Chapter 3
Research Methodology

The research on the effect of the development of the competence on teaching critical thinking has employed the collaborative learning and action research engaged by the teachers in a large private school as the research process. It also follows the research and development scheme in that there would be the study, planning, implementing the teaching competence developing plans with the evaluation during the operation and revise to get the efficient and effective process along the set objectives. The researcher divided the operation into 2 phases:

Phase One: It is the phase to develop the competence on teaching critical thinking and ability to analyze and select the curriculum contents that could facilitate the development of critical thinking.

Phase Two: This phrase was for planning and implementing the instructional plans collaboratively developed by the teachers.

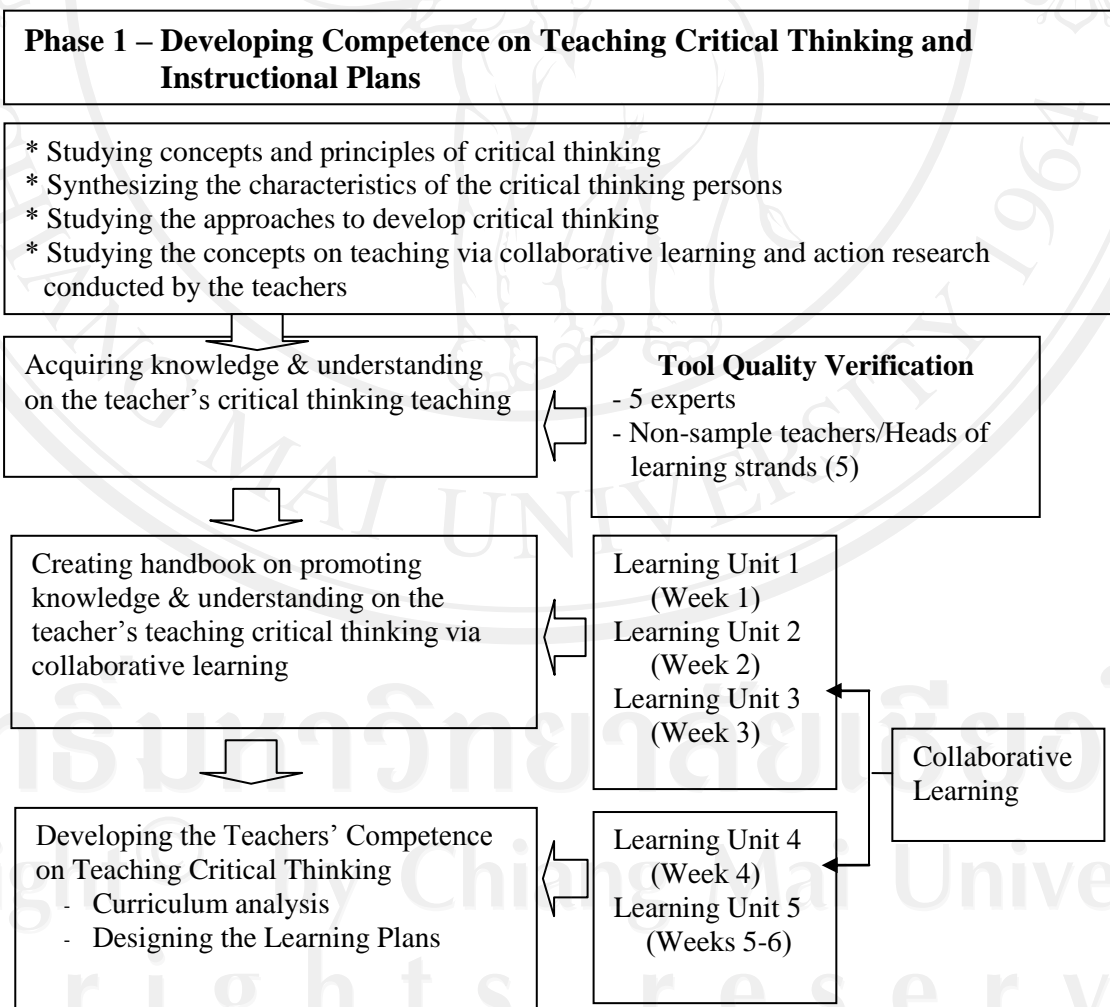Details of the research procedural steps are shown in Chart 3 and Chart 4

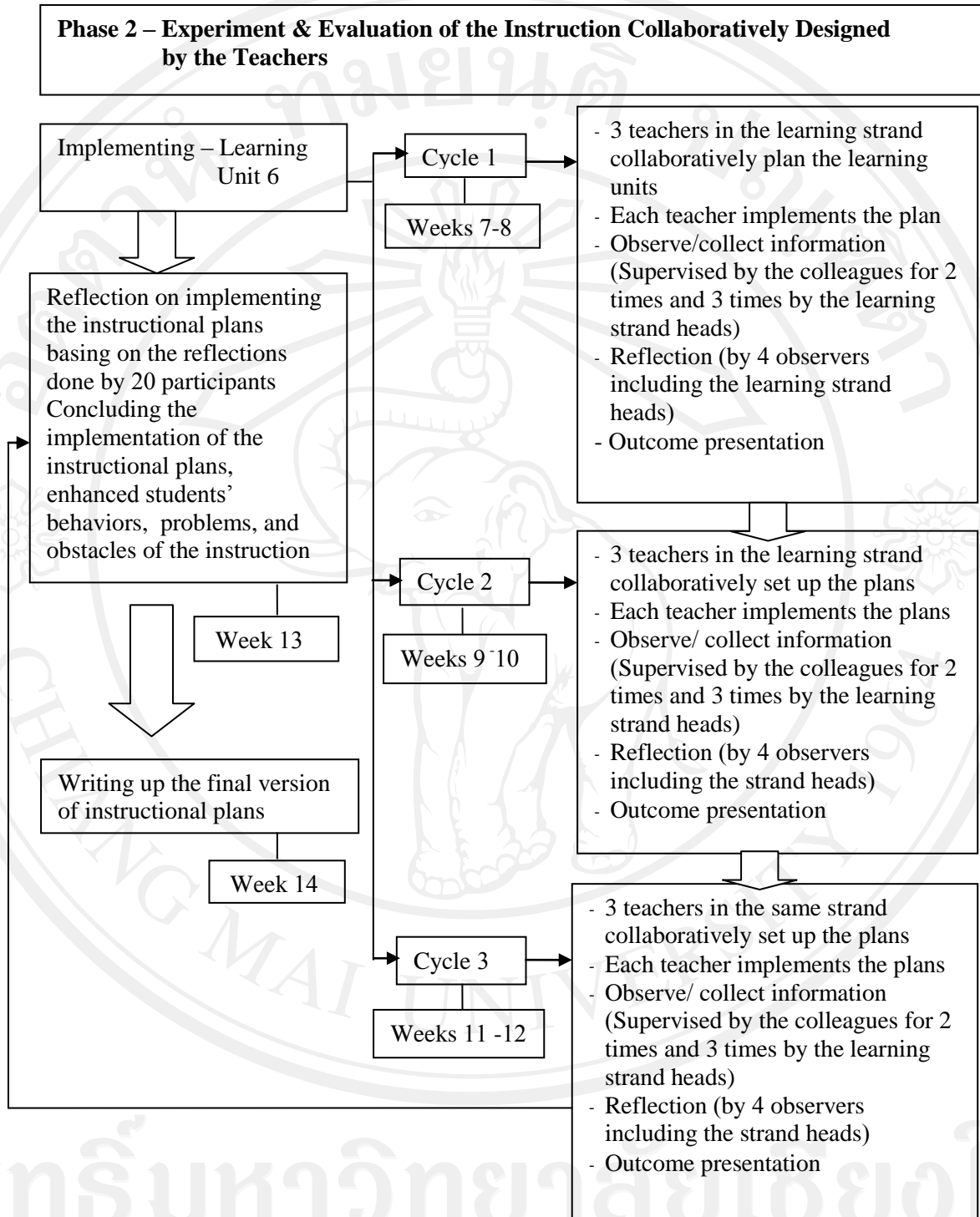**Chart 3 : Phase 1 of Research Procedure**

Phase 2 – Experiment & Evaluation of the Instruction Collaboratively Designed by the Teachers

Implementing – Learning Unit 6

Reflection on implementing the instructional plans basing on the reflections done by 20 participants Concluding the implementation of the instructional plans, enhanced students' behaviors, problems, and obstacles of the instruction

Week 13

Writing up the final version of instructional plans

Week 14

Cycle 1

Weeks 7-8

- 3 teachers in the learning strand collaboratively plan the learning units
- Each teacher implements the plan
- Observe/collect information (Supervised by the colleagues for 2 times and 3 times by the learning strand heads)
- Reflection (by 4 observers including the learning strand heads)
- Outcome presentation

Cycle 2

Weeks 9 ̄10

- 3 teachers in the learning strand collaboratively set up the plans
- Each teacher implements the plans
- Observe/ collect information (Supervised by the colleagues for 2 times and 3 times by the learning strand heads)
- Reflection (by 4 observers including the strand heads)
- Outcome presentation

Cycle 3

Weeks 11 -12

- 3 teachers in the same strand collaboratively set up the plans
- Each teacher implements the plans
- Observe/ collect information (Supervised by the colleagues for 2 times and 3 times by the learning strand heads)
- Reflection (by 4 observers including the strand heads)
- Outcome presentation

Chart 4 : Phase 2 of Research Procedure

Population and Sample

The populations for this research are those of the 27 teachers teaching at The Prince Royal's College at Mathayom Suksa 1 in the 1st semester of 2012 academic year, 8 learning strand heads, and 556 Mathayom Suksa 1 students.

The samples are as follows:

    1) 15 teachers teaching in 5 learning strands at Mathayom Suksa1 level, in the 1st semester of 2012 academic year purposively selected from those taught at Mathayom Suksa 1/8, 1/8 and 1/9, 3 were from Thai language, 3 from mathematics, 3 from science, 3 from social studies, religion, and culture, and 3 from English language.

    2) Head of each learning strand totaling 15 of them who were purposively selected as the sample.

    3) 119 students 39 of whom were from Mathayom Suksa 1/7, 40 from Mathyom Suksa 1/8, and 40 from Mathayom Suksa 1/9 all are the classes where the sampled teachers of the 5 learning strands were teaching.

Research Instruments

The instruments used in this research include:

1. Handbook for enhancing the knowledge and understanding on teaching critical thinking for collaboratively learning of the teachers covering 4 sets of contents, namely, 1) knowledge and understanding on teaching critical thinking, 2) analysis of the curriculum on the learning strands that facilitate the critical thinking teaching, 3) designing and writing up the instructional plans, and 4) guidelines for implementing the instructional plans.

2. A questionnaire for assessing the relevancy of the curriculum contents to the critical thinking composing of rating five scale items by the teachers in the 5 prime learning strands.

3. Form to evaluate the instruction collaboratively set up by the teachers on how it facilitated the critical thinking of the students composing items with 5 rating scales to be rated by each teacher and the learning strand head.

4. Form to observe the instructional provision of the teacher composing 20 close-ended questions with 4 rating scales and five open-ended questions used by the observers who were the colleagues in the same learning stand and the heads of the learning strands who would observe the teachers of the same learning strand on their instructional preparation, learning experience provision, lesion conclusion, and measurement and evaluation.

5. Form for observing enhanced critical thinking behavior of the students composing of 15 close-ended 4 scale rating items used to observe the student's learning behaviors in the aspects of participation, carefully analyzing before making decision, effort to find the reasons to support the argument, the concern with the perspectives other than one's own, opening for new information, utilizing the information appropriately, and courage to think and express. The form is used to observe the student's behavior while being taught by the teacher in each learning strand. The observers are the same as those in 4.

6. Form to note down the reflection on the teaching on how it promoted critical thinking to be used by the teachers in each learning strand who jointly reflect on each instruction. It is composed of 7 open-ended questions covering the issues on

introduction to the lesson, instructional activity arrangement, lesson conclusion, evaluation, media and equipments used, problems, and obstacles in the learning provision, guidelines for developing the lesson plans for next time, and suggestions. The form is to be filled out by the teacher representing each of the learning strands.

Instrument Construction

    The researcher had constructed each of the instruments for this research through the following steps:

    1. Handbook for enhancing the knowledge and understanding on teaching critical thinking for collaborative learning of the teachers was developed by the researcher following the steps as follows:

      1.1 Compiling basic information and problems concerning teaching critical thinking in The Prince Royal's College to realize the present thinking condition of students, the teachers' teaching practice on analyzing the curriculum, planning, and implementing the critical thinking inducing instructional plans, their reflection on the implementation, including the teachers' behavior in reasoning things and their concern with the reliability of the information to be used in the instruction.

      1.2 Studying principles, concepts, and theories concerning critical thinking from documents, books, textbooks, and researches to form the guideline for constructing the principles for developing the teachers' competence in teaching critical thinking.

      1.3 Studying Theoretical concepts concerning collaborative learning and action research to lead to the promotion of thinking competence and collaborative learning and the approaches to improve the performance using action research to promote the teachers' critical thinking that emphasizes the interaction among them and open for the teachers to reflect and find rationality of the practice and be concerned with reliability of the information which would facilitate the teachers to perform analytical and synthetic thinking with criticism, ability to make decision, and solving the problems.

      1.4 Studying the methods and processes of constructing handbook to promote knowledge and understanding on teaching critical thinking for collaborative learning among teachers to get ideas on the basic components of the handbook such as introduction, instruction, concepts, principles, objectives, contents, media, and measurement and evaluation

      1.5 Setting up the content structure of the handbook covering 4 parts, namely, knowledge and understanding on teaching critical thinking, curriculum analysis to find the contents of the learning strand that facilitate the critical thinking teaching, instructional planning, and implementing the instructional plans to develop the students' critical thinking

      1.6 Constructing the draft handbook to promote knowledge and understanding on teaching critical thinking

       (1) Preface, instruction, rationale and principles, objectives, learning stand content structure, media, measurement and evaluation

       (2) Guidelines for organizing the learning activities in the 6 learning units, namely, unit 1- knowledge and understanding on critical thinking, unit 2- phase one of critical thinking developing plans, unit 3 – phase two of the critical thinking developing plans, unit 4 – curriculum analysis on the basic learning strands that

facilitate teaching critical thinking, unit 5-instructional planning to promote critical thinking, and unite 6 – implementing the plans.

1.7 Send the draft handbook on promoting knowledge and understanding on teaching critical thinking for collaborative learning of the teachers to the 5 experts one of whom was the expert in curriculum and instruction, two were the experts on teaching critical thinking, one was the expert on action research, and one was the expert on collaborative learning, to verify validity and reliability on the contents. The 5 experts had reviewed the draft and expressed their comments which could be summarized that the organization of the contents starting from the preface, instruction, concept, rationale and principle up to the design of each of the 6 learning units were accountable for the objectives of the research. They also recommended on the language which should have been modified to more smoothly communicative and well connected to one another. To them, the activities designed were suitable.

1.8 The researcher revised the draft along the experts' recommendations.

1.9 Produced the handbooks and distributed them to the 5 teachers in charge of the head of the learning strands to review it on its comprehension, language usage, and feasibility. The 5 teachers had made their comments which could be summarized as follows:

"The Handbook had identified concepts and principles with a good organization of the issues in a coherent way. Its objectives are understandable and reflect the need of the developer. The contents, media, and measurement and evaluation were all clear and relevant to the issue of critical thinking and facilitate the readers in their putting into practice."

Head of a learning strand, May 31, 2012

1.10 The researcher revised the draft along the recommendations of the experts as mentioned above and set up the handbook which was 60 pages long as a separate document from this research report.

2. Concerning the questionnaire asking the relevancy of the curriculum contents that facilitate critical thinking, the researcher would follow the following procedural steps.

2.1 Studying principles, concepts, and theories from the documents, books, textbooks, and researches relating to the curriculum analysis facilitating the teaching of critical thinking for teachers

2.2 Setting up 9 indicators to be used in the process of curriculum contents that facilitate the teachers' teaching critical thinking

2.3 Constructing the questionnaire asking the congruence of the curriculum contents in facilitating the critical thinking teaching for collaborative learning among the teachers

2.4 Through the questionnaire, the 5 experts were asked to judge the relevancy of the curriculum contents to the critical thinking teaching. The index of congruence was calculated through the formula as follows (Ritcharoon, Pichit, 2006: 242)

$$IOC = \frac{\sum R}{N}$$

IOC   stands for the index of congruence with the objective

$\sum R$ stands for total scores of the experts' opinion

N   stands for number of the experts

Scales to be checked by the experts are as follows:

      +1   Congruent with the content

       0   Not sure

      -1   Not congruent with the content

          The results come out that the indicators of congruence (IOC) were at 0.80 – 1.00.

         2.5 Revised the questionnaire asking the congruence of the content and its facilitating teaching critical thinking for collaborative learning of the teachers in aspect of the language used as recommended by the expert and (Appendix, p.114)

         3. The form to evaluate the instructional plans that facilitate the teachers' teaching critical thinking was developed by the researcher along the following process:

         3.1 Studying the principles, concepts, and theories from the documents, books, textbooks, and researches relating to the evaluation of the teachers' instructional plans for teaching critical thinking

         3.2 Setting up 15 five-scale items to be used to evaluate the instructional plans for facilitating the teachers' teaching critical thinking basing on criticism, careful consideration, reasonability, and the concern with reliability of the information

         3.3 Constructing the form to evaluate the learning plans that facilitate the teachers' teaching critical thinking

         3.4 Sending the draft form for evaluating the learning plan facilitating the teachers' teaching critical thinking to the 5 experts to assess the congruence to the content from which the indicator of the congruence (IOC) was at 0.80 – 1.00

         3.5 Revising the evaluative form on language usage as recommended by the experts

         3.6 Creating the form to evaluate the facilitation of the learning provision on the teachers' teaching critical thinking (Appendix, p. 115)

         4. Form to observe the learning provision of the teachers for the observers was developed by the researcher through the following process:

         4.1 Studying the principles, concepts, and theories from the documents, books, textbooks, and researches related to the construction of the form to observe the teacher's teaching.

         4.2 Create 20 four scale items for each aspect concerning the learning provision of the teachers basing on careful consideration, reasonability, and the concern with the information reliability.

         4.3 Constructing the Form to Evaluate the Teacher's Teaching

         4.4 Having 5 experts to assess the form's content congruence and deriving IOC at 0.80 – 1.00

         4.5 Revising the observing form on language complying to the experts' recommendations

4.6 Constructing the final version of the form for observing the teacher's teaching (Appendix, p. 117)

5. Drafting the form for observing the student's critical thinking behavior along the process as follows:

5.1 Studying the principles, concepts, and theories from documents, books, textbooks, and researches related to the construction of the form for observing the student's behavior

5.2 Creating 15 four-scale items each for observing the teacher teaching behavior and the development of student's desirable behaviors

5.3 Constructing the form for observing the student's developed behaviors

5.4 Have the draft of the form to observe the student's developed behavior assessed by 5 experts to check for validity and the congruence with the congruence deriving the indicator of congruence (IOC) at 0.80 – 1.00

5.5 Revising the drafted form on language along the recommendations of the experts

5.6 Creating the final version of the form for observing the student's developed behavior (Appendix, p. 119)

6. Form for recording the reflections on learning provision that promotes critical thinking was developed by the researcher through the following process:

6.1 Studying the principles, concepts, and theories from documents, books, textbooks, and researches concerning the construction of the form to record the reflection of learning provision the promote critical thinking

6.2 Setting up the indicators for the itemized statements to evaluate the teachers' collaborative learning and reflective behaviors which are open-ended; during these two phases of the process, the researcher observed, recorded, and conducted the informal interviews.

6.3 Constructing the drafted form for recording the reflection on the instruction for developing critical thinking

6.4 Sending the drafted form for recording the reflection on the teaching to promote the critical thinking to 5 experts to assess the congruence with the content which yielded the indicator of congruence (IOC) at 0.80 – 1.00

6.5 Developing the final version of the form for recording the reflection on the instruction provided for promoting critical thinking (Appendix, p. 120)

7. VDO recording was used to supplement the instruments 4 and 5.

Information Collection

The researcher had proceeded to collect the information along the following process.

The researcher coordinated with 15 teachers at Mathayom Suksa 1 level who were the teachers in the 5 major learning strands and 5 heads of the learning strands to inform about the purposes of the research, its methodology, instructional plans construction, and, measurement and evaluation.

Phase 1 (March-May, 2012) The researcher called the meeting of the teachers to collectively study the handbook to promote knowledge and understanding on critical thinking, and engage in the workshop on curriculum analysis. The questionnaire on congruence of the curriculum content on critical thinking was distributed to the

teachers to respond. The workshop also trained the teachers on planning the learning units and reviewed the instructional plans collaboratively constructed by the teachers. The teachers and learning strand heads responded to the form to evaluate the learning plans facilitating the teachers' critical thinking teaching.

      Phase 2 (May – October, 2012) teachers in the learning strands who served as part of the sample used the learning plans to teach the students for 3 times each on which was on a topic. In each teaching, there would be the observation on the instructional plan implementation and recording learning behavior of the students conduced by the colleague teacher in the same learning strand and heads of the strands. The observers used the form to observe the teacher's teaching and the student's developed behavior. After that, the derived results were discussed and reflected by the teachers in the learning strand and its head using the reflecting form. The process followed the Plan, Act, Observe, and Reflect cycle for 3 times. Then all the teachers used the results from phase 3 to draft the instructional plans for the phase 4 to come. Note that at this last phase, the teachers were required only to get the instructional plan done. They did not have to implement it.

Information Analysis

      1. The information on the competence on curriculum analysis of the teachers in the 5 prime learning strands derived from the questionnaire asking about the congruence of the content for promoting critical thinking of each teacher in each of the 5 learning strands. The quantitative information was analyzed in terms of means and standard deviation. The information on the teacher's ability to insert the thinking standards and features that facilitate the critical thinking in each of the instructional implementation was collected and analyzed in terms of frequency and percentage.

      2. Competence of the teacher in setting the instructional plans was derived through the information from assessing the instructional plans that facilitate the teacher's critical thinking teaching. The form was checked by each teacher and the heads of the learning strands. It is a rating scale with 5 rating levels. The information was then analyzed in terms of mean and standard deviation.

      3. Information on the competence of the teacher in implementing the developed instructional plans was collected through observation conducted by the colleague teachers in the same learning strand using the observing form containing 20 close-ended questions. The answers from 5 open-ended questions were analyzed on the content to summarize the outstanding characteristics of the teachers emerging during the teaching. Some of them were to be changed for the better development. Outstanding behaviors of students as well as those which needed improvement were all concluded in qualitative terms. The recommendations, a form of reflection, were also note down for the improvement for the next cycle of teaching.

      4. The student's critical thinking behavior having been developed as the result of using the instructional of the teacher was also observed and recorded. These included their behaviors in participating, thinking thoroughly before making decision, attempting to find the reasoning to supplement an assertion, using different perspectives from one's own, opening for new information, using information appropriately, and courage to express one's idea. The instrument was the form to observe the student's behavior composing 15 close-ended questionnaire items. The quantitative information was analyzed in terms of mean and standard deviation.

5. Problems and obstacles encountered during the learning provision for promoting the teacher's competence on teaching critical thinking were derived from the reflections done by the teachers in each learning strand after each teaching. The form consisted of 7 open-ended questions covering the introduction of the issue into the lesson, the organization of the instructional activities, lesson conclusion and evaluation, teaching media usage, problems and obstacles, guideline for developing instructional plans next time, and the recommendations. All this information was processed through the content analysis.

Criteria for Interpretation

In interpreting the results of the information analysis, the researcher set the criteria for interpreting the as follows:

1. The interpretation of the mean of the information derived through the information gathered from the questionnaire asking the relevance of content to critical thinking and the form to assess the facilitation of the learning plans on the competence on teaching critical thinking. This was adopted from that used by Srisa-ard, Boonchom (2000: 162-163) as follows:

4.50 – 5.00	most suitable
3.50 – 4.49	much suitable
2.50 – 3.49	moderately suitable
1.50 – 2.49	minimally suitable
1.00 – 1.49	least suitable

2. The mean scores from the form to observe the instructional provision basing and the form to observe the student's critical thinking development are interpreted on the following criteria:

3.50 – 4.00	very much practiced
2.50 – 3.49	much practiced
1.50 – 2.49	moderately practiced
1.00 – 1.49	minimally practiced