

CHAPTER III

RESEARCH METHODOLOGY

A. Conceptual Framework

In this study, the research was undergone in order to examine and describe the issues concerning whether the teaching strategies used by teacher who is teaching the Cambridge IGCSE syllabus in latent heat topic reflect efforts in achieving compliance of the goals contained in the curriculum is discussed in this research. In an effort to get the picture, all instruments were deployed as a tool to get the data. In this study each instrument was made to be used in capturing the data needed to answer the three research questions.

B. Operational Definition

Operational definition is a definition which gives meaning to a term related research, thus leads to a common perception. The followings are descriptions of terms included in this research. This is intended to avoid misperception in interpreting some terms related to the title of research, The Implementation of Physics Teaching Strategies which Refers to Cambridge IGCSE Curriculum in Latent Heat Topic: A Case Study of an International School in Tangerang.

1. Teaching Strategies

Teacher plays an important role as a figure in which students is depending on them in establishing the learning process in classroom. There are a lot of interpretations of teaching. One of them is like proposed by Gurney (2007) which states that teaching is far more than simply transferring information. It is the engaging of minds to seek out answers. Meanwhile, Gray (2009) conveys idea that strategy is about directing and using something to achieve a selected purpose. From that definition, in this study the meaning of teaching strategies is more concerned on planning how physics teachers deal with teaching and learning in physics lesson (latent heat topic) and how they draw up plans to engage students in the learning process.

2. Implementation

Implementation is attempts to translate the intended into practice (Diepenbroek, 2007). Refers to that definition, the implementation in this research concerns to the realization of idea or process in applying strategies and plans which are written in IGCSE curriculum in order to accomplish the objectives and goals.

3. IGCSE Curriculum

IGCSE (International General Certificate of Secondary Education) curriculum in school is designed by the school itself with the help of Cambridge IGCSE to build a relevant curriculum for individual needs. The curriculum can be built around the core subject groups of mathematics, science and English. Each core subject has a range of alternative syllabuses to suit each student (Cambridge IGCSE, 2011). From the information described, what is meant by IGCSE curriculum in this research concerns to the content of the curriculum such as design, planning and delivery. And it will be more focused on Cambridge IGCSE physics syllabus code 0625.

4. Case Study

Yin (Rowley, 2002: 18) states that a case study is empirical inquiries that investigate contemporary phenomena within its real life. In other word case study is one of research that examines phenomena in order to try and understand what happened and why. In this research it refers to identification and description an actual situation regarding is the selected teaching strategies used reflect efforts in achieving compliance of the goals contained in the curriculum.

5. International School

International school is loosely defined as a school that promotes interbational education, in an international environment, either by adopting an international curriculum, or by following a national curriculum different from that of the country the school is located in (Wikipedia, 2013). International school in this research is one international school which implements the Cambridge curriculum.

C. Subject of Study

This research involved physics teacher who is teaching the Cambridge IGCSE syllabus in one international school located in Tangerang, as a source of information research.

D. Sampling Technique

Concerning to the research explanations which have been described in the previous, this research will require information regarding whether the teaching strategies used by teachers who are teaching or the Cambridge IGCSE syllabus in latent heat topic reflect efforts in achieving compliance of the goals contained in the curriculum. The technique used in the appointment of research sample is purposive sampling technique. According to Rizky, Rudiyanti, and Muskananfola (2012), it is a technique in which the samples were taken with an intention or a certain purpose i.e. to get information directly from physics teacher about the undertaken teaching strategies in latent heat topic while implementing the Cambridge IGCSE.

E. Research Method

The research method used is qualitative method. Musfiqon (2012) stated the characteristic of qualitative is having non-numbers data. The type of data can be in form of sentence, statement, document, etc. which are analyzed qualitatively. And it does not utilize the statistics in analyzing research data.

F. Research Design

A qualitative research design used in this study is Case Study. Case study design is an approach that more appropriate to be used to examine the single fact that has not been much going on in the community (Musfiqon, 2012). The case being studied in this research is physics teaching strategies in the implementation of the Cambridge IGCSE. The data is only based on the facts that occurred and not be manipulated. It is also accordance to Jennifer Rowley (2002) that case study research is also good for contemporary events when the relevant behavior cannot be manipulated.

G. Data Collection Technique

According to Musfiqon (2012) technique of collecting data should be adjusted to the type of data desired in the research to determine whether the predicted outcomes are evident. The data which are desired to obtain in this research is all information regarding goals contained in Cambridge IGCSE curriculum, skills and competencies should learners acquire through it, how teacher organizes content and kind of strategies used in delivering topic.

Those are collected by doing video recording of lesson in topic latent heat, interview (conducting interviews according to the interview guidelines), analyzing document (examining some documents to acquire information and strengthen the existing data) and also distributing questionnaires. Those activities are used as data collection techniques in this study to obtain the data of research. The procedure while collecting data research will be described further in the Research Procedure point Data Collection Stage.

Table 3.1 below presents the techniques used in obtaining information to answer the four research questions.

Table 3.1 Techniques Used to Answer the Research Questions in the Study.

Aspects Studied	Techniques Used				Subject of Study
	Recording video of lesson	Interview	Questionnaire	Document analysis	
Goals in Cambridge IGCSE curriculum which are promoted in learning latent heat	✓	✓	✓	✓	Physics teacher who are teaching the Cambridge IGCSE syllabus
Skills and competencies should learners acquire through Cambridge IGCSE curriculum	-	✓	✓	✓	

Aspects Studied	Techniques Used				Subject of Study
	Recording video of lesson	Interview	Questionnaire	Document analysis	
Organizing content by teacher	✓	-	✓	✓	Physics teacher who are teaching the Cambridge IGCSE syllabus
Kind of strategies used	✓	✓	✓	✓	

H. Instruments

The tools used to obtain the data and information needed in answering the research problem is called as research instruments. In developing instruments certainly it should be related to the type of data desired (M. Musfiqon, 2012). In this study, the instruments were made to be used in capturing the data needed to answer the four research questions and used to gain the required information for answering those research questions. Those instruments are:

1. Video Recording

Yin (2003) stated observation can be so valuable if considering photographs. In this research, video recording of instructional process in latent heat topic is used to obtain information about goals in Cambridge IGCSE curriculum which are promoted in learning latent heat, organizing content by teacher, kind of strategies used in delivering latent heat concept. Concerning not every school allows recording during the lesson, so the use of video recording should be based on permission from the school.

2. Interview Guide and Recording Devices

Interview guide was used while conducting the interview. So that the path of interviews becomes clear in directing to the information sought. Meanwhile, the recording device is as a matter of personal preference. Even Yin (2003) suggested audiotapes, because it certainly provides a more accurate rendition of

any interviews than any other methods. These instruments are intended to obtain information for answering research question 1, 2, and 4 regarding goals in Cambridge IGCSE curriculum which are promoted, skills and competencies should learners acquire and kind of strategies used.

3. Questionnaires

According to Musfiqon (2012) questionnaires are a number of questions which are arranged systematically to be responded by the source of research data (respondent). This instrument was intended to obtain information including goals in Cambridge IGCSE curriculum which are promoted in learning latent heat, skills and competencies should learners acquire through Cambridge IGCSE curriculum, content organized by teacher and kind of strategies used. This information was proposed to answer those four research questions.

4. Documents

The documentary information is likely to be relevant to every case study topic. It plays an explicit role in any data collection in doing case studies (Yin, 2003). Yin also stated that document corroborates and augments evidence from other sources. It can be used to acquire information and strengthen the existing data. The document which was examined in this research is any documents in case can provide the information to answer the research question 1, 2, 3 and 4. In particular it is purposed to identify goals in Cambridge IGCSE curriculum which are promoted in learning, and skills and competencies should learners acquire through the curriculum. And other documents can also be used to identify how teacher organizes the content as well as the teaching strategies used in order to be in line with what expected in the curriculum.

Instruments which have been developed are not directly usable. So it is necessary to test the validity and reliability to determine whether an instrument is valid and reliable (M. Musfiqon, 2012). According to Yin (2003) there are four tests to establish the quality and which are relevant to case studies i.e. construct validity, internal validity, external validity, and reliability. The procedure in

testing the instruments will be described further in the Research Procedure point Test Validity and Reliability.

I. Research Procedures

The following is the explanation on how the steps were taken when undergoing the research. And these steps are divided into three stages as described below. Diagram 3.1 presents the flow of steps taken during undergoing research.

1. Preliminary Stage

In this stage, the activity was focusing on determining topic, arranging proposal, managing permission, determining subject of study and designing instruments. The followings are descriptions on how the activities done in this stage:

a. Doing literature study

It was done to develop the basic theory used in doing research such as gaining the accurate theory behind the research, looking for the appropriate method and any related information of the research. That information was obtained from latest journals, books, articles, CIE website and other resources.

b. Discussing idea of research

It is done by consulting with lectures, discussing with teachers and peers, as well as realizing the circumstances which influences the possibility of research to carry out. It discusses the topics and issues that will be raised in the study, as well as formulating of research problems.

c. Constructing research proposal

It is as an initial step in proposing the research plan and as an early attempt to convince idea to get a study permit.

d. Managing permission

This is done by submitting a proposal which has been presented previously, to one international school located in Tangerang as a request for permission to conduct and collect research data at that school.

e. Determining subject of study

It is done by conducting field survey to obtain prior information related to research, then discussing with the parties concerned. It is purposed to have description regarding subject of study as an information resource in this research.

f. Constructing and justifying instruments

As it has been mentioned, an instrument needs to be tested before using. In this research, the instruments construction was adjusted to the type of data required to facilitate in the process of analyzing data. Meanwhile for instruments justification several steps were performed, and the descriptions are presented below.

g. Test validity and reliability

Judging the quality of instrument can be done according to certain logical test. There are four tests considered to be relevant to case studies; those are construct validity, internal validity, external validity, and reliability (Yin, 2003).

1) Construct validity

According to Kidder & Judd (Yin, 2003: 34) construct validity is establishing the correct operational measures for the concepts being studied. There are two steps that must be completely done to meet the test of construct validity (Yin, 2003), first is select the specific types of subjects to be studied and relate them to the original objectives of the study. In this study there are four specific subjects to be studied; those are goals in Cambridge IGCSE curriculum which are promoted in learning latent heat, skills and competencies should learners acquire through Cambridge IGCSE curriculum, content organized by teacher and kind of strategies used. Second, demonstrate that the selected measures of the subjects under study indeed reflect the specific subjects that have been selected. The selected measures which are convinced to reflect it are doing recording the video of lesson, analyzing document, conducting interview and distributing questionnaires.

Yin (2003) stated there are three tactics which available to increase construct validity when doing case study. The first is the use of *multiple source of evidence*, using many different sources of evidence to explain one subject in data

collection. This step is also done in this research. It can be seen again in Table 3.1, where each component of research questions uses the four instruments to answer. A second tactic is to establish *a chain of evidence*, allowing external observer to follow the derivation of any evidence – ranging either from initial questions to conclusion, or from conclusions back to initial research questions. And the third tactic is to have the draft case study report reviewed by key informants; the draft report is reviewed not just by peers but also by the participants and informants in the case. The two steps of construct validity test are met in this study. This contributes positive to the validity.

2) Internal validity

According to Yin (2003) internal validity is only concern for causal case studies, in which an investigator is trying to determine whether even x led to even y . He also stated that this logic is inapplicable to case studies, which are not concerned with making causal claims. In case studies the inference is made from some earlier occurrence, based on interview or documentary evidence collected as part of case study. Nevertheless a research design that has anticipations towards questions in making inferences has begun to deal with internal validity. Four tactics in conducting internal study according to Yin (2003) are *pattern matching*, *explanation building*, *addressing rival explanations*, and *using logic models*.

3) External validity

According to Kidder & Judd (Yin, 2003), external validity is establishing the domain to which a study's findings can be generalized. Case studies rely on *analytical* generalization, in which the investigator is striving to generalize a particular set of result to some broader theory (Yin, 2003). In generalizing the finding of this study, it must be tested by repeating it in a second or other topics and the same result of finding should occur. Since this is the first study, so the external validity of this study can be considered low.

4) Reliability

Kidder & Judd (Yin, 2003) states reliability is demonstrating that the operations of a study such as the procedure of data collection can be repeated and produce the same result. The instrument should be repeatable to ensure it deals with the reliability. The purpose of reliability is to minimize the errors and biases in study (Yin, 2003). In this study, the reliability is probably low because the poor timing and duration of this research in repeating the instrument. The remarks of the four tests for quality of instruments in this research are given in table 3.2.

Table 3.2 Remarks of the Quality of Research Instruments

Test validity	Degree
Construct validity	High
Internal validity	Low
External validity	Low
Reliability	Low

h. Analyze the results of testing

After the instruments are tested for its validity and reliability, the result of testing is analyzed based on certain criteria. And then it is sorted to obtain set of instruments that fulfill the criteria only. According to U.S. General Accounting Office (Yin, 2003), there are four criteria which are commonly used to establish the quality of research i.e. trustworthiness, credibility, conformability and data dependability.

i. Consult with lecturer or expert

Consult with lecturer or expert is very important to help us in constructing an appropriate instrument of research.

j. Make revision

2. Data Collection Stage

Data collection stage is the stage at which the data collecting process began. The activity focuses on conducting the data collection techniques through implementing the instruments as well as analyzing documents. These all are done in purpose to collect data which can be used as evidences to answer the research problem. The activities done in this stage are:

a. Analyzing documents

Analyzing documents is done because it has values in any data collections in doing case studies (Yin, 2003). First, it is helpful in verifying the correct information that might have mentioned in an interview. In this study the information that will be verified is regarding goals in Cambridge IGCSE curriculum which are promoted in learning, and skills and competencies should learners acquire through the curriculum, how teacher organizes the content as well as the teaching strategies used in order to be in line with what expected in the curriculum. Second, documents can provide other specific detail to justify information which was obtained from interview, questionnaire or observation. And the third, an inference can be drawn from/based on documents. Yin (2003) stated that in analyzing documents, it is needed to identify research objectives, so that the analysis will be more appropriate in interpreting the contents of the evidence.

Substantively, analyzing documents have been done in the preliminary stage in point of doing literature study. But in this stage it is done more specifically by exploring the content of Cambridge IGCSE Physics syllabus code 0625 to have identification and verification regarding goals in Cambridge IGCSE curriculum which are promoted in learning, and skills and competencies should learners acquire through the curriculum. And other documents is used to identify how teacher organizes the content as well as the teaching strategies used. In this study, the documents used are lesson plan, Cambridge IGCSE, CIE official website and Cambridge IGCSE Physics syllabus code 0625, etc. It is purposed to answer research question 1, 2, 3 and 4.

b. Implementing research instruments

The research instruments are implemented in this stage. The implementation techniques of instrument depend on techniques of collecting data. The further descriptions are discussed below:

1) Recording video of lesson

It was done by recording the performance of the physics teachers in latent heat topic. It is intended to describe in details the description of goals in Cambridge IGCSE curriculum which are promoted in learning latent heat, organizing content by teacher, kind of strategies used in delivering latent heat concept.

2) Conducting interview

Interviews are essential sources of case study information; it is helping to identify other relevant sources of evidence (Yin, 2003). According to Musfiqon (2012) the use of interview technique is intended to construct thoughts, events, perceptions, experiences and opinions about the issue of research. This is done through interactive communication with the subject of research to get information desired. There are three types of interview according to Yin (2003), i.e. open-ended nature, focused interview, structure questions. The type of interview which has been conducted in this study is open-ended nature. The respondent was asked regarding goals in Cambridge IGCSE curriculum which are promoted, skills and competencies should learners acquire and kind of strategies used. In open-ended nature the respondent can be asked to propose his or her own insights into certain occurrences. The respondent also can suggest other persons to interview. It was done by the help of the interview guide and recording devices. This is intended for answering research question 1, 2, 3 and 4.

3) Distributing questionnaire

Questionnaire is also one of major techniques in conducting qualitative research (Musfiqon, 2012). He stated there are two types of questionnaires; i.e. open questionnaire and closed questionnaire. The type of questionnaire used in this research is open questionnaire. In open questionnaire, the respondent has

opportunity to answer with alternative answers they want. Distributing the questionnaire is intended to obtain information regarding goals in Cambridge IGCSE curriculum which are promoted in learning latent heat, skills and competencies should learners acquire through Cambridge IGCSE curriculum, content organized by teacher and kind of strategies used. This is proposed to answer research question 1, 2, 3 and 4.

3. Final Stage

This is the last stage of this research. Meanwhile the activities carried out in this stage are as follows:

- a. Analyzing data

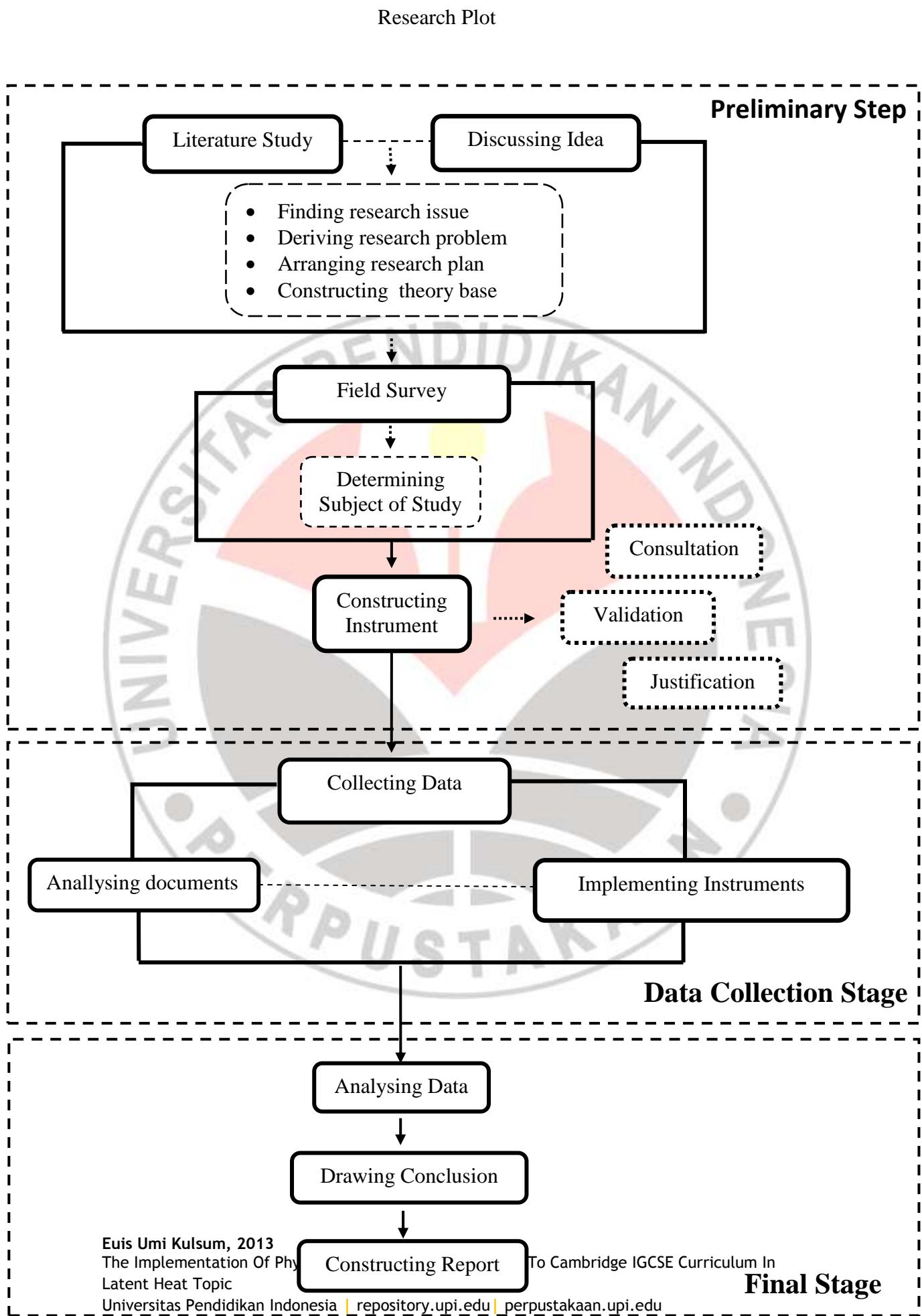
After data collection stage had conducted, all data gained from the instruments was collected, classified then analyzed qualitatively. It is done to find out information required to answer the research problem.

- b. Drawing conclusion

Once all the data has been discussed and the three research questions were answered, the conclusion was obtained.

- c. Constructing report

The report is constructed as the final product of this research.



J. Data Analysis Technique

The data gained from this study is qualitative data. Qualitative data represents non number data. It can be text, video, statements and documents. Process of data analyzing also uses qualitative analysis techniques which is different from the quantitative data that using the help of statistical software in the process. Qualitative analysis have researcher as an analytical tool (human as instrument). The researcher is required to systematically link among the existing data in order to get 'meaning' to address the research problem.

There are six qualitative analysis techniques according to Sarwono (2006). But the qualitative analytical technique used in this study is Domain Analysis Technique. This analysis technique is more concern on general overview in describing symptoms, phenomena or facts under investigation. So, in this research the data analysis focuses on the description concerning the goals in Cambridge IGCSE curriculum are promoted in learning latent heat topic, skills and competencies should learners acquire through Cambridge IGCSE curriculum, how the teacher organize the content of latent heat topic, and what kind of strategies used while teaching latent heat topic in an effort to achieve compliance of the goals contained in Cambridge IGCSE curriculum.