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The comparisons of effects of the cooperative learning model using metacognitive moves and traditional instruction on the science for quality-of-life subject for enhancing the learning achievement and critical thinking of undergraduate students at Chaiyaphum Rajabhat University

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Abstract

The purposes of this research were; (1) to determine the effectiveness of a cooperative learning model with cognitive techniques, (2) to study the index of effectiveness of a cooperative learning model with cognitive techniques, (3) to compare learning achievement and critical thinking of students studying the science for quality-of-life subject by using a cooperative learning model with cognitive techniques and learning using traditional methods, (4) to compare the learning achievement and critical thinking of students studying the science for quality-of-life subject by using a cooperative learning model with cognitive techniques with different achievement motivation. The sample group consisted of two classrooms of 30 students in second semester, academic year 2019, totaling 60 students. The research instruments consisted of; (1) learning management plan, (2) achievement motivation test, (3) critical thinking measurement model, (4) model test to measure learning achievement. The statistics used for data analysis were percentage, mean, standard deviation and hypothesis testing using the *t*-test independent and the two-way ANOVA test. The results showed that; (1) the effectiveness of the cooperative learning model using cognitive techniques was found to be effective E1/E2 = 82.42/84.17 with the set efficiency value of 80/80, (2) the model effectiveness index of cooperative learning using cognitive techniques of students had a model effectiveness index of .70, (3) from the results of comparing the learning achievement and critical thinking of students using the cooperative learning model using cognitive techniques and learning by traditional methods, it was found that the students who studied with a cooperative learning model with cognitive techniques and traditional learning methods had an achievement score and critical thinking with a cooperative learning model with cognitive techniques higher than learning achievement and critical thinking through traditional methods, statistically significant at the .05 level, (4) from the results of comparing students' learning achievement and critical thinking by using a cooperative learning model with cognitive techniques with different achievement motivation, it was found that in those with high achievement motivation and the low achievement motivated groups that were used, there were no different effects on learning achievement and critical thinking.

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Introduction

The thinking processes used to deal with thought strategies in order to direct and control learning and the process of memory is called cognition (metacognition). Flavell (1979) said that cognition can make students successful in learning and that the knowledge that arises could be linked with intelligence abilities. Moreover, metacognition is a high level of thought involved in governance, controlling or manipulating one's thoughts (Mittlefehldt & Grotzer, 2003) with cognitive techniques. This is also known as cognitive skills (metacognitive techniques), a strategy that allows learners to apply and harness knowledge and other skills (Nickerson, Perkins, & smith, 1985) that commonly uses three elements; comprehensibility (intelligibility), ability to be widely applied (wide-applicability) and reliability (plausibility) (Beeth, 1998).

Cooperative learning refers to learning in a small group where approximately 3–6 members of different competent groups learn to achieve the target of the group. The learning together method, developed by Johnson and Johnson (1994), was comprised of four to five people in a different group of learners performing tasks assigned on a worksheet. The group submits the same work and receives praise or awards according to the group's performance of helping each other. To achieve the goals (Johnson & Johnson, 1987), collaborative learning was also unique team building on education and evaluating the work within the group by using groups to work together to solve conflicting problems. In addition, cooperative learning allows learners to have critical thinking, such as organizing a collaborative learning activity based on the 4 MAT cycle, where students had critical thinking ability post-test higher than pre-test. (Phongphan, 2005).

Critical thinking is a thinking process to ponder carefully by virtue of one's knowledge, thoughts and experiences from various learning sources to lead decision-making to apply the correct method to solving problems (Sripongwiwat, 2005), Marzano et al. (1988 as cited in Suwancharat, 2000), explained that critical thinking is a characteristic of the complex Thinking Processes. It consists of many thinking skills and Beyer (1983), explained that critical thinking is a mental operation that consists of information processing skills, which include remembering, interpreting, interpretation, application, analysis, synthesis, evaluation and reasoning. Therefore, critical thinking is the basis of all thinking. When a person has already thought of a particular matter and gets ideas that have been through critical thinking, the acquired thinking can be further used in other processes such as decision making and problem solving (Khammanee & Sakonrak, 2001). To decide whether to believe or what to do when learners find problems, learners will interact with others through knowledge acquisition and rational information based on observations from reliable sources, which are clear, critical, summarized, referenced, deductive, inductive, and judgmental. They can consider an alternative with sufficient basic information. They can weigh up between good and bad or the good and the bad result before making a decision.

Teaching and learning science for quality-of-life subject is a subject in the general education group of Chaiyaphum Rajabhat university. It is teaching and learning that integrates knowledge of general science, both health science and sports science, used in teaching and learning management to improve the quality of human life. The study of science and technology development processes and creates scientific knowledge to apply in the development of quality of life for a happy life. It recognizes the impact of scientific progress on humans, the environment, society, politics and culture, and the problems encountered in tertiary education management. From the current higher education quality assurance report on the issue of organizing the educational and learning process in Thailand, it was found that one of the major weaknesses was the link between knowledge and skills in the classroom and their use in real life. In addition, the report by Sinlarat, Triraphichit, and Chaodamrong (2005) found that "... The learning process at the higher education level and Thai universities did not really create wisdom for learners since the teaching style created by the lecturer, caused students to memorize, and memorizing as instructed by the teacher as a principle of wisdom was not development. Therefore, graduates had more knowledge than thinking ability. Besides, teaching and learning processes did not create wisdom and the content taught did not lead to true knowledge, causing insufficient intelligence..." (Wattananikorn, 2007). Moreover, the research by Phonsaram and Thephasdin Na Ayuthaya (2001) showed that the teaching and learning management at the bachelor level faced problems for both teachers and learners; namely, the teacher often teaches by lecture, teaching methods used knowledge transfer and did not transfer ideas into doing, focus on memorization for students, teachers lack of production skills and techniques and using teaching materials. In addition, teaching methods were used with a large group, which makes teachers and students less close to each other. The students have lack of good interpersonal

skills, lack of perseverance, patience, and lack of cognitive skills (Phonsaram & Thephasdin Na Ayuthaya, 2001).

From such above issues, the researcher was interested in conducting a comparative study of teaching and learning results through a cooperative model using cognitive techniques and traditional teaching on the science for quality-of-life subject for enhancing the learning achievement and critical thinking of students at the bachelor's degree level in Chaiyuphum Rajabhat University. The research questions were as follows: (1) For students studying science for quality-of-life subject by using a cooperative learning model with cognitive techniques and learning by conventional methods, had there been more learning achievement than before studying or not? (2) For students studying science for the quality-of-life subject by using a cooperative learning model with cognitive techniques and learning by conventional methods, had there been an increase in critical thinking from before studying or not? (3) How did the students with different achievement motivation perform in the learning achievement and critical thinking when studying the science for quality-of-life subject? The objectives of this research were as follows: (1) to determine the effectiveness of a cooperative learning model with cognitive techniques, (2) to study the index of effectiveness of a cooperative learning model with cognitive techniques, (3) to compare learning achievement and critical thinking of students studying the science for quality-of-life subject by using a cooperative learning model with cognitive techniques and learning using traditional methods, (4) to compare the learning achievement and critical thinking of students studying the science for quality-of-life subject by using a cooperative learning model with cognitive techniques with different achievement motivation. The assumptions were as follows: (1) students who study with a cooperative learning model with cognitive techniques obtained the effectiveness according to the criteria 80/80, (2) students studying with a cooperative learning model with cognitive techniques obtained increased index of effectiveness of learning progress, (3) students studying science for the quality-of-life subject by using a cooperative learning model with cognitive techniques and learning by traditional methods had learning achievement and critical thinking higher than before studying this subject, (4) students studying science for the quality-of-life subject by using a cooperative learning model with cognitive techniques and learning by traditional methods had learning achievement and critical thinking higher than before studying.

Literature Review

1. Theory of knowledge creativity (Constructivism). Knowledge theory is the theory that learning is a process that occurs within the learner with the learners creating knowledge from the relationship between what they see and their prior knowledge by trying to bring in understanding about the events and phenomena that they had seen and create a cognitive structure, also known as a schema, the smallest unit of intellectual structure, or the structure of knowledge in the brain. This cognitive structure contains the meaning of things in the language of events, or what each person had through experiences or events, may be the understanding or knowledge of the individual (Chaicharoen, 2008).

2. Cognitive techniques (metacognitive moves or techniques). Cognitive techniques can help learners use cognitive thinking properly. This technique is called cognitive skills (metacognitive skills), which is a quality of strategy that allows learners to apply and control both knowledge and technical skills (Nickerson, Perkins, & smith, 1985). Three types are commonly used (Beeth, 1998).

1) Comprehension (Intelligibility) is the ability of abstract reflection on the essence of one's thinking. For example, use the question, "What does this mean to me? How?" Or "Do I understand this? How?" Such asking questions are helpful to learners. This is because it gives learners a basic conceptual framework that can be used to stimulate their cognitive processes. When assessing their ability to understand new concepts, the students will reflect on their own ideas. Parent concept or teacher concept in which the students ask “Can the way this person thinks about his concept help me understand that concept?” The researcher will see that the comprehension is well utilized on a personal level (Intra-Personal) and level between individuals (Inter-Personal) by acting as a reflection between individuals or groups of learners.

2) Ability to apply widely (Wide-Applicability) is the ability of the learners to apply their knowledge of thinking from one context to other contexts, wanting to connect or examine the role of reflection through experience. The students ask themselves if this idea can help them understand what they learned about other things “or” My classroom or outside experience? Can it help me understand this new concept? However, there was still some confusion between transfer and application. (Application) is applied as part of the transfer process. The transfer was to know the similarity or similarity between two contexts and to use them to test the answers

to the problem by thinking; to try to apply a skill or idea in a new context (Georghiades, 2000), so it was widely used as a catalyst (Catalyst).

3) Transfer (Plausibility) is used to test one's belief in an idea from a number of alternative ideas. This type of cognition occurs when the learner asks himself: "Should I really believe this idea?" On a test of confidence in an idea, a student may seek evidence that had been invented or contradicted. For students to become self-aware about learning, they will be skeptical of what they learnt and about concepts they can understand.

3. LT (Learning Together) is a cooperative learning method based on social psychology developed by David and Roger of the University of Minnesota, which created a cooperative learning method. It consisted of four-five students each with differences working as assigned on a worksheet. The group submits the same work and receives praise or award based on a group's performance (Johnson & Johnson, 1994).

4. Critical thinking; this is thought, pondering and logical thinking aimed at deciding what to believe or what should be done helps to judge the situation correctly. Ennis, 1985, described the meaning of critical thinking with the definition that thinking arises from the way people interact with other people and is associated with justification, where the thinker must use critical thinking before deciding to believe or act on that justification (Ennis, 1985). Such consisted of four critical thinking elements: (1) ability to determine the reliability of sources and observations, (2) deductive ability, (3) inductive ability, (4) the ability to identify preliminary agreements.

5. Achievement motivation: this is the desire to accomplish one thing well by competing with the standard of excellence or making it better than others involved. Try to overcome obstacles, have peace of mind when you are successful and feel anxiety when failing (McClelland, 1953). Such consisted of six attributes: (1) Moderate Risk-Taking, (2) Energetic, (3) Individual Responsibility, (4) Knowledge of Result of Decision/ Action, (5) Forward-looking (Anticipation of Future Possibilities), and (6) having skills in organizing work (Organizational Skills/Abilities).

Methodology

This research was a quasi-experimental research by using a cooperative teaching model using cognitive techniques and traditional teaching using the pretest posttest design experiment with the experimental group and the control group, as shown as Table 1.

Table 1 Experimental plan by the two-control group pretest posttest design

Group	Pre-test	Post-test
K_1	A_1	B_1
K_2	A_2	B_2

Information:
K_1 = experimental group
K_2 = control group
A_1 = experimental group pre-test
A_2 = control group pre-test
B_1 = experimental group post-test
B_2 = control group post-test

Participants

1. The populations used in this research were the regular undergraduate students of Chaiyaphum Rajabhat university who were enrolled in the science for quality-of-life subject in the second semester, academic year 2019, total of 120 students.

2. The sample used in this research was undergraduate students in the regular session of Chaiyaphum Rajabhat university who were enrolled in the science for quality-of-life subject in the second semester of academic year 2019. Two classrooms, 30 students each, totaling 60 people, were obtained by a specific cluster random sampling and the sample group was assigned into two groups as follows: (1) The experimental group of 30 people who studied with cooperative learning style by using cognitive techniques, (2) The control group of 30 people who studied by the traditional method.

3. Tools used in research and quality determination of tools. Creating a tool from the subject of study relevant documents and research were used to determine the quality of the tools by offering to seven experts who were experts in the field of education, including doctoral degrees or Assistant Professor, Associate Professor and Professor to assess the validity and reliability of the instrument as following:

1) There were two types of teaching management plans for the science for quality-of-life subject for the experimental group using (1) The cooperative teaching plan using eight cognitive techniques and eight regular control group teaching plans, (2) Cooperation teaching by using cognitive techniques to test and try-out with non-sample students. (Phramawong, 1977), including regular undergraduate students enrolled in the science for quality-of-life subject in the first semester of academic year 2019. The steps were as follows: (1) One to One Test of 3 people found that the process efficiency value

and the resulting efficiency value were 70.42/76.11. (2) A small group test of 9 people found that the process efficiency value and the resulting efficiency value were 75.83/78.33 and forward tested into the field group. (3) Field testing of 30 people showed that the resulting efficiency factor E1/E2 were 81.88/84.06, which showed that the planned teaching using cognitive techniques was effectively based on the 80/80 criteria.

2) Achievement motivation form of science for quality-of-life subject test. It was created using McClelland's theoretical framework as a five-level rating scale based on Likert's method, totaling 30 items with six aspects: (1) Reasonable risk, (2) Enthusiasm, (3) Self-responsibility, (4) A need to know the outcome of the decision, (5) Foresight, (6) Having skills in organizing work. A correlation coefficient between .31–.85 was found.

3) Critical thinking test was multiple choice, 4 choices, 40 items consisting of 4 aspects: (1) Ability to consider the reliability of the data source and observation, (2) deductive ability, (3) inductive ability and (4) ability to identify preliminary agreements. The researcher improved Suwanjarat's model (2000), which was based on the concept of Ennis (1985), with a difficulty value of 0.23–0.63 and a classifying power from 0.20–0.67, and obtained a test confidence value of 0.91.

4) Learning achievement test of the science for quality of life subject was multiple choice, 4 choices and 60 questions. According to Boom's concept of cognitive domain, it was classified into six areas: cognition, memory, comprehension, application, analysis, synthesis and valuation. The discriminant value (B) was between 0.20–0.73, the difficulty value of an individual test between 0.30–0.80, and the reliability value of the whole test was 0.96.

5) The teaching management plans for the science for quality-of-life subject for the experimental group used (1) the cooperative teaching plan using eight cognitive techniques and eight regular control group teaching plans, (2) cooperation teaching by using cognitive techniques to test and try-out with non-sample students. (Phramawong, 1977). Using the constructivist method of Chaicharoen's (2008) model, such consisted of five steps; (1) Problem base, (2) Scaffolding, (3) Resources, (4) Coaching, and (5) Collaborating, then, connecting to teaching plan and linking to the experimental and (LT) +control group of cooperative teaching plan using eight cognitive techniques starting from START to Main menu (Unit 1–8), Sub menu (Objective, Summary of content and exercise), Post-test and FINISH, shown as Figure 1.

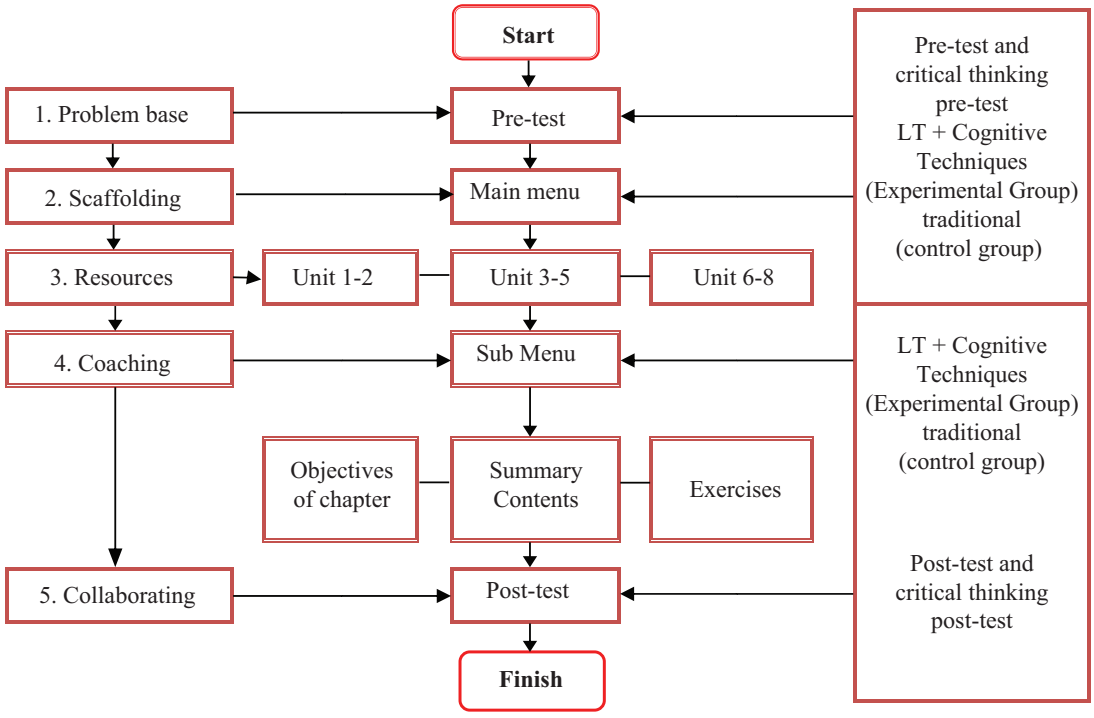

Figure 1 The teaching plan using constructivist model and learning by experimental group and control group

Data Collection

1. Conduct data collection by clarifying the purpose of the experiment. Both methods of learning used cooperative learning by using cognitive techniques including; (1) Able to understand (Intelligibility), (2) Ability to apply widely (Wide-Applicability), and (3) Reliability (Plausibility) (Beeth, 1998) with the experimental group and the control group using traditional learning allowing both groups of students to acknowledge and perform a test to measure achievement before studying. A critical thinking test before studying was used with both groups of students.

2. The students in the experimental group and the control group proceeded to study according to the teaching activity plan until the end of the lesson. Then, the experimental group and the control group proceeded to take a test to measure the learning achievement and a critical thinking test after class.

Data Analysis

1. Find the mean and standard deviation of the scores obtained from the pre-test and post-test study achievement test, and test scores for critical thinking (Critical Thinking) of the learners before and after studying.

2. Find the effectiveness (try out) of cooperative learning using cognitive techniques developed using the 80/80 criterion.

3. Determine the Effectiveness Index (EI) of cooperative learning using cognitive techniques.

4. Study learning achievement using a cooperative learning model using cognitive techniques and traditional instruction of students in Chaiyaphum Rajabhat university, and the student's critical thinking scores used the t-test independently.

5. Analysis of the results of the use of two learning models: cooperative learning using cognitive techniques with traditional instruction of the students as a whole classified by high and low achievement motivation by using statistics to test the hypothesis about the difference between the variables by analyzing two-way variance (Two Way ANOVA).

Results

1. From the results of the efficacy of the cooperative learning model using cognitive techniques for efficiency, 80/80 had the process efficiency value and the resulting efficiency factor E1/E2 was 82.42/84.17, as according to Table 2.

2. From the results of the study, the index of effectiveness of a cooperative learning model with cognitive techniques of students studying the science for quality of life subject, the model effectiveness index was 0.70, as according to Table 3.

3. From the results of comparison of learning achievement and critical thinking of students studying the science for quality-of-life subject by using a cooperative learning model with cognitive techniques and learning by the conventional method, it was found that students who studied with a cooperative learning model with cognitive

Table 2 the effectiveness solving of experiment group sample

List	Unit of learning									Post-test scores
	1	2	3	4	5	6	7	8	Total unit	
Full scores	10	10	10	10	10	10	10	10	80	60
No. of students	30	30	30	30	30	30	30	30	30	30
Total scores	247	246	250	248	248	246	248	245	1978	-
$\overline{X}$	8.23	8.20	8.33	8.27	8.27	8.20	8.27	8.17	65.94	50.50
SD	0.57	0.48	0.48	0.52	0.52	0.71	0.45	0.70	0.56	2.06
Percentage	82.30	82.00	83.30	82.70	82.70	82.00	82.70	81.70	E1=82.42	E2=84.17
E_1/E_2	82.42/84.17									

Table 3 Index of effectiveness of learning with a cooperative learning model using cognitive techniques science for quality-of-life subject bachelor degree Chaiyaphum Rajabhat university

Number of students	Full scores	Mean ($\bar{x}$)		Effectiveness index (E.I.)
		Pre-test	Post-test	
30	60	26.10	49.97	0.70

techniques and learning using traditional methods had an achievement score and critical thinking with a cooperative learning model with cognitive techniques higher than learning achievement and critical thinking with traditional methods with statistical significance at the .05 level, as according to Table 4–5.

4. From the results of comparison of learning achievement and critical thinking of students studying the Science for quality-of-life subject by using a cooperative learning model with cognitive techniques with different achievement motivation, it was found that with the high achievement motivation and the low achievement motivation groups used, there were no differences in learning achievement and critical thinking, as shown in Table 6–8.

From Table 7, it was found that there was no difference between the learning achievement variable and the critical thinking variance of the students.

From Table 8, it was found that the groups of students with high motivation for achievement and low achievement motivation had no difference in learning achievement, and there was no difference in critical thinking.

Discussion

It is clear that our research makes advanced understanding related to research questions, research assumptions, reviewed documents and research objectives as following:

Table 4 Comparison of the learning achievement of students who took the Science for quality-of-life subject by using a cooperative learning model with cognitive techniques and learning by traditional methods

Learning styles	Learning achievement		df	*t*	*p*
	$\bar{x}$	*SD*			
1. Traditional methods	44.20	3.83	58	6.673*	.000
2. Cooperative learning with cognitive techniques	49.96	2.77			

Note: *$p < .05$.

Table 5 Comparison of critical thinking of students studying the science for quality-of-life subject by using a cooperative learning model with cognitive techniques and learning by traditional methods.

Learning style	Critical Thinking		df	*t*	*p*
	$\bar{x}$	*SD*			
1. Traditional methods	29.36	2.15	58	5.936*	.000
2. Cooperative learning with cognitive techniques	32.60	2.06			

Note: *$p < .05$.

Table 6 The results of comparative analysis of learning theory and critical thinking of students with difference for achievement motivation, comparison of students who were motivated to achieve

Comparison	Achievement motivation of students			
	High (n = 17)		Low (n = 13)	
	$\bar{x}$	*SD*	$\bar{x}$	*SD*
1. Learning achievement	50.17	2.62	49.69	3.03
2. Critical thinking	33.05	1.85	32.00	2.23

Note: *$p < .05$.

Table 7 Analysis of variance of achievement variables and the variance of critical thinking

Learning styles	F	df1	df2	*p*
1. Learning achievement	.179	1	28	.676
2. Critical thinking	.825	1	28	.372

Table 8 The results of comparative analysis of students with learning achievement and critical thinking of students with different achievement motivation

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	*F*	*p*
Corrected Model	Learning-achievement	1.727	1	1.727	.219	.644
	Critical-thinking	8.259	1	8.259	2.012	.167
Intercept	Learning-achievement	73473.460	1	73473.460	9.299E3	.000
	Critical-thinking	31180.525	1	31180.525	7.596E3	.000
Clus	Learning achievement	1.727	1	1.727	.219	.644
	Critical thinking	8.259	1	8.259	2.012	.167
Error	Learning achievement	221.240	28	7.901		
	Critical thinking	114.941	28	4.105		
Total	Learning achievement	75123.000	30			
	Critical thinking	32006.000	30			

Note: $p < .05$.

1. The study of effectiveness of a cooperative learning model using cognitive techniques was found to be effective E1/E2 = 82.42/84.17 according to the established criteria 80/80, which was based on the hypothesis. This means the development of a cooperative teaching model and cognitive techniques that we had reviewed can be applied to the students and help them learn this subject thoroughly, with these criteria 82.42/84.17. Also, in accordance with research by Gingphum (2006), the results of learning by networking informatics and inquiry on learning achievement and achievement of undergraduate students, the lesson efficiency was 80.94/88.19, which was higher than the 80/80 criteria.

2. For index of effectiveness of the study on cooperative learning model using cognitive techniques, the model's effectiveness index was .70, or equivalent to 70 percent of the learning progress, which was based on the assumptions that increase during studying, and the reflection of learners on their learning ability with cooperative learning using cognitive techniques to cause the learning achievement of learner post-test to be higher than pre-test, as well. Also, in teaching and learning activities that encourage learners to take action learning by doing, the LT (Learning Together) strategy was used in conjunction with activities and clear measurement and evaluation, and informing the learners' learning results can make the students enthusiastic to learn in line with the research of Thanadca (2012), who had studied and developed a collaborative teaching model on the web using LT techniques, as of the documents reviewed.

3. Higher learning achievement than traditional methods with statistical significance at the .05 level of students, which was in accordance with the hypothesis related to our documents reviewed on the cooperative learning model, that encourages learners to think, consider and realize the mission that was assigned together. This study was consistent with Thongdeelert's (2004) research, which found that the experimental group of students who studied with a collaborative learning model had a statistically higher post-test of learning achievement than pretest at.05 as well, as of the research assumption.

4. The students had higher achievement motivation in this study, which was not in accordance with the assumptions of the research question set. This may be because learners were motivated, committed, persistent, eager to accomplish anything as intended or planned related to the documents reviewed on the constructivism so far. The students had systematic work skills and were not afraid of failure in their work, and there were efforts to improve the work for the better. Motivation for achievement was also the desire to accomplish one thing as well. They had high ambition, not discouraged by the obstacles that prevented trying to find a solution to the problem leading to success in line with Phumisrikaew (2009), who found that the students who studied by learning with a cooperative group used skill training, and a cooperative group used a diagram. This may be because students had practiced critical thinking skills along with cognitive thinking practice, especially thinking about their own opinions and those of others, thinking about thinking. (Livingston, 1997). Also, the two groups learned together, exchanged ideas and helped each other according to the concept of social constructivism (Thammakhan, 2008), where students can develop learning achievement and critical thinking not differently as of the research question and documents reviewed.

In this study, the researchers discovered a new technique for teaching hands-on learning using cognitive techniques where students had fun, interest and cooperation in doing activities that affect scientific teaching in the quest of truth, which could be used in teaching in another subject.

Conclusion and Recommendation

Suggestions for Application

1. Research comparing the results of cooperative learning using techniques regular cognition and teaching science for quality-of-life subject towards learning achievement and critical thinking of students at the undergraduate level Chaiyaphum Rajabhat University to be used to teach in the science for quality-of-life subject in other Rajabhat universities as well as being a guideline for creating other general education subject.

2. Teaching and learning activities able to adjust the learning style according to the appropriate content of the subject. If you want to focus on training students to develop any skills, then design activities for learners to practice in order to generate skills such as problem-solving skills, etc.

3. Other faculty members should discuss the impact of studying science for the quality of life and research in the future, especially the learning together (LT) involving with co-operative learning, metacognitive techniques and achievement motivation.

Suggestions for the Next Research

1. Cooperative learning should be developed using other techniques such as STAD, TGT, etc. for using with another subject.

2. An instructional style that further enhances advanced thinking skills should be developed.

3. There should be a study to compare the durability of learning during the study,
cooperative learning using cognitive techniques and other teaching methods as well.

Conflict of Interest

There is no conflict of interest.

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