

## CHAPTER III

### METHODOLOGY

#### Introduction

This study has five main objectives. They are:

1. to identify some basic science concepts that Form Five students used in their 1998 *Reka Cipta* projects,
2. to investigate how often science concepts were used in *Reka Cipta* lessons,
3. to identify the perceptions of Form Five students on the importance of these science concepts in *Reka Cipta* lessons,
4. to identify some of the problems that Form Five students faced when applying science concepts in their *Reka Cipta* projects, and
5. to suggest several ways to overcome these problems.

This chapter outlines the methodology of the study. Among the items highlighted are the sample, the instrument, the administration of the instrument and analysis of data.

#### The Sample

This study was confined to Form Five students who were taking *Reka Cipta* as an elective subject in the 1998 *Sijil Pelajaran Malaysia* (SPM) examination. The students were taken from one of the districts in the state of Sabah. Two schools in that district offered *Reka Cipta* at upper secondary level. Both schools participated in this study.

Thirty three Form Five students in these two schools were taking *Reka Cipta* as an elective subject in their 1998 *Sijil Pelajaran Malaysia* (SPM) examination. Thirty two students were given a questionnaire each (see Appendix A) as one student was absent on the day the questionnaire was administered. A total of 96.9% (31) of the students responded to the questionnaire. Interviews were also carried out on 22.6% (7) of the students.

### The Instrument

As this was the first study done on the applications of science concepts in the *Reka Cipta* subject, no instrument was readily available. Therefore, the instrument had to be self-constructed by the researcher.

The survey method and structured interview were used. The main instruments were 'Science Concepts in *Reka Cipta* Questionnaire' (Appendix A) and 'Science Concepts in *Reka Cipta* Interview Schedule' (Appendix B). Both instruments were in *Bahasa Melayu*, the national language.

### Pilot Test

A pilot test on the 'Science Concepts in *Reka Cipta* Questionnaire' was done on 10 December, 1997 on a separate set of students from one of the schools. All 18 Form Five students who had sat for their 1997 *Sijil Pelajaran Malaysia* (SPM) examination were chosen for the pilot test. At the time of the pilot test, these students were about to complete their Form Five and were leaving school. A total of 83% (15) of the students responded to the questionnaire.

From the pilot test, shortcomings of the questionnaire were identified and modifications were made. For example, repetition of questions were

identified by the supervisor and the questions were subsequently modified. The initial 4-point Likert scale questions on the problems that students faced in the application of science concepts in *Reka Cipta* projects were changed to multiple-choice questions. Likewise, all open questions were modified and converted into multiple-choice questions. The questionnaire for this pilot test is attached as Appendix C.

#### Teachers' Rating Form

A Teachers' Rating Form (Appendix D) was administered on two out of four teachers who were teaching *Reka Cipta* at upper secondary level in the chosen district. One teacher was a Sabah state resource personnel for the *Reka Cipta* subject whereas the other was an ordinary *Reka Cipta* teacher.

Both teachers established the science concepts they felt were applied in the themes lighting, separation and protection. This assisted the researcher in constructing the students' 'Science Concepts in *Reka Cipta* Questionnaire'.

From the Teachers' Rating Form, it was found that there were repetition of concepts. Therefore, repeated concepts were trimmed to only a single concept in students' questionnaire. Two concepts i.e. momentum and conservation of momentum principle were found to be not applicable in the themes lighting, separation and protection. As a result, these two concepts were deleted and not listed in students' questionnaire. Besides that, since prism was an object and not a science concept, it was dropped from the original students' questionnaire. The results of teachers' rating are shown in Table 5.

Table 5: Results of Teachers' Rating

SCIENCE CONCEPTS	TEACHER	
	A	B
Light	3	3
Refraction of light	1	2
Reflection of light	2	2
Dispersion of light	1	2
Heat	3	2
Temperature	1	2
Electricity	3	3
Kinetic energy	2	2
Potential energy	2	2
Solar energy	3	3
Light energy	3	3
Chemical energy	3	2
Sound energy	1	2
Pressure	2	2
Prism	1	2
Electric current	3	3
Potential	1	3
Gravitational pull	2	2
Resistance	3	2
Law of energy conservation	3	2
Movement	1	2
Force	3	2
Momentum	1	1
Conservation of momentum principle	1	1
Gravity	2	2
Transformation of energy	3	2
Sound	2	2
Transfer of heat	2	2

Note: 4 Frequently Applied  
 3 Sometimes Applied  
 2 Seldom Applied  
 1 Never Applied

### Questionnaire for Reka Cipta Students

Appendix A is the students' 'Science Concepts in *Reka Cipta* Questionnaire'.

The questionnaire contains three sections. Section I of the instrument consists of three questions (Questions 1, 2 and 3) to gather information of the students.

Section II consists of two questions (Question 4 and 5) pertaining to students' *Reka Cipta* projects. Question 4 enquires about some selected basic science concepts that students used in the themes lighting, separation and protection. Question 5 contains five 4-point Likert scale questions on the importance of science concepts in *Reka Cipta* projects.

Section III consists of four questions on *Reka Cipta* lessons. Question 6 investigates the frequency of applications of science concepts by students in *Reka Cipta* lessons. Question 7 probes for problems that students faced in the application of science concepts. Question 8 asks students for suggestions and ways to overcome these problems. Question 9 seeks the perceptions of students on whether science concepts should be taught in *Reka Cipta* lessons.

#### Structured Interview

Structured interviews were conducted to probe for further and more detailed descriptions of problems that students faced in the applications of science concepts in their *Reka Cipta* projects. An Interview Schedule is shown in Appendix B.

There are six questions in the Interview Schedule. Questions 1 is a warm-up question and therefore, would not be discussed in the analysis. In the analysis, only data collected for Questions 2 - 6 would be discussed.

#### The Administration of Instrument

The administration of the questionnaire was personally done by the researcher in one school while the assistance of a teacher in the other school was sought. The questionnaires were distributed to all Form Five students who

were taking the elective *Reka Cipta* subject. A total of 96.9% (31 out of 32) of the students returned the questionnaires.

Interviews were also carried out on 22.6% (7) of the students. The purpose of these interviews was to probe for further and more detailed descriptions of the problems students had faced in the application of science concepts in *Reka Cipta*, as well as, ways to overcome these problems. Figure 2 shows a flow chart of data collection.

### Analysis of Data

The data collected through the questionnaire were analyzed quantitatively using frequency counts and percentage. The interviews were transcribed and analyzed qualitatively. A detailed analysis of data is discussed in Chapter IV of this study.

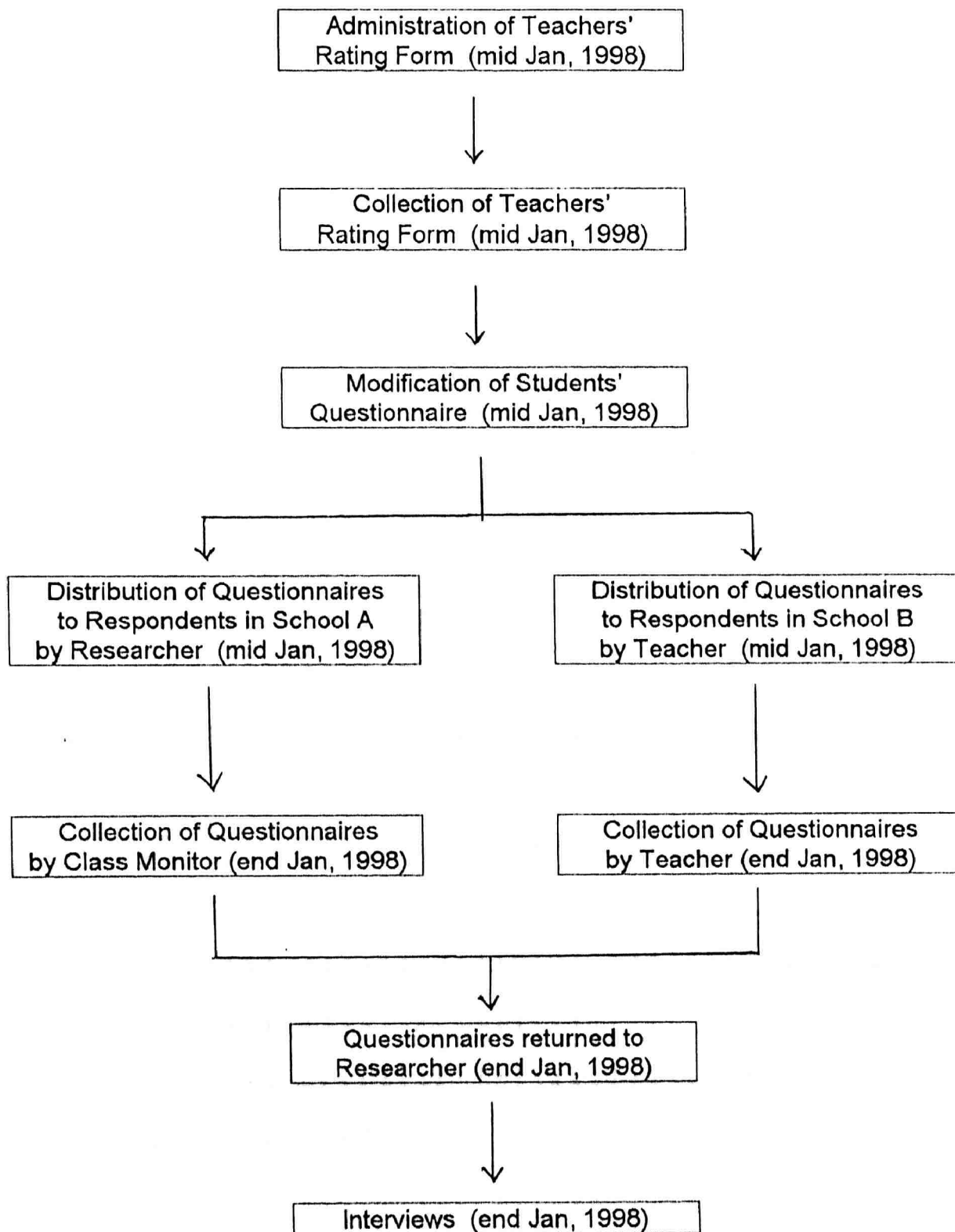


Figure 2: Collection of Data