CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

The main purpose of this study is to find out the problems of teaching and learning Science in English. This study will also explore the learning strategies that students use in learning Science in English as well as teaching strategies that teachers employ in the teaching of Science in English in the classroom. This research also highlights students' and teachers' responses in learning and teaching Science using English language respectively.

3.1 Research Design

In this research, a qualitative method was used to gather data on the problems teachers and students face in the teaching and learning of Science in the English language. According to Selinger and Shohamy, (1989), “a qualitative method is concerned with providing descriptions of phenomenon that occur naturally, without the intervention of an experiment or an artificially contrived treatment”(p.116). A Qualitative method also concerns with “studying human behavior within the context in which that behavior would occur naturally (Selinger & Shohamy, 1989, p. 118). In fact, Selinger (1989) adds that a qualitative method is more precise and suitable in explaining a social context of second language learning (p.121).

For the purpose of this study, a case study approach was applied. Selinger and Shohamy, (1989) describe a case study approach as “some aspects of the second language performance of one or more subjects as individuals, as individual performance is more revealing than studying large groups of subjects” (p.125). Brown, (2002)

explains that case study research involves “an intensive study of the background, current status and environmental interactions of a given social unit: an individual, a group, an institution or a community”(p. 21). Adelman et al.,(1976) says that the benefit of applying case study research is that the outcome of the study can be used immediately for evaluation purposes and transformation in educational policy (as cited in Nunan, 1992, p. 78). This notion is applicable to the study administered by the researcher who hypothesized that the problems faced by students in learning Science in English correlate with problems faced by teachers.

In carrying out the case study for this dissertation on 'Problems faced in the teaching and learning of Science in English' a multiple-case design is used. According to Tellis, (1997) “Case study can be single or multiple-case designs, where a multiple design must follow a replication rather than sampling logic”(p. 1). This study applies a multiple case study because it follows the nature of replication of studies carried out by two educationists in the same university (University Malaya). The two studies were carried out by Ganti Mathi (2004) on *Perceptions of teachers towards the teaching of Science in English in Form One* which involved a closed and open-ended questionnaire among 30 Science teachers, and studies by Thilagavathi (2005) on *Problems and Prospects of Learning and Teaching Science in English* among 84 students from two different schools in Kuala Lumpur. Studies have been also carried out Hamidah,R., Aziz,N.,Mukheta,I. et al., (2005) from University Teknologi Malaysia on *Teachers' Competency In The Teaching of Mathematics in English In Malaysian Secondary Schools* which involved 575 teachers throughout the country. Although the study by Hamidah,R., Aziz,N.,Mukheta,I. et al., (2005) concerns the teaching of Mathematics and not Science, this study involved learning a content subject in a second language and they have used a large sampling that is 575 respondents.

This research study is a multiple-case study because the study is not made on sampling logic where a selection is made out of population instead the study is based on the problems faced by teachers and students in the teaching and learning of Science in English besides the teaching and learning strategies employed by teachers and students for the same subject matter. As such, since this research study involves 245 students which is the entire population of the form three students in a particular selected school in Selangor; therefore a multiple-case design is applied in gathering this data.

3.2 Respondents

The sample consisted of 245 Form Three students taking the Penilaian Menengah Rendah (PMR) Examination this year and four Science teachers from a selected school in Selangor: Sekolah Menengah Kebangsaan Bukit Jelutong, Shah Alam. The students in Form Three hail from 60% in urban community and 40% are the sub-urban community students. The Form Three students are streamed in their respective classes based on their overall performance in the Final Year Examination in the previous year. Table 3.1 below shows the seven form three classes and the classification of classes with the number of students in each class.

Table 3.1

Classification of Form Three Classes and Number of Students

Name of Class	Number of Students	Level
3 Alpha	37	Excellent
3 Beta	40	Excellent
3 Delta	40	Average
3 Sigma	35	Average
3 Omega	35	Moderate
3 Epsilon	29	Weak
3 Zeta	29	Very weak
Total : 7 Classes	**Total : 245 students**	

Students in each class hail from the urban living community which is Bukit Jelutong, the elite group of living standard, Section 13, Monterez and also from the vicinity of Jelutong such as Kampung Subang, Bukit Subang, Puncak Alam, Subang Bestari, Kampung Melalyu Subang, Subang Perdana, Subang Permai, Puncak Perdana and others.

The four teachers teaching Science in the Form Three classes are all Malay female teachers. They have had 8 to 20 years of teaching experience in Science before the change in policy in teaching Science using English language. They are graduate teachers who are degree holders in Science, learnt Science in Bahasa Malaysia and have been teaching Science in Bahasa Malaysia before the shift in the medium of instruction was made by the Government.

3.3 Instruments

The instruments used in this study are a combination of questionnaire, interview and observation. This study involves an open-ended questionnaire, a structured interview and classroom observation. For this study, a triangulation method was adopted for collecting data as it enhances the reliability and validity of the study.

3.3.1 Questionnaire

According to Richards and Lockhart (1994) questionnaires are an effective method of "gathering information about affective dimensions of teaching and learning such as beliefs, attitudes, motivation preferences and also enables a teacher to collect a large amount of information relatively quickly"(p. 10). For this study, a different set of questionnaires was used for this study for students and teachers. Five open-ended questions were designed to elicit responses for the research questions of this study in

both sets for students and teachers. For the students' questionnaire, it focused on students' point of view on language problems in learning Science in English, learning strategies that they employ and feedback towards the implementation of learning Science in English. For the teachers' questionnaire it emphasizes on the teachers' point of view on problems in teaching Science in English, teaching strategies employed in the classroom and feedback towards the implementation of teaching Science in English.

The questions were designed in accordance to answer the research questions of this study and the instrument had a free-response or unstructured format where students and teachers had to write down their points of view or opinion which are parallel to Nunan, (1992) who claims that the opinions given by a respondent in open-ended questions are precise of what he/she actually wants to say (p.143).

3.3.2 Student's Questionnaire

The student's questionnaire consisted of five open-ended questions. Each question was designed to seek answers for the research questions of this study. The questions are as below:

Item 1

1. What are the language difficulties you face in learning Science in English?

   This question seeked a direct response from students on the language difficulties they encountered in learning Science in English

Item 2

2. What are the learning strategies you use in learning Science in English?

   Item two investigated the student's language strategies that they personally used in learning the subject. The researcher also introduced learning strategies to the students as they have no idea what learning strategies are all about.

Item 3

3. What are the teaching strategies employed by your Science teacher in teaching Science in English?

   This question was set to find out the teaching approaches Science teachers used in the classroom.

Item 4

4. What is your opinion in learning Science using English as the medium of instruction?

   This question elicits a direct response of students' personal views in learning Science using English as the medium of instruction.

Item 5

5. What is your feedback towards the implementation of learning Science in English?

   This question seeked the student's feedback towards the implementation of learning Science in the English language.

3.3.3 Teacher's Questionnaire

The teacher's questionnaire contained five open-ended questions related to the research questions of the study. The five items were designed as below:

Item 1

1. What are the teaching strategies you employ in teaching Science in English in your form three classroom?

   This question seeked the teacher's pre-planned strategies or current strategies that are used in classroom teaching in order to ensure student's comprehension.

Item 2

2. What are the difficulties you face in teaching Science using English as the medium of instruction in the form three classes?

   This item examined teachers' personal difficulties or problems in delivering the Science lesson in English language in the classroom.

Item 3

3. In your opinion, what are the language difficulties your Form 3 students face in learning Science using English in the classroom?

   Item three looked into the Science teachers' point of view towards students' problems in understanding Science using English language

Item 4

4. What is your opinion in teaching Science using English as the medium of instruction?

   Item four reflected the teachers' opinions on the new system of teaching Science which was learnt and taught in Bahasa Malaysia but now is taught and learnt in English.

Item 5

5. What is your feedback towards the implementation of teaching Science in English?

   This question seeked teacher' responses towards the Government implementation or change in policy of teaching Science in English.

3.3.4 Interview

In carrying out the interview, a structured interview method was used by the researcher. Nunan, (1992) explains, in the structured interview, “the agenda is totally predetermined by the researcher who works through a list of questions in a predetermined order”(p. 149). Four students in each classroom were selected for the structured interview to give their own points of view of the language difficulties, learning strategies and feedback in learning Science using English as the medium of instruction. The four students selected in each class for the purpose of the interview was based on the one highest scorer, one average scorer, one moderate scorer and one weak scorer in the school-based Science examination in 2007. This four students criteria was based on the school's streaming of students according to their achievement level which is excellent, average, moderate and weak. For this purpose, the students were identified

and selected based on their scores in their Science marks in the school based March test and Mid-year examination in 2007.

The interviewer prepared a set of questions to be asked during the interview. The teachers' interviews probe questions on problems teachers faced in teaching Science in English, teaching strategies in teaching and their opinions on the shift in the medium of instruction in teaching Science from Malay to English. In the students' interviews, the questions focus on language problems that students face in learning Science in English, learning strategies that they used in understanding Science and their opinions on learning Science in English.

3.3.5 Observation

For the purpose of this study, the researcher has also adopted the observation technique for triangulation of data besides using the questionnaire and the interview.

The observation for this study will be carried out in three selected form three classes. The classes will be the first class which is 3 Alpha (Excellent level class) , the third class which is 3 Delta (Average class) and the last class which is 3 Zeta (Very Weak class). In carrying out the observation, the researcher will adopt and adapt an observation checklist written by Richards, (1990, p. 126-127).

Table 3.2 lists out the Observation Checklist that the researcher used in the Science classroom.

Table 3.2

Observation Checklist

Observation	Description
Classroom Management	➔ Teacher orientated or student-centered ➔ Classroom environment (positive or negative)
Teacher-Student Interaction	➔ How much they are engaged or committed? ➔ How much interest or attention maintained?
Task	➔ Pacing of tasks (time) ➔ What kind of task, how much are they engaged in the lesson?
Teaching Resources	➔ Teaching aids, effective?
Problems in Teaching	➔ Language, teaching materials
Teaching Strategies	➔ Meta cognitive, Cognitive or Social/Affective strategies
Quality of Input	➔ Natural speaking style or a foreigner talk ➔ How ofter or to what extent does the teacher use translating or native tongue in teaching?
Questions and Feedback	➔ How does the teacher correct errors and the answers and repeats for clarification ➔ How is communication breakdown dealt with?

(Source: Taken from Richards,1990, p. 126-127)

The researcher will look into the elements stated above in looking at the teaching of Science in English as it answers the research questions in this study which look into problems in teaching using a second language, teaching strategies that teachers apply in the classroom according to different levels of students' ability and teachers reflection or opinion in using a second language to teach the Science content.

According to Richards and Lockhart (1994) “observation is a way of gathering information about teaching, rather than a way of evaluating teaching” (p. 12) . He also claims that observation should be seen as a “positive experience and the observer's function be limited to gathering information only” (p. 12). In line to that, in this study,

the observation is limited to gain insights on teaching methods and strategies used in the classroom and not to evaluate the teacher's capabiliy in classroom teaching.

3.4 Data Collection Method

For this study, the entire Form Three students in 2007 which is 245 were taken as respondents in answering the questionnaire. The researcher, being an English teacher and the Coordinator for Form Three Classes in the respective school, personally administered the questionnaire to the 245 students by gathering all the form three students in the school hall on a Motivational Programme Day called *'Program Kecemerlangan PMR*' in April, 2007. Students were informed verbally that they were involved in a study to investigate the problems and the learning strategies used in learning Science in English. They were informed that as the questionnaire was not a measure of language proficiency, they could write their responses in Bahasa Malaysia, if they had difficulty in expressing themselves in English. A 30-minute time limit was allocated for students to answer the questionnaire. The researcher explained all the questions that had been set for them to answer. Students were able to respond to all the questions except the one on Learning Strategies. They had no idea of what Learning Strategy means and what it was all about. The researcher asked on how students learned or revised Science to improve their comprehension on the Science content as well as the English language. Students responded on the different methods of studying and the teacher pointed out the three major components in the Learning Strategy. Then they were asked to write their method in learning Science if they were unsure of the component in Learning Strategy that the researcher had explained. The researcher would then classify the methods stated by the students to the three major categories of the Learning strategies.

The Teacher's Questionnaire was given to the Science teachers personally by the researcher. All the four female Science teachers teaching in Form Three were taken as respondents. The teachers had no difficultly in answering the questionnaire except for the questions on Teaching Strategy as they found them unfamiliar. The researcher explained briefly on the teaching methods that Science teachers used in classroom.

The structured interviews were conducted for two weeks in June after a *'Program Kecemerlangan PMR'* was held. Four selected students in each of the form three classes were selected to be interviewed about the personal views or opinions on the problems in learning Science in English language, the learning strategies they used in understanding the content and the language of Science and the feedback towards the shift in the medium of instruction in learning Science. All the four selected students in a class were interviewed on the same day one after another. The interview session with each class was held on different days within the two-week period. They were allowed to choose to converse in the language they felt most comfortable with, that is, Bahasa Malaysia or English. Students were interviewed individually for about ten minutes by the researcher.

For the teacher's interview, all the four form three Science teachers' were interviewed by the researcher on different days in July 2007. The teachers' interviews also focused on the same aspect; problems in teaching Science using English, teaching strategies that they employ in their classes and their opinions on the shift in the medium of instruction made by the Government.

The observations in each of the three form three classes were carried out after making an appointment with the respective Science teachers. The observations were carried out in July as students had to sit for their Mid-Term Examination in May and June. It was followed by a two weeks' school break until the end of June. Therefore, the

researcher had to carry out the observation in July as the second semester lessons had begun. Each of the classes being observed was carried out on different days following the double-period Science lesson in a week. The researcher carried out one observation only with each class using the observation checklist given in Table 3.2. The purpose of the observation was to seek answers on problems teachers faced while teaching using a second language, and the teaching strategies used in different levels of classes by using the checklist suggested by Richards, (1990, p. 126-127).

3.5 Data Analyses

In analyzing the data gathered, this study applied a mixed method of qualitative and quantitative study. The qualitative data gathered from the findings from the 245 students' open-ended questionnaire and the four Science teachers' open-ended questionnaire will be analyzed in a qualitative and quantitative form by categorizing the answers in frequency counts and percentages. The fact that open-ended questions can be analyzed both qualitatively and quantitatively have been verified to be possible by two research methodology lecturers in the Faculty of Languages and Linguistics in University Malaya. They are Dr. Ng Lee Luan and Dr. Mahmud Hassan Khan.

The responses from the 28 students and 4 Science teachers' interviews were transcribed in a research report and analyzed in a written report by the researcher. The observation in each of the three Science classrooms will also be transcribed and analyzed in a written report by the researcher and will be matched against the Observation Checklist given by Richards (1990, p. 126-127).