Chapter 2
Related Concepts and Theories

In this research on the results of developing the competence in teaching critical thinking using collaborative learning and action research of the teachers in a large private school, the researcher had reviewed the related literatures on the following issues.

1. Critical Thinking
   - 1.1 Definitions of Critical Thinking
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1. Critical Thinking

1.1 Definitions of Critical Thinking

The Thai term for "criticism" as defined in the dictionary published in 1982 by the Royal Institute is the intelligence that is able to know or to provide correct reasoning. Others also define the term whose definitions could be classified in 2 groups as follows:

1. Critical thinking that focuses on decision making basing of the information and reasoning: This group defines critical thinking as the analysis of the argument leading to the agreement, acceptance, conforming, or denial (Ennis, 1990: 4; Fowler, 2001: Online; Nakemanurak, Penpisut 1994: 14; Suwannajarus, Supannee, 2000; Moonkham, Suwit, et al, 2006: 46). Moreover, Kelly (2001: 2) and Parker (2001: 1) agreed in their defining the term critical thinking that it was the thinking that evaluated the situation of the argument. Meanwhile, Cottrell (2005: 1) stated that critical thinking was a cognitive activity that connected to the mental process which included attention, classification, selection, and decision making.

2. Critical thinking that focuses on cognitive process: This group definedcritical thinking as the thinking during thinking. It constructed a thought and used it in analyzing, synthesizing, and evaluating the information acquired or judged by observing, criticizing, reasoning, or communicating as the guideline for a belief or action and basing on cognitive values of the issues (Scriven and Paul, 2001: Online; Nosich, 2001: 3). Thinking about thinking is the operation on the analysis, evaluation, and development of a thought. It is a skill and enthusiasm in explaining, evaluating, observing, and communicating information and the argument. Paul (2006: 5) explained critical thinking as the thinking mode regarding the content or problem to prove the quality of thinking through the skills in analyzing, evaluating, reconstructing, self-regulating, and correcting. Charoenwongsak, Kriangsak (2006: 117-127) added the definition to the term. He defined critical thinking as an intellectual process to know or to reason in a correct, fair, neutral, non-biased, nor taking side, careful, not jump to conclude, without leaving off any minor evidence, with consciousness and search for knowledge to answer the question, and comprehensively consider all the related information.

However, critical thinking is the thinking that comes in various forms unable to be exclusively classified as there are overlaps and interconnections within the term. It requires abilities and components to form the critical thinking such as the cognitive process or thinking during the thinking requires information and reasoning leading to a decision making. In making decision, one needs to think over and over or to review the thinking. The definitions proposed by these two groups, however, depend on each other to reach the needed goal.

From these definitions of critical thinking mentioned above, it could be concluded that critical thinking is a cognitive process that facilitates other types of thinking to achieve their highest quality, particularly analytical, synthetic, deciding, and problem solving ones on critical and logical bases and being concerned with the r reliability of the information leading to the analytical, synthetic, decision making, and problem solving in critical way.

1.2 Concepts of Critical Thinking

Critical thinking is a mental ability or cognitive process which is complex and crucial. It is one of the meta-cognitive thinking modes basing on principles, reasons, and facts. It is regarded important for learning and life maintaining in the present world. Many scholars who have been interested in critical thinking have attempted to define it as follows:

Bloom (1979: 38) started with the explanation on intelligence. He contented that individuals could search for knowledge and techniques from their past experiences in an attempt to understand the new problems or phenomena. Through this process, the person had to analyze or make him/herself understand the new situation and rely on basic knowledge and methods. He or she had to be flexible in seeing the connection between the past experiences and the confronting one. Bloom viewed the competence as the combination of skills and knowledge that are relevant to the management of information both of the old and the new ones to achieve the cognitive goal. Intellectual competency, to Bloom, was the situation in which the person was expected to apply the technical knowledge to solve the new problem which required knowledge and intelligence both of art and skills

Besides, Bloom had proposed 6 steps of thinking which included knowing, understanding, applying, analyzing, synthesizing, and evaluating. One of the steps related to critical thinking was the analysis which was the ability to classify things in a meaningful way and the person could see the relationship among the parts including the way to manipulate them and the structure. The techniques or tools led to the assignment of the meaning onto them or derive a conclusion for communicative purpose. Moreover, concerning learning, the analysis could ensure better understanding and lead to evaluation as well. Synthesis was the way to combine all the parts to form a clear pattern of structure. The individual had applied his/her old experiences to the new materials. The learner searched around the new situation and applied his/her old knowledge onto it to construct the new product that could be observable and conceivable. Evaluation was the final cognitive behavior. It was a value judgment on the object or choice comparing with a standard for a certain purpose in the processes of thinking, operating, solving problem or others. Evaluation was concerned with criterion or standard. The judgment could be done both in quantitative or qualitative terms and based on the standard set by the learner him/herself or a give one (Khaemmanee, Tissana et al, 2001: 11-13).

The concept suggested by Bloom could differentially illustrate cognitive behavior of people in a concrete way, particularly the one on analytical, synthetic, and evaluative steps, all of which are related to critical thinking as it needs the careful review, reasoning, and the concern with reliability of the information leading to analytical, synthetic, decision making, and problem solving all of which in a critical way. However, it also requires levels of knowing – steps 1-3, knowing, understanding, and applying along as well.

Ennis (1985: 21) suggested a structural framework of the critical thinking. It was composed of the thinker's disposition and ability. The disposition of the critical thinker was composed of 14 characteristics, namely, 1) Try to analyze the argument issues, 2) Be determined to find the supporting reasons, 3) Carefully attempt to compile all the needed information, 4) Attempt to use and cite the reliable source of information, 5) Be aware of the factors affecting the situation, 6) Try to discover the prime principles, 7) Be interested in compiling details of the interrelated issues, 8) Be aware of the various alternatives, 9) Open heart to listen to opinions of the others, 10) Be reasonable and ready to change if there is better reason, 11) Be determined to sort out the main issues, 12) Be determined to deal with the complexity step by step, 13) Use critical thinking competency, and, 14) Be concerned with feeling of other people.

Paul (2006: 14) stated that the person with critical thinking was characterized by 8 features, namely, 1) Intellectual Humility, 2) Intellectual Perseverance, 3) Intellectual Autonomy, 4) Intellectual Confidence in Reason, 5) Intellectual Integrity, 6) Intellectual Empathy, 7) Intellectual Courage, and 8) Fair – mindedness.

Chareonwongsak, Kriengsak (2006: 108-119) discussed habit development for being critical suggesting that one should start from being critical on his/her own thinking. Then he/she should open mind to listen to opinion of other peoples and not to easily jump to conclude, have stable mind and not easily switch, be with freedom of express, be reasonable not to listen only to the seemingly interesting information, be non-biased, have skill in searching for the information that solves his/her doubt, and have no bias against the change.

Taking the ideas proposed by Ennis (1985: 21), Paul (2006: 14) and Chareonwongsak, Kriengsak (2006: 108-119) combined to come up with the crucial characteristics of the people with critical thinking, such characteristics would be the awareness of his/her own ability, perseverance and determination to find the reasons to support the conclusion, being free to think and decide, attempt to find the evidence, be interested to listen to other perspectives, courage to think and express, open heart and have reasons, and have skills in searching for knowledge. All these characteristics would equip the person with critical thinking which was concluded by Ennis (1985: 21) as follows: 1) Ability to clearly identify if the statement was the reason, the problem, or the conclusion, 2) Ability to analyze a reasoning, 3) Clearly ask or answer the question on the clarity and legality, 4) Defining the concepts which were ambiguous, 5) Pointed out to the hidden ideas, 6) Determining the reliability of the ideas and reasons, 7) Observing and assessing the observation report, 8) Deciding the use the rules and evaluating the assessment, 9) Using reasoning to examine the existing information to come up with some principles and assessing the reasoning process that had led to the conclusion, 10) Examining the values and the value judgment, 11) Examining and reasoning the hypotheses and foundations of the ideas on which one did not agree or still had some doubt, 12) Combing the ability and other behaviors in making decision and presenting such decision in an acceptable way, 13) Following the standard procedural steps suitable to the situation such as the steps of problem solving to review one's own thinking and using the appropriate criteria, 14) Being sensitive to feeling, knowledge, and knowledgeableness of others, and 15) Using proper verbal methods in discussing and proposing opinion or reacting to the wrong idea or beliefs to reflect one's enthusiasm on the feeling of other people and always had answer or response relevant to the situation. All these would lead to the conclusion with reasoning and through evaluated processes.

The person who was with critical thinking, besides having characteristics that facilitate critical thinking, had to have skills in using the critical thinking as well.

Janine Huot (1998) stated that the thinking skill determined the success in learning of each learner. A graduate should have the crucial competencies and skills to assure his/her successful learning. The skill on critical thinking was among these which covered the following ones:

The first skill is the one on evaluating and judging the information, contention, and argument. This skill is needed in analyzing the assumption and the conclusion if such information or argument is based on reliable evidences. The assessment to reach the conclusion of the argument is a skill on using critical thinking which has to be used in other cases beyond the problem under argument such as in problem solving, decision making, and the reliability of the assumptions.

Second skill is the one on compiling, analyzing, and organizing the information. In doing so, There is a need for many sources of information. This skill deals with 3 parts of the information manipulation – compilation, analysis, and organization. The analysis part is the essence of critical thinking where learners have to sort out which information is necessary and reliable. The organizing part would compare similarity or difference before classifying and put the information in order and sequence.

Third skill is on evaluation and review of the person's own thinking while engaging in the procedural process of problem solving and making decision. It is the

skill used in critical thinking for the person to check which information he/she has or has not known and how to solve the problem. Was the attempt successful? What would be the next steps to do?

Watson and Glaser (1964: 435) suggested the skills which were part of the critical thinking and should be developed as follows:

1. Skill in searching for the problems
2. Skill in selecting the ever-changing information to be used in the problem solving
3. Skill in distinguishing between the correct and fault information
4. Skill in choosing the information relevant to the problem solving in the process of hypothesis setting
5. Skills in coming up with the conclusion which is valid and reliable and in checking the validity and reliability of the information

Case (1994: 101-107) explained the skill needed for critical thinking which included the one in predicting the problem solving. This part suffers from the fact that most problem lack of information certainty. The first step of decision making is the prediction which requires the skill on it. The prediction helps one work on the every changing situation to come up with a framework for the problem identification and formation. The person has to have critical thinking and be open-minded to readily get on the new perspectives. He or she must always ask him/herself how the new information differs from the one previously acquired. He or she should also check with the others for any possible different perspectives.

From examining the concepts proposed by Janine Huot, Watson and Glaser, Ennis, and Case, it could be concluded that the basic skills laid out as the foundation of critical thinking include the followings, namely, questioning skill, information compiling and manipulating skill, skill in sorting out the issues from the reasons, indentifying opposing ideas and personal opinion, skill in identifying the evidences such as reasoning, problems, facts, similarities, differences, conclusion, and argument, and information analyzing skill to identify if it is the conclusion, opinion, or fact. The skills for interpretation includes defining, analyzing the meaning, finding relationship, connecting the relationships which are congruent, skill in setting up the hypotheses, inductive and deductive thinking skills, language skill which includes the interpretation of hidden propositions, ambiguity, questions, denial, and connections, the skill is setting up the criteria to deal and determine the situation, skill in forming the conclusion, skill in setting up the alternatives, choosing the alternatives, and skill in determining the reliability of the information and evidences.

All these skills are crucial indicators for the development of critical thinking competence. If a learner has possessed these skills, he or she could be identified as having the critical thinking.

Considering the competence of the individual with critical thinking suggested by Ennis and skills of the person with critical thinking as suggested by Janine Huot, Watson and Glaser, and Case, it could be said that the person with critical thinking would be able to critically think, critically synthesize, critically consider the reliability of the information, and critically decide.

It could be concluded that critical thinking is composed of competencies, abilities, and skills that are significant for critical thinking. The characteristics of the critical thinking person are related to the competencies and skills needed for critical

thinking. In considering the goal of solving a problem, one needs to have reasons to consider. He or she has to interact with the others, listen to the every related idea and opinion, get information from the others, observe, and consider the observation, accept the justified conclusion, including the compilation of information and reasons for thinking – inductive, deductive, value judgment, etc. leading to thinking and deciding to believe on or deny. The person who has competency and skill in questioning would be the one who persists to analyze the argument in on a clear basis. The person who could analyze the argument would be the one who persists in finding the reasons to resolve the argument. The one who has persisted in sorting out the issues in the argument would be able to make better decision. In order to develop the person's critical thinking, his/her critical thinking competence, and skills used for critical thinking are to be developed all along.

1.3 Prime Components and Standards of Critical Thinking Components of Thinking

From the review on the critical thinking competence suggested by many academics above could lead to the analysis of the basic components of the critical thinking as follows:

1.3.1 Careful deliberation is the first component of critical thinking. This deals with getting the main idea by questioning and getting the answer to clearly identity if the issue is a logical claim, problem, or conclusion. It also deals with the differentiation of the conclusion including the review or repeating to get the correct information.

1.3.2 Logical consideration – this is to explore the reasons to scrutinize the conclusion if it is valid considering if the logic is acceptable. It analyzes the reasoning by looking at the given argument or looking for more information. It also considers its compatibility with the context or situation for the completion of the logic. If all these are satisfying, the conclusion should be considered reliable.

1.3.3 Reliability – This is to check the reliability of the information to evaluate the correctness, appropriateness, fitness, relationship, significance of the width and depth, and fairness of the information, all of which lead to the conclusion on the validity of the information to be used in solving the problem on critical basis.

Such components of the critical thinking could be used to check the thinking. It is not necessary to follow a standard procedure. One can claim if he or she has critical thinking by showing his or her skills and abilities along all these components.

Thinking Standard

Besides the components of critical thinking as discussed above, the person who is with critical thinking has to have the thinking standard that signifies his/her thinking quality. Concerning this, Bailin, et al. (1999) asserted the significance and need for the standards of good thinking including critical thinking which had 2 kinds of standards.

1. Standard for assessing the intellectual product (Thinking)
2. Standard for the procedure in engaging the inquiry and deliberation

These two standards are interrelated as the deliberation (Type 1) is standard appropriate for judging the intellectual product (Type 2).

Standards or principles used for assessing the intellectual product include:

- Adequacy of the claims and definitions
- Reliability of the expressions made by the concerned individuals
- Reliability of the report written by the observers
- Validity of the deductive arguments
- Solid reasons for the inductive arguments
- Adequacy of the moral, legal, and aesthetical reasoning

Standards or principles for the inquiry and deliberation are as follows:

- Consideration of the reasonable alternatives for variety of actions to fit the context and justification having been used in the similar situations
- Attempts to search for and take into consideration the information concerning nature of each alternative and its consequences appropriate to the context
- Attempts to understand the perspective or view point or assumption of one's thought and bias or negative consequences which would follow

Concerning this set of standards, Paul (2008:12) focused on the standards that serve as the criteria for reasoning by taking into consideration each component of the reasoning to identify who has the thinking competency and to what extent. Standards of thinking proposed by Paul are as follows:

1. Clarity – understandability and concrete definition
2. Accuracy – with details and specificity
3. Precision – valid and could be tested and proved
4. Significance – focuses on the main issue not tiny little things
5. Relevance – related to the situation at that very moment
6. Logicalness – All parts go together on certain principle without and conflict against one another
7. Fairness – It's provable truth not personal belief nor one-sided view
8. Depth – complex and multi-level related
9. Breadth – covering wide and complex perspectives

The standards proposed by Bailin, et al. (1999), and Paul (2006:14) could be integrated and summarized as follows:

1. Clarity is referred to the true understanding without any confusion or ambiguity.
2. Accuracy is referred to the access to the existing information without any mistake.
3. Precision is referred to the fitness and specificity of the details to that particular topic.
4. Relevance is referred to the appropriateness of the thing to the issue under consideration.
5. Adequacy is referred to the depth – complexity, and the width – covering all points of view with open-mindedness.
6. Logicalness is referred to reasonability of argument with conflicting ideas to maintain balance of view points and reasoning

7. Significance is referred to the focus on main ideas not the tiny little things.
8. Fairness is referred to the action basing on justice not with bias nor dishonesty nor preference basing on personal benefits nor deceiving nor non-justice.

When combining the standards proposed by Bailin et al. (1999), those of Paul (2006:14)ม and the characteristics of critical thinking proposed by Ennis (1985:21), the intellectual traits of critical thinking could be constructed as in the diagrams below:

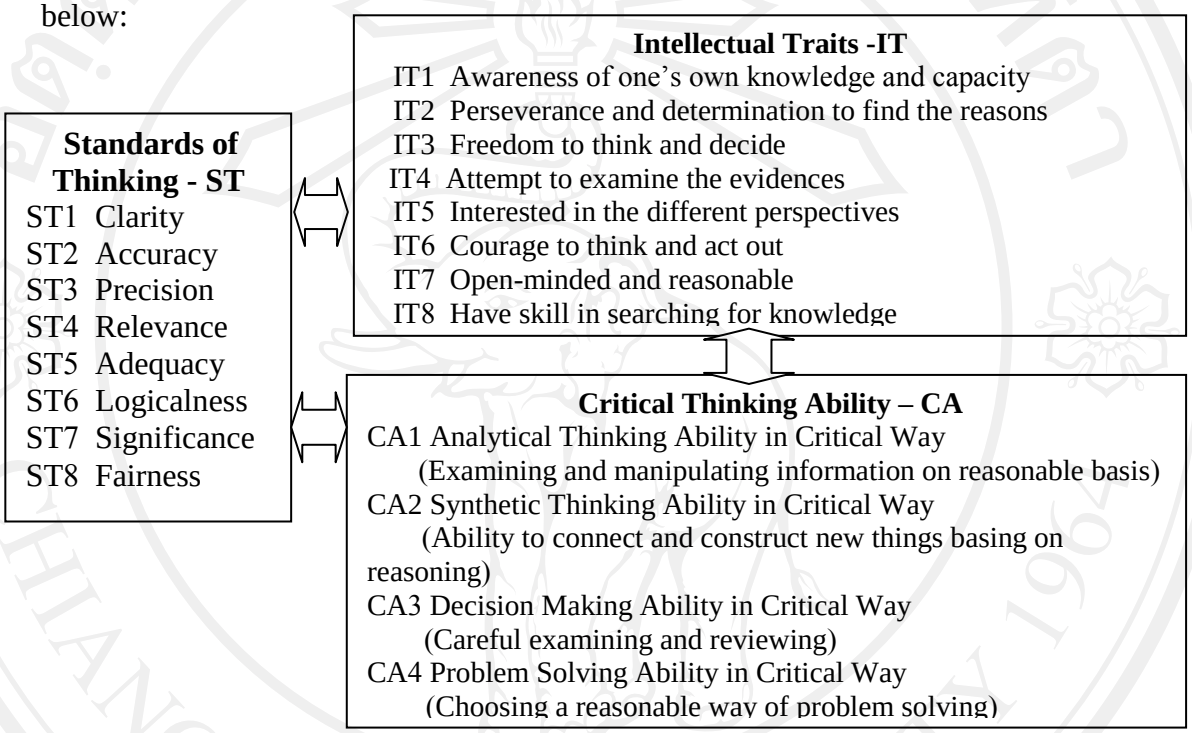

Chart1: Inter-relationship among Thinking Standards, Intellectual Traits, and Critical Thinking Ability

1.4 Critical Thinking Process

Concerning the process of the critical thinking, many academics came up with the following procedural steps as follows:

1.4.1 Those who regarded critical thinking as the process with procedural steps:

Ennis (1985: 28) differentiated critical thinking in 5 steps as follows:

1) Elementary Clarification: This step is composed of Focusing on a Question, Analyzing Argument, and Asking and Answering Questions to Clarify

2) Basic Support: Examining the reliability of the information, observing and assessing the information acquired through the observation

3) Inference: Using deductive and inductive approaches and setting up the evaluative criteria

4) Advanced Clarification: Composing of identifying comprehensive and clear definitions and analyzing the conclusions

5) Strategy and Tactics: The strategies and tactics for problem solving are composed of decision making and interaction with the others.

Critical Thinking conceived by Ennis is the procedural steps of examining the problems or arguments starting from understanding the situation, examining the information and reasons, leading to the decision making.

Kelly (2000: 64 – 65) proposed the process for analyzing the argument which could be used in everyday life as follows:

1. Thoroughly read the argument to identify the problem, arguments, and issues to be examined
2. Sort out the evidences and conclusions
3. Sort out the inferring statements
4. Survey the reliability of the information sources
5. Evaluate if the evidences are accepted or reliable
6. Decide if the evidences could be modified to fit the argument
7. How to reject the reasoning and sort out the convincing techniques

Nosich (2001: 3) proposed the guideline for critical thinking using the model with the outcomes relating to the components of thinking and thinking standard criteria. He suggested the core process of critical thinking which could be practiced in 3 steps as follows:

1. Step of problem or question presentation
2. Step of thinking using the reasoning components –critical thinking components
3. Step of setting up standard criteria to examine the thinking components

Bowell and Kamp (2005: 6) also proposed the 3 steps of critical thinking as follows:

1. Step of differentiating the issues read or listened to check the intentions of the writer or speaker in the argument
2. Step of understanding and finding information to support the arguments
3. Step of evaluating if materials are correct or appropriate

Chareonwongsak, Kriengsak (2006: 5 – 6) suggested that critical thinking required criticism to acquire the needed outcomes that are logical. Critical thinking occurred naturally through the 5 steps:

1. Trigger Event occurred and confronted by the person
2. Appraisal – the person compiled the ideas how to respond to the event.
3. Exploration – attempt to find the explanation of the conflict occurring to construct alternative or new idea
4. Development of Alternatives – that better explained
5. Integration – the thinking and behavior leading to the change for better situation.

1.4.2 The group that viewed that critical thinking process did not follow any definite steps but occur during the thinking. Paul (2006) proposed an approach to train oneself to become a critical thinker. He suggested the focus on reasoning and thinking standards that looked for meaning and significance in the components in the reading or writing processes. The person had to explain in details the analysis of the issues

such as goal, question, perspective, hypothesis, inferences, information, facts, information, conclusion or induction, and concepts. The point of Paul's propositions was the use of thinking while examining all components, self-regulation to focus on the object of thinking. Paul did not come up with clear standard procedures.

1.5 Role of the Teacher in Developing Critical Thinking

Arch-in, Sittipon (2007: 39-40) proposed the guideline in developing critical thinking. He contended that for a teacher to teacher the learners to have critical thinking, the teacher had to understand the thinking and actualize it herself first. In developing the teaching on critical thinking, there was a need to develop the teachers in 3 aspects, namely, 1) basic knowledge on critical thinking, 2) practicing critical thinking, and 3) developing the teachers on teaching critical thinking. The details of each are as follows:

1.5.1 Basic Knowledge on Critical Thinking

Thinking is a process and method. It does not occur out of nowhere. First of all, it has to start with the person who would do the thinking. It has to have content or information to be thought about. To become a teacher competent on teaching critical thinking, a teacher has to have basic knowledge on critical thinking such as its meaning, concepts and theories related it, components, characteristics, ability, and standards of critical thinking. Not only the teacher has to have knowledge and understanding on the process of critical thinking, she also has to have skills on the critical thinking as well. Besides, the teacher has to have other characteristics that facilitate critical thinking such as the awareness of her own capacity, the patience and commitment in trying to find the explanatory reasons, autonomy in thinking and decision making, interest in different perspective, courage to think and express, with open-mind and rationality, and skill in searching for knowledge.

1.5.2 Critical Thinking

Critical thinking is an important process which is needed to be developed and promoted in everybody, particularly the teachers. The teachers have to have clear knowledge and understanding on critical thinking process. They need to be trained on thinking process to become critical thinker in order to organize learning for developing critical thinking of the students. Regarding training the teachers to have critical thinking, its situation and goals have to be set up first. The goals are, for example, being able to do critical thinking with reasons and caution, synthetic thinking with reasons and caution, being concerned with reliability of the information, being able to make decision with reasons and caution, and being able to solve the problem basing on critical thinking.

1.5.3 In enabling the teachers to be able to teach critical thinking, the teacher should be developed in the following aspects:

1) Knowledge, understanding, and deep experience on the issues that are central to the argument: This would enable the teacher to identify the goal, issue, argument, or information. If any of them is not clear, the teacher should be able to improve it. They should have the skills in raising questions that get deeper into the story to see the goal and differentiate and find the relationship embedded in the issue. They should be able to analyze the phenomenon to get the issues and to try to understand such issues

2) Ability to compile the information, being interested in things, having eager to find the answer and skills in identifying the information to test the

facts, examining the information and choose the one relevant to the problem, and awareness of the significance of the reliable information sources

3) Ability to manage the information by analyzing, comparing, relating, and classifying the information

4) Ability to set up the assumptions and inferences, and to focus on the guideline for inferring the problem, the argument, hypothesis, opinions, interpretations, and alternatives and their feasibility and logical conclusion

5) Ability to evaluate and conclude, having up-to-date knowledge, being open-mindedness, and trying to find the reasons for things, deciding to reach a correct and logical conclude from the existing information if there is enough reasons, being confident in the reasoning, being able to provide reasons and use the question to explain, refraining from prejudice or emotion in making decision, listening to opinion of others, and being able to change opinion or perspective if new information emerges or there is better logic than his/hers

1.6 Teaching for Developing Critical Thinking

Phothisuk, Usanee (2002: 83-84) discussed the learning and teaching organization that developed the critical thinking skill. She suggested that, in general, there were 2 ways. Firstly, it was the provision of specific program or teaching to directly develop the thinking process. These could be set up as special programs beyond the normal classroom teaching. The program included the instructional media and lesson plans. The second method was the teaching through the learning substances in an integrative way. Through this, the teacher had to use the learning substances normally learned in various strands but focused on the critical thinking. The teacher would facilitate the students to practice thinking along the learning substances. This approach is now considered normal. The thinking skill is not singled out but integrated in the content. Concerning method of teaching, Paul (1985: 36-39) suggested that the teacher should teach the students to think. A good technique was the use of questions which stimulated the students to think but they must be interesting and induce the students' interest in following through. Besides, Wichitporn Lausuwanagoon (2001: 47-48) suggested the individual practice as an instructional step in developing critical thinking skill. Each learner practiced thinking in each component of the thinking process – interpreting, analyzing, inferring, evaluating the argument, explaining, setting up the assumptions, and self-regulating. Each learner was encouraged to freely think facilitated by the teacher's additional explanation. If the learner had question, he or she would be given enough time and was stimulated by the teacher who would question, reinforce, and observe the learners' behavior.

From the review done by the researcher, the teaching method that could be used in promoting critical thinking is the one in which the teacher should apply all these techniques in each of the learning strands. These methods are as follows:

1. Inductive Method - This is the method by which the learners could learn from the cases or pieces of information leading toward the generalization into principles later on by observing, experiment, or comparisons which open for the learners to see similarities and differences which could be generalized to be the criteria or principles. These concluded principles then serve further for the learning in explaining and predicting in the new scenarios to be encountered.

2. Deductive Method – This method is opposite of the inductive one. Through it, the learners are taught to solve the problem by applying the criteria, definitions, generalization, formula, or principles previously learned to solve the new problem.

3. Problem Method – Through this method, the learners learn by themselves through the discussion on the problems in small groups to try to find the solution to the problem introduced by the teacher. The teacher serves as the facilitator who would enable the students to adjust themselves toward the environment and the changes in the society. Students are expected to search for knowledge to be used in the process to solve the problem. They are encouraged to solve the problem and to be equipped with the skills to solve all the problems normally encountered in their everyday life enabling them to help themselves and discover the academic facts via reasoning process. Foundation of this method was introduced by John Dewey, an American educator and philosopher who brought up the method of teaching basing on learning psychology which insisted that "Learning occurs when there is a problem." The approach follows a scientific method.

4. Inquiry Method – This method is referred to the teaching that develops the ability on problem solving through the process that trains the learners search for the knowledge by using the reasoning to discover the knowledge or guideline to solve the problem themselves. The teacher raises questions to stimulate the learners to use their thinking in trying to solve the problem and could apply such knowledge in their everyday life.

5. Learning Center – The method takes the learners as the center of the learning process. The teachers and learners are both responsible for running the learning center which opens the opportunity for the learners to learn by themselves by taking action. In the classroom, the learners are divided in groups. The content is also divided into parts each of which would become the basis for setting up an activity center. In each lesson, there might be 4-5 activity centers. When the learners got through the activity in one center, they would move to the next activity center and engage in the activity prescribed for the center until they got through all of the centers. Time is allocated for each activity center such as 10-15 minutes. The students are expected to get involved in all centers in one class period.

6. Questioning Method – This method is to develop the students' thinking process. The questions fed to the learners would serve as the condition for the students to practice analytical and critical thinking. It is important that the teachers have to come up with the questions that challenge the students to think or this method might fail to develop the desirable thinking mode onto the learners.

7. Integration – This is the method that requires the organization of the learning units as the combination between the learning experience and contents from all learning strands such as in social studies, the topic on oil crisis involves contents from geography, history, religion, current events, economics, etc.

8. Case Study Technique – This teaching technique is the use of stories or current events in the society to base a case story for the learners to study from. The case should be designed to fit the learners, with sufficient details, to get the learners' enthusiasm making them internalize it onto their life. Such enthusiasm would get them totally involved and express their real feeling in the discussion and analysis of the problem. This method is aimed at training the learners to act out on compiling information, and collectively analyze the problems in a systematic way. The method

is not only limited to the classroom but could be transferred to the learners' real life problem as well.

These teaching methods could enhance the students' critical thinking through the following components and processes.

Critical Thinking Abilities (CA) covering CA1 – CA5
Intellectual Traits (IT) covering IT1 – IT8
Standards of Thinking (ST) covering ST1 – ST8

Moreover, there are other methods to promote critical thinking that fit the context of each learning strand. The teacher has to be able to apply them to benefit the instruction that is aimed at promoting the learners' critical thinking.

2. Collaborative Learning Approach for Developing the Critical Thinking Teaching Competence

Collaborative learning is a learning process in which all members in the group interact and fulfill the role designed to facilitate the common goals. Through this, everybody has to respect individual rights and ability and to help one another.

2.1 Meaning of Collaborative Learning

Collaborative learning, according to a dictionary, is referred to the attempt to work together through a learning process of the group. Anuradha (1995) stated that effect of the team working in collaborative learning is a higher form of learning. It is an achievement which is better than from learning by oneself as, in the collaborative learning, there must be exchanges of ideas and experiences in the small group whose members shared the interest and have opportunity to engage in the conversation exchanging opinion, take responsibility for his/her own, and have chance to induce critical thinking. Myers (1991) suggested that collaborative learning permitted the group to look at the issues in qualitative way. They analyzed and criticized in the group and had direct interaction. Johnson and Johnson (1986), meanwhile, pointed out that collaborative learning is the learning process that ran the process of idea exchange in the small group. It did not only increase the interest of the members but encouraged the analysis and exchange of knowledge and learning among them. Besides members had chance to discuss, they were also responsible for their own learning. The authors also stressed that collaborative learning is the process of idea exchange. As the learners had to work together, they learned to understand one another. They learned the group work process to collectively achieve the lesson's objectives. Through the process, they learned to negotiate and to exchange not only on the issue but also on the group working process. The learning acquired through it is open-ended where the learners could search and discover the knowledge. This small group learning allows the learners of different skills and abilities to work together to find the solution for the problem occurred. McAlpline (2000) remarked that one value of the collaborative learning which was often felt was that the learners were active. They were stimulated to eager for learning, and there would be a deep compilation of the information. Moreover, the author contended that this method required the learners' higher responsibility for their own learning and their interaction with other learners both within and between the groups. The interaction opened from the learners to carry out the missions and manage the knowledge. McGregor (1990) pointed also that this collaborative learning was the learning on wide scope though it occurred in the classroom. There were group works created around the classroom activities. There

were discussions among members of the group and class. There were team work studies working along procedural steps along which the students could develop themselves along their interest. They acquired learning skills such as questioning and social skills of helping one another. They developed responsibility and learned cognitive skills on analyzing and creating meaning.

From the meanings explained by many academics above, the definition of term collaborative learning could be concluded as the learning method that opens for the learners to collectively exchange and learn as well as to help one another to study what they are interested in basing on their knowledge and experiences including the external sources of information to collaboratively construct the work and present it for the group learning with opinion sharing, discussion, analyzing, and criticizing focusing on interaction among the learners who learn from and accept one another.

2.2. Main Characteristics of Collaborative Learning

In order to develop the teachers to have their competence in teaching critical thinking to the learners, this research had employed collaborative learning as a tool. During this process, the teachers took the role of students. It was to encourage the teachers to collaboratively learn. Hamilton (1995), Bonwell (2005), Supervisory Unit (1999: 3-4), Khemmanee, Tissana (2544: 4-6) and, Moonkham, Suwit (2001) had characterized the collaborative learning and their definitions could be summarized as follows:

1. The learners are responsible to their own learning starting from taking part in choosing and planning what they would like to learn that fit their interest and aptitude. Their responsibility covers the learning and the evaluation of their own learning.

2. The learners took part in the learning activities and had worked together with friends in discovering the answer and new issues to find the news answer and explanation as they could ask their friends or other people and find the answer from the problem solving which required their reasoning thinking and problem solving skill.

3. There were knowledge exchanges, assistances, and facilitation among themselves creating the happy, interactive, and reflective learning processes.

4. The learners could discover their own capacity, become more self-confident, and develop themselves along the collaborative learning.

5. The learners had to engage in various activities in which they had to take part in the learning activities which did not emphasize the knowledge delivery but the analysis and thinking process from the basic level up to higher ones.

6. The learners had to construct knowledge directly from the integration of old knowledge to the new one which had just been acquired.

7. The learners had to collaboratively learn through social actions of the interaction and other modes of communication.

8. The learners had to realize the social relationship of knowledge and understanding and the collaboration to support further understanding.

Moreover, Dittasakul, Supin (1999) proposed that the collaborative learning should be characterized as follows:

1. Group working to assure the collaborative learning – the grouping was normally based on the same interest among the members. Number of member in each group was not necessarily the same and each group's competence could differ.

2. Nature of the work required collaboration among members. Thus the work had to pass the consensus of the group before they could collectively set up the plan.

Collaborative learning is the strategy using interaction to build up the collaboration. It was a learning process in which members helped one another and it also promoted the thinking ability and learning of the learners from exchanging, opinion sharing, and collective work.

2.3 Collaborative Learning Techniques

Barkley, Cross, and Major (2004) had classified the collaborative learning techniques into 5 types.

1. Technique for Discussion – This was the technique for exchanging information, knowledge, ideas, and opinions. This type of techniques was widely used as it would facilitate the learners in finding the methods to use thinking and learn through the communication. The discussion encouraged the learners to learn to think about the principle, characteristics, and language equipping them with various perspectives that were challenging, and inducing further thinking in a more complex way. The technique helped the learners get deeper into the issue and kept them in the long term memory. These techniques are as follows:

Think-Pair-Share Technique – In this technique, each learner spent a short period of time in thinking and comparing it with a partner first before exchanging to the whole class. The technique helped prepare the learner to take part effectively in the whole class discussion.

Round Robin Technique – It was for the learners to construct thinking and express to move from one learner to another. It is the technique that helped the learners to brainstorm on the issue.

Buzz Groups Technique – It was the discussion in a small group in a short period of time among few members who prepared themselves for the discussion in the main group.

Talking Chips Technique - In this group, the participants who had proposed a proposition had to give up to the comments that came with the clearer evidences to overcome the original proposition. The technique helped establish the fairness among the students.

Three-Step Interview Technique – This was the interview conducted with each member from which the interviewer would report to the big group what he/she had learned helping other learners to learn along. It was a learning network that helped enhance the communicative skills.

Critical Debate Technique - This technique set up the situation simulating the conflict among members with opposite perspectives. It helped develop critical thinking and encouraged them to challenge and set up their own hypothesis.

2. Reciprocal Teaching - The most effective thing in each time of teaching was the teacher and learners having goals. An interesting method was having the learners teach their classmates through switching role known as reciprocal approach. Students would perform roles of both the teacher and learner and had part in reciprocal learning through their pairing. The technique included many specific ones as follows:

Learning Cell Technique - The learners raised the question concerning the materials read from the book or the things learned while engaging in the activities. All these involved the learners in the activities in which they would think about a content and challenge them to exercise the thinking at high level.

Fishbowl Technique - In small group, members discuss about things while the surrounding students listened and observed.

Jigsaw Technique – It a development on a certain topic. It was the technique that motivated the learners to deeply learn about the process sufficient for teaching members of his/her own group.

3. Techniques for Problem Solving – This was the technique that was aimed at developing the learners' problem solving ability. The complicated content would be a good exercise for practicing thinking. It was a problem-based learning which motivated the learners to survey the knowledge needed for the problem solving until they could successfully solve them. The specific activities are as follows:

Think-Aloud Pair Problem Solving (TAPPS) Technique - TAPPS utilized the problem to encourage the learners to try to give out reasoning in pair in which the learners could be able to sort out the wrong reasoning or process. The technique focused on the process than the outcome.

Case Study Technique – The technique set up a simulated scenario from the facts in everyday life. In each case, the learners analyzed and proposed the solutions. Afterward, the learners would collectively induce Theoretical principles from the solutions. This would help them see the connection between theories and practice.

Send a Problem Technique - This was an attempt to solve the problem in group through the problems and their solution then passed it to the group that had faced similar problem and learned from them. At the end, the groups that dealt with the same problem discussed and shared the solutions.

4. Graphic Information Organizer Using Technique – graphic information organizer was a powerful tool in transforming the complex information to a meaningful graphic. The constructed organizing graphic would help the learners to discover the form and connect it to the thought. The graphic would show the connection between parts and helped the learners develop perspective on it while still noted the details. The graphic helped learners interpret, understand, and get insight into to things. The graphic information organizer using technique could come in other forms such as:

Team Matrix Technique – The technique trained the learners to sort out the similar things by observation and marked them down on the chart.

Sequence Chains Technique – The technique was for the learners to analyze and draw the graphic about the events, actions, roles, or decisions.

5. Technique Focusing on Writing – In this type of techniques, the learners used writing to express their opinion. Writing was a means for a deep learning. It helped the learners understand the principles and contents leading to the learning and skill on thinking. The learners also learned from collaboration through the activities specifically design for this purpose such as peer editing, collaborative writing, and paper seminar, for instances.

Dialogue Journal Technique – The learners were to note down their thinking in their private journal. They might be paired to exchange the journals to

share their thinking. Questions from the partner were welcomed to facilitate the learners' connection between the subject content and their real life and also the interaction with the others.

Round Table Technique – The learners were seated around before one of them started up a word, words, phrase, and sentence and send around for the next students to add on.

Peer Editing Technique – Students were paired and one of them wrote down a short paragraph on some topic and passed it to the partner who would read and edit it. He or she might need some time to collect information from further reading to support his/her reflection.

From compiling the techniques relevant to the collaborative learning, it was found that they all were suitable for developing the competence on teaching critical thinking of the teachers. This research would employ the Think-Pair-Share, Round Robin, Buzz Groups, Talking Chips, Three-Step Interview, Team Matrix, and Peer Editing techniques in the research process.

3. Action Research for Developing the Competence on Teaching Critical Thinking

3.1 Meaning of Action Research

Action research is a strategy for personnel development. Many educators had defined the term action research as follows:

1.Action research is a form of collective self-reflective enquiry undertaken by participants in the social situation in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of these practices and the situations in which these practices are carried out. (Kemmis and McTaggart, 1990: 5)

2. A "systemic inquiry that is collective, collaborative, self-reflective, critical and undertaken by participants in the inquiry" (McCutcheon and Jung, 1990:148).

3. Action research is the research that is conducted to lead to the improvement of the researcher's performance of the operation collectively engaged by the participants through the process of reflection. The results would be used for the development of the operation (Bassey, 1986).

4. Action research is collaborative, critical and self-critical inquiry by practitioners into a major problem in their own practice. They own the problem and feel responsible and accountable for solving it through team work and through following a cyclical practice of 1) strategic planning, 2) action - implementing the plan, 3) observation - evaluation and self evaluation, and, 4) critical and self-critical reflection on the results of points 1-3 and making decisions for the next cycle of action research, such as revising the plan, followed by action, observation, and reflection to continuously improve the operation (Zuber-Skerrit, 1996).

5. Action research is a model of research to search for knowledge with four sequences, namely, plan, act, observe, and reflect. The researcher is the person who is directly responsible for the operation (Saenthawee, Bancha, 2002: 5, and Traimongkolkul, Pongpan, 2010: 28).

6. Action research is a systematic study on the operation of the persons who perform it to gain better understanding or solve the problems occurring or when

there are some changes. It is the product of information collecting, collaborating, self-reflecting, and using criticism under the ethical code commonly held (Punyapinyophol, Kittiporn, 2006: 15).

From all these, it could be concluded that action research is an approach to improve the operation by creating some changes and learn from the changes. It is the process carried out by the persons who operated the missions who do it with willingness and recognition of its significance for a systematic and cyclical development of the operation. The cycle starts from planning, acting the plan, observing, and reflecting. The cycle continues until the operation has been improved as needed through the collaboration of all the sides concerned.

3.2 Main Features of Action Research

Besides what mentioned above, Kemmis and McTaggart (1990) had provided specific definition of an action research as the explanation of the phenomena occurring by utilizing knowledge and experiences of the job performers under the conditions and environment that actually exist than depending on a belief nor on solely inferring outside theories. It is the highly flexible process with ongoing modifications responding to the information and situation at that time. It emphasizes observing and recording the information on things actually occurred at each time period to analyze and validly conclude. It emphasizes both the outcomes and the process of the operation and the quality than quantity. Context is important with which the operator has to take into consideration at every procedural step. Traimongkolkul, Pongpan (2010: 28) suggested also that the action research was the research that checked the actual operation at the real place and analyzed it by the researcher him/herself. Meanwhile, Wongwanich, Suwimon (2007: 21), mentioned the crucial features of action research. She insisted it was the reflection on one's performance of an operation and consequent outcomes opened the opportunity for the individuals concerning learning and teaching and colleagues to collectively criticize the operation and its outcomes. Moreover, Punyapinyophol, Kittiporn (2006: 15) characterized action research as when the concerned individual focused on the tasks being performed and implementing all kinds of methods to lead to an improvement of the operation through the cyclical process that continued screwing down with critical concern and sequential operational process until desirable changes occurred with the timing responses during the operation.

3.3 Action Research Procedural Steps

This process of action research could be described in operational terms when it is used as the process for developing and improving the operation along the cycle suggested by many academics as follows:

Freeman (1998) proposed the process of action research that came in 6 steps.

Step 1 Raising questions on the occurring conditions

Step 2 Setting up the research problem or raising more specific questions which are researchable

Step 3 Compiling information

Step 4 Analyzing information to answer the research questions

Step 5 Making oneself understand what had happened

Step 6 Disseminating the findings among the concerned people to be informed and make use.

Sagar (2000), Creswell (2002), and Mills (2003) (cited in Punyapinyophol, Kittiporn, 2006) concluded that the cycle of an action research was composed of problem identification, information collection, information analysis, construction of the operating plans, implementation of the plans, and, reflection

Wongwanich, Suwimon (2007: 43), Punyapinyophol, Kittiporn (2006: 31), and Saenthawee, Bancha (2002: 6) compiled the literatures and proposed the action research cycle as composed of:

Step 1 Plan
Step 2 Act
Step 3 Observe
Step 4 Reflect

The steps of action research as proposed by the academics could be summarized and used by the researcher in developing the teacher's competence on teaching critical thinking along with the collaborative learning as follows:

1. Plan – It is the step to adjust the teacher's knowledge on critical thinking. Then members of the research group utilize the concepts to analyze the curriculum by considering the details, standards, indicators, and learning substances, to identify the content which is facilitative to the teaching on critical thinking and set up the model, steps, teaching method, and evaluation to come up with the learning organizing plans.

2. Act and Observe – It is the step where the teacher implemented the plans designed for teaching critical thinking in the classroom along with the observation of the performance results and collect information on the outcomes of the operation by the researcher and teachers in learning strands.

3. Reflection – It is the part in which the results of the observation and the information compilation including the problems occurred from implementing the learning plans designed for teaching critical thinking were reviewed and assessed to find the problems, constraints, and obstacles of the instruction through the process of discussion and opinion raising by the observers and the teachers in learning strands, and the teacher to derive the guidelines for developing and improving the instruction and setting up the plan for taking action in the next operational cycle.

3.4 Advantages of Action Research

Punyapinyophol, Kittiporn (2006: 38-39) summarized the advantages of the action research as follows:

1. Action research could be used with the operation being carried out by the performers who were the sources of change as part of the routine activities.

2. Action research helped equip the performer with the capacity for learning management as the cycle of action research was naturally a learning developing cycle.

3. Action research could help improve the teacher's teaching while the learners could also happily learn and better achieve.

4. Action research encouraged the participation which could improve the interrelationship among the involved individuals.

4. Related Researches

From reviewing the literatures related to the development of the learners' critical thinking, there are points concerning teaching for the learners' critical thinking as follows:

Nekmanurak, Penpisut (1994) had conducted a research on developing the model for enhancing critical thinking of the student teachers. The sample included 42 students of Chiang Rai Teachers College. The findings reveal that the experimental group students had higher critical thinking after the experiment than those of the control group at .001 level of statistical significance.

Somsak, Malivan (1997) conducted a research to study the teaching model that could develop the critical thinking of the students in the educational opportunity expanding schools. The subjects were 64 Mathayom Suksa 3 students at Wat Thai Sampao. It was found that the effectiveness of the teaching in terms of the students' critical thinking was higher after the experiment than the set criterion (80/80). The critical thinking of the students in the experimental group was higher than that of those in the control group with a statistical significance ($p < .01$).

Rattanawijit, Arunee (2000) studied critical thinking ability and effect of critical thinking training on Mathayom Suksa 1 students, Tha Nang Naew Wittaya, Waeng Noi District, Khon Kaen. The findings reveal that the students trained on critical thinking had higher critical thinking ability than those who did not get the training at .05 level of statistical significance.

Kleekhajai, Tipvadee (2004) studied critical thinking ability of the students at basic education level in the private schools in Bangkok Education Service Area 1 to see if it was determined by reasoning aptitude in classifying analogous, generalizing, serial, and analytical aspects of critical thinking, gender, and grade level. The findings reveal that the reasoning, analogous, serial, and analytical aptitudes had effect on critical thinking ability at .01 level of significance. The generalizing aptitude had no significant effect.

Arch-in, Sittipon (2007) conducted the research on the model to develop the competence for teaching critical thinking of the science teachers in elementary schools. The sample included 186 teachers in science strand at elementary education level. It was found that the teachers who participated in the training had higher critical thinking than before the training at .001 statistical significance and 29 teacher trainees could develop the learning plans focusing on critical thinking at the very good level while 21 of them could do it at good level.

Ferrell (1992) had studied the effect of the teacher question usage focusing on the relationship between amount of the teachers' critical thinking inducing questions and amount of the students' critical thinking based answers. It was found that critical thinking of the students taught by the teachers who had asked more questions was higher after the experiment. There was a positive relationship between the amount of critical inducing questions and the students' critical thinking based answers. The amounts of questions and answers between the teacher and the students had relationship with the students' critical thinking.

Cave (1993) surveyed the behavior and characteristics of the teachers that had effect on the critical thinking of the students comparing the characteristics of the teachers who created high and low levels of critical thinking. It was found that the teachers who were with high critical thinking would teach the students with various teaching methods such as teaching students in small groups having them involved with the instructional activities to promote the applying skills. The teacher rated low in critical thinking would teach the students to learn individually, set up the classroom's regulations, and base on the textbooks.

Hendrix (1995) studied the critical thinking ability of the students taught to read with critical thinking and of the students who were taught through normal curriculum. It was found that the critical thinking ability of both groups of students did not differ at .05 level of statistical significance.

Seidman (2004) studied the relationship between the teachers' belief and critical thinking teaching at upper secondary school level aiming at examining the teachers' belief on critical thinking and its relationship with the teaching. The findings reveal that the teaching method of each teacher was relevant to their actual teaching. The belief on critical thinking and the teaching topic were related to the teaching method. The teacher who taught critical thinking as a learning strategy would assign tasks to the students to write and test them with composition. The teachers who had narrow perspective on teaching would teach along their belief. The teachers' fundamental beliefs in teaching critical thinking included: 1) critical thinking grew through the action and experience, 2) classroom discussion was crucial for developing critical thinking, 3) the promotion of critical thinking was as equally significant as the content, and, 4) individualist principles were important for promoting critical thinking in the aspects of application, development, and future research.

From all these rationales and researches mentioned above, it is necessary to develop the critical thinking onto the learners by building up a clear understanding on part the teachers and their competence on thinking process and critical thinking development as well as the techniques and models of the critical thinking skill development. The researcher has become interested in developing the teachers' competence in teaching critical thinking at lower secondary education level at a large private school in Chiang Mai. The research was aimed at enhancing its teachers' competence in teaching critical thinking and their ability in organizing learning activities for developing the critical thinking of the students later on.

5. Research Conceptual Framework

The researcher constructed the research framework along those proposed by Ennis (1985), Paul (2006), and Chareonwongsak, Kriengsak (2006) which were based on the thinking standards in developing the characteristics of the individuals with critical thinking. The process to develop people with critical thinking employs the collaborative learning and action research as the guideline to equip the teachers and learners with the thinking competence. This research framework is as follows:

Research Conceptual Framework

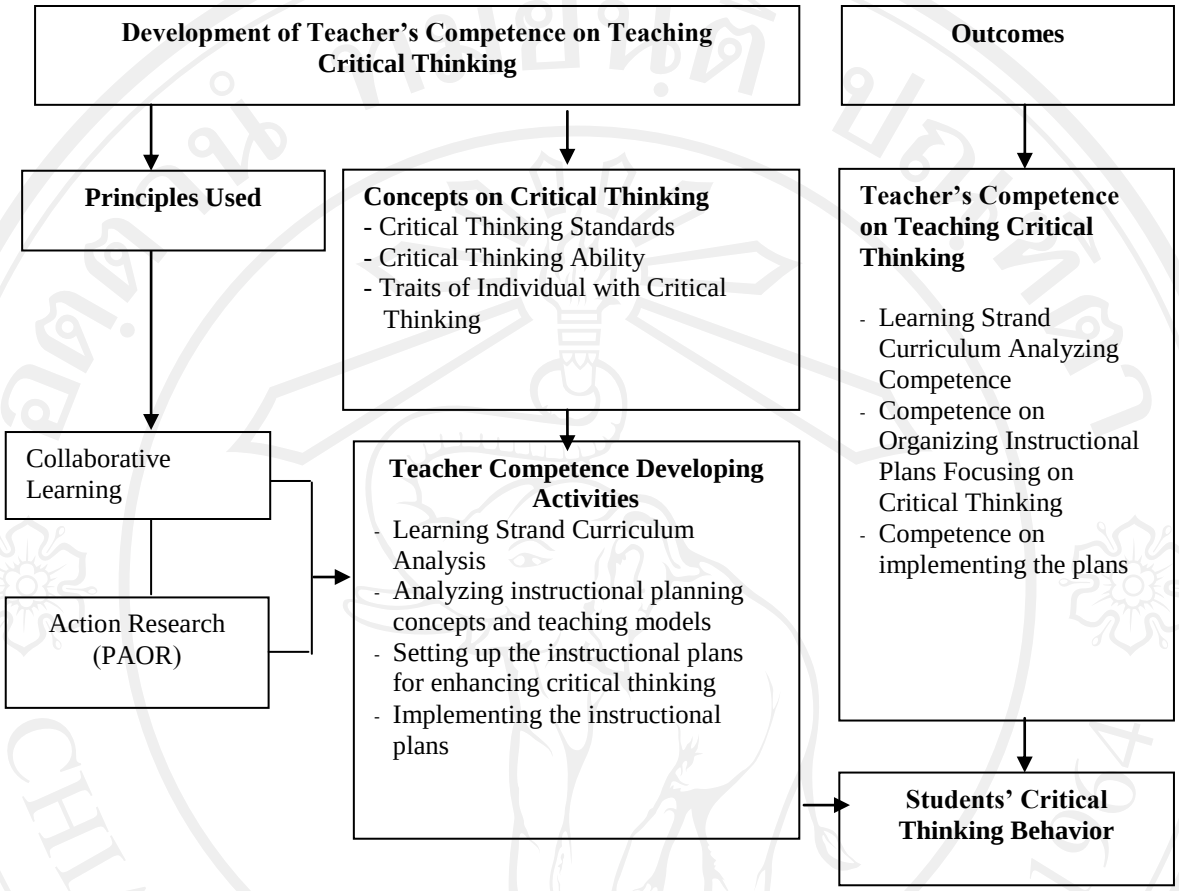

Chart 2 : Research Conceptual Framework