

CHAPTER I

THE PROBLEM

Background of the Study

A new trend has emerged in Malaysian education as a result of Vision 2020 proposed by the Prime Minister, His Excellency Datuk Seri Dr. Mahathir Mohammad on 28 February, 1991 (Malaysia, 1995a). High ability in the field of science and technology is vital in order to ensure the success of achieving a developed country status by the year 2020 and education plays the vital role of realising this vision (Malaysia, 1995a). As part of the educational program devised to realise Vision 2020, a new subject, 'Invention' or formally termed '*Reka Cipta*' was launched in all schools throughout the country in 1996 (Malaysia, 1995a; Malaysia, 1996).

Reka Cipta, as a subject, is all about inventing a new product or innovating an existing invention in the field of technology that is designed to meet current or future demands of consumers. The product to be invented has to be of original idea or innovation which has the potential to be marketed (Malaysia, 1995b).

Reka Cipta is important as Malaysia prepares to compete in the field of sophisticated inventions and to become a 'producer' and not merely a 'consumer' of technology. (Malaysia, 1995a).

The *Reka Cipta* subject was first introduced in 1989 as an activity to be organized as part of the Science and Technology Week held at school, district, state and national levels. Then, the activity was jointly hosted by the Ministry of

Science, Technology and Environment, Ministry of Education, and several professional bodies such as Malaysian Scientific Association (MSA), Standard Industrial Research Institute of Malaysia (SIRIM) and Malaysian Inventions and Design Society (MINDS) (Silva, 1995; Malaysia, 1991).

The academic year 1994/95 saw the introduction of *Reka Cipta* in 64 schools, including 14 schools at upper secondary level. In the following year, this subject was launched in all primary schools, all lower secondary schools and 104 upper secondary schools throughout Malaysia. With the introduction of *Reka Cipta*, it is hoped that our younger generation would be given the opportunity to be involved in practice and invention activities so as to inculcate and develop their creative, innovative and inventive powers. It is hoped that one day, Malaysia could take pride in being a nation of producer and exporter of high quality technological products.

Statement of the Problem

Every year, three themes are given for *Reka Cipta* inventions. The themes initially given for the 1996 *Sijil Pelajaran Malaysia* (SPM) examinations were cleaning, storage and movement. The themes for 1997 *Reka Cipta* SPM examinations were cutting, drying and picking (Malaysia, 1996a) and 1998 were lighting, separation and protection (Malaysia, 1997a).

Students are free to choose any of the themes to be incorporated in their invention projects. Inventions (or innovations) based on the given themes revolve around science concepts. In fact, the subject of *Reka Cipta* which emphasizes technological design (Malaysia, 1995a) focuses on applications of science

concepts. Furthermore, applications of science concepts have to be mentioned in documentation as well as 'viva voce' presentation in front of an examiner (Malaysia, 1996a).

Past inventions as seen at Mindex/Innotex (Malaysian Inventions and Designs/Innovative Exhibitions), state and national levels Mechatronics, Robotics and Automation competitions, Science and Technology exhibitions (Malaysia, 1991; Malaysia, 1996b) as well as international competitions such as International Exhibition of Inventions (Pillai, 1998) acknowledged the vital role of science concepts.

The researcher's one-and-a-half-year experience in teaching *Reka Cipta* at a project school also saw the need to apply science concepts into inventions and innovations created by her students. For example, concepts in electricity and electronics were applied in the *Reka Cipta* themes of picking, cutting and lighting where students used electric circuits, relays, timers, motors or even power-windows to move their inventions (Chang, Silva, Teoh, Tan & Rukimin, 1996). Concepts in heat and temperature as well as solar energy were applied in the themes drying and lighting. Besides that, the concepts in mechanics were applied in almost all themes especially movement, picking and separation. Although science concepts are the integral part of invention, the teaching of this aspect is not done explicitly in *Reka Cipta* lessons. It is assumed that students know and are able to apply them in their invention projects.

Reka Cipta is a compulsory subject for all students in the lower secondary level but at upper secondary level, it is offered to all students as an elective subject. In addition, at lower secondary level, *Reka Cipta* is taught by

teachers who are currently teaching Living Skills who may not be science optionists and at upper secondary level, it is taught by any teachers who are interested in the subject. As such, it is envisaged that students as well as teachers will face problems in applying science concepts in inventions and innovations.

Reka Cipta is considered still at the infant stage and as such there is few research on the issue of the lack of emphasis given to science concepts in *Reka Cipta* lessons. Therefore, a study is needed in order to identify some of the basic science concepts used, the frequency of science concepts applications in *Reka Cipta* lessons, the perceptions of students on the importance of these science concepts in *Reka Cipta* lessons, and the problems students face in the applications of science concepts in their *Reka Cipta* products. As part of the implications of the study, some suggestions for resolving issues relating to science concepts applications in *Reka Cipta* lessons can be recommended.

Objectives of Study

This study aimed at investigating : a) some of the basic science concepts that Form Five students used in their 1998 *Reka Cipta* projects, b) the frequency of science concepts applications in *Reka Cipta* lessons by these students, c) the perceptions of these students on the importance of science concepts in *Reka Cipta* lessons, d) the problems these students faced when applying science concepts in their *Reka Cipta* projects, and e) several ways to overcome these problems.

Major Research Questions

Specifically, this study attempts to answer the following research questions:

1. What were some basic science concepts that Form Five students used in their 1998 *Reka Cipta* projects?
2. How frequent did Form Five students apply science concepts in *Reka Cipta* lessons?
3. What were the perceptions of Form Five students on the importance of science concepts in *Reka Cipta* lessons?
4. What were the problems that Form Five students faced when applying science concepts in their *Reka Cipta* projects?
5. What were several ways that Form Five students used to overcome these problems?

Rationale for the Study

Reka Cipta is only in its third year (fourth year for 64 project schools) of implementation in Malaysian schools. There is no standard text book made available to students. As such, it is envisaged that students will face problems in applying science concepts in their projects as this aspect is not taught explicitly in *Reka Cipta* lessons. Therefore, research is vital at the early stages.

Reka Cipta is still at the infant stage, leaving much room for further development and improvement. It is best to identify the weaknesses and problems at an early stage so that improvement can be made immediately as one of the steps in realising Vision 2020.

Significance of the Study

Through this study, some of the basic science concepts applied by Form Five students in the 1998 *Reka Cipta* syllabus have been identified. This study also investigated how often Form Five students used science concepts in *Reka Cipta* lessons. These students' perceptions regarding the importance of science concepts in *Reka Cipta* lessons have also been determined. Some problems faced by students in the applications of science concepts in *Reka Cipta* have been identified and ways to overcome these problems will be proposed at the end of this report. The findings can be used to devise ways to overcome the weaknesses encountered in *Reka Cipta* lessons in order to improve the applications of science concepts by students in future. This study can also serve as a guide to the present ways of teaching and learning *Reka Cipta*, especially with regards to applications of science concepts. It can also become handy for in-house or in-service course planners to plan more suitable and effective programs for teachers. Last but not least, it can be used as a guide by curriculum developers to organize better steps of further guidance.

Limitations of the Study

This study is limited in that it focused merely on the aspect of applications of science concepts in *Reka Cipta*. It was done at Form Five level, focusing on students who were taking *Reka Cipta* as an elective subject in the 1998 *Sijil Pelajaran Malaysia* (SPM) examinations. The sample size is small and therefore, the study cannot assume to represent a cross-section of the student population. Neither can the findings be generalized to all students in the country. Also, the

sample was obtained from one of the districts in Sabah. So, discussion of the findings would have to be limited to the subjects themselves.

Definition of Terms

Several terms which are used in this study need to be defined for proper understanding of the study. The definitions are described below.

Reka Cipta

A subject introduced in Malaysian schools in 1994 as outlined in the *Reka Cipta Syllabus*, known as the *Draf Sukatan Pelajaran dan Huraian Mata Pelajaran Reka Cipta* (Malaysia, 1995b). This subject is about inventing a new invention or innovating an existing invention in the field of technology to meet current or future demands of consumers. The project to be invented has to be an original idea or innovation which has the potential to be marketed (Malaysia, 1995b).

Science Concepts

According to Pella (1966), a concept is "a summary of essential characteristics of a group of ideas and/or facts that epitomize important common features or factors from a large number of ideas." This definition includes concepts learnt as principles or laws in physical science for example 'motion', 'force', 'conservation of momentum principle' and 'Hooke's Law'.

In this study, science concepts are concepts used by Form Five students in their 1998 *Reka Cipta* projects which have relationships with areas in science subjects like Chemistry, Physics or Biology.

Perception

According to Page (1977), perception can be defined as 'the process by which the individual makes sense of his/her sensory experiences'.

In this study, the perceptions of students are the ways Form Five *Reka Cipta* students made sense of the importance of science concepts in *Reka Cipta* lessons through their perceptual processes.