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A Framework of Modified Knowledge Creation Theory for Teaching Practice-Oriented Module

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Abstract— **Base on the knowledge creation, the SECI model defines a sequence of activities to exchange a knowledge and an experience, analyze the received knowledge, verify the correctness and apply in the real situations to solve problems. From the observation, if the students pay attention only the lecture class without practicing, they cannot gain the thorough knowledge and apply with the real circumstances. The taxonomy of educations by Anderson and Krathwohl which is based on Bloom's taxonomy said about 6 levels of an intelligence. There are remembering, understanding, applying, analyzing, evaluation and creating. If the student focuses only the lecture class without practicing, they will achieve only the remembering level of Anderson and Krathwohl's theory. The SECI model is a framework of knowledge creation theory to create, update and share knowledge among people. Thus, to improve an intelligence and accomplish all levels, the reversion of SECI model is purposed. Its processes go counterclockwise from internalization, combination, externalization and socialization. From the observation, the practice-oriented module can help the student's comprehension by practicing. They can establish the new ideas, thought and knowledge by themselves from what they have learnt in the lecture class. Thus, the framework of reversing the SECI processes is the way which can improve the ability of student's intelligence to reach the highest level.**

Keywords- knowledge management, knowledge creation, SECI model, Bloom taxonomy, Anderson and Krathwohl, reverse engineer

I. INTRODUCTION

Main purpose of the education would like the students accomplish on their enrolled course. Benjamin Bloom [1] presented a taxonomy of education. He ordered 6 levels of an intelligence which are knowledge, comprehensive, application, analysis, synthesis and evaluation. Then, we noticed with our bachelor degree education pattern in Thailand at the present which is designed to use lecture class and lab class as a base. The lecture class needs a lecturer to pass on knowledge by giving a talk method. Sometime, the lecturer designs and demonstrates the content by using power point slides. Then, most of students can catch up the point of each chapter and easy to understand. Thus, the student seems like to be only a listener in the classroom. Otherwise, there is another class which is called lab class to ask the student pay attention and practice on what they have learnt from the lecture class. Most students will understand more in the content and apply their knowledge to the real situation. However, there are many constraints to conduct the lab class by the lecturer. Because of the example of the content which is hard to compare with the real world situation, so the lab assignments are designed under the limited environment. It implies that most of students cannot get the new ideas when they meet some different problems out of the classroom. So, the student achieve only first three intelligence's levels of Bloom's taxonomy. In addition, Anderson and Krathwohl are Bloom's disciple who discovered the new order of cognitive domain improvement. [2] They presented the new arrangement of 6 levels as remembering, understanding, applying, analyzing, evaluating and creating.

Then, the knowledge creation theory which known as a SECI model is popular used its process with the teaching on some subjects. The purpose is to transform the knowledge from tacit knowledge to explicit knowledge and vice versa. [3] However, we found out that the SECI model cannot be used with this research because the limitation on the learners' experience. It means that the learners have to have a thorough knowledge. Then, they will discuss, exchange on their applied knowledge with their friends and share to others. Moreover, the research shows that most of students do not have any ideas and knowledge before the new course begins. It is impossible for them to implement the SECI model directly.

To make the learners achieve completely on 6 levels as Anderson and Krathwohl's theory, we decided to design the new process of the knowledge creation theory. This paper focuses on the bachelor degree education in Thailand and purpose the reversion steps of SECI model by using reverse engineer. The learners can revise on their experience and knowledge before they transfer and share with others. This paper demonstrates the conceptual framework and application of each reversion step in the knowledge creation theory domain as appropriate. In section 2, the literature reviews and related

works regarding the knowledge management theory, knowledge creation theory and taxonomy of education. Then, the research methodology is discussed in section 3. The concept framework of the education and discussion are presented in section 4. Finally, section 5 is the conclusion and future work.

II. LITERATURE REVIEW

A. Knowledge Management Thoery

The knowledge is an important factor to lead people improve their ability and succeed on their works. It is a tool to create and produce the efficient innovation which is needed the knowledge management theory. [4, 5] Thus, the knowledge is one kind of resource which is impossible to imitate and compensate. [6] Actually, the knowledge is divided to 2 categories which known as tacit knowledge and explicit knowledge. The tacit knowledge is personal abilities which are from experience, learning or gift. This kind of knowledge is usability only for the owner because it does not present on books, manual and database. [6, 7] Otherwise, the explicit knowledge is a developed knowledge, stored orderly and ready to use simply. [8] This kind of knowledge is tangible information which is in the form of document, picture, flowchart or manual. The high quality and reliability database is needed to gather the knowledge which allows users to adopt, apply for solving their problems easily. After that, the linked knowledge will be solved the related problems. Then, the appropriate knowledge can be selected for reusing and sharing to others. [7]

B. Knowledge Creation Theory

Nonaka et al. [3] present the dynamic process of knowledge creation which known as SECI model. The main function of SECI model is to transform the knowledge between tacit knowledge and explicit knowledge. The model composes of 4 tasks which are socialization, externalization, combination and internalization as shown in Figure 1.

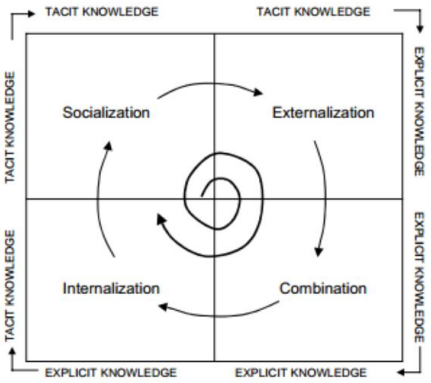

Figure 1. The original SECI model

From Figure 1. illustrates that each task of SECI model responses on different purpose of the knowledge transformation. The socialization is the first step to convert from tacit knowledge to tacit knowledge. Since the tacit knowledge is hard to explain, the sharing knowledge via giving a talk on experience or doing activities are expected. Furthermore, there are many techniques such as seminar, teaching and interview. The second step is externalization which alter the tacit knowledge to explicit knowledge. All gathered knowledge from socialization is needed to explain in the form of document, picture or flowchart. Next step is combination that change explicit knowledge to explicit knowledge. When they study a lot via reading process from books, analyzed documents, pictures or manual and exchanging with others, they gain the complex level of knowledge. Finally step is internalization which transform explicit knowledge to tacit knowledge. This step show the usability of gained knowledge to apply and practice in the real situation. This task can be called as "learning by doing". Thus, all processes of SECI model which alter both kinds of knowledge can occur repeatedly. It is another way knowledge creation which the new knowledge is established. Then, the knowledge is shared for others to select an appropriate knowledge to apply on real world situation.

C. Taxonomy of Education

In 1956 Benjamin Bloom [1] presented the taxonomy education on cognitive processes. The taxonomy education composes of 6 levels from lowest to highest which are separated by the learning behavior. There are knowledge, comprehensive, application, analysis, synthesis and evaluation which are described as follow.

1. Knowledge – The knowledge is obtained on the remembering. This is the first step that learners recall and recognize on ideas or what they have done.
2. Comprehensive – The second level on the intellectual that earns information from the communication.
3. Application – The learner focuses on the meaning of documents that they understand. Then, apply and practicing follow the given content which base on their problems.
4. Analysis – This level emphasizes on the relationship between knowledge that the learner understand. There are 3 subcategories in the analysis task which are knowledge, the relationship among knowledge and the organizational on gained knowledge.
5. Synthesis – After apply and analysis, the learner can establish the new knowledge structure.
6. Evaluation – It is important task to judge the value of the knowledge following by standard or criteria.

After that in 2001, the Bloom taxonomy is developed and updated on the same domain by Anderson and Krathwohl [2] who are Bloom's disciple. Not only the new purpose was defined, they rearrange and presented the new level of the taxonomy of education. Base on their concept, the taxonomy

consists of 6 levels from lowest to highest as Bloom's taxonomy. Otherwise, there are remembering, understanding, applying, analyzing, evaluation and creating which are described as follow.

1. Remembering – The ability which is to recall and recognize what you have in your memory.
2. Understanding – The learners have ability to describe the meaning instruction.
3. Applying – The ability which accomplish the practice base on selected situation.
4. Analyzing – The learners' ability is to verify how applied knowledge related to solve their problems.
5. Evaluation – The learners have ability to make a judgement base on selected criteria.
6. Creating – The ability which learners can plan, design and implement the new methodology.

III. PROPOSED FRAMEWORK

Base on the bachelor education in Thailand, most of practice-oriented module are allowed students to enroll lecture class and lab class together. The students have to attend the lecture class to gain the tacit knowledge from lecturers. In the lab class is emphasized and asked the students to practice on the simulated situation. Then, the student need to analyze and apply what they have learnt with their gained knowledge. Somehow not only the example which is hard to compare with the real world situation, the given case study is hard to modify for the student. So, the student needs more time on researching and trying to understand content clearly. Then, we studied the taxonomy of education on cognitive domain to make the student accomplishes on every levels.

When the Bloom's theory said that there are 6 levels of the improvement of the intelligence, Anderson and Krathwohl found that not all 6 levels of intelligence is improved on the science subjects. The improvement effects only first three levels. They noticed that the students who study science subjects have the different order on their improved intelligence. Since Bloom mentioned the synthesis is on the fifth, Anderson and Krathwohl did not agree and moved the synthesis to be a second after the student's remembering. That is the reason that Anderson and Krathwohl presented the developed the taxonomy of educations. [9]

So, we realized that the knowledge creation is important to build and originate the new knowledge. We selected the SECI model which is popular procedure of knowledge management. Since the first through last steps of SECI model presented how basic knowledge is altered to complex knowledge. We combined the taxonomy of education concept of Anderson and Krathwohl. We found that the normal procedure of SECI model does not lead the student achieve on our selected subjects. As we mentioned that the practice-oriented module are selected. The students already have had the knowledge from lecture class but not applied yet. The main purpose of the practice-oriented module is to make students analyse their problems, synthesize the solution and apply their knowledge. Thus, we purposed the reversed framework of SECI model. The behavior of model is started with internalization, combination, externalization and socialization.

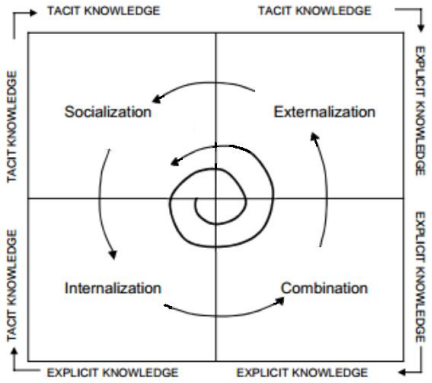

Figure 2. The proposed framework of reversed SECI model

The conceptual framework is a reversion of the SECI model operation as shown in Fig.2. The operations go counterclockwise of the normal process of SECI model. The lecturer of practice-oriented module would like the students try to understand the circumstance of case study by themselves. It is a good practicing to make the students have confident after we graduate and deal with the real situation. The internalization phase is a trial and error. The student needs to understand the problem situation. Then, they should have the googling skill to find out the proper solution whether they do not know the exactly result. Sometime, some students can show the different ideas which is unexpected. In addition, it becomes the specific knowledge of each person. After that, the combination phase is a checking and reviewing the created knowledge with other sources such as books, manuals, pictures and flowcharts. The student is allowed to brainstorm and discuss with expert. Otherwise the internet is easy to access everywhere, they can verify their knowledge and ideas as simple. Then the externalization phase is the arrangement of their knowledge. The student has to organize their ideas and interpret to be a documents or reports. Finally, the socialization allows every single person to share and exchange own knowledge. Mostly, the method of giving a talk is usually the best to transfer the knowledge such as seminar, interview or doing the activities.

IV. CONCLUSION

In the conclusion, the conceptual framework is focused on the learning process of practice-oriented module. The paper demonstrated the reversion of SECI model to perform the procedures from internalization through back to socialization. The purposed framework can be made students have the activity of trial and error. Then, they can solve their problems by themselves. Furthermore, during the process of solving, the new specific knowledge will be discovered by single person. When the knowledge is shared and exchanged at the end of

process, the gained knowledge of each person will be updated and improved. Because of the different perspective of each person, it will be shown the various ideas, and knowledge on a same problems.

In addition, the future work of this conceptual framework will be verified through the practice-oriented module. The experiment will establish the case study for students to solve. The steps will go along with the reversed framework of SECI model as mentioned. Then the result will be evaluated by using the statistics tool and compare with the normal process that the lecturer used. Thus, the reversed framework of SECI model can be a tool to establish the new and various knowledge for others to select the most appropriate.

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