INTEGRATION OF CONCEPT MAPPING AND FREQUENT CLASSROOM TESTING (CMFT) INTO A THAI EDUCATION LAW SUBJECT TO FOSTER LEARNING ACHIEVEMENT OF THAI UNDERGRADUATES STUDENTS

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Abstract - The contents of Thai Education Law courses usually contains high complexity and rigid key terms that can create confusions and difficulties to those who are required to learn the courses as a beginner. Traditional teaching and classroom activities fail to accommodate students with their learning goals. Instead, they create the overwhelmed feeling towards the learning tasks to the students, and turned them to be unmotivated to learn. Integration of the concept mapping strategy come in to play as an alternative to simplify the learning contents by visualizing abstract information to more concrete concepts, as well as to reduce students' cognitive load. When lessons are simplified and the students start to get better understanding of what they learn, their learning motivation is also increased. That can create more engaging classroom atmosphere. Besides, incorporating frequent classroom testing was brought in to promote the students self-regulated learning ability. The ultimate objective of the integration of the concept mapping and frequent classroom testing (CMFT) into a Thai Education Law Subjects was to foster the students' learning achievement. A pre-test, six immediate posttests, and a post-test were employed for qualitative data collection. A group interview was conducted after the post-test to gather data on qualitative aspects. Statistics used in this study consisted of percentage, Mean, S.D., and Paired-Sample t-test. Interview data were analyzed by using Content analysis. The research findings revealed that there was highly positive effects of CMFT towards the students' learning achievement of the course.

Keywords - Concept Mapping, Frequent Classroom Testing, Thai Education Law Subject, Learning Achievement

I. INTRODUCTION

Thai higher education institutions, especially universities in Rajabhat network, had been assigned with a main national mission in producing teachers for the country, in particular. Thai Education Law was included as one of the courses required in the curriculum. However, the content of Thai Education Law course was very complex. The language was full with various specific terms and the descriptions of codes needed to be interpreted. To get better understanding of the law, a learner required to interpret well on the enforcement of the codes or regulations.

Interpreting the law was also not an easy task, even for the teachers who had experience in the field, since the content of the course dealt a lot with examples or case studies to learn until the information was certain and settled. To meet that point of understanding, a learner needed to put a lot of effort to solve the problems of the law language and to find out how to explain each code. Therefore concepts of the content needed to be clear enough to put the law into practical applications.

From the aforementioned, one effective way to reduce cognitive load and to promote better understanding of learners was the use of concept mapping. As Mayer (2002) initiated his concept regarding the benefits of multimedia, he mentioned that people learned better from words together with pictures than the words alone, based on dual coding theory (Paivio, 1986). The learner could process the information faster, and also strengthen long-term memory of the incoming information by using multimedia.

Apart from incorporating concept mapping for solving the problem regarding the complexity of learning content. Still, the students lacked self-motivation to come to class for learning because the lesson itself cannot inspire them much to learn. Students came to study with no specific purposes or explicit goals, and even took it as a burden then finally withdrew from the course. Therefore, self-regulation played an important role to help disciplining the students. To bridge the gap, frequent classroom testing was an effective option for learners. It was used as a tool to control attendance and helped fostering students' memory. When a lesson was broken down into smaller units, there was higher possibility for the learners to remember and it was easier to remember smaller chunks of the learning contents. In this way, the learners would be able to plan how to improve their learning better by themselves because they had already know their performance well. However, there was not much of previous research involving with the particular kind of such contexts and settings as mentioned above. This study, the integration of CMFT into a Thai Education Law Subject, thus, aimed to provide an alternative for those of Thai instructors or others who were encountering the similar kind of the learning circumstances.

II. LITERATURE REVIEW

A. Concept Mapping

Concept mapping was a method to create a concept map, representing something or some ideas. A concept map usually included nodes and labeled line. The

noted corresponded to a depicted key term or a concept, whereas the line drew about the connections or the relations between a pair of concepts. A group of two nodes and their connection with specific labels was called a proposition. Commonly, concept maps were used to represent some concepts of knowledge. White and Gunstone (1992, pp. 17-18) suggested a set of steps for concept mapping starting from the teacher's activities (e.g., selecting concept terms, and introducing how to create concept mapping, etc.) and the students' activities (e.g., sorting the terms and drawing the links between the nodes). Holley and Dansereau (1984) also recommended their five or six steps to create concept maps or network maps. The activities included selecting key concepts, writing the key concepts, making an attributed list of the key concepts, relating the key concepts, rearranging the representations, as well as comparing the representations of the concepts.

In this study, the teachers provided information about how to develop a concept map and gave some examples. Later, the students constructed their own concept mapping and class came to discuss the subject matters.

Concept mapping dimensions could be varied such as in a hierarchical form, a spatial form, a non-hierarchical form, a self-generated form, a map-provided form, etc. Even though, hierarchical form was the most common to be seen. However, if the relation of the subject matter was not hierarchical, there was no need to impose such structure (White, 1987). In this study, the teacher encouraged the students to create their own concept maps from scratch.

In a previous research, Hu & Wu (2012) incorporated the concept mapping into a Food Science classroom conduct. In their study, the main aim was to reduce the students' learning cognitive load. Their findings indicated that the concept maps they generated helped a lot for students to get better understanding and clarification of the learning content, especially from the courses in their curriculum. An additional advantage of concept mapping from their study was the capability to enhance the students' learning interests.

To recap, in this study, the teachers explained concept mapping to the students first, then provided examples, and presented the subject matters by using the concept maps. The students were assigned to generate their own concept maps for particular topics that they had been earlier assigned.

B. Frequent Classroom Testing

Frequent classroom testing was a formative assessment that regularly took place in the classroom. There had been a lot of previous research on frequent classroom testing since in the past from 1914 and 1922. At the beginning era, the research had been carried out on frequent testing in the area of psychology. The common purposes were on the investigation of the effects of the frequent testing towards the students' retention and recall. For example, in Jones's study (1923), he suggested that frequent testing was highly associated with an increase of the students' retention. They used regular-basis examination as the tool. The research claimed that the regular tests could stimulate information rehearsal and inhibited the normal decay. He also added that testing could be an active practice. It could strengthen the connection between stimuli and responses.

The effectiveness of the application of frequent classroom testing was found in a study of Mawhinney, Bostrow, Laws, Blumenfeld, and Hopkins (1971). As they demonstrated that students who experienced tests regularly received a higher score than the students who were tested less frequently.

C. Pedagogy for Education Law Course

Education Law Course was a compulsory course in the curriculum of Thai Faculty of Education. The course content involved explanations or descriptions of low that often contained many complex terms and subtled distinctions. The clarity of the course presentation were normally based on discussions about the nature of the acts, regulations, legislation, responsibility, accountabilities was well as the constitutional rights related to educational operation.

The subject matters of law themselves were complicated and that was the main reason for instructors to put all attempts in finding out how to properly conduct the class.

According early studies about the pedagogy used in law subjects, the visual learning had been frequently integrated as a conventional tool by the instructors of Law subjects, especially mind mapping and flowcharts. One good example was that of Francina, C. & Ian, S. (2016), as they used visual learning in law subjects in their study. Their finding added another proof that visual learning could assist students to get better understanding of the concepts and connections between the legal concepts, legislation, and applications. They used mind mapping and flowchart techniques to illustrate the law subject matters. Those findings showed strongly positive effect towards the law students' performance.

In addition, Deplano, R., (2018) studied the benefits of using concept maps as a core component of an undergraduate curriculum in Law. According to the result of the study, it was evident that concept mapping was a tool for enhancing deep learning for those who enrolled on the compulsory Constitutional and Administrative Law module. Recommendation from the study was to use the concept maps as an integral part of small group teaching activities to help students balance themselves between traditional rote learning to a more meaning learning.

Integration of concept mapping and frequent classroom learning aimed to fill the niche of previous related studies as mentioned all the above, with the assumption that the integration would best benefit to

teacher students in Education who needed to study Education Law course, and those who were teaching it.

D. Conceptual Framework of the Study

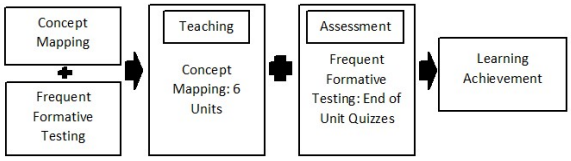

Fig. 1: Theoretical Framework of the Study

According to the information in fig 1, to elaborate, the inputs in the research were the integration of concept mapping and frequent formative classroom testing. The protocol used mainly for teaching was concept mapping and the protocol adopt for assessment was frequent formative classroom testing. The final output was the improvement of students' learning achievement. The researcher applied and adhered with the framework in analyzing research data in this study.

III. RESEARCH METHODOLOGY

A. Research Design and Objectives

Mix Methods (Quantitative and qualitative design) was employed. For quantitative data, an experiment in One-Group Pretest-Posttest Design was carried out.

The objective of the research was to investigate the effects the integration of CMFT into a Thai Education Law subject towards learning achievement of Thai undergraduate students.

B. Samples of the Study and the Tool for Data Collection

Sample group of the study was an intact class of 21 undergraduates who enrolled in Education Law Subject in the first semester, 2019.

The instruments used for quantitative data collection consisted of a pretest, a posttest, and six immediate-tests at the end of lessons. Validation of those tests was conducted with a panel of three experts by using Index of Congruence (IOC), with the result of 0.97. Slight adjustments of the tests were made according to additional comments.

The instrument used for qualitative data collection was a group interview. Guided questions were validated by the same experts again to ensure the validity and appropriateness of the questions, with the result of 0.89 IOC.

C. Research Procedure

1. Lessons & Course Contents: The course entitled, "Thai Education Law" as one of compulsory basic courses for all undergraduates in Faculty of Education of Rajabhat university group in Thailand. The course content was divided into 16 weeks for a semester enrollment. Week 1: Course Orientation, Week 2: General Education Law, Week 3: Constitutional Law, Week 4-5: Government Administration Act, Week 6-8: National Education Act, Week 9-12: Government Teacher and Education Personnel Act, Week 13: Teachers and Educational Personnel Council Act, Week 14-15: Codes and Regulations regarding Education Personnel's Leaves and School Operation, and Week 16, Posttest.
2. Number of formative tests: There were 6 classroom formative tests in total. They were designed in multiple-choice format of 10-20 items. One test was administered at the end of each unit.
3. Duration of treatment: A class duration was 3 hours in total. 2.30 hours were allocated for learning activities and the last 30 minutes was for sitting the tests.
4. Classroom assignments and activities: The class members were assigned with a group work to do a self-study project about the topic of each week, particularly on their selected sub-topics, in advance. Then, the groups needed to come up with their own concept maps and presented the maps in front of the class. After each presentation, the class discussed about the concept map that were just presented and adjusted the maps as necessary, for a clearer and better understanding of the learning contents. Comments and feedbacks by the teacher were given to the class at the final step to ensure that the concepts were appropriate and exactly fit with the correct meanings.
5. Class level: Most of the students had no or little background of the education law and they were considered at a beginner level.

D. Data Collection & Analysis

The pretest was carried out in the first week of the course. An immediate posttest was performed at every end of each unit, and the posttest was administered in the final week.

Statistics used for quantitative data analysis included mean, S.D., percentage, and paired sample *t*-test.

Content Analysis was employed for qualitative data analysis. The researcher, a primary coder, coded the data from the interview, based on each of the variables and the coding schemes. An inter-rater, the other coder, reviewed the codes and rated on the agreement. After that, both coders came to joint reviewing their coding and resolved any disagreements.

IV. FINDINGS & DISCUSSION

A. Learning Achievement

Students' learning achievement was measured by using pre-test and post-test score comparison. The hypothesis was statistically tested by using Paired-Sample *t*-test. Students' performance from immediate posttest scores from each unit was also presented by using percentage.

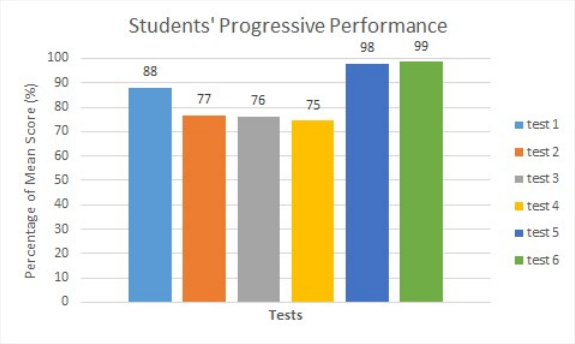

Fig. 1. Histogram Showing the Distribution of Scores from Frequent Classroom Testing

According to the result illustrated in the histogram, the percentages of the scores of the immediate posttests at the end of each unit were relatively at a high to a very high level. The minimum score percentage was found in test 4 (75%) and the maximum score percentage was found in test 6 (99%). All of the score percentages were above a criterion of 60% pass, indicating that the students' performance was satisfied and at a considerably good level.

The result of the formative scores above revealed the effectiveness of the frequent classroom testing. Congruently, as Rickards (1979) mentioned in his study that, if a learning task was divided into small units and then such units were set up in test-like environment, there was high possibility for the students to improve their learning achievement.

	n	Full Score = 100				
		Mean	S.D.	t	df	Sig.
Pre-test	21	48.8571	5.25629	19.026	20	0.000
Posttest	21	77.619	6.03719			

**** p<0.005***

Table1: The result of the Students' Learning Achievement from Paired Sample *t*-test

Table 1 showed the result of the comparison of the students' learning achievement between before and after experiencing CMFT. Post-test score (Mean = 77.61, S.D. = 6.03) was significantly higher than the pre-test score (Mean = 48.85, S.D. = 5.25), at a significant level of 0.000. That meant the students' learning achievement had definitely been improved after learning through CMFT.

Additional unconcealed factor helped improving the students' learning achievement was that the tests functioned as a diagnostic tool for individual student. Frequent testing not only allowed an individual learner to get better understanding of his own weakness, but also paved a way for him to learn better how to improve himself in an appropriate manner (Kulik & Kulik, 1986-87). Another empirical evidence was found from Bangert-Drowns et al. (1991) as the researchers examined a meta-analysis on the use of classroom testing and discovered that frequent testing could increase learning performance. However, in return, the growth rate was gradually diminishing and that seemed normal for the nature of information in a memory to be decayed by time.

B. Effects of Integration of CMFT from Interview

1. Effects towards Concept Mapping: Most of the students reflected that concept mapping helped them to get better understanding of the learning content. Visualizing abstract concepts was a great benefit for them in a way that the complex things were simplified.
2. A number of previous studies strongly supported the positive effects of concept mapping towards the memory. A recent robust proof was added from the research of Hu & Ming (2012), investigating on the effect of concept mapping on students cognitive load. The result of their study discovered that the students' frustration and mental load had been decreased by the use of concept mapping strategies. When the brain constrictions were reduced, the better comprehension took place.
3. However, there were a few students commented that the concept mapping presentations and the reviews sometimes happened too fast to catch up. Slowing down the pace might be helpful for them. This phenomenon was not out of the ordinary as Vasudevan (2017) noted that a slow learner often needed more time to acquire knowledge. They were more likely to reply themselves on concrete materials rather than abstract ones. Therefore, integration of CMFT needed to take students' level and learning pace into consideration for a course design as well.
4. Effects towards Frequent Testing: The students claimed that CMFT had an influence and could create intrinsic motivation for them to attend class regularly and to be on-time. Due to the tests that was held on regular basis, the students were afraid that misbehaviors would cause them some troubles and that might affect their scores. A similar previous study showed strong relation between formative assessment and self-regulated learning. The study discovered that formative assessment could encourage students to pay more attention on their learning goals, e.g., passing the tests, looking good, changing expectations, etc., (Nicol et al., 2006).

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