RELATIONSHIP BETWEEN FORM 4 STUDENTS' PERCEPTIONS OF SCIENCE CLASSROOM ENVIRONMENT WITH ATTITUDES TOWARDS SCIENCE

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FACULTY OF PSYCHOLOGY AND EDUCATION
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ABSTRACT

Science educators have been interested in understanding students' achievement and have undergone decades of studies about it. It is essential to develop positive attitudes towards science as one of the legitimate goals of science education in Malaysia. The purpose of this study was to investigate the relationship between students' perceptions of science classroom environment and their attitudes towards science. This study was a non-experimental quantitative research and employed a sample survey method to collect data. Samples were selected by using the two-stage cluster random sampling. In this study, the Test of Science-Related Attitudes (TOSRA) was adopted to measure students' attitudes towards science while students' perception towards classroom environment was measured with 'What Is Happening In This Class' (WIHIC) instrument. The seven subscales in TOSRA measured were Social Implications of Science, Normality of Scientists, Attitude to Scientific Inquiry, Adoption of Science Lessons, Leisure Interest in Science, and Career Interest in Science. The seven subscales in WIHIC measured were Student Cohesiveness, Teacher Support, Involvement, Investigation, Task Orientation, Cooperation, and Equity. Independent sample t-test, Pearson Product Moment Correlation and Multiple Regression Analysis were used to test the stated null hypotheses at a predetermined significance level, alpha = .05. Data analysis showed that both gender and school locations do not have a significant effect on students' perceptions of science classroom environment. Apart from that, gender also did not have a significant effect on students' attitudes towards science. However, school locations had a significant effect on students' attitudes towards science in which urban schools' students are shown to display more positive attitudes towards science than their rural peers. Correlation analysis results showed that there was positive low to moderate significant correlations between students' perceptions of science classroom environment and their attitudes towards science. Multiple regression analysis showed that students' perception of science classroom environment is a significant predictor of students' attitudes towards science in Tenom and Kota Kinabalu. Further analysis showed that WIHIC's subscale of Task Orientation is the most significant predictor to students' attitudes towards science.

ABSTRAK

Hubungan Antara Persepsi Suasana Kelas Sains dengan Sikap Terhadap Sains Dalam Kalangan Pelajar Tingkatan 4

Para pendidik sains meminati dalam memahami pencapaian pelajar dalam Sains selama bertahun-tahun dan telah menjalankan kajian tentang isu tersebut selama berdekad-dekad. Adalah sangat penting untuk menggalakkan sikap positif terhadap sains sebagai salah satu matlamat dalam pendidikan sains di Malaysia. Tujuan kajian ini ialah untuk mengkaji hubungan antara persepsi pelajar terhadap suasana kelas sains dan sikap mereka terhadap sains. Kajian ini menggunakan non-experimental quantitative research dan sample survey method untuk mengumpul data. Sampel dipilih dengan menggunakan teknik Two-Stage Cluster Random Sampling. Dalam kajian ini, instrumen Test of Science-Related Attitudes (TOSRA) digunakan untuk mengukur sikap pelajar terhadap sains manakala persepsi pelajar terhadap suasana kelas pula diukur dengan menggunakan What Is Happening In this Class? (WIHIC). Tujuh subskala TOSRA yang akan diukur ialah Social Implications of Science, Normality of Scientists, Attitude to Scientific Inquiry, Adoption of Science Lessons, Leisure Interest in Science, dan Career Interest in Science. Tujuh subskala WIHIC yang akan diukur ialah Student Cohesiveness, Teacher Support, Involvement, Investigation, Task Orientation, Cooperation, dan Equity. Independent sample t-test, Pearson Product Moment Correlation dan Multiple Regression Analysis akan digunakan untuk menguji hipotesis-hipotesis nul pada tahap signifikan alpha= .05. Analisis data menunjukkan kedua-dua jantina dan lokasi sekolah tidak mempunyai kesan signifikan terhadap persepsi pelajar terhadap suasana kelas Sains. Selain itu, jantina pelajar juga tidak mempunyai kesan signifikan terhadap sikap pelajar terhadap Sains. Tetapi, lokasi sekolah mempunyai kesan signifikan terhadap sikap pelajar terhadap Sains di mana pelajar-pelajar sekolah kawasan bandar menunjukkan sikap terhadap sains yang lebih positif berbanding pelajar-pelajar kawasan luar bandar. Analisis korelasi menunjukkan korelasi positif rendah hingga sederhana yang signifikan antara persepsi pelajar terhadap suasana kelas Sains dan sikap pelajar terhadap Sains. Analisis regressi pelbagai menunjukkan bahawa persepsi pelajar terhadap kelas Sains merupakan peramal yang signifikan terhadap sikap pelajar terhadap Sains. Analisis lebih mendalam menunjukkan subskala WIHIC iaitu "Task Orientation" merupakan peramal yang paling penting bagi sikap pelajar terhadap sains.

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LIST OF ABBREVIATIONS

TOSRA	Test of Science-Related Attitudes
WIHIC	What Is Happening In This Class?
KPM	Kementerian Pelajaran Malaysia
JPN	Jabatan Pendidikan Negeri
PPD	Pejabat Pendidikan Daerah
SPM	Sijil Pelajaran Malaysia
PISA	Program for International Student Assessment
TIMSS	Trends in International Mathematics and Science Study

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will discuss about the background of the study, problem statement, research purpose, research objectives, research questions and null hypothesis. This chapter also discuss about the significance of the study.

1.2 Background of the Study

In the 21st century, education is one of the most empowering tools to help one achieve his or her potential. Education is a form of learning where methods like teaching, training and research can instill in a person the knowledge, skills and habits necessary for his or her well-being. Students are given education so that they can prepare for a better living, and they must be certain how they can achieve it and what discipline they can attain it (Jebson and Hena, 2015). This is true even for students in Malaysia; a rising nation with the goal of becoming a fully developed country by the year 2020. Science is an enterprise which encourages people to use their intellect to solve real-world problems in a way of creating, inventing, building and developing new ideas and ways of thinking (Barba, 1995). That is why science education in Malaysian high school primarily aims to provide students to learn about themselves and their surroundings, to acquire skills and knowledge in science and technology, able to do scientific investigations, and so on. Interest in science must be instilled and fostered at an early educational stage so students will have an interest in science and technology subjects that will be introduced in the later stages of learning experience.

Science is taught in schools as one of the essential components of a broader education just like language arts and mathematics. Before, the goal of teaching science was to assemble the next generations of scientists. Now, the teaching of science focuses on helping students to become scientifically literate, to assist them to develop practical understandings of science despite students choosing or not choosing to continue to study science (Settlage and Southerland, 2012). The American Association of Advancement of Science, or the AAAS, provided several specific definitions of scientific literacy; being familiar with the natural world, understanding the key concepts and principles of science, employing scientific ways of thinking, recognizing that science is a human enterprise, and using scientific knowledge and ways of thinking to make informed decisions (Settlage and Southerland, 2012). Science is crucial not in a way we will definitely gain many scientists in the course of teaching science as part of the educational curriculum. It is important because it can provide students greater control over their lives as they grow up. They would know what caused them to be sick, they would know how to preserve the nature, they would know how to keep disease carrying insects away from their home environment and many more.

Malaysian educational curriculum aspires to develop a society that is concerned, dynamic and progressive with a science and technology culture that values nature and works towards the preservation and conservation of the environment (Curriculum Development Centre, 2003). It needs citizens who are creative thinkers; those who are capable of finding solutions to problems. Apart from that, Malaysian education aims for the science curriculum in secondary schools to provide students with the knowledge and skills in science and technology, as well as to enable them to solve problems and make decisions in everyday life based on scientific attitudes and noble values (Curriculum Development Centre, 2003). Apart from that, science educators have been interested in understanding students' academic achievement and have undergone decades of studies about it. According to Ong and Ruthven (2009), research in academic achievement reveals that there is a strong association between science achievement and attitudes towards science. Students' attitudes towards science are one of the ways to obtain information that could provide an educational context for interpreting the science achievement result.

Thus, it is essential to develop positive attitudes towards science as one of the legitimate goals of science education in Malaysia.

Attitudes towards science are learned tendencies to respond consistently toward a given object (Lamb, Hair, and McDaniel, 2015). It has been an important concept for science educators for several reasons. The investigation of students' attitudes towards science and interest has been a substantive feature of the work of science education research community for the past 30 to 40 years (Cokadar and Külce, 2008). First, attitudes towards science are thought to satisfy basic psychological needs for example the need to know and the need to succeed. Second, attitudes towards science are believed to influence future behaviors such as interest in working on a science project at home and in visiting a science museum (Koballa, Jr and Crawley, 1985). Students with positive attitudes towards science showed increased attention to classroom instruction and participate more in science activities (Jarvis and Pell, 2005). Not only that, Napier and Riley stated that attitudes towards science had been shown to correlate with achievement in science (Smist, Archambault, and Owen, 1994). Attitudes towards science had been a cause for concern for decades where Dainton presented a report emphasizing on the phenomenon known as the 'swing from science' (Osborne, Simon, and Collins, 2003). Historically, the concept of attitude in science education context had been explained rather vaguely, but Klopfer presented several aspects of affective behaviors in science education; the manifestation of favorable attitudes towards science and scientists, the acceptance of scientific inquiry as a way of thought, the adoption of scientific attitudes, the enjoyment of science learning experiences, the development of interests in science and science related activities, and the development of an interest in pursuing a career in science or science related work (Osborne, Simon, and Collins, 2003). Generally, the factors that frequently influence students' attitudes towards science are gender (girls versus boys), age (primary, lower secondary, upper secondary), schools (private versus state schools), or peer influences towards school science. Previous research had shown boys to be more positive in their attitudes towards science compared to girls (Jones, Howe and Rua, 2000; Osborne, Simon and Collins, 2003; Mensah, 2007; Cheung, 2009; Desy, Peterson and Brockman, 2011).

Students spend much of their youngest years in schools where they learn and socialize mostly in classroom, and they may continue to belong in a classroom until they reach highest education. Therefore, the events in classrooms and students' reaction to as well as perceptions of their educational experiences are important (Fraser, 2012). Research on classroom environments has focused historically on its psychosocial dimensions which are human behavior in origin or outcome within the environment (Dorman, Fisher, and Waldrip, 2006). Urdan and Schoenfelder defined the classroom environment as the general class atmosphere including attitudes toward learning, norms of social interactions, acceptance of ideas and mistakes, and learning structures set up by the teacher (In Spearman and Watt, 2011). According to Moos, the three basic types of dimensions within a classroom are relationship dimensions, personal development dimensions, and system maintenance and system change dimensions (Fraser, 2012). The interactions that exist among teachers and students or students and students can affect their attitudes in science and their perspective in science as Goodnow and Wentzel had revealed that it is the students' perceptions of classroom environment that constructs students' learning (In Spearman and Watt, 2011). According to Fisher, Henderson and Fraser, a positive learning environment is influential in student achievement and attitudes (In Özkal, Tekkaya, and Çakiroğlu, 2009). Positive classroom environment with conducive learning atmosphere can improve students' attitudes thus leading to good achievement and enjoyable learning experiences for them.

Students' perceptions of their learning environment are influenced by factors including gender, subject, grade-level, school-type, school-location (city and rural) and ethnic-related differences in classroom learning environments (Murugan, 2013). Research from Greene, Miller, Crowson, Duke and Akey shown that students with a high sense of self-efficacy hold more positive perceptions of their classroom environment than those with a low sense of self-efficacy (Alkharusi, 2010). Furthermore, Meece, Herman and McCombs reported that females have more positive perceptions of their classroom environment (Alkharusi, 2010). This may be because female students tend to bond quicker than male students as research had shown female to have better learner cohesion than male students (Sethna, 2010), and this helped in constructing positive perceptions of classroom environment. However, this was not the same for science setting. Females were less confident

about their ability in science despite their achievement and opportunities to learn (Gömleksiz, 2012). Kahle (1983) stated that the lack of scientific experiences in the classroom, bias treatment from teachers and lack of role model contributed to female students' declining attitudes towards science. This meant that male students have positive perceptions due to it being gender appropriate for them to master science and technology.

Attitudes towards science is closely related to motivation (Osborne, Simon, and Collins, 2003), and motivations can come from good relationship with teachers and peers in the classroom (Fuhrer and Skinner, 2003). Apart from gender, school locations are also one of the most important variables in determining students' attitudes towards science. Research showed that urban schools students had marginally better attitudes towards science than students from rural schools (Shah, Mahmood , and Harrison, 2013). Part of it may be explained that rural students tend to have lower academic aspirations, have less value on academics and low academic motivations (Xu, 2009). Students in rural areas also reported greater anxieties in learning science subjects than students in urban areas (Singh and Thukral, 2009; Woldeamanuel, Atagana, and Engida, 2013). Singh and Thukral (2009) also stated that students in urban area were exposed to better facilities and more intelligent alert. This may have explained better attitudes towards science for students in urban school settings. However, Fan and Chen (1998) found that rural students perform as well as their urban peers on reading, science, mathematics and social studies. Girls students in rural area also indicated that they were aware of the relevance of science in their lives as they were also slightly more interested in science and math than boys (Maharaj-Sharma, 2007).

1.3 Problem Statement

Many Malaysian students are facing problems learning science. Science had always been a difficult subject for students due to its abstract nature and lack of connection to students' experiences (Magnusson, Kragcik, and Borko, 2001). That is why attitudes towards science and science teaching had been a major concern in the field of science education research (Barmby, Kind, and Jones, 2008). In the Programme for International Student Assessment (PISA), Malaysian students had performed

poorly in science as evident with PISA 2012 result (OECD, 2012). The PISA 2012 data showed that Malaysia's mean performance score for science was 420, which was significantly below the OECD average Science mean score of 501 (OECD, 2012). Having such a low score on Science and problem-solving skills give the impression that Malaysia is going to have a future generation that has no adequate skills to deal with future problems or economic issues. However, there had not been many studies that explore the problems that are causing Malaysian students to have poor achievement in Science.

Not only did Malaysian students performed poorly on PISA for science, they also did not do well on TIMSS where there was a decrease in science achievement compared to other countries (Martin, Mullis, Foy, and Stanco, 2011). Poor achievement was also recorded in the drop of Sijil Pelajaran Malaysia (SPM) result from 2013 to 2014 with Science and Mathematics facing decline (Bernama, 2015). There had been a rise in indicators and achievement predictors with educational reforms in Malaysia in recent years with implementing higher order thinking skills type of questions in obligatory exams like UPSR and SPM (Bernama, 2016). The changes in educational policies and format showed that success in education is valued above all by the government for the benefit of society and the country. On a smaller scale, poor achievement among students may prevent them from continuing higher studies or obtain better jobs in the future (Loney, 2014).

Classroom environment is an important determinant of student learning in educational system (Fraser, 1994). There has been a lot of research on classroom environment, but a lot of these were in Western context (Koul and Fisher, 2002; Houston, Fraser, and Ledbetter, 2003; Logan and Skamp, 2013; Wahyudi and Treagust, 2004; Arisoy, 2007; Brok, Fisher, Rickards and Bull; 2006). Though there had been more research done within Asia in countries such as Korea and China (Chang, Hsiao and Chang, 2011; Yang, 2015), there have not been many research done on science classroom environment in Malaysia, especially within Sabah context. Students' learning development takes place when interactions between students and teachers or among the students themselves occur. A good-teacher relationship is superior to the creation and maintenance of a positive classroom environment (Lau Shiao Wei and Habibah Elias, 2011). Lau Shiao Wei and Habibah Elias (2011) also

stated that students learn better when they perceive their classroom environment more positively. Research had indicated that achievement in science subjects had positive correlation with positive attitudes towards science, attitude and certain characteristics of the classroom environments that used personal support, use of variety of teaching strategies, innovative learning activities, and student-centered instructional designs (Osborne, Simon, and Collins, 2003). An overview by OECD (2013) reported that teachers in Malaysia spent most of their time in the classroom managing disruptive students' behaviour and administrative issues instead of focusing on lesson time. When teachers focused more on discipline than on providing support or focus on the students, students began to lose motivation to learn (Lau Shiao Wei and Habibah Elias, 2011), and this affect their attitudes towards science. However, the lack of study in Malaysia concerning how science classroom environment affect attitudes towards Science made this matter unclear.

There is difference in attitudes towards science with perception on science classroom environment based on gender because of subconscious actions of the people surrounding boys and girls. According to Mundia and Moono (2015), this caused a conscious and unconscious discouragement of girls' participation in these subjects both from the school and home. In classrooms for instance, teachers subconsciously expected boys to dominate the teachers' time and classroom resources and this is particularly insidious in science and mathematics classroom (Scantlebury, 2009). These cause girls to be reluctant to ask questions, participate fully in discussions or work in groups with friends, despite the fact that girls like working with their classmates (Mundia and Moono, 2015). Therefore, having positive attitudes towards science meant that positive relationship fostered within the classroom environment allow them to fully participate in science lessons. However, it was interesting to note that female students in Malaysia actually outperformed male students in Science (Martin, Mullis, Foy, and Stanco, 2011). But the study provided little insights about attitudes towards science between male and female students, and therefore no conclusion can be made as to whether positive attitudes is related to the achievement or not. Moreover, most previous research explored the gender factor within western context, and the problem regarding gender discussed within said context may not apply in Malaysia as some research that were not based on western countries had shown different conclusion (Abu-Hola, 2005; Cokadar and