A Survey of Critical Thinking Skill of Matthayomsueksa 5 Students in Thailand

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Abstract
The purpose of this research was to survey the critical thinking skill of Matthayom Sueksa 5 Students. The participants were 120 students of academic year 2015 from Roi-et Wittayalai School, Muang, Roi-et which selected by using the purposive sampling technique. The research instrument was the 30 items of critical thinking test which measured in 5 aspects including 1) Inference, 2) Recognition of assumption, 3) Deduction, 4) Interpretation and 5) Evaluation of arguments. The data was analyzed by using frequency, mean, percentage, standard deviation, and ANOVA. The results indicated that the students' mean score in all aspects of critical thinking was 3.88. Regarding to each aspect of critical thinking, inference, recognition of assumption, deduction, interpretation and evaluation of arguments were 4.07, 5.03, 4.68, 3.23 and 2.42 respectively.

Keywords: Critical Thinking Skill

Introduction

The currently results of the study in Thailand show that the quality of education is not as good as international. The results of the Trends in International Mathematics and Science Study (TIMSS) of Matthayom Sueksa 2 students of Thailand in 1999, 2007 and 2011 had an average score on Science of 482 471 and 451 respectively (TIMSS IPST. 2011: 20). It could see that the average score of science in each year would had reduced evidently. It indicated that Thai students did not developed reach their full potential. Therefore, their academic abilities were not up to standard and a lack cultivate of desirable characteristics, such as the logical thinking, creative thinking, critical thinking and problem solving thinking. The same as Roi-et Wittayalai School, Muang, Roi-et Province which was the extra-large school. The researcher collected the data from the Physics teacher in the science department which found that there were the problems in the organized learning activities. The students had not an opportunity to inquiring and creating knowledge by themselves. As well the activities which promoted the development of higher-order thinking skills should be used. It should be improve the teaching. The learning activities should focus on teaching the children to solve their own problems. It can help the children having the process of thinking from the children's determination, assumptions and selected solution by focusing on working together as a group. It influence on the student experience and the success in learning.

Aforementioned, higher-order thinking skills consisted of many aspects such as logical thinking, creative thinking and critical thinking which were very important for living in the present society. Critical thinking skill was a reasonable thinking process which refers to the criteria and evidences. The review of evidences and facts carefully about the information which were problems or vague information by knowledge, ideas and their own experiences in rethinking to lead to sensibly conclusion, before decided whether to believe or not and whether to act or not (Prapansiri Susoarat. 2008: 92). It enables students to solve problems effectively and let them to have the analyzing ability and finding the answers to the summary event. The decision whether or not do something when they faced with a different problem in the daily life reasonably accurate and appropriate. Critical thinking skill consists of five aspects including of, 1) Inferences aspect which measure the ability of classification of the probability of the conclusion to determine which conclusion was true or false, 2) Recognition of assumptions aspect which measure the ability of identify which messages was a preliminary agreement or not, 3) Deduction aspect which measure the ability of find a reasonable conclusion by using the logic, 4) Interpretation aspect which measure the ability of providing the weight of evidence to determine the possibility of a conclusion, 5) Evaluation of arguments aspect which measure the ability of identify the using reasons for what is the reasonable (Watson and Glaser. 1964) . All aspects of critical thinking skill was important in human daily life. Because of its important, critical thinking skill was used to decide before doing or not doing something when they had faced with the situations in daily life.

As mentioned, the researcher attempts to survey the critical thinking skill of Matthayom Sueksa 5 students in Roi-et Wittayalai School, Muang, Roi-et. In this study, this information will be useful and can be applied in the learning activities of this school in various subjects actually.

Research Purposes

The purpose of this research was to survey the levels of the critical thinking skill of Matthayom Sueksa 5 students.

Participants

The participants of this study consisted of 120 students from 3 classrooms of Matthayom Sueksa 5 students which have the different levels of the achievement. There were 44 students from the low level classroom, 34 students from the medium level classroom, and 42 students from the high level classroom.

Research Instruments

The research instrument of this study was the 30 items of critical thinking test. It measured in 5 aspects including 1) Inference, 2) Recognition of assumption, 3) Deduction, 4) Interpretation, and 5) Evaluation of arguments. The test showed an Item Objective Congruence (IOC) between 0.60 – 1.00.

Procedures

In this research, the data of the critical thinking skill of Matthayom Sueksa 5 Students was collected from the critical thinking test. The process of collecting data as following:

1. The researcher had studied the basic data and developed research instrument.
2. The basic data was collected not only from the literature review but also from interview the science teacher who taught in science subject. The interviewees were interviewed in the point of the general conditions of teaching science and problems topic.
3. The critical thinking test was developed and asked a students to do the test.
4. The data was analyzed by using mean and standard deviation. The ANOVA was using to test the data among each levels of student's prior knowledge.

The data was interpreted by using the interpretation of mean which was categorized to 5 levels including very good, good, medium, poor, and very poor respectively (Boonchom Srisa-ard. 1990). The criteria of interpretation of mean showed in Table 1.

Table 1. The criteria of interpretation of mean

Mean	Levels
4.81 – 6.00	Very Good
3.61 – 4.80	Good
2.41 – 3.60	Medium
1.21 – 2.40	Poor
0.00 – 1.20	Very Poor

Results

According to the students' achievement, which were divided to three groups by their prior knowledge levels. The students were divided to high group, medium group and low group, which were Matthayom Sueksa 5/11 (42 students), 5/14 (34 students), and 5/5 (44 students) respectively. The data were presented in Table 2 and Table 3.

Table 2
The ANOVA of students' achievement who have different prior knowledge level.

	Sum of Squares	df	Mean Square	F	sig.
Between Groups	16.111	2	8.056	239.301	.000
Within Groups	3.939	117	.034		
Total	20.050	119			

* $p < .05$

Table 3
The comparison of the student's achievement of each prior knowledge levels groups (which maximum was 4).

	N	$\bar{x}$	Mean Difference		
			High	Medium	Low
High	42	3.64	-	.17581*	.82518*
Medium	34	3.47	-.17581*	-	.64937*
Low	44	2.82	-.82518*	-.64937*	-

* $p < .05$

The mean scores of the results indicated that the students mean scores in high group, medium group, and low group were 3.64, 3.47, and 2.82 respectively. Regarding the results, It indicated that there pairs of mean difference were significantly difference at the .05 level

The all aspects of Critical thinking.

Critical thinking skill played an essential role in education and occupations that require cautious analytical thinking to performed essential job performance. It consists of five aspects including of, 1) Inferences aspect, 2) Recognition of assumptions aspect, 3) Deduction aspect, 4) Interpretation aspect and, 5) Evaluation of arguments aspect.

Table 4
The ANOVA of students' critical thinking skill scores who have different prior knowledge level.

	Sum of Squares	df	Mean Square	F	sig.
Between Groups	11.253	2	5.672	12.740	.000
Within Groups	51.674	117	.442		
Total	62.927	119			

* $p < .05$

Table 5
The comparison of the student's critical thinking skill scores of each prior knowledge levels groups (which maximum was 6).

	N	$\bar{x}$	levels	Mean Difference		
				High	Medium	Low
High	42	3.83	good	-	-.51261*	.24675
Medium	34	4.34	good	.51261*	-	.75936*
Low	44	3.58	medium	-.24675	-.75936*	-

* $p < .05$

The results indicated that the student's critical thinking skill mean scores in high group, medium group, and low group were 3.83, 4.34, and 3.58 respectively. Regarding the results, it indicated that there were significant difference in 2 group consist of high – medium and medium – low. However there show no difference between high and low.

The mean scores of each aspect of critical thinking skill which were 1) Inference, 2) Recognition of assumption, 3) Deduction, 4) Interpretation, and 5) Evaluation of arguments were used to test the significance of the difference of scores and the results of which are shown following here.

Aspect of inference.

This aspect was discriminated among the degrees of truth or falsity of inferences drawn from the given data. The analyzed data were presented in Table 7 and Table 8.

Table 6
The ANOVA of students' score in inference aspect of critical thinking who have different prior knowledge level.

	Sum of Squares	df	Mean Square	F	sig.
Between Groups	9.808	2	4.904	3.994	.021
Within Groups	143.659	117	1.228		
Total	153.467	119			

* $p < .05$

Table 7
The comparison of the student's score in inference aspect of critical thinking of each prior knowledge levels groups (which maximum was 6).

	N	$\bar{x}$	levels	Mean Difference		
				High	Medium	Low
High	42	4.00	good	-	-.50000	.20455
Medium	34	4.50	good	.50000	-	.70455*
Low	44	3.80	good	-.20455	-.70455*	-

* $p < .05$

The results indicated that the student's inference mean scores in high group, medium group, and low group were 4.00, 4.50, and 3.80 respectively. Regarding the results, it

indicated that there was significant difference between medium – low. However there show no difference in 2 groups consist of high – low and high – medium.

Aspect of recognition of assumption

This aspect was about the recognizing unstated assumptions or presuppositions in the given statements. The analyzed data were presented in Table 9 and Table 10.

Table 8
The ANOVA of students' score in recognition of assumption aspect of critical thinking who have different prior knowledge level.

	Sum of Squares	df	Mean Square	F	sig.
Between Groups	14.420	2	7.210	6.418	.002
Within Groups	131.446	117	1.123		
Total	145.867	119			

* p < .05

Table 9
The comparison of the student's score in recognition of assumption aspect of critical thinking of each prior knowledge levels groups (which maximum was 6).

	N	$\bar{x}$	levels	Mean Difference		
				High	Medium	Low
High	42	4.95	very good	-	-.60644*	.24784
Medium	34	5.56	very good	.60644*	-	.85428*
Low	44	4.71	good	-. 24784	-. 85428*	-

* p < .05

The results indicated that the student's recognition of assumption mean scores in high group, medium group, and low group were 4.95, 5.56, and 4.71 respectively. Regarding the results, it indicated that there were significant difference in 2 group consist of high – medium and medium – low. However there show no difference between high and low.

Aspect of deduction

This aspect was about the determining whether certain conclusions necessarily follow from the information in the given statements. The analyzed data were presented in Table 11 and Table 12.

Table 10
The ANOVA of students' score in deduction aspect of critical thinking who have different prior knowledge level.

	Sum of Squares	df	Mean Square	F	sig.
Between Groups	13.925	2	6.963	5.721	.004
Within Groups	142.400	117	1.217		
Total	156.325	119			

* p < .05

Table 11
The comparison of the student's score in deduction aspect of critical thinking of each prior knowledge levels groups (which maximum was 6).

	N	$\bar{x}$	levels	Mean Difference		
				High	Medium	Low
High	42	4.69	good	-	-.45658	.39502
Medium	34	5.15	very good	.45658	-	.85160*
Low	44	4.30	good	-.39502	-. 85160*	-

* $p < .05$

The results indicated that the student's deduction mean scores in high group, medium group, and low group were 4.69, 5.15, and 4.30 respectively. Regarding the results, it indicated that there was significant difference between medium – low. However there show no difference in 2 groups consist of high – low and high – medium.

Aspect of interpretation

This aspect was about weighing the evidence and the deciding if generalizations or conclusions based on the given data were warranted. The analyzed data were presented in Table 13 and Table 14.

Table 12
The ANOVA of students' score in interpretation aspect of critical thinking who have different prior knowledge level.

	Sum of Squares	df	Mean Square	F	sig.
Between Groups	13.017	2	6.508	3.495	.034
Within Groups	217.908	117	1.862		
Total	230.925	119			

* $p < .05$

Table 13
The comparison of the student's score in interpretation aspect of critical thinking of each prior knowledge levels groups (which maximum was 6).

	N	$\bar{x}$	levels	Mean Difference		
				High	Medium	Low
High	42	3.33	medium	-	-.28431	.51515
Medium	34	3.62	good	.28431	-	.79947*
Low	44	2.82	medium	-. 51515	-. 79947*	-

* $p < .05$

The results indicated that the student's recognition of assumption mean scores in high group, medium group, and low group were 3.33, 3.62, and 2.82 respectively. Regarding the results, it indicated that there was significant difference between medium – low. However there show no difference in 2 groups consist of high – low and high – medium.

Aspect of evaluation of arguments

This aspect was about distinguishing between arguments that were strong and relevant and those that were weak or irrelevant to the particular issue. The analyzed data were presented in Table 15 and Table 16.

Table 14
The ANOVA of students' score in evaluation of arguments aspect of critical thinking who have different prior knowledge level.

	Sum of Squares	df	Mean Square	F	sig.
Between Groups	10.645	2	5.392	5.738	.004
Within Groups	108.522	117	.928		
Total	119.167	119			

* p < .05

Table 15
The comparison of the student's score in evaluation of arguments aspect of critical thinking of each prior knowledge levels groups (which maximum was 6).

	N	$\bar{x}$	levels	Mean Difference		
				High	Medium	Low
High	42	2.17	medium	-	-.71596*	-.12879
Medium	34	2.88	medium	.71596*	-	.58690*
Low	44	2.30	poor	.12879	-.58690*	-

* p < .05

The results indicated that the student's recognition of assumption mean scores in high group, medium group, and low group were 2.17, 2.88, and 2.30 respectively. Regarding the results, it indicated that there were significant difference in 2 group consist of high – medium and medium – low. However there show no difference between high and low.

Conclusions and Discussions

Considering the critical thinking skill (from Table 5) showed the overall mean scores of critical thinking skill of the students in high, medium, and low group were in a good, good, and medium level respectively. The result indicated that the critical thinking skill scores of students who were in the medium group were difference from other groups. In view of the inference aspect, the levels of mean score in this aspect of all groups were in good level. In recognition of assumption aspect, the levels of mean score of high, medium, and low group were in very good, very good, and good level respectively. In deduction aspect, the levels of mean score of high, medium, and low group were in good, very good, and good level respectively. In interpretation aspect, the levels of mean score of high, medium, and low group were in medium, good, and medium level respectively. In evaluation of arguments aspect, the levels of mean score of high, medium, and low group were in medium, medium, and poor level respectively. Moreover, medium group had the highest scores than other groups. Furthermore, the mean score in recognition of assumption aspect was the highest and the mean score in evaluation of arguments aspect was the lowest. In consideration of

the methods and opportunities of learning found that the learning activity of the students in each group were difference. The students in the high group who learned in science-math program classroom had learned with a lecture method and a 5E instructional model. Firstly, the teacher came to the classroom with a lecture and then students were asked to doing the activity. Sometimes they were learned by doing experiment. The students in the medium group who learned in the gifted program classroom had learned with the innovation such as a learning with the animations, doing the experiments, and learning by doing project. The students in the medium group had an opportunity to learning by doing the experiments and learning by project-based more than the other groups. As well, all of them had doing the individual study. The students in the low group who learned in science-computer program had learned with the lecture method. The teacher usually taught the classroom by a lecture. Sometimes students were asked to doing some activity and they were hardly learning by doing experiment. Additionally, the learning process of medium group which learning with doing the experiment and project helped them developed their thinking process. This showed that the teaching styles more influenced on the critical thinking skill than the prior knowledge level of the students. Corresponding with the information form interviewed the teachers in Roi-et Wittayalai School described that, the way to made children can learn better was let them try to made an experiments, let them to face the problems with themselves and not just only learning from the imagination but also learning by doing. This statement was supported by Wongdoen Jaiaoon (2009), she claimed that learning by doing projects provide the students to think. In order that, thinking process was practiced when they have an opportunity to talking, thinking, and working with their friends. Additionally, the process in doing project let the students to think logically. McCrink (1999) had studied the results of teacher's teaching and the learning activities which affect student's critical thinking skill. The result from his study showed that the methods of the teaching which affect student's critical thinking skill were teaching with the educational innovation such as internet, instructional module, and multimedia. In this process the student can discover knowledge on their own which affect them sustainable and applicable to solve the problem in everyday life.

Recommendations

1. This research describes about the levels of the critical thinking skill of only Matthayom Sueksa 5 students in Roi-et Wittayalai School.

2. This research was reported about the levels of the critical thinking skill of Matthayom Sueksa 5 students in Roi-et Wittayalai School which was in the early stage, so the information should be included in the learning activity of this school in the future.

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