CHAPTER 1

THE STATEMENT OF PROBLEM

1.0 Introduction

For many years now, researchers have described the nature of learning environments and have provided teachers with tools to look into their classrooms and to assess the status of the learning environment (Lorsbach & Tobin, 1995). The classroom is a place where the teacher and students interact constantly to achieve educational objectives. Hence, the learning environment is very much an integral component of the teaching-learning process.

"A learning environment is a construction of the individuals in a given social setting, an individual's ... beliefs about the opportunities each has to learn and the extent to which the social and physical milieu constrains learning" (Lorsbach & Tobin, 1995, p.19).

Fraser, McRobbie and Giddings (1993) reported that considerable interest has been shown internationally in the conceptualisation, measurement and investigation of perceptions of psychosocial characteristics of the learning environment of classrooms at the elementary, secondary and higher education levels. Hegarty-Hazel's study (as cited in Fraser et al. 1993), noted that before the 1990's there

was hardly any research that focused on the science laboratory environments. Hence, Fraser et al. (1993) initiated the development of a new evaluation instrument for assessing students' perception of science laboratory classroom environment.

The instrument, called Science Laboratory Environment Inventory (SLEI), consists of two distinct versions that measure students' perception of the actual (or experienced) laboratory environment and preferred laboratory environment. The preferred form is concerned with goals and value orientations and measures perception of the laboratory environment ideally liked or preferred.

The SLEI has 35 items after it was subjected to a series of vigorous validation processes. A series of factor analysis led to the categorising of the items into the five subscales of Student Cohesiveness, Open-endedness, Integration, Rule Clarity and Material Environment.

According to Fraser et al. (1993), the SLEI can be used to investigate the impact of laboratory classes on student outcomes and to guide improvements in the environment settings. Furthermore, information gathered from the SLEI could contribute to improve teaching and learning in science laboratory classes.

Influences on student achievement are many and varied. Schibeci and Riley (1986) reported that studies had shown that students' perception of the science classroom was positively correlated with achievement. Students' perception of the learning environment accounted for 13% to 46% of the variance in science achievement (Lawrenz, 1976).

Odubunmi and Balogun (1991) reported findings that laboratory-based method which involves the use of processes of science could be effective in improving the science achievement of students. Their research confirmed that the use of laboratory-based method had a significant effect on the achievements of the low and average achievers.

The study by Haladyna, Olsen and Shaughnessy (1982) showed that learning environment is strongly related to attitude toward science. In addition, Fraser and Giddings (1995) showed in their study that there was a relatively strong and consistent association between students' attitudinal outcomes and their classroom environment perception. Similarly, Asghar and Fraser (1996) found that science classroom environment was associated with attitude toward science among lower secondary school students in Brunei Darussalam. If these findings are generalisable to the Malaysian context, then teachers can make adjustments to improve their science laboratory environment so as to foster better attitude toward science.

Lawrenz (1987) showed in his study that there was gender related differences in students' perception of the classroom psychosocial environment. For high school students, the girls viewed their classes as significantly more cohesive than the boys. The study by Fraser and Giddings (1995) indicated significant gender differences in the perception of the science laboratory environment and that females generally perceived the science laboratory environment as more favourable than the males. On the other hand, Asghar (1996) found no gender differences in Form Three pupils' perception of the science classroom environment in Brunei Darussalam.

Achievement in science has always been a special concern to science educators. Jacobson and Doran's study (as cited in Doran Fraser & Giddings, 1995) reported that science achievement in Australia has slipped considerably and there was evidence of declining participation rates in science and technology disciplines at the secondary and college levels.

Malaysia is now experiencing a similar scenario. The recent examination results of the 1995 Sijil Pelajaran Malaysia (SPM) as compared to that of 1994 SPM indicated a decline of between 1.3% and 3.8% in the performance of science subjects ("Ministry Sets Target", 1996). An even more acute problem faced by Malaysia is that the ratio of science stream students to that of arts stream counterparts is on a downward trend.

Since 1986, it has dropped from a ratio of 40:60 (Science to Arts) to the current ratio of 20:80. For instance, Pusat Perkembangan Kurikulum (1993) reported a drop from 24.7% to 22.3% across the school years from 1991 to 1992 in student enrolment in the science stream. If this declining trend continues, serious problems would arise. This would certainly jeopardise Malaysia in realising the targets set in Vision 2020 to become a scientific and progressive country. It is estimated that 40% of the students should be in the science stream in order to produce 1000 scientists per million of our population by the year 2020 (Pusat Perkembangan Kurikulum, 1993).

Hence, there is a definite urgency for science educators to seek solutions to reverse the trend so that more students would choose science instead of arts. Providing an optimum science laboratory environment to boost the students' interest in science may be one of the solutions. To attract more students to take up the sciences, the Minister of Education, Datuk Seri Najib Tun Abdul Razak has in fact advocated that "the designs of laboratories also need to be changed to make it more appealing to pupils" ("Ministry Sets Target", 1996).

As such this study will assess the Form Two students' perception of the science laboratory environment in Sekolah Menengah Hulu Kelang and examine its relationship with science achievement, attitude toward science and gender.

1.1 Research Questions

This study is to investigate the Form Two students' perception of the science laboratory environment and its relationship to their science achievement, attitude toward science and gender.

The students' perception of the laboratory environment will be measured by the instrument SLEI which comprises the subscales of Student Cohesiveness, Open-endedness, Integration, Rule Clarity, and Material Environment.

Specifically, the study is to answer the following research questions:

1. What are the Form Two students' perception of the science laboratory environment?

2. Is there any significant relationship between the science achievement of the Form Two students and their perception of the science laboratory environment?

3. Is there any significant relationship between the Form Two students' attitude toward science and their perception of the science laboratory environment?

4. Are there any significant gender differences in the Form Two students' perception of the science laboratory environment?

1.2 Definition of Terms Used in the Study

According to Fraser et al. (1993), the science laboratory environment refers to the three general categories of dimensions identified by Moos (1974). They are the Relationship Dimensions that refer to the nature and intensity of personal relationships; the Personal Development Dimensions that indicate the basic directions along which personal growth and self-enhancement tend to occur, and lastly, the System Maintenance and System Change Dimensions that assess the extent to which the environment is orderly, clear in expectation, maintains control, and is responsive to change.

1.2.1 The terms listed below are the subscales of the SLEI as defined by Fraser et al. (1993).

Student Cohesiveness

The extent to which students know, help, and are supportive of one another. An example of the items in this subscale is "Students in this laboratory class get along well as a group".

Open-endedness

The extent to which the laboratory activities emphasize on open-ended, divergent approach to experimentation. An example of the items in this subscale is "There is opportunity for students to pursue their own science interests in this laboratory class".

Integration

The extent to which the laboratory activities are integrated with nonlaboratory and theory classes. An example of the items in this subscale is "We use theory from our regular science class sessions during laboratory activities".

Rule Clarity

The extent to which behaviour in the laboratory is guided by formal rules. An example of the items in this subscale is "Our laboratory class has clear rules to guide student activities".

Material Environment

The extent to which the laboratory equipment and materials are adequate. An example of the items in this subscale is "The equipment and materials that students need for laboratory activities are readily available".

Note: SLEI is sometimes used as an adjective in the study to describe a noun such as SLEI item.

1.2.2 Attitude toward Science in School Assessment (ATSSA)

Attitude toward Science in School Assessment (ATSSA) was the instrument used to assess the students' attitude toward science. This instrument (Germann, 1988) measures a single dimension of a general attitude toward science, specifically on how the students feel toward science as a subject in the school. It should be noted that the ATSSA does not measure other dimensions of attitude or of science.

1.2.3 Science Achievement Test (SAT)

To assess science achievement, the school's Second Semester examination was used. This Science Achievement Test (SAT) was specifically developed by the teacher concerned and the researcher to assess the achievement in science for the Form Two students.

1.3 Significance of the Study

If the findings indicate that there is a significant relationship between the students' perception of the science laboratory environment (as measured by the SLEI) and science achievement, then the science laboratory environment can be adjusted so as to enhance the performance in science.

Special attention should be provided to improve achievement in

science by enhancing the laboratory environment as this is particularly relevant to the Kurikulum Bersepadu Sekolah Menengah (KBSM) for Science (Form One to Form Five) which emphasises on the inquiry and the manipulative skills for conducting experiments in the science laboratory.

Furthermore, if attitude toward science is associated with any of the SLEI subscales, the implication is that a favourable science laboratory environment will lead to improved science achievement. This is because students with positive attitude toward science will develop a deeper appreciation and understanding of science and consequently achieve better in science (Canon & Simpson, 1985).

If it is found that there are gender differences in students' perception of the science laboratory environment, then the implication is that teachers and science educators should try to create a science learning environment that can reduce or even eliminate the gap between the differences in order that all the students can benefit equally from the psychosocial environment of the science laboratory.

Therefore, the science laboratory environment is an important factor in science education. Teachers can use the assessment of their students' perception of their science laboratory environment to assist them in improving the science laboratory environment and thus enhance learning.

1.4 Limitation of the Study

Results obtained from the study was only based on the Form Two students from a coeducational secondary school situated in a semi-urban area. Thus, the findings of this study are only applicable to Sekolah Menengah Hulu Kelang, Selangor.