when speaking English, and anxiety about the correction of using vocabulary and grammar when speaking English were their main problems affecting English speaking skill.

### Discussion and Conclusion

. This research aimed to investigate the level of English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University and also investigate the factors affecting their English speaking skill.

The results of this research indicated that the level of English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University was at low level, average point of English speaking test was 7.09 out of 20 (35.45%). The lowest average point of English speaking test was the situation of describing study or work and favorite activity, 5.33 out of 20 (26.65%), and the highest average point of English speaking test was the situation of date and time, 8.97 out of 20 (44.75%). However, this highest average point was at low level because it was lower than half of full score.

As the result of the students' points of view, it shows that the students' attitude of learning English was at moderate level ( $\bar{x} = 2.87$ ), the students' motivation of enhancing English skill was at moderate level ( $\bar{x} = 2.71$ ), the students' opportunity to use English was at low level ( $\bar{x} = 2.35$ ), the students' personality of using English was at low level ( $\bar{x} = 2.27$ ), and the proficiency of management in teaching and learning English was at low level ( $\bar{x} = 2.44$ ).

From the result above, it leads to the factors affecting English speaking skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University. There are 3 factors affecting their English speaking skill as follows:

Firstly, Opportunity to use English skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University, it was averagely at low level ( $\bar{x} = 2.35$ ). The factor about the opportunity to use English skill affecting their English speaking skill were (1.) opportunity for communication in English with friends and the others in daily life and (2.) opportunity for communication in English with the native speaker.

Next, Personality of using English skill of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University, it was averagely at low level ( $\bar{x} = 2.27$ ). The factor about the personality of using English skill affecting their English speaking skill were (1.) more English learning, (2.) attempt to communicate in English, (3) excitement when speaking English, and (4) anxiety about the correction of vocabulary and grammar when speaking English.

Finally, Management in teaching and learning English of first year engineering undergraduate students at That Phanom College, Nakhon Phanom University, it was averagely at low level ( $\bar{x} = 2.44$ ). The factor about the management in teaching and learning English affecting their English speaking skill were (1.) study with the native speaker, (2.) activity for communication in English outside the classroom, and (3.) teaching technique for easy understanding, grammar emphasis in learning English.

As the result from the open ended question in questionnaires, it shows that the most of students indicated that inadequate knowledge about vocabulary, less opportunity in speaking English, excitement when speaking English, and anxiety about the correction of using vocabulary and grammar when speaking English were their main problems affecting English speaking skill. This result is consistent to Huang Xiao Hua's research (Huang Xiao Hua, 1985). His topic of study is English communicative skills learning strategies of Chinese students. The result of his study indicated that using English in real situation related to improving English speaking skill. Moreover, English learning strategy and habits in learning English language were the factors affecting the students' English speaking ability

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**BESSH-17**

**The Development of Learning Innovation to Enhance Knowledge Construction and Critical Thinking for Undergraduate Student**

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Abstract

The purpose of this research was to develop learning innovation to enhance knowledge construction and critical thinking for undergraduate student. Research design was product and tool research. Several methods were used as document analysis and survey. The target groups of this study comprised 1) 5 experts to review the assessment of learning innovation's efficiency to enhance knowledge construction critical thinking for undergraduate student, and 2) 28 third-year students who studied in the course of design of on-line lessons. The procedures were as follows: 1) to examine and analyze the principles and theories, 2) to explore the context concerning knowledge construction and critical thinking of learners, and 3) to synthesize the theoretical framework and the designing framework of the learning innovation to enhance knowledge construction and critical thinking for undergraduate student. The findings shown that the learning innovation to enhance knowledge construction and critical thinking for higher education comprised 7 components as follows: 1) problem base, 2) learning resource, 3) scaffolding, 4) collaborative learning, 5) coaching, 6) Center for enhance critical thinking, and 7) related case

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*Keywords*— Knowledge Construction, Critical Thinking, Learning Innovation

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Introduction

Learning in the 21<sup>st</sup> Century in universities nowadays is affected by the high increasing of technology. Instruction tends to focus on the learning environment which is relevance to constructionism. Learning activities can occur anywhere. Primary learning objectives of a subject has changed to focus on setting a learning environment that increase students' performances. Among these changes, students are expected to construct their own value of understanding both inside and outside classrooms (Keefe, 2007).

In Thailand school environment observation from all over the country which consisted of 2,508 teachers about Thailand education in the views of teachers found that 30.36% of the teachers thought Thai students lack of critical thinking skill (Suan Dusit University, 2013). Moreover, students these days are raised in the digital environment, for example, communication technology, internet, laptop, and smart and portable devices, that makes their life more comfortable (Paitoon Srifa, 2012). Thus, learning instruction should facilitate hands-on activities through the usage of suitable technology (Smaldino, Lowther, & Russell, 2012).

In order to develop the learning innovation, the development should enhance students' knowledge construction process, support critical thinking not merely remembering. Importantly, the instruction must focus on situating cognitive experiences which make the learning more meaningful than only lecturing and remembering. Textbook facts may cause decontextualization of learning that students are not be able to apply knowledge into real life problems efficiently (Jonassen & Henning, 1999; White, 1993; Sumalee, 2014). This research aims to develop innovative learning to promote constructionism and critical thinking for undergraduate students preparing the students to face changes in the future, also to get the guideline to develop innovative learning and promote students' critical thinking skill. Then, the students will be able to adapt themselves through the shift of technology and learn life-long.

Research purpose

To develop the learning innovation to enhance knowledge construction and critical thinking for undergraduate student.

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## Research Method

The Developmental Research Type 1 was applied (modified from Richey's and Klein's, 2007) comprising 3 processes: 1) Design Process, 2) Development Process, and 3) Evaluation Process. Several methods were used as document analysis and survey.

## Target Group

- 1) 5 experts to review the assessment of learning innovation's efficiency to enhance knowledge construction and critical thinking for undergraduate student.
- 2) 28 third-year students who studied in the course of design of on-line lessons

## Research Scope

The scope of this research is to develop the learning innovation to enhance knowledge construction and critical thinking for undergraduate student. The theories used are as follows; 1) knowledge construction used as following 2 kinds: (1) Cognitive constructivism based on Jean Piaget (1965), and (2) Social Constructivism based on Lev Vygotsky (1925/1971) 2) The theory critical thinking bases on Ennis (2002) consisted of 5 process which are: 1) Elementary clarification 2) Basis for the decision 3) Basis for the inference 4) Advance clarification and 5) Supposition and integration.

## Research Instruments

The instruments used of in this study were 3 kinds as following details:

- 1) The document examination and analysis recording form. The scope of document analysis regarding with constructivist theories, critical thinking, and media theory.
- 2) The record form for synthesis of the designing framework of cognitive innovation to enhance knowledge construction and critical thinking for undergraduate student.
- 3) The expert review record form for evaluation of the Designing framework. The framework of this instrument consists of 3 major issues which are: 1) Content, 2) Multimedia, and 3) Design of the learning innovation to enhance knowledge construction and critical thinking for higher education

## Data Collection and Analysis

Data of the two processes were collected and analyzed as follows:

### 1. Design and Development Process

- 1.1 Literature review was performed to study and analyze the principles, theories, and related research in learning innovation to enhance knowledge construction and critical thinking for undergraduate student. The relevant theories studied included cognitive-related theories such as the information processing theory and Constructivist Theory. Multimedia symbol system was also included as the basis for our study, and the data was recorded in the document- checklist for analysis and interpretation.
- 1.2 Theoretical framework was synthesized from review of related theories and research from Number 1. There were 4 aspects synthesized: 1) psychological learning base, 2) pedagogical base, 3) content base, and 4) technological base.
- 1.3 Contextual study involved the course of design of on-line lessons. It comprised teacher's instruction. The data was collected by a survey of real context of instruction at third-year students who studied in the course of design of on-line lessons, teachers, and students, where knowledge construction and critical thinking were emphasized. The data was finally analyzed, concluded, and interpreted, together with the data obtained from in-depth interview.
- 1.4 The designing framework was based on the theoretical framework and contextual study.
- 1.5 The cognitive innovation was synthesized according to the designing framework in Number 1.4.
- 1.6 The designing framework and learning innovation components were examined, criticized, evaluated by experts; then improved and modified accordingly.

### 2. Evaluation Process

- 2.1 The learning innovation to enhance knowledge construction and critical thinking for undergraduate student was constructed from the synthesis of learning innovation components.
- 2.2 The learning innovation to enhance knowledge construction and critical thinking for undergraduate student were reviewed by experts in the aspects of: 1) content, 2) multimedia, and 3) the design that enhances knowledge construction and critical thinking for undergraduate student. It was then adjusted according to experts' suggestion before being analyzed and interpreted.

2.3 The learning innovation to enhance knowledge construction and critical thinking for undergraduate student was experimented on its efficiency in terms of the appropriate number of students per group, instruction process, and students' attitudes towards the innovation through observation, survey, and in-depth interview. The data was again analyzed and interpreted.

### Research Findings

#### 1. The design and development of learning innovation to enhance knowledge construction and critical thinking for undergraduate student.

Synthesis of the designing framework based on the theoretical framework prior to implementation in the design involved the following: 1) problem base, 2) learning resource, 3) scaffolding, 4) collaborative learning, 5) coaching, 6) Center for enhance critical thinking, and 7) related case, shown in Figure 1.



Figure 1 : The component of learning innovation to enhance knowledge construction and critical thinking for undergraduate student

#### Problem base:

Context enabling was conducted in accordance with Piaget's Constructivism which is based on cognitive development. It is believed that knowledge is derived from experiences, knowledge construction process, or action. An imbalance situation was designed where there was a cognitive conflict. With this basis, the researchers designed the problem base where authentic and real-world contexts were enabled, based on the Situated Learning principle so that learners could link new knowledge with their former experiences or knowledge (Jonassen, 1991).

*Learning resource:* is the source of data, content, information used by learners to solve the problems they confront. Learning resource contains various items learners can work out for the discovery. Design of Learning resource is based on the SOI Model which enables understanding and activation of cognitive processes that take place in learners' brain while they are learning and selecting related information (Mayer, 1996). The acronym SOI stands for 'select', 'organize', and 'integrate'. This is used with the theory of information processing. In designing the design bank, we presented information with a concept map showing relationships among all content, using graphic and moving pictures to present important content. For example, colors, sizes, underlining, and sounds were used to stimulate learners to select relevant information (S: select). Besides, Learning resource shows organization of information designed in the form of charts and maps for organization (O: organize) and presentation of pictures to let learners see the real world that might link to their former knowledge (I: integrate).

#### Scaffolding:

In order to support learners when they do their activities, scaffolding becomes very useful. Scaffolding presents or provides conceptual framework that assists learners in their work more than supporting learners in their capacity. According to Vygotsky's Social Constructivism related to the Zone of Proximal Development, learners who are above this zone can assist themselves while learners lower than this zone cannot. The latter can be assisted by scaffolding

(Vygotsky, 1971). The scaffolding consisted of 1) Conceptual scaffolding 2) Metacognitive scaffolding 3) Procedural scaffolding 4) Strategic scaffolding (Hannafin et al, 1999).

*Collaborative learning:*

This center promotes learners in doing collaborative activities. It is again based on Vygotsky's Social Constructivist, which states that, "Learners are able to construct knowledge through social interaction with others." Therefore, design of the Collaborative Learning emphasized missions where learners collaborated in problem solving. They exchanged knowledge and experiences among peers, or with teachers and experts to elaborate their concepts. Here, the Facebook social network was used for the activities.

*Coaching:*

Coaching was the component mainly to help the students to be able to do complex tasks with two models as observable process model and expert practicing model including cognitive process which invisible. Coaching helped them to learn the correct procedures, its own reasons with the explanations based on cognitive apprenticeship of Collins et al (1991) was used as a principle to shift them from being novice to expert. so this component was designed in accordance with this principle by setting the teacher to analyze student's feedback, and guide them in learning process. The researchers design this coaching as in the classroom and online where they could raise a question to the expert all the time

*Center for enhance critical thinking:*

the research team designed the innovation to create the problem situation in authentic context, to practice their critical thinking skills, and to collaborate them on critical thinking. The critical thinking of Ennis (2002) was applied as process: 1) Elementary clarification 2) Basis for the decision 3) Basis for the inference 4) Advance clarification and 5) Supposition and integration.

*Related case:* based on constructivist learning environments (CLEs) (Jonassen, 1999). The important principle was to design to relate the experiences closed to problem which the students could refer and connect to their prior experience. The related case was design based on the theory of cognitive flexibility which designed and presented in various context in many complex levels embedded in information. So, in this case, the designing was well designed in cases related such as Fish Housing- the students could study this information and use to solve the problems about Life and its habitat relations. This would help them to think and solve other problems in the similar situation. This presented in terms of case samples, solution methods, and reasons.

*The evaluation of learning innovation's efficiency to enhance knowledge construction critical thinking for undergraduate student*

In this study, we found that the design and development of the learning innovation to enhance knowledge construction and critical thinking for higher education correlated to the principles and theories on which it was based. Constructivist's Theory enhances knowledge construction and information processing that supports memory register. Evaluative evidences were found in the following components:

*Content:*

The information content was clear, appropriate and holistic, thus facilitating learners' searching of knowledge. The language use was suitable for learners and easy to understand. The design of lexical-based statements and presentation of contents took multiple forms, for example, letters were highlighted with colors, moving pictures were used and the problem-based learning correlated to the content to study. Learners were encouraged to construct knowledge and on their own. The situations were planned to be similar to the true instructional problems. The researchers took into consideration experts' suggestions to improve the use of language so that it was more formal and organized appropriately for ease of study.

*Multimedia:*

This was found to be appropriate and interesting owing to still and moving animation with background sounds. Presentation of contents was efficient and the contents were organized in suitable categories so that students could click to select the content they wanted. The sizes were suitable, but the font colors should be improved for ease of reading. Statements were colourful, pictures and sounds were able to draw attention. Design was consistent with signposts that enabled conveyance of required information. Usage was simple. Links could be made for sentences or pictures, allowing efficient access to information. Design encouraged learners to act and utilize multimedia to the utmost extent. It supported collaborative learning and working in groups. Learners were encouraged to practice analyzing and practicing. Design of each mission encouraged all learners to participate in working and solving problems. It opened a chance for learners to learn independently and select what each wanted to learn by doing any mission first. Group work allowed collaborative learning where learners exchanged ideas. Learners were encouraged to enthusiastically learn on their own from real practice. Hence, they were able to construct knowledge and develop their thinking skills. The multimedia enabled learners to learn at anytime and anywhere they wanted.

*Design of the learning innovation to enhance knowledge construction and critical thinking for higher education:*

It was found that the innovation supported learning and group work. Everyone participated in working and decision making for problem solution. Learners learned independently and selected an item to study according to their interest. The learning atmosphere was suitable. Collaborative learning allowed exchanges of ideas. Learners could learn anytime and anywhere. There were tools for learners that assisted them to understand what they learned profoundly. Scaffolding and coaching supported learners to think and solve their problem. And regards the expert's assessment, the consistency between the theory and theoretical and designing framework was found.

Conclusion and Discussion

In the design and development of the learning innovation to enhance knowledge construction and critical thinking for undergraduate student comprised 7 components as follows: 1) problem base, 2) learning resource, 3) scaffolding, 4) collaborative learning, 5) coaching, 6) Center for enhance critical thinking, and 7) related case. The reason why such elements were included in the innovation may be because the design and development of 'constructivist learning innovation to enhance critical thinking for higher education was based on ID theory. The ID theory was originally taken from constructivist theory which focuses on the knowledge construction and critical thinking based on Ennis (2002). This study applied theories and critical thinking which emphasized all of 5 process: 1) Elementary clarification 2) Basis for the decision 3) Basis for the inference 4) Advance clarification and 5) Supposition and integration. as the bases for the instructional design. Our findings correlated to studies by Hongsunee Uarattanaraksa et al, (2012) and Petchtone, Puangtong and Chaijaroen, Sumalee (2012) Relevant theories, including the Constructivism, Cognitivism, principles and other theories on learners traits needed to be developed were incorporated in the design together with multimedia. The multimedia characteristics and the symbol system that enhances knowledge construction and critical thinking were taken into consideration. The said studies were different from our research which emphasized the design of innovation that enhances knowledge construction and critical thinking for higher education using the Theoretical Framework consisting of 1) psychological learning base, 2) pedagogical base, 3) content base, and 4) technological base. It was also found that the learning innovation examined by experts in terms of quality and the evaluation of usage should have 3 members per group for effective collaborative learning.

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