

## **Chapter 4**

### **Results of the Information Analysis**

The results of the information analysis for the research on critical thinking teaching competency development through the collaborative learning and action research for the teachers in the Prince Royal's College are to be presented in 3 parts along the research objectives as follows:

**Part 1:** Results of the construction of the handbook to enhance knowledge and understanding on critical thinking for collaborative learning engaged by the teachers

**Part 2:** Results of using the handbook to handbook to enhance knowledge and understanding on critical thinking for collaborative learning engaged by the teachers

2.1 Teacher's competence in analyzing the contents that facilitated critical thinking

2.2 Teacher's competence in instruction planning

2.3 Teacher's competence in implementing the instructional plans collectively developed by the teachers

2.4 The students' critical thinking that had been developed as the result of using the teacher's instructional plans

**Part 3:** Problems, obstacles, and guidelines for developing the teacher's critical thinking teaching competence for lower secondary school level

#### **Part 1: The Results of the Construction of the Handbook to Enhance Knowledge and Understanding on Critical thinking for Collaborative Learning to be engaged by the Teachers**

The researcher designed and constructed the handbook to enhance knowledge and understanding on Critical thinking for the collaborative learning to be engaged by the teachers. They were trained to analyze the contents that could facilitate the critical thinking teaching, instructional planning, and implementing the instructional plans to acquire the critical thinking teaching competence. The handbook could be summarized as follows:

#### **1. Components of the Handbook for Enhancing Knowledge and Understanding on Critical Thinking Teaching Competence of the Teachers**

##### **1.1. Principle**

Critical thinking skill is the skill to facilitate the students' successful learning. It is a desirable characteristic for the students at all school levels. They should be able to criticize and examine the information on the events and phenomena occurring either near or far away from them. They could apply this skill in variety of situations. Critical thinking, then, is the foundation of other thinking modes. Hence, the teachers in every learning strand should have the competency in organizing the instruction to develop the students' critical thinking skill and encourage them to realize the significance of critical thinking. To achieve such goal, the teacher has to be able to identify the method to prepare his/her instructional plans, to connect the critical thinking to the content of the subject. The teacher should realize also that the development of critical thinking could be done simultaneously with other skills. He or

she should use “thinking standards” which include clarity, accuracy, precision, relevance, adequacy, logicalness, significance, and fairness to facilitate the learning process to examining the issues on reasonable basis. The teacher has to have knowledge and understanding on how to build up the characteristics that facilitate critical thinking. Hence, in developing this handbook, the researcher had utilized the principles of thinking standards and characteristics of the critical thinking person. In developing the teacher’s critical thinking, collaborative learning and action research were the processes used.

## **1.2 Objectives**

To develop the handbook for enhancing knowledge and understanding on critical thinking for collaborative learning to be engaged the teachers to develop the teacher’s competence in teaching the students to have critical thinking composed of 4 aspects:

1.2.1 Critically analytical thinking – reasonably examine and manipulate the information

1.2.2 Critically synthetic thinking – able to link and construct new idea basing on reasoning

1.2.3 Critically decision making – examine options, criticism, and carefulness in examining aspects or options

1.2.4 Critically problem solving – choose the reasonable way of problem solving

## **1.3 Contents**

The handbook to enhance knowledge and understanding on critical thinking for the teachers’ collaborative learning was composed on the following contents:

1.3.1 Basic knowledge on critical thinking consisting:

(1) Definition of critical thinking

(2) Concepts and theories on critical thinking

(3) Components and standards of critical thinking

1.3.2 The content used for training critical thinking of the teachers was concerned with the people’s everyday life which dealt with ambiguous situations requiring critical thinking to carefully examining it to lead to a reasonable conclusion. These situations are:

Situation 1 – “Does wage raise really solve the problems of the laborers?”

Situation 2 - “Would the earth come to an end in 2012?”

Situation 3 - “Does the teacher teach people?”

The researcher had set up 6 learning units for building up the teachers’ competence the first 3 units of which would utilize the above 3 situations. These 6 learning units are:

Unit 1 Knowledge and Understanding on Critical Thinking (2 hours)

Unit 2 Critical Thinking Development Plans 1 (2 hours)

Unit 3 Critical Thinking Development Plans 2 (2 hours)

Unit 4 Analysis on the Congruence of the Curriculum Contents that Facilitated critical thinking (2 hours and Taking a week to finish)

Unit 5 Organizing Instructional Plans to promote critical thinking (2 hours and 2 weeks for collaboratively planning)

Unit 6 Implementing the developed instructional plans in the classroom (Using the instructional plans and collectively reflected on them and planned for the new cycle each of which took 2 weeks totally 6 weeks for the 3 cycles and collectively construct the final version of the plans taking 1 week)

#### **1.4 Learning Activities**

In each of the learning unit, there were 6 steps as follows:

1.4.1 Step of Providing Knowledge and Understanding including the reviews of old knowledge of the teachers for collaboratively connecting the things learned with their own experiences

1.4.2 Step of Presenting the Situations for the teachers to examine and make themselves understand – the situations were presented in Learning Units 1-3.

1.4.3 Step of Practicing Thinking on Individual Basis – In this step, the teachers focused on the main issues of the situation by analyzing and synthesizing, considering the information reliability, finding reasons to support, applying the conceptual framework to facilitate the them in realizing their own knowledge, ability, patience, and determination to find the reasons to support, and freedom to think and make decision, efforts to examine the evidences, and skills in searching for knowledge.

1.4.4. Step of Practicing Group Thinking - The teachers presented their ideas to their colleague teachers in the same learning strand for them to discuss and express their opinion, have open-mindedness, and be reasonable in listen to the other people's ideas and be interested in the different perspectives.

1.4.5 Step of Self-reflection and Building up Options – This is the step of considering the reliability of the information from the discussion to review and reflect by oneself to reach the logical conclusion.

1.4.6 Step of Making Decision and Solving the Problems – In this step was the step to using knowledge and ability on critical thinking in the similar or new situation.

The main components of the 6 learning units were summarized in Table 1 below.

**Table 1** Components of the Learning Units on the Teachers' Critical Thinking Competency Development

Component	Learning Unit 1 Knowledge and Understanding on Critical Thinking (1 hour)	Learning Unit 2 Critical Thinking Process Training Plan 1 (2 hours)	Learning Unit 3 Critical Thinking Process Training Plan 2 (2 hours)	Learning Unit 4 Analysis of the Main Learning Strands that Facilitate Critical Thinking Teaching (1 week)	Learning Unit 5 Setting up Instructional Plans to Enhance Critical Thinking (2 hours and 2 weeks for planning together)	Learning Unit 6 Implementing the Instructional Plans (2 weeks per cycle - 3 cycles taking 6 weeks)
Objectives	1. Able to explain the concepts and principles on critical thinking 2. Able to explain the major components of, thinking standards for, and critical thinking competence	1. Able to carefully and thoroughly think, identify the reasoning, and consider the information validity 2. Able to use the thinking standard as the framework to indentify the characteristics and critical thinking competence		1. Able to analyze the curriculum learning strands that facilitate the critical thinking teaching 2. Able to carefully and thoroughly, identify the reasoning, and consider the information validity including to use the thinking standard and characteristic of critical thinking in curriculum analysis	1. Able to write the instructional plans to enhance critical thinking 2. Able to carefully and thoroughly, identify the reasoning, and consider the information validity including to use the thinking standard and characteristic of critical thinking in writing up the instructional plans	1. Able to implement the developed instructional plans in providing learning and teaching 2. Able to carefully and thoroughly, identify the reasoning, and examine the information validity including to use the thinking standards and characteristics of critical thinking in implementing the instructional plans

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**Table 1** (cont.)

<b>Component</b>	<b>Learning Unit 1</b>	<b>Learning Unit 2</b>	<b>Learning Unit 3</b>	<b>Learning Unit 4</b>	<b>Learning Unit 5</b>	<b>Learning Unit 6</b>
<b>Scope of the Contents</b>	Meaning, concepts and theories concerning the situation on “Does wage raise really solve the problems of the laborers?”	Situation on “Would the earth come to an end in 2012?”	Situation on “Does the teacher teach people?”	Analyzing the contents of the main learning strands that facilitate critical thinking teaching	Writing up the instructional plans that enhance critical thinking	Implementing the developed instructional plans in organizing learning and teaching
<b>Learning Activities</b>	Step of Situation Presentation (Trainees presented the situation ) Step of Situation Examination (Knowledge and Understanding ) Step of Individual Thinking Practice Step of Group Thinking Step of Self-reflection and Identifying Options Step of Decision Making and Problem Solving (on Individual Basis)					Step of Reviewing Knowledge and Understanding Step of Implementing the Instructional Plans and Observing the Outcomes (Cycle 1) Step of Reflecting on the Performance Outcomes (Cycle 1) Step of Planning to Implement (Cycle 2) Step of Implementing the Plans and Observing the Outcomes (Cycle 2) Step of Reflecting on the Performance Outcomes (Cycle 2) Step of Planning to Implement (Cycle 3) Step of Implementing the Plans and Observing the Outcomes (Cycle 3) Step of Reflecting on the Performance Outcomes (Cycle 3) Step of Planning to Implement (Cycle 4)

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**Table 1** (cont.)

<b>Component</b>	<b>Learning Unit 1</b>	<b>Learning Unit 2</b>	<b>Learning Unit 3</b>	<b>Learning Unit 4</b>	<b>Learning Unit 5</b>	<b>Learning Unit 6</b>
<b>Measurement and Evaluation</b>	1. Observing the collaborative learning and reflecting behaviors of the teachers 2. Recording the thinking outcomes of each individual teacher 3. Recording the thinking outcomes for the whole group	1. Observing the collaborative learning and reflecting behaviors of the teachers 2. Recording the thinking outcomes of each individual teacher 3. Recording the conversation	1. Observing the collaborative learning and reflecting behaviors of the teachers 2. Recording the thinking outcomes of each individual teacher 3. Recording the thinking outcomes for the whole group	1. Observing the collaborative learning and reflecting behaviors of the teachers 2. Assessing the congruence between the content of the subject and critical thinking teaching	1. Observing the collaborative learning and reflecting behaviors of the teachers 2. Evaluating the instructional plans that facilitated critical thinking developed by the teachers	1. Observing the collaborative learning and reflecting behaviors of the teachers 2. Observing the instructional provision 3. Observing the student behavior

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In Table 1, on Learning Units 1- 5, the teachers had opportunity to examine and search for knowledge from the documents, think individually, and think in group. They had the opportunity to study, search for knowledge from the documents, to think individually, etc. After having exchanged within the group, the teachers took what learned from the group to review and examine the reliability and reasoning by themselves for one more time before coming up with the options for decision making or problem solving. Afterward, in Learning Unit 6, the teachers had practiced the critical thinking competence development via action research which included, collaborative planning, implementing the plans, and observing the performance outcomes. These steps were followed for 3 cycles. In the 4<sup>th</sup> cycle, they collaboratively evaluated the instructional plans.

These research instruments were evaluated by 5 experts who examine them and provided comments. The comments could be concluded that the organization of the 6 learning units covering the introduction, instruction, concepts and principle, through the design of these learning units had been congruent with the research objectives and designed activities were appropriate.

## **Part 2 The Outcomes of the Implementation of the Handbook to Enhance the Knowledge and Understanding on Critical Thinking for Collaborative Learning of the Teachers**

### **2.1 The teacher's competence in Analyzing the Learning Strand Contents that Facilitate the Critical Thinking**

After using Learning Units 1- 3, in the Handbook, 3 teachers of each of the 5 main learning strands totaling 15 of them and the 5 heads of the learning strands had collaboratively analyzed the contents relevant to be used in teaching thinking, thinking standards, and characteristics that facilitated critical thinking in their own learning strand for the whole semester. It appeared that the teachers could be able to set up the learning units for their learn strand as follows:

#### **Thai Learning Strand**

Unit 1 Words for Fun  
Unit 2 Fun with Travel  
Unit 3 Language of Thailand  
Unit 4 Pay Attention to Literature  
Unit 5 Legend Stories

#### **Mathematics Learning Strand**

Unit 1 Greatest and Least Common Factors  
Unit 2 Integer System  
Unit 3 Logarithm  
Unit 4 Fundamental Geometry

#### **Science Learning Strand**

Unit 1 Atmosphere  
Unit 2 Temperature and Heat  
Unit 3 Substances and Their Properties  
Unit 4 Solution  
Unit 5 Solution in Everyday Life

#### **Social Studies, Religion, and Culture Learning Strand**

Unit 1 Good Citizenship  
Unit 2 Buddhist Missions and Tripitaka  
Coming to Thailand  
Unit 3 The Life of Buddha  
Unit 4 Worth Knowing Dharmic Principles

### English Language Learning Strand

Unit 1 Friends

Unit 2 The Arts

Unit 3 Television

#### 2.1.1 Relevancy of Asserting Critical Thinking in the Contents

**Facilitating Critical Thinking** from the opinion of teachers and learning strand heads is as in Table 2

**Table 2** Mean and Standard Deviation of Relevancy in Inserting Critical Thinking onto the Curriculum

Inserting Critical Thinking Teaching	Level of Relevancy		
	$\bar{X}$	S.D.	
1. Choosing standards/indicators to insert critical thinking	4.10	.85	Much
2. Assigning works to enhance critical thinking	3.75	.55	Much
3. Setting up measurement and evaluation relevant to critical thinking	3.50	.60	Much
4. Setting up instructional activities relevant to critical thinking	3.80	.61	Much
5. Choosing media and learning resources relevant to critical thinking	3.50	.51	Much
6. Identifying thinking standard/characteristics of the critical thinker relevant to the standards/indicators in each unit	4.15	.67	Much
7. Identifying thinking standards/characteristics of the critical thinker relevant to the assignment/work	4.00	.45	Much
8. Setting up the thinking standards relevant to the instructional activities	3.80	.58	Much
9. Setting up the characteristics of the critical thinker	3.57	.63	Much
<b>Total Average</b>	<b>3.81</b>	<b>.60</b>	<b>Much</b>

From Table 2, it shows that the teachers and learning strand heads thought that there was relevancy of critical thinking in the learning strand, in general, at much level ( $\bar{X} = 3.81$ ). When each action was concerned, it was found that the identification of thinking standards/characteristics of the critical thinker was relevant to the standard/indicator of each unit with the highest mean ( $\bar{X} = 4.15$ ), followed by the choosing of standards/indicators to insert critical thinking ( $\bar{X} = 4.10$ ). The measurement and evaluation relevant to critical thinking and the choosing of media and learning resources were relevant the critical thinking was at the much closing to middle level ( $\bar{X} = 3.50$ ).



### **2.1.2 Results of the Evaluation on Competence on Inserting thinking standards and Characteristics that Facilitated Critical Thinking of the Teacher in 5 Learning Strands**

Basing on the form for analyzing the learning substances facilitating critical thinking in the 5 learning strands, the teachers had recorded the frequency of thinking standards and characteristics that had facilitated critical thinking having been inserted in the learning strands in the 1<sup>st</sup> semester as shown in Tables 3 – 4 as follows:

**Table 3** Number and Percentage of the Insertion of Thinking Standards as Appeared in Each Learning Strand

Learning Strand	Thinking Standards																	
	Clarity		Accuracy		Precision		Relevance		Adequacy		Logicalness		Significance		Fairness		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Thai Language	13	16.46	10	9.80	10	20.41	9	17.65	8	14.54	5	8.06	8	22.86	2	7.69	65	<b>14.16</b>
Mathematics	15	18.99	17	16.67	6	12.24	7	13.73	19	34.55	21	33.87	6	17.14	4	15.38	95	<b>20.70</b>
Science	25	31.65	22	21.57	24	48.98	16	31.37	4	7.27	9	14.52	7	20.00	14	53.85	121	<b>26.36</b>
Social Studies	10	12.66	12	11.76	6	12.24	13	25.49	5	9.09	13	20.97	11	31.43	5	19.23	75	<b>16.34</b>
English Language	16	20.25	41	40.20	3	6.12	6	11.76	19	34.55	14	22.58	3	8.57	1	3.85	103	<b>22.44</b>
Total	79	100	102	100	49	100	51	100	55	100	62	100	35	100	26	100	459	100
Percentage	17.21	-	22.22	-	10.68	-	11.11	-	11.98		13.51	-	7.62	-	5.66	-	100	-

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In Table 3, it is shown that, in setting up the instructional plans, the teachers from 5 learning strands had inserted thinking standards on accuracy the most (22.22%), followed by clarity (17.21%), and fairness the least (5.66%). Science learning strand teachers had inserted thinking standards the most (26.36%), followed by those of English learning strands (22.44%), and the least was the Thai language learning strand teachers (14.16%). In regard to the insertion of thinking standards in each of the learning strands, it was found that teachers in Thai language learning strands had inserted thinking standards on significance the most (22.86%) and precision the next (20.41%). Teachers in mathematics learning strands had inserted the thinking standards on adequacy the most (34.55%) and logicalness the next (33.87%). Teachers in science learning strands had inserted the thinking standards on fairness the most (53.85%) and precision the next (48.98%). Teachers in social studies, religion, and culture learning strands had inserted the thinking standards on significance the most (31.43) and relevance the next (25.49%). Lastly, the teachers in English learning strands had inserted thinking standards on accuracy the most (40.20%) and adequacy the next (34.55%).

**Table 4** Number and Percentage of the Insertion of Characteristics Facilitating Critical Thinking as Appeared in Each Learning Strand

learning strand	Characteristics Facilitating Critical Thinking																	
	Awareness One's own knowledge capacity		Perseverance & determination to find reasons		Freedom to think & decide		Attempt to examine evidences		Interested in the different perspectives		Courage to think & act out		Open-minded & reasonable		Have skill in searching for knowledge		All characteristics	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Thai Language	7	28	3	6.38	5	17.24	4	8.33	3	10.71	8	20	7	15.22	6	14.29	43	<b>14.10</b>
Mathematics	2	8	17	36.17	8	27.59	14	29.17	6	21.43	4	10	5	10.87	5	11.90	61	<b>20.00</b>
Science	1	4	15	31.91	2	6.90	12	25.00	15	53.57	20	50	22	47.83	19	45.24	106	<b>34.75</b>
Social Studies	4	16	6	12.77	7	24.14	9	18.75	2	7.14	4	10	6	13.04	6	14.29	44	<b>14.43</b>
English Language	11	44	6	12.77	7	24.14	9	18.75	2	7.14	4	10	6	13.04	6	14.29	51	<b>16.72</b>
<b>Total</b>	<b>25</b>	<b>100</b>	<b>47</b>	<b>100</b>	<b>29</b>	<b>100</b>	<b>48</b>	<b>100</b>	<b>28</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>46</b>	<b>100</b>	<b>42</b>	<b>100</b>	<b>305</b>	<b>100</b>
<b>Percentage</b>	<b>8.20</b>	<b>-</b>	<b>15.41</b>	<b>-</b>	<b>9.51</b>	<b>-</b>	<b>15.74</b>	<b>-</b>	<b>9.18</b>	<b>-</b>	<b>13.11</b>	<b>-</b>	<b>15.08</b>	<b>-</b>	<b>13.77</b>	<b>-</b>	<b>100</b>	<b>-</b>

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From Table 4, it was found that the instructional plan setting up of the 5 learning strands' teachers, the teachers had inserted characteristics that facilitated critical thinking, in general, on the attempt to examine the evidence the most (15.74%), perseverance and determination to find reasons the next (15.41%), and awareness of one's own knowledge and capacity the least (8.20%). When breaking down on each learning strand, it was found that science learning strand was inserted with the critical thinking facilitating characteristics the most (34.75%), mathematics learning strand the next (20.00%), and Thai language learning strand the least (14.10%). When the insertion of the characteristics in each learning strand, it was found that Thai language learning strand teachers had inserted the awareness of one's own knowledge and capacity the most (28.00%), and courage to think and act out the next (20.00%). Mathematics learning strand teachers inserted the perseverance and determination to find the reasons the most (36.17%) and attempt to examine evidence the next (29.17%). Science learning strand teachers inserted the interest in different perspectives the most (53.57%) and courage to think and act out the next (50.00%). Teachers in social studies, religion, and culture learning strand inserted the freedom to think and decide the most (24.14) and attempt to examine evidences the next (18.75%). Lastly, the teachers in English language learning strand had inserted the awareness of one's own knowledge and capacity the most (44.00%) and freedom to think and decide (24.14%).

## **2.2 The teacher's Competence in Setting Up the Instructional Plans to Enhance Critical Thinking**

After the teachers had collaboratively analyzed the contents of the learning strand that could facilitate the critical thinking, the sampled teachers had come up with the instructional plans and were to implement the instructional plan for three time for each learning strand. In each classroom teaching, the teachers of the particular learning strand jointly conducted action research. They collaboratively constructed, evaluated, and revised the instructional plans. Afterward, each teacher implemented the instructional plans during which there would be the peer-observations by a colleague teacher in the same learning strand and its head. Teacher 1 observed Teacher 2's teaching. Teacher 2 observed the teaching of Teacher 3 who would observe the teaching of Teacher 1. The head of the learning strand observed every teacher in the strand. After that, they got together to comment on one teacher at a time and collectively reflected on the teaching. The comments were used to set up the plan for the next teaching. They did this for 3 times and took the comments and observations from the 3<sup>rd</sup> time to set up the plan for the 4<sup>th</sup> time which focused only writing up the instructional plans.

From observing the instructional plan setting up behavior of the teachers by the researchers themselves, it was found that the teachers and learning strand heads had collaboratively analyzed, considered the appropriateness of the learning standards/indicators, and contents by linking to the thinking standards and characteristics that facilitated critical thinking. They carefully reviewed and criticized every aspect and tried to find the proper option in writing up the instructional plans.



From the interview with the teachers during the instructional planning stage on June 27, 2012, the teachers had expressed their views as summarized as follows:

*I had looked back at myself and found that the instructional plan to organize the learning and teaching activities had many points to be revised and developed. The instruction activities should be set up to allow the students to think both individually and in group. They have to practice critical, comprehensive, in depth and width, and know how to listen to opinion of the others.*

*A mathematics teachers*

*The teacher had to plan what he or she would teach the students to think in the an instructional plan and then everybody try it. The reflections made by colleague teachers could be used for planning the next 2 or 3 instructional plans by linking them to and inserting the thinking standards and characteristics that facilitated thinking. This process helped the teacher to indentify the instructional approach that opened more for the students to think.*

*A Thai language teacher*

*The process helped us understand and know how apply the thinking standards, characteristics, and capacity on critical thinking in writing up the details of the instructional plans. The teacher has to realize that the students have to learn what thinking standards are to facilitate the critical thinking. This enables use to better set up the instructional plans to promote critical thinking in the subject we teach.*

*An English language teacher*

In setting up the instructional plans, he teachers in each of the 5 learning strands had created the assignment to promote critical thinking for the students to engage with the activities in the instructional plans that were collectively constructed by the teachers. The process could be summarized as in Table 5 below:

**Table 5** Assignments to Enhance Critical Thinking for the Students to Engage in the 4 instructional plans

Instructional plans	Assignment	Thinking Standards	Characteristics
<b>Thai Language Learning Strand</b>			
Summarizing	Create 2 verses of Thai poem and translate into ordinary language	ST3 ST4 ST5 ST6	IT1 IT3 IT4 IT5 IT6 IT7 IT8
Concluding	Construct a mind map for the conclusion	ST2 ST4 ST6 ST7	IT1 IT4 IT3 IT8
Opinion Expressing	Analyze Pra Ruang's Proverbs	ST1 ST2 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
Reasoning	Analyze poems	ST1 ST2 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8

**Table 5 (Cont.)**

<b>Instructional plans</b>	<b>Assignment</b>	<b>Thinking Standards</b>	<b>Characteristics</b>
<b>Mathematics Learning Strand</b>			
Adding, subtracting, multiplying, and dividing of integers	Creating small notebook to summarize knowledge on integers	ST1 ST2 ST3 ST4 ST5 ST6 ST7	IT2 IT4 IT5 IT6 IT7 IT8
Multiplying squared numbers	Creating model for multiplying exponential numbers of the same base numbers and doing the exercise	ST1 ST2 ST4 ST5 ST ST6 ST7 ST8	IT2 IT3 IT4 IT5 IT6 IT7
Using properties of squared numbers	Designing methods to solve word problems assigned and creating the standard procedures for mathematics problem solving	ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
Percentage in everyday life	Designing methods to solve word problems assigned	ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
<b>Science Learning Strand</b>			
Weather Phenomena	Creating a simple anemometer	ST1 ST2 ST3 T4 ST5 ST6 ST7	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
Natural Indicators	Creating natural indicators and Recording group discussions	ST1 ST2 ST3 ST4 ST ST6 ST7	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
Sorting out Heterogeneous Mixture	Recording the conclusion, questions & answers, recording the experiment's results	ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8	IT2 IT5 IT8
Solution in Everyday Life	Designing experiment from the engagement in the experimenting activities	ST1 ST2 ST3 ST4 ST5 ST6 ST7	IT2 IT4 IT5 IT6 IT7 IT8

**Table 5 (Cont.)**

<b>Instructional plans</b>	<b>Assignment</b>	<b>Thinking Standards</b>	<b>Characteristics</b>
<b>Social Studies, Religion, and Culture Learning Strand</b>			
Good Citizenship	Role play and report on acting out good citizenship	ST1 ST4 ST5 ST6 ST7 ST8	IT1 IT3 IT5 IT6 IT7
Resource Management via Self-sufficiency Economy Philosophy	analyzing the content for philosophical principle of self-sufficiency economy and analyzing news from the media	ST1 ST2 ST3 ST4 ST ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
Buddhist Proverbs	Analyzing Buddhist proverbs and analyzing news in the newspapers	ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
Culture and Life Maintenance	analyzing essences of Thai Culture, similarities and differences between Thai culture and that of other ASEAN countries	ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
<b>English Language Learning Strand</b>			
Present Simple & Present Continue Tense	Comparing time-related terms to identify the appropriate tense	ST1 ST2 ST3 ST4 ST5 ST6 ST7	IT1 IT2 IT4 IT5 IT6 IT7 IT8
Young Heroes (reading)	Writing up comments on the story “ Young Heroes ”	ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
Control your TV	Speaking and writing on the advantages and disadvantages of the television	ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8
Television	Writing the comments on American school life and Thai school life	ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8	IT1 IT2 IT3 IT4 IT5 IT6 IT7 IT8

\*Notes

**Thinking standards :** ST1 Clarity      ST2 Accuracy      ST3 Precision  
                                  ST4 Relevance      ST5 Adequacy      ST6 Logicalness  
                                  ST7 Significance      ST8 Fairness

**Characteristics that facilitated critical thinking :**

- IT1 Awareness of one's own knowledge and capacity
- IT2 Perseverance and determination to find reason
- IT3 Freedom to think and decide
- IT4 Attempts to examine evidences
- IT5 Interested in the different perspectives
- IT6 Courage to think and act out
- IT7 Open-minded and reasonable
- IT8 Have skills in searching for knowledge

From Table 5, it is clear that, in every instructional plan, the students would have to do the assignments dealing with thinking standards and characteristics that facilitated critical thinking.

There was information to show that the teachers have competence in setting up the instructional plans that facilitated critical thinking teaching. From the form to evaluate the 4 instructional plans facilitating critical thinking teaching collaboratively developed by the teachers. The planning process was composed of 2 phrases. Phase 1 was for planning the instruction that was generally appropriate. Phase 2 was to make the plans facilitative to critical thinking which was evaluated by the teachers and learning strand heads. The results are as in Table 6.

**Table 6** Mean and Standard Deviation of the Scores Evaluating How the Instructional Plans Facilitated the Teachers' Critical Thinking Teaching (N = 20)

Evaluative Points	Plan 1		Plan 2		Plan 3		Plan 4		Total		
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	Level
<b>Part 1-Appropriateness of the Instructional Plans in General</b>											
1. Introduction was with details and clear	4.20	0.69	4.43	0.47	4.40	0.59	4.55	0.64	4.40	0.60	Much
2. Identified the standards and indicators required by the curriculum in clear, correct, and comprehensive ways	4.45	0.51	4.70	0.47	4.65	0.48	4.48	0.41	4.57	0.47	Very Much
3. Identified the content relevant to the standards and indicators	4.55	0.51	4.70	0.57	4.65	0.48	4.65	0.48	4.64	0.51	Very Much
4. Identified the components of the instructional plans relevant to the learning strand, standards, and indicators	4.30	0.73	4.60	0.59	4.60	0.59	4.65	0.48	4.54	0.60	Very Much
5. Identified the assignments/tasks for the students to engage in clear basis and relevant to the learning strands and learning standards	4.10	0.71	4.55	0.51	4.50	0.60	4.65	0.48	4.45	0.58	Much
6. The instructional plans set up was relevant to the learning strand and standards	3.95	0.51	4.40	0.50	4.50	0.68	4.50	0.51	4.31	0.55	Much
7. The instructional plans were made of the learning processes which were well organized along the clear and comprehensive steps	3.65	0.67	4.25	0.44	4.35	0.58	4.43	0.57	4.17	0.57	Much
<b>Mean Average (Part 1)</b>	<b>4.17</b>	<b>0.61</b>	<b>4.51</b>	<b>0.50</b>	<b>4.52</b>	<b>0.57</b>	<b>4.55</b>	<b>0.51</b>	<b>4.44</b>	<b>0.55</b>	<b>Much</b>



**Table 6 (cont.)**

Evaluative Points	Plan 1		Plan 2		Plan 3		Plan 4		Total		
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	Level
<b>Part 2 Critical Thinking Enhancement</b>											
8. The instructional activities opened for the students to individually think.	3.70	0.65	4.15	0.36	4.25	0.63	4.50	0.51	4.15	0.54	Much
9. The instructional activities opened for the students to think in group.	3.70	0.57	4.30	0.47	4.75	0.44	4.75	0.44	4.38	0.48	Much
10. The instructional activities encouraged the students to dare to think and act out	3.65	0.58	4.10	0.30	4.55	0.51	4.95	0.22	4.31	0.40	Much
11. The instructional activities opened for the students to review and criticized the conclusions derived in careful way.	3.55	0.60	4.15	0.36	4.50	0.51	4.65	0.48	4.21	0.49	Much
12. The instructional activities encouraged the students to use the thinking standards in regulating their own thinking	3.60	0.68	4.20	0.41	4.40	0.50	4.65	0.48	4.21	0.52	Much
13. The instructional plans clearly identified media, learning tools, and learning resources to supplement the students' earning.	3.80	0.83	4.20	0.41	4.45	0.60	4.50	0.60	4.24	0.61	Much
14. The instructional plans identified the clear and comprehensive methods for measurement and evaluation.	3.55	0.75	3.90	0.39	4.35	0.48	4.55	0.51	4.09	0.53	Much
15. The period instructional plans were congruent with the learning unit plans.	3.90	0.64	4.25	0.44	4.40	0.50	4.50	0.51	4.26	0.52	Much
<b>Average Mean (Part 2)</b>	<b>3.68</b>	<b>0.66</b>	<b>4.15</b>	<b>0.39</b>	<b>4.45</b>	<b>0.52</b>	<b>4.63</b>	<b>0.46</b>	<b>4.23</b>	<b>0.51</b>	Much

In Table 6, Part 1 – the appropriateness of the instructional planning in general, it was found that it was at much level ( $\bar{x} = 4.44$ ). Mean of each next plan was higher than the previous one (Plan 1 -  $\bar{x} = 4.17$ , Plan 2 -  $\bar{x} = 4.51$ , Plan 3 -  $\bar{x} = 4.52$ , and Plan 4 -  $\bar{x} = 4.55$ ). When considering on evaluative point, most were at much. Three of them were at very much level. These were, in ranking order of the means, the identification of content relevant to the standards and indicators, the identification of the standards and indicators required by the curriculum in clear, correct, and comprehensive ways, and, the identification of the components of the instructional plan relevant to the learning strand, standards, and indicators. In part 2, concerning the enhancement of the critical thinking, it was found that, in general, it was much level ( $\bar{x} = 4.23$ ). The mean of the next plan was higher (Plan 1 -  $\bar{x} = 3.68$ , Plan 2 -  $\bar{x} = 4.15$ , Plan 3 -  $\bar{x} = 4.45$ , and, Plan 4 -  $\bar{x} = 4.63$ ). When each evaluative point of evaluation was concerned, it was found that it all was at much level. The highest mean was on the instructional activities opening for the students to think in group ( $\bar{x} = 4.38$ ), followed by the one on the instructional activities encouraging the students to dare to think and act out ( $\bar{x} = 4.31$ ).

### **2.3 Teacher's Competence in Implementing Instructional Plans Collaboratively Developed by the Teachers**

#### **2.3.1. Results of Instructional Plan Implementation (from observation and informal interviews)**

The instructional plans collaboratively developed by the teacher were implemented with the supervision and reflection by the teachers of the 5 learning strands. Observation was conducted on the developed behavior of the students, including the problems and obstacles before the reflection on them. The results of the reflections were used for setting up the next cycle of instructional plans along the action research cycles which included plan, act, observe, and reflect. The result of the cycle was to be used for the planning phase of the next cycle until the 3<sup>rd</sup> cycle which was the final one.

From observing the implement of the instructional plans by the teachers in the 5 learning strands, it was found that the teachers learning strand 5 learning strands had required the assignment and tasks that would promote the critical thinking and lead to the instructional activities that facilitated the thinking. While implementing the instructional plans, the teachers had used questions to emphasize the main issues of the lesson by giving the students enough time to think without rushing to get the students' response. They also encouraged the students to examine, criticize, and look for the reliability of the information including the logicalness of their answer before exchanging it with their friends in the group where everybody collaboratively mobilized the ideas to find the options and reasonable conclusion. The teacher also opened for the opportunity for the students to diversely express their ideas without jumping to conclude. These points were reflected in the following observations of the 3 teachers as follows:

*Mathematics Teacher 2 (August 5, 2012)*

*The teacher assigned the work for the students to engage starting with the teacher together with students examining the principles embedded in the case. The teachers repeatedly reviewed the principles to allow the students to carefully and critically think before giving out the answer and the teacher did not rush for the answer from the students. Afterward, the teacher had the students work on the assignment card and share with the classmates during their attempt to find the answer. The teacher proposed diverse guidelines for solving the problem and had the students to collaboratively examine them. They freely discussed and used critical thinking on the information before making decision. The teacher opened for the students to raise questions for both the teacher and their classmates to answer. The teacher repeatedly asserted that if the student could not think by him/herself, he or she should find a companion to think in pair. If thinking in pair could not yet reach the answer, they should join the group to find the answer. The students had to be critical and to review the principles to the point it became their skill of solving the confronting problem. The continuous practice would assure the skill to solve the confronting problem. They must be sure before giving out the answer.”*

*Thai Language Teacher 3 (August 14, 2012)*

*The teacher had assigned the students to study Praruang’s proverbs. The students had to choose a particular proverb and study it to come up with the point such proverb had attempt to remind. If the student followed it, what effect would be on him/her. While the students were engaging in the activities, the Thai language teacher kept reminding the students to use reasoning to carefully review the scenario before reaching any conclusion. The students were also encouraged to exchange ideas with friends in the class in the group before choosing a representative to present in front of the classroom. In the presentation, other students were encouraged to criticize. Afterward, the teacher would try to facilitate the student to link the issues and worked with them in making conclusion on the proverb.*

*Social Studies, Religion, and Culture Teacher1(August 14, 2012)*

*The teacher gave out 3 assignments. Before that, the teacher had the student watch television clip on street fighting. Afterward, the students individually predicted the consequences of such fighting before dividing in groups to find the solution. The teacher tried to connect to religious principles of various religions feasible for dealing with the problem. They collectively analyzed the situation and focused also on Buddhist philosophy for solving the problem and chose a representative to report in front of the class. While students engaging in the activities, the teacher reminded the student that they had to be critical and consider the information. They had to mobilize ideas freely derived individually. Though there were different points of view on the issue, one had to be open-minded to listen to. To say a thought was wrong required reasoning to support. The teacher told the students to get together for discussion before the representative would present.*

From interviewing with the teachers in the 5 learning strands regarding the implementation of the instructional plans, the teachers expressed their opinion that teachers could design the activities to have the students think individually then proposed it to exchange in the group. This would ensure the students' learning better. In each time of using thinking standards, the teachers had gained better clarity, accuracy, precision, wide perspective, logicalness, and fairness in the things to be taught. Besides, such process should also foster the students to adopt the characteristics that facilitated critical thinking. This was realized by the following 3 teachers.

*English Language Teacher 1 (September 4, 2012)*

*The use of the instructional plans for enhancing critical thinking facilitated the teachers to learn and could provide instruction by utilizing thinking standards to build up the characteristics that facilitated critical thinking onto the students.*

*Mathematics Teacher 3 (September 4, 2012)*

*The collaborative reflection on the implementation of instructional plans ensured the teachers' competence in designing and setting up the instructional activities and inserting the critical thinking standards and characteristics relevant to the learning strand. The teachers could set up the activities to stimulate the students to identify the variety of options for the answer. The instruction designed to have the students exchange their ideas and the use of questions would stimulate the students to work out on the ambiguous things. Teacher should give the students enough time for carefully thinking and identifying the reasons for the answer. The teacher should also provide psychological supports for the students in the process.*

*Science Teacher 1 (September 4, 2012)*

*Having clear knowledge and understanding on thinking standards and characteristics that facilitate critical thinking, the teachers would be able to design instructional activities suitable to the learning strand. The teachers should not jump to the conclusion but have the students carefully think and exchange their ideas with the classmates to effectively enhance the critical thinking.*

**2.3.2 Results of the Observation on the Implementation of the Instructional Plans that Facilitated Critical Thinking Teaching** – The instruction in general and on enhancing critical thinking was as shown in Tables 7 and 8.



**Table 7** Mean and Standard Deviation of Scores on the Evaluative Points on the Instruction in General

Evaluative Points	Observation 1			Observation 2			Observation 3			Total		
	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level
1. Setting up the instructional plans before teaching	3.55	0.68	Very Much	3.25	0.71	Much	3.75	0.44	Very Much	3.52	0.61	Very Much
2. Interesting introduction to the lesson	3.05	0.82	Much	3.1	0.64	Much	3.4	0.59	Much	3.18	0.68	Much
3. Carrying out instruction along procedural steps	3.35	0.74	Much	3.2	0.61	Much	3.65	0.58	Very Much	3.40	0.64	Much
4. Clearly setting up the instructional issues/goals	3.10	0.71	Much	3.15	0.58	Much	3.7	0.47	Very Much	3.32	0.59	Much
5. Organizing instructional activities along various Methods	2.45	0.68	Mode rate	2.55	0.51	Much	3.3	0.57	Much	2.77	0.59	Much
6. Providing reinforcement for student's correct response	3.05	0.99	Much	3.25	0.71	Much	3.75	0.44	Very Much	3.35	0.71	Much
7. Students were active and joyful in studying	2.65	0.93	Much	3.00	0.56	Much	3.55	0.51	Very Much	3.07	0.67	Much
8. Inserting morality during the instruction	2.85	0.93	Much	3.20	0.69	Much	3.4	0.59	Much	3.15	0.74	Much
10. The teacher was kind, fair, and without bias.	3.35	0.74	Much	3.40	0.68	Much	3.65	0.48	Very Much	3.47	0.63	Much
11. The teacher concluded the lesson clearly and Understandably	3.00	0.79	Much	3.20	0.52	Much	3.75	0.44	Very Much	3.32	0.58	Much
12. Measurement and evaluation were systematic and appropriate	2.80	0.76	Much	3.20	0.61	Much	3.55	0.51	Very Much	3.18	0.63	Much
<b>Mean Average</b>	<b>3.01</b>	<b>0.79</b>	<b>Much</b>	<b>3.13</b>	<b>0.62</b>	<b>Much</b>	<b>3.58</b>	<b>0.51</b>	<b>Very Much</b>	<b>3.24</b>	<b>0.64</b>	<b>Much</b>



Table 7 - Appropriateness of the instruction in general – It was found that in general the instruction was appropriate at very much level ( $\bar{x} = 3.24$ ). When each of the evaluative points was concerned, most of them were appropriate at much level. The setting up of the instructional plans before teaching was highest evaluated ( $\bar{x} = 3.52$ ), followed by the teacher being kind, fair, and without bias ( $\bar{x} = 3.47$ ), and organizing instructional activities along various methods was at the least appropriate level ( $\bar{x} = 2.77$ ).

**Table 8** Mean and Standard Deviation of the Evaluation on the Implement of the Instructional Plans Enhancing Critical Thinking

Evaluative Points	Observation 1			Observation 2			Observation 3			Total		
	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level
1. Focusing on main issues	2.90	0.91	Much	3.2	0.69	Much	3.5	0.51	Very Much	3.20	0.70	Much
2. Organizing activities to facilitate the students' Examination ,observation, information collection, analytical and synthetic thinking, and problem solving	3.00	0.97	Much	3.15	0.67	Much	3.7	0.47	Very Much	3.28	0.70	Much
3. Students had thought out with various modes and built up the body of knowledge by themselves	2.80	0.89	Much	3.00	0.72	Much	3.7	0.47	Very Much	3.17	0.69	Much
4. Having the students to carefully review and criticize	2.95	0.68	Much	3.30	0.65	Much	3.65	0.58	Very Much	3.30	0.64	Much
5. Having the students to be determined to find reasons to support the reasonable decision making	2.75	0.71	Much	3.15	0.58	Much	3.65	0.67	Very Much	3.18	0.65	Much
6. Encouraging the students to take part in expressing opinion, search for knowledge, and find the answer by themselves	2.95	0.82	Much	3.15	0.67	Much	3.7	0.47	Very Much	3.27	0.65	Much
8. Encouraging the students to listen to the others' opinions	2.70	0.80	Much	3.10	0.78	Much	3.35	0.58	Much	3.05	0.72	Much
9. Opening for the students to raise questions and opinion and dare to think and act out	2.75	0.96	Much	3.15	0.74	Much	3.55	0.68	Very Much	3.15	0.79	Much
10. Having the students to carefully examine the information before making decision	2.70	0.86	Much	3.25	0.44	Much	3.65	0.58	Very Much	3.20	0.63	Much
<b>Mean Average</b>	<b>2.83</b>	<b>0.84</b>	<b>Much</b>	<b>3.16</b>	<b>0.66</b>	<b>Much</b>	<b>3.60</b>	<b>0.55</b>	<b>Very Much</b>	<b>3.20</b>	<b>0.68</b>	<b>Much</b>

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Table 8 shows the enhancement of the critical thinking which was found that in general the implement was at very much level ( $\bar{x} = 3.20$ ). When considering each evaluative issue, it was found that most of them were practiced at much level with having the students to carefully review and criticize the most at very much ( $\bar{x} = 3.30$ ), followed by organizing activities to ensure the students' examination, observation, information collection, analytical and synthetic thinking, and problem solving ( $\bar{x} = 3.28$ ).

#### **2.4 The Developed Critical Thinking of the Students as the Consequence of the Teacher's Instruction**

The teachers in the 5 learning strands had implemented the instructional plans set up together, the colleague teachers in the same learning strands and the researcher had observed the developed critical thinking behavior of the students during Instructional Plans 1-3 of the teachers in the learning strand. It was found that the outstanding behavior of the students was their being interested in and paying attention to the study, taking part in answering the question, being active in searching for clear and non-ambiguous answers, checking their thought with those of their friends and not jumping to conclude, dared to think and act out, being able to make relevant conclusion, being interested in other perspectives than their own, and listening to their friends' opinion. Their behaviors that should be improved included participation in the group work, interest in and attention to the study of some students, some students had lacked of confidence in answering the question and their spending time on certain activity more than that allowed.

In interviewing with the teachers on critical thinking behavior of the students at the end of the 3<sup>rd</sup> instruction, the teachers expressed their opinions as follows:

*Mathematics Teacher 2 (September 10, 2012)*

*The students helped one another in finding the reasons to support the decision in working on each task of the assignment to achieve the objective of such task. The students had carefully reflected on their own thinking and known how to provide moral supports for their classmates who had not yet done the task leading to their mutual understanding, good relationship, and trust. They learned to be good leader and followers, and listen to opinions of the others, not to jump to conclude basing mostly on their own thought but searched for additional information and reasons from the class discussion and could choose and decide relevant to the issue.*

*Social Studies, Religion, and Culture Teacher 2 (September 10, 2012)*

*The students had modified the behavior on expressing opinion with careful criticism, finding reasons, not jumping to conclude but exchange ideas with friends, listening to different opinions, engaging in the interaction, and dare to think and act out on reasonable basis.*

*English Language Teacher 1 (September 10, 2012)*

*The students could apply knowledge learned, were with careful thinking and reflecting, and examine the information before deciding to do something, were able to express opinion from various perspective, dared to think and act out, were open-minded, had reasons, and knew how to choose information to support the decision on reasonable basis.*

*Thai Language Teacher 1 (September 12, 2012)*

*After using instructional plans that enhanced thinking each time, it was found that most students were aware of their own knowledge and capacity, patient and determined to find the answer, and increasingly dared to express, making the learning atmosphere full of fun.*

*Science Teacher 3 (September 12, 2012)*

*The students were trying and free to think, capable of finding additional knowledge, brave to confidently express opinion, reasonable in learning, and able to work along with others and accept other people's opinion of the others. When encountering with problem, they could make decision and choose the way to solve the problem on reasonable, clear, reasonable, and fair bases.*

The results of observation on the developed critical thinking behavior of the students using observation form during the teacher's teaching. The general picture of the whole class in each instruction was presented in Table 9 below.

**Table 9** Mean and Standard Deviation of the Scores on the Students' Critical Thinking Behavior (N = 20)

Points to Be Evaluated	1 <sup>st</sup> Evaluation			2 <sup>nd</sup> Evaluation			3 <sup>rd</sup> Evaluation			Total		
	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level	$\bar{X}$	S.D.	Level
1. Interested and active in searching for knowledge	2.95	0.75	Much	2.95	0.51	Much	3.65	0.48	Very Much	3.18	0.58	Much
2. Opening mind to listen to friend's opinions	2.85	0.48	Much	3.10	0.64	Much	3.45	0.60	Much	3.13	0.57	Much
3. Determined to find sufficient supporting information	2.65	0.87	Much	2.90	0.78	Much	3.35	0.58	Much	2.97	0.74	Much
4. Focusing on main than the minor issues	2.75	0.96	Much	2.90	0.71	Much	3.35	0.48	Much	3.00	0.72	Much
5. Attempting to examine the evidences	2.85	0.81	Much	3.10	0.55	Much	3.45	0.51	Much	3.13	0.62	Much
6. Not jumping to conclude (think before responding)	3.00	0.56	Much	3.05	0.68	Much	3.25	0.55	Much	3.10	0.60	Much
7. Interested in differing perspectives	2.80	0.61	Much	3.05	0.68	Much	3.30	0.47	Much	3.05	0.59	Much
8. Carefully review and criticize before deciding	2.70	0.73	Much	3.10	0.64	Much	3.50	0.51	Very Much	3.10	0.63	Much
9. Using information to support decision on reasonable basis	2.70	0.65	Much	3.00	0.64	Much	3.55	0.51	Very Much	3.08	0.60	Much
10. Determined to find reasons to reasonably support decision	2.55	0.60	Much	3.20	0.61	Much	3.50	0.51	Very Much	3.08	0.57	Much
11. Able to link between causes and effects in a clear way	2.65	0.74	Much	2.85	0.74	Much	3.10	0.55	Much	2.87	0.68	Much
13. Accepting one's wrong thought and be ready to modify it	2.80	0.61	Much	3.15	0.36	Much	3.55	0.60	Very Much	3.17	0.52	Much
13. Dare to think and express in the group discussion	2.65	0.93	Much	3.25	0.55	Much	3.40	0.68	Much	3.10	0.72	Much
14. Be responsible for one's individual and group learning	2.80	0.83	Much	3.20	0.69	Much	3.60	0.50	Very Much	3.20	0.67	Much
15. Able to conclude and present the clear issues	2.80	0.69	Much	3.05	0.68	Much	3.30	0.57	Much	3.05	0.65	Much
<b>Mean Average</b>	<b>2.76</b>	<b>0.72</b>	<b>Much</b>	<b>3.05</b>	<b>0.63</b>	<b>Much</b>	<b>3.42</b>	<b>0.54</b>	<b>Much</b>	<b>3.08</b>	<b>0.63</b>	<b>Much</b>

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In Table 9, it was found that the student's developed critical thinking behavior in general was at very much level ( $\bar{x} = 3.08$ ). When breaking down into the times of implementation, it was found that the mean score of the students' critical thinking behavior had increased with  $\bar{x} = 2.76$  from the 1<sup>st</sup>,  $\bar{x} = 3.05$  from the 2<sup>nd</sup>, and  $\bar{x} = 3.42$  from the 3<sup>rd</sup> evaluation. However, when considering on each evaluative point, the developed critical thinking behavior of the whole class from the use of the teacher's 3<sup>rd</sup> instructional plan which was the last one was as follows. The students developed mostly in 6 behaviors, in ranking order, namely, Interested and active in searching for knowledge ( $\bar{x} = 3.65$ ), Be responsible for one's individual and group learning ( $\bar{x} = 3.60$ ), Using information to support decision on reasonable basis, and Accepting one's wrong thought and be ready to modify it ( $\bar{x} = 3.55$ ), and, Carefully review and criticize before deciding, and Determined to find reasons to reasonably support decision ( $\bar{x} = 3.50$ ).

### **Part 3 Problems, Obstacles, and Guidelines for Competency Development on Critical Thinking Teaching of the Teacher at Lower Secondary Education**

#### **3.1 Problems, Obstacles, and Solutions**

From the operation to develop the teachers' critical thinking teaching competence through collaborative learning and action research in the 1<sup>st</sup> semester of 2012 academic year, the researcher had concluded from the information analysis on problems, obstacles, and the action taken to solve problems and improve the situation. These are presented along the phases of the research process as in Table 10.

**Table 10** Problems, Obstacles, and Solution Taken to Improve the Teachers' Critical Thinking Teaching Competence

<b>Phase</b>	<b>Problems/Obstacles</b>	<b>Solutions Taken</b>
Developing knowledge and understanding on critical thinking of the teachers in the 5 learning strands	<ul style="list-style-type: none"> <li>- Knowledge and understanding on critical thinking of the teacher were not yet clear, particularly when the uses of thinking standards and characteristics that facilitated critical thinking were concerned.</li> <li>- The teachers' competences on analytical and synthetic thinking, decision making, and problem solving of each the teacher differed and diverted.</li> </ul>	Setting up a collaborative learning workshop on basic knowledge and understanding concerning analytical, synthetic, decision making, and problem solving and using thinking standards and building up of characteristics that facilitated critical thinking in the training process for the teachers in the 5 main learning strands
Analysis of the appropriateness of the insertion of the critical thinking teaching in the content of the learning strand	In analyzing the congruence of the learning standards, indicators, and the selection of content to insert thinking standards and characteristics that facilitate critical thinking, the teachers had not yet fully come up with the	Calling the meeting of the teachers in the same learning strand to collectively reflect and mobilize opinions, carefully examine, find logicalness, appropriateness, relevancy, congruence, and integration, select the content,

Table 10 (cont.)

Phase	Problems/Obstacles	Solutions Taken
	appropriate instructional activities.	focusing on using thinking standards as the framework for designing the instructional activities that facilitated critical thinkers of the students
Setting up the instructional plans	<ul style="list-style-type: none"> <li>- The instructional design had focused on carrying out the activities basing on the content than enhancing the characteristics that facilitated critical thinking</li> <li>- The d instructional activities set up were not suitable with the time available for the instruction (1 hour).</li> <li>- Many teachers were not able to design the tasks, assignments, or tools that helped the students to practice critical thinking in various, interconnecting, and continuous ways.</li> </ul>	<ul style="list-style-type: none"> <li>- Called the meeting to mobilize the ideas, reflect the operation, and exchange among the teachers in the same learning strand concerning the setting up of the instructional activities that were relevant to the thinking standards, characteristics that facilitated thinking, critical thinking competence, and the content of each learning strand; carefully examine the appropriateness of activity design, variety, continuity, and length of the assignments,</li> <li>- The researcher and the teachers collaboratively designed the analysis table on learning unit, standards/ indicators, tasks/assignments, measurement and evaluation, instructional activities, thinking standards, characteristics that facilitated thinking, and media/ learning resources to facilitate the teachers in appropriately connecting the issues.</li> </ul>

**Table 10** (cont.)

Phase	Problems/Obstacles	Solutions Taken
Implementing instructional plans	<ul style="list-style-type: none"> <li>- Some teachers repeatedly used the instruction to teach the students to think which failed to challenge the students to learn.</li> <li>- The instructional activities that opened for the students to discuss and learn from one another might be loud, some students did not totally engage, some teachers lacked of skill in managing the class making them unable to direct the activities to the objectives as set in the plan.</li> <li>- In critical thinking teaching on some contents had to take time to open the opportunity for the students to think and exchange then review and reflect on the information mobilized all of which took time and in the large class, the teacher would have problem on time management.</li> <li>- In developing critical thinking using collaborative learning and action research required all the teachers to be available at the same time for them to get together and reflect on their implementation of the instructional plans.</li> </ul>	<ul style="list-style-type: none"> <li>- Setting up the meeting to reflect on the use of instructional plans and the guideline to organize instructional activities centering at students.</li> <li>- A resource person was invited in to provide supplementary knowledge to the teachers on designing the student-centered instruction.</li> <li>- Set up a meeting to mobilize ideas and exchange on classroom management techniques among the teachers with a resource person invited to comment and provide additional knowledge.</li> <li>- The researcher had advised the teachers to mobilize ideas on designing the learning activities relevant to the class size.</li> <li>- The researcher recommended the School administrators to set up the policy on number of students per class to be suitable for the operation of the instructional activities.</li> <li>- Set up the schedule for the teachers of the same learning strand to be free at the same time.</li> </ul>

Results of the questionnaire asking 15 teachers in the 5 learning strands on problems and obstacles encountered in carrying out their critical thinking teaching. The teachers had responded to the questionnaire after each of the three instructions was as in Table 11 as follows.

**Table 11** Frequency and Opinion of the Teachers on Problems and Obstacles of the Teacher's Critical Thinking Teaching (N=15)

Opinion	Frequency	%
1. Time allocated for each instructional planning was not sufficient	15	100
2. Instructional activities to enhance critical thinking were not diverse enough.	14	93.33
3. The slow-learning students took a long time to find the answer.	12	80.00
4. Large number of students in the class lessened the students' intensive participation in all the activities.	12	80.00
5. Students lacked of skill on presentation and some groups could not come up with the main ideas.	7	46.66
6. Media and equipments were not facilitative to the teaching on thinking and were not sufficient.	7	46.66
7. There were few connecting questions made by the students.	6	40.00
8. Measurement and evaluation on the student's thinking were not clear.	5	33.33

From Table 11, it was found that the teachers had mostly reflected that the time allocated for each instruction was not sufficient (100%) followed by the instructional activities to promote critical thinking were not diverse (93.33%) and the least problematic problem was the unclear measurement and evaluation (33.33%).

**Table 12** Opinion of the Teachers Concerning Critical thinking teaching Competency Development for the Teacher (N=15)

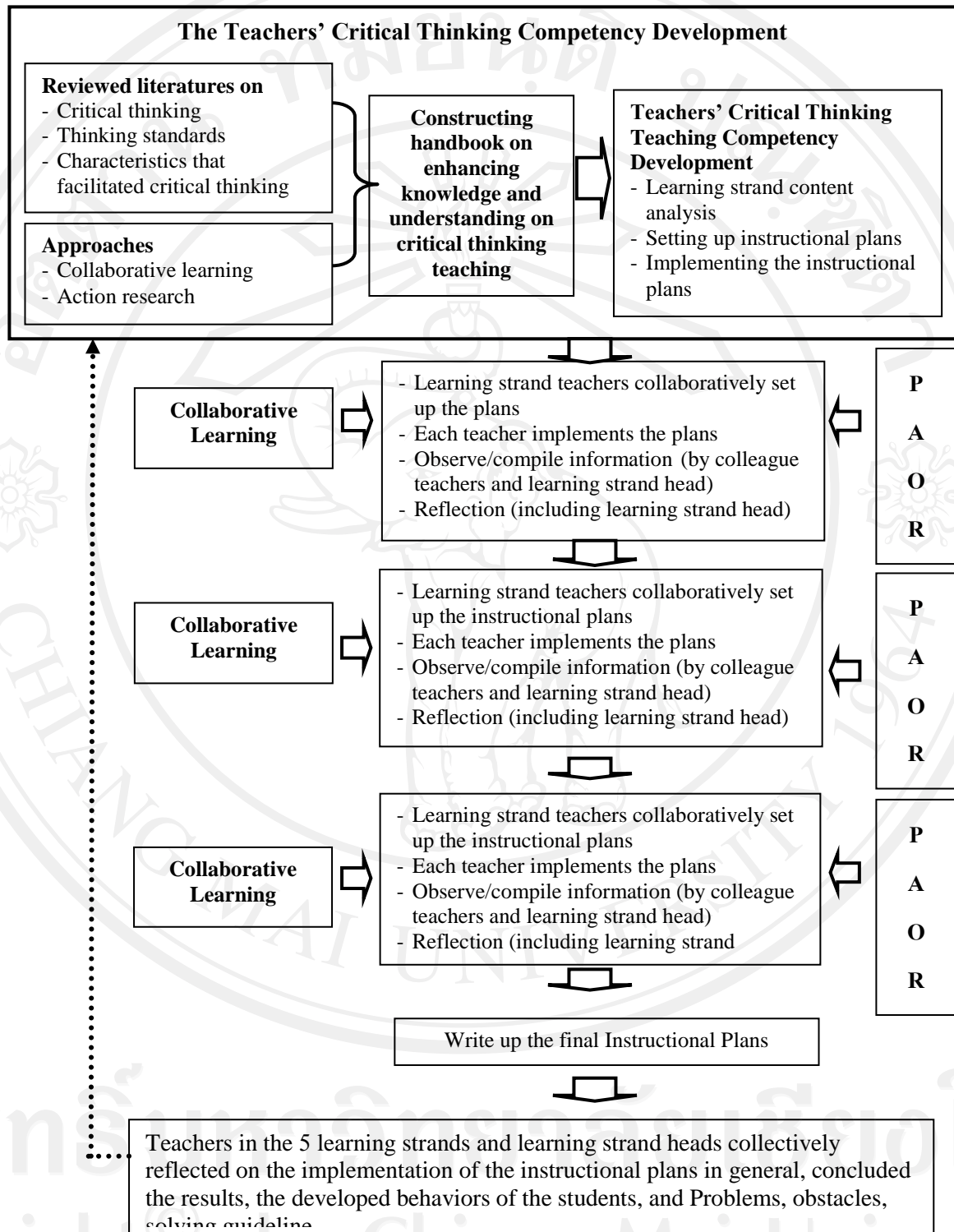
Competence Needed to Be Developed	Frequency	%
1. Using more diverse techniques in setting up the instruction that facilitated the student's thinking both individually and in group.	14	93.33
2. Increasingly using thinking-stimulating questions that were related to thinking standards and thinking characteristics.	13	86.66
3. Using techniques for arranging students into groups and their group work presentation.	11	73.33
4. Designing the instructional activities that suited the contents, activities, and time.	7	46.66
5. Classroom management techniques	6	40.00

From Table 12, it was found that the teachers needed their competence to be developed the most was using more diverse techniques in setting up the instruction that facilitated the student's thinking both individually and in group (93.33%), followed by increasingly using thinking-stimulating questions that were related to thinking standards and thinking characteristics (86.66%). The two least wanted competences to be developed were classroom management techniques and collaborative learning.

### **3.2 Guideline for the Teachers' Critical Thinking Teaching Competency Development**

The research on critical thinking teaching competence of the teacher in The Prince Royal's College had derived the guideline for the teacher teaching competency development. It starts from developing knowledge and understanding on critical thinking, thinking standards, characteristics that facilitated thinking to the use of handbook enhancing knowledge and understanding one critical thinking in developing the capacity on analyzing the learning strand contents the facilitated the students' critical thinking, setting up the instructional plans, and implementing the instructional plans. The process employed collaborative learning and action research covering the teachers' reflection which was highly crucial for revising and implementing the instructional plans. The researcher proposed the approach for the teacher's critical thinking teaching competency development as in Chart 5 as follows:





**Chart 5 :** Model for Developing the Teachers' Critical Thinking Teaching Competence