MALAYSIAN INDIAN STUDENTS' ATTITUDE, AWARENESS AND PRACTICE OF INDIAN TRADITIONAL KNOWLEDGE FOR SUSTAINABILITY

NAGAMAH MARIMUTHU

UNIVERSITI SAINS MALAYSIA

2012

INDIAN STUDENTS' ATTITUDE, AWARENESS AND PRACTICE OF INDIAN TRADITIONAL KNOWLEDGE FOR SUSTAINABILITY

by

NAGAMAH MARIMUTHU

Thesis submitted in fulfillment of the requirements
for the degree of
Doctor of Philosophy

February 2012

ACKNOWLEDGEMENT

I humbly acknowledge and thank the Almighty for answering my prayers, giving me strength and keeping me motivated throughout the entire period of research and for enabling me to complete this thesis successfully.

The completion of this thesis would not have been possible without the dedication and help from my supervisor, Associate Prof. Dr Subadrah Madwa Nair. Her knowledge, insight and dedication guided me in making the thesis more precise and in completing it on time. A note of gratitude to my second supervisor, the late Associate Prof. Dr Sharifah Norhaidah Syed Idros for her motivation and support which created a deep interest in me to progress further in this research. My heartiest thanks to Dr Muhammad Ali Shamsudin, who has shown great generosity in sharing his knowledge and inspiring me with his ability, time and advice.

I wish to acknowledge all officers and friends from the JPN, PPD and all the schools in Kuala Muda/Yan and Kulim/Bandar Bahru districts, who provided me with the invaluable help and information that I needed to complete this research successfully. I am also greatly indebted to my students, friends, colleagues and academicians, especially Dr Abdul Razak Othman and Mr. Gengatharan Das who aided me at all times to write this thesis.

This thesis in dedicated to my swamiji, Swami Brahmananda Saraswati for his blessings which served as a constant motivating factor in my endeavours at completing this thesis.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

DESD -	Decade of Education for Sustainable Development
DV -	Dependent variable
ESD -	Education for Sustainable Development
ITK -	Indian traditional knowledge
IV -	Independent variable
JPN -	State Education Department
MOE	Ministry of Education
Patti -	Parents' views on the students' attitude towards science
PDFDiet -	Parents' views on the students' awareness of food and diet
PDPHeal -	Parents' views on the students' awareness of disease prevention and healing activities
PEFPrac -	Parents' views on the students' awareness of environment friendly practices
PPD -	District Education Department
RQ -	Research question
Satti -	Students' attitude towards science
SD -	Sustainable development
SDFDiet -	Students' awareness of food and diet
SDPHeal -	Students' awareness of disease prevention and healing activities
SEFPrac -	Students' awareness of environment friendly practices
TK -	Traditional knowledge

SIKAP, KESEDARAN DAN AMALAN MURID INDIA MALAYSIA TERHADAP PENGETAHUAN TRADISI UNTUK KELESTARIAN

ABSTRAK

Kajian ini telah dijalankan untuk menyiasat sikap, kesedaran dan amalan murid India Malaysia Tingkatan Empat aliran sains terhadap sains dan kerelevanan sains dalam kehidupan seharian dan pandangan ibu bapa mereka terhadap anak-anak mereka. Kajian in menggunakan kaedah QUAN-Qual melibatkan kaedah tinjauan dan temu bual. Dua set soal selidik digunakan bagi kaedah tinjauan. Sampel kajian terdiri daripada 80 orang murid lelaki dan 80 orang murid perempuan dari sekolah bandar dan luar bandar termasuk ibu bapa mereka. Kaedah temu bual dilakukan dengan menggunakan satu set soalan semi berstruktur sebagai 'panduan temu bual'. Peserta kajian terdiri daripada 5 orang murid dan ibu bapa mereka. ANOVA Dua-hala dan MANOVA Dua-hala digunakan untuk menganalisis data tinjauan manakala analisis deskriptif digunakan untuk kaedah temu bual. Keputusan ANOVA Dua-hala murid menunjukkan faktor gender memberi perbezaan yang signifikan iaitu murid lelaki mempunyai sikap positif terhadap sains berbanding murid perempuan. Keputusan MANOVA Dua-hala menunjukkan terdapat perbezaan yang signifikan antara lokasi murid pada kombinasi linear dari segi kesedaran terhadap kerelevanan sains dalam kehidupan seharian; murid bandar menunjukkan kesedaran yang tinggi berbanding murid luar bandar dari segi makanan dan pemakanan, pencegahan dan rawatan penyakit dan amalan mesra alam. Kajian temu bual menunjukkan para murid dan ibu bapa mereka menyetujui peranan sains dalam amalan kehidupan seharian, namun amalan spiritual dan budaya masih menjadi panduan dalam kehidupan seharian mereka untuk kelestarian.

MALAYSIAN INDIAN STUDENTS' ATTITUDE, AWARENESS AND PRACTICE OF INDIAN TRADITIONAL KNOWLEDGE FOR SUSTAINABILITY

ABSTRACT

The purpose of the study was to investigate the Form Four Malaysian Indian science stream students' attitude towards science and awareness of the relevance of science and their parents' views on them. A QUAN-Qual mix-method model with a survey and interview method was used to design and analyze the research. The data collection for the survey method consisted of two sets of questionnaires. The samples for the study consisted of 80 males and 80 females with equal number of urban and rural students and their parents. An 'interview question guide' with semi structured questions was used to collect the data for the interview method. Five students and their parents were selected for the study. A Two-way ANOVA and a Two-way MANOVA analysis was used for the quantitative study and a descriptive data analyze was used for the qualitative study. The Two-Way ANOVA results showed that the students' attitude to science based on gender was statistically significant where the male students have a positive attitude towards science than their female counterparts. The MANOVA findings showed that there was a significant difference between the locality of the students on the linear combination of awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices where the urban students have higher awareness than the rural students. The interview findings showed that science plays an important role in the students' daily practices for a healthy lifestyle, yet their 'inbuilt' spiritual and cultural practices still become the guiding force in handling the natural resources and contributing to the goal of sustainability.

CHAPTER 1

INTRODUCTION

1.0 Introduction

Currently, the quest for education for sustainable development and inculcation of traditional knowledge and values had been the basis of various missions of stakeholders in science education around the world. Most of the science works and researches are inspired by some visions for future school science to be meaningful and relevant in students' daily lives. The World Conference on Science (WCS, 1999) organized by UNESCO comes with the objectives to help strengthen the science education, research and development, and to define a strategy that would ensure that science responds better to society's needs and aspirations in the twenty-first century. The results of the Conference are embodied in two principal documents:

(i) *Declaration on Science and the Use of Scientific knowledge* and

(ii) *Science Agenda - Framework for Action*.

Both the *Declaration on Science and the Use of Scientific knowledge* and the *Framework for Action* are meant to collaborate both science and society to triumph over the challenges of the future. Hence, it was observed a proper interaction between science and local cultures is crucial to achieve this task. In this connection paragraph 26 of the *Declaration* (WCS, 1999) notes:

> "*…that traditional and local knowledge systems as dynamic expressions of perceiving an understanding the world, can make and historically have made, a valuable contribution to science and technology, and that there is a need to preserve, protect, research and promote this cultural heritage and empirical knowledge..."*
>
> (WSC, 1999, p.26)

Traditional knowledge (TK) is a basic knowledge that is available to all the societies at all the time as a valid and accumulated knowledge that handed down from one generation to the next with an understanding of the human beings in ecological, cultural and spiritual sense (Freeman, 1992; Iaccarino, 2003). In fact, TK historically had made many contributions to science in solving many complex problems (Feyerabend, 1987). But in current situation this knowledge is gradually being forgotten under the impact of modernization and of enduring globalization processes. Therefore, there is a necessity to protect and further develop the knowledge generated and perpetuated through attitude and awareness-raising, educational programs and validation procedures.

According to Ahlberg (2004), by educating youngsters to value diverse ways of knowing, to identify with their own cultural heritage and to respect community-based approaches (Allchin, 1988) could help to redress the dominance of science and nature study into much contemporary, meaningful and balanced education (Soloman, 1993). According to Agrawal (1995b) and Allchin (1988), TK and values entering science through culture, religion or from virtually any source helps exposing error and deepening interpretative objectivity in highlighting the more positive role of individual values in science. Even, Brokensha, Warren and Werner (1980), Compton (1989), Gupta (1992), Niamir (1990) and Warren (1990) assert TK and values incorporated science knowledge is the mechanisms for a balancing education to triumph over in educating people for sustainable resource use and balanced development.

1.1 Background of the study

Agenda 21 is a blueprint for action towards sustainable development (SD) for the 21st century. It was conventionalized in Rio de Janeiro in 1992 during the United Nations Conference on Environment and Development (UNCED, 1992). It is a plan made to achieve a sustainable society in this environmentally, economically and socially inequitable world. Chapter 36 of Agenda 21, in particular, stresses on the education, including non-formal and formal education, public awareness and training, should be recognized as a process by which human beings and societies can reach their fullest potential (Malaysia Country Profile, 2002).

Rattclif (2004) noted that in addressing the goals of sustainability the role of science is crucial. Science is to play a critical role in this social engineering, serving as a mechanism for generating citizens useful for a sustainable steady-state of a country (Anderson & Cavanagh, 1996; Bencze, 2001; Longbottom & Butler, 1999; Saul, 1995). The Declaration on Science and the Use of Scientific Knowledge adopted by the World Conference on Science affirms that scientific knowledge has led to remarkable innovations that have been of great benefit to humankind. In paragraph 01 of the Declaration it is stated:

> "*…the sciences should be at the service of humanity as a whole, and should contribute to providing everyone with a deeper understanding of nature and society, a better quality of life and a sustainable and healthy environment for present and future generations...*"
>
> (WCS, 1999, p.01)

However, Nader (1996) reminded, we need not idealize science as autonomous, value free, self generated and omnicompetent and progressive to make the point that there are different types of knowledge that provide valid truths of use to humankind exist. According to her, if a dominant science silences that knowledge, we all lose. Hence, to understand our world and to contribute to the need for broadly based problem-solving, we need to consider TK. TK systems preserve the wisdom gained through millennia of experience, direct observation, and verbal interaction for human survival and development. It need to be studied, documented, preserved, and used for the benefit of humankind before they are lost due to the onslaught of Western science and development projects based on them (Ramakrishnan, 2000).

According to Mitch and Jorgensen (1989), it is essential to integrate TK into the current science knowledge to make full use of its potentials. It must become an integral and operational part of planning, execution and interpretation. Incorporating both the TK and scientific knowledge is vital to adopt in together, in seeking imaginative, innovative and perhaps unexpected solutions to obtain sustainability. These, eventually, lead the societies to increase the general awareness and positive attitude towards their culturally and spiritually accepted knowledge. Furthermore, the need and wants to preserve and learn from a diversity of cultural experiences relating to the resource base in a synergistic fashion would stimulate social-environmental self-regulatory patterns for sustainability.

Furthermore, in recent years, there is a growing interest among educational researchers to view learning as cognitive, emotional, social (Illeris, 2003) and cultural (Aikenhead, 1997) integrated process with a contextualized setting for a meaningful

education. Therefore, a situated learning with a distributed focus among person, language, artifacts, activities and environment ensure internalization of the knowledge learned for holistic learning process. Shepard (2002) views learners construct knowledge and understandings within a social context and their learning is shaped by prior knowledge and cultural perspectives. TK incorporated curriculum enable a more situated learning (Brown, Collins & Duguid, 1989; Lave & Wenger, 1999; Solomon, 1993) where students' socially situated character of learning from their collective, cultural, historical forms of located, interested, conflictual, meaningful activity (Chaklin & Lave, 2003) seen as a way to conceptualising it. However, it is believed that the current curriculum does not address the complex interactions between people, resources, environment and development (Stiegelbauer, 1991).

Therefore, efforts should be continued to promote recognition of the validity and utility of traditional or local knowledge of the natural environment as it constitute parallel bodies of knowledge and know-how practices which can complement scientific knowledge and technology (DPCSD, 1997). It would lead to a science and local knowledge interface where academicians and researchers can come forward to fill in the information gaps, and assist government and private sectors towards minimizing or eliminating the impact of economic development on the human and natural environment for addressing sustainability. An education model by Alsop and Watts (1997) concluded that a person's engagement with scientific knowledge must fit with his or her self-image and lifestyle to enable them to act with confidence and self-direction.

Currently, Malaysian education system secures an on-going effort towards further developing the potential of individuals in a holistic and integrated manner, so as to produce individuals, who are intellectually, spiritually, emotionally and physically balanced and harmonious, based on firm believe in god. Common basis of human values is made compulsory in our education system to equip students with positive attitudes, awareness, knowledge and skills. Though, it is often said that our national assessment system puts a limit to pedagogies in the classroom, many education programs aims to develop healthy lifestyle to promote the active participation of students in nation building (MOE, 2004) and very much desirable to achieve sustainable education.

Moreover, the mission of the Ministry of Education (MOE) is *" ...to develop a world class quality education system which would be able to realize the full potential of the individual and fulfill the aspirations of the Malaysian...* ". Such an effort is designed to produce Malaysian citizens who are knowledgeable and competent, who possess high moral standards, and who are well responsible and capable of achieving high level of personal well-being. This enables us to contribute to the harmony and betterment of the family, the society and the nation at large (MOE, 2004) to succeed the nations' effort to safeguard the environment.

Therefore, increasing attitude and awareness in science among the students is the goal of the Malaysian science curriculum. It is emphasized in the formation of relevant science and technological knowledge and values and development of the skills and cognitive ability required for active involvement and commitment as individuals or members of community in solving daily lives problems (MOE, 2004).

Students' involvement and commitment to science through positive attitude and awareness have great influence on their lifelong learning and participation in science (Simpson & Oliver, 1990) whereas a negative attitude leads to a lack of interest and avoidance of the subjects. It is the major concern in recent education reform efforts (Trumper, 2006).

1.2 Research problem

There are relatively few examples of research studies in science education in Malaysia which attempt to answer the question of learners' attitude towards science and awareness of the relevance of science for them to commit, participate and perform on environmental issues. Most of the studies done are based on environmental education, participation and commitment without looking in the root cause of the relevance science educational experience by the students (Ahmad Nurulazam Md Zain, Rohandi and Azman Jusuh, 2010). Nevertheless, reviews of such considerably fewer studies that address the attitudinal aspects of attitude towards science and awareness of the relevance of science in daily lives have been published, and there is an increasing concern about such factors as equally important as the conceptual understanding and achievements on tests and assessments.

Therefore, the study tries to make a foremost attempt to seek the students' daily life practices covering food and diet, disease prevention and healing activities and environment friendly practices as it may be the good indicator to show the relevance of classroom science. In addition, learning of scientific concepts is much enhanced with if more attention is given to the affective dimensions like attitudes,

beliefs, values, interest, appreciation and awareness (Fensham, 2000a; 2000b: Sjoberg, 2002a) of the students in learning science.

In addition, Anderson (2006) claims that gender and locality differences in learning science is less pronounced in developing countries. Thus, as a developing country, the research on gender and locality of the students can be an influencing tool to measure our educational and learning achievements. It may create a platform for comparisons of the effectiveness of different teaching approaches in succeeding our learning goals. Hodson (1998) views that in many situations girls in developing countries are alienated in science rather than given an equal opportunity to learn science. Siraj-Blatchford (2000) also strongly asserts the role of young girls are minimized in science learning because they sense their self and started to loss interest in so called unfeminine world of science and technology.

Locality of the student is also an important factor in deciding the students' science performance and socially desirable outcomes such as social concerns, aptitude, intelligence, aspirations and etc... Furthermore, a general perception states that rural students usually receive an inferior education than the urban students (De Young & Lawrence, 1995). Therefore, the study attempts to clarify the role of gender and locality in determining the students' attitude towards science and awareness on the relevance of science in daily lives.

Moreover, the failure of the Malaysian education system in environmental issues effectively also could attribute to the pedagogical and teaching strategies to deliver the knowledge (Zeeda, 2001). A science curriculum that places value on

students' home culture and teaching strategies according to their worldview can give science more equitable places in increasing students' engagement towards science and relevance of science education.

In this context, TK incorporated science is seen as best option for the students to have a better understanding of science. It relates them with desired relationships and emotions towards science and technology for meaningful, motivating, interesting, engaging and important classroom science learning. TK that intertwines with culture, value and spirituality will be representing science more than mere science data. The community base collective traditional knowledge and data can corroborate, compliment scientific information as well as conforming scientific hypothesis and filling the gaps in technical information.

To verify it, this study focuses on Indian students' practice and their parents' views on the relevance of science by incorporating Indian traditional knowledge (ITK) for sustainability. The author believes that a relevant science curriculum that internalizes knowledge, skills and values by combining and utilizing Indian Form Four students' home practices together with more typical scientific data could bring good changes in attitude and awareness in them for sustainable future disregarding gender or locality of the students. Hence, this study proposes the idea of incorporating TK via cultural and religious knowledge in classroom science as an ultimate solution to inculcate positive attitude and awareness in science among students in daily lives for sustainability. In order to achieve the goal of sustainability, this study urges incorporating TK in science through the means of mandatory infusion of TK in our formal science education.

1.3 Purpose of the study

The study aims to investigate Form Four Indian science stream students' attitude towards science and awareness of the relevance of science on food and diet, disease prevention and healing activities and environment friendly practices based on their gender and locality. It also investigates the parents' views on the students' attitude towards science and awareness of the relevance of science on food and diet, disease prevention and healing activities and environment friendly practices based on the students' gender and locality.

This study also aims to identify the students' and their parents' views on the relevance of science in daily lives by incorporating ITK for sustainability. For that purpose, the views of Form Four Indian Science stream students and their parents will be the focus of the study. The findings could become an intellectual contribution to enrich our present science knowledge. In addition, by incorporating TK in classroom science could be a great contribution to science curriculum for sustainability.

1.4 Research questions

RQ1. a. Is there any significant main effect of the gender on the attitude of the students towards science?

b. Is there any significant main effect of the locality on the attitude of the students towards science?

c. Is there any significant interaction effect between the gender and locality on the attitude of the students towards science?

RQ2. a. Is there any significant main effect of the students' gender on the parents' views on the attitude of the students towards science?

b. Is there any significant main effect of the students' locality on the parents' views on the attitude of the students towards science?

c. Is there any significant interaction effect between the students' gender and locality on the parents' views on the attitude of the students towards science?

RQ3. a. Is there any significant main effect of the gender on the linear combination of the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices?

b. Is there any significant main effect of the locality on the linear combination of the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices?

c. Is there any significant interaction effect between the gender and locality on the linear combination of the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices?

RQ4. a. Is there any significant main effect of the gender on the linear combination of the parents' views on the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices?

b. Is there any significant main effect of the locality on the linear combination of the parents' views on the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices?

c. Is there any significant interaction effect between the gender and locality on the linear combination of the parents' views on the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices?

RQ5. What are the views of Form Four Indian students and their parents on Indian traditional knowledge that arises in daily life with respect to sustainability?

1.5 Research hypotheses

H_{01}. a. There is no significant main effect of the gender on the attitude of the students towards science.

b. There is no significant main effect of the locality on the attitude of the students towards science.

c. There is no significant interaction effect between the gender and locality of the attitude of the students towards science.

H_{02}. a. There is no significant main effect of the students' gender on the parents' views on the attitude of the students towards science.

b. There is no significant main effect of the students' locality on the parents' views on the attitude of the students towards science.

c. There is no significant interaction effect between the students' gender and locality on the parents' views on the attitude of the students towards science.

H_{03}. a. There is no significant main effect of the gender on the linear combination of the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices.

b. There is no significant main effect of the locality on the linear combination of the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices.

c. There is no significant interaction effect between the gender and locality on the linear combination of the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices.

H_{04}. a. There is no significant main effect of the gender on the linear combination of the parents' views on the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices.

b. There is no significant main effect of the locality on the linear combination of the parents' views on the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices.

c. There is no significant interaction effect between the gender and locality on the linear combination of the parents' views on the students' awareness of the relevance of science in daily lives on food and diet, disease prevention and healing activities and environment friendly practices.

1.6 Rationale of the study

Despite the growing importance of science and technology in all realms of life in any society, students appear to lose their interest for it in schools. It seems they have developed ambivalent attitudes on science, awareness of the relevance of science and perceptions on science and technology (Schreiner & Sjoberg, 2004). In the quest for solutions to the lack of interest, commitment and participation that young people have for science and technology education (Black & Atkin, 1996), most research in science and technology education has focused on the cognitive sides of teaching and learning. However, currently there is growing acceptance among the educational researchers of the significance of the affective dimensions of the issue.

Knowing more about their attitudes towards science education and awareness of the relevance of science may open way for alternatives and improvements. A successful science teaching goes through knowing something about the views and perceptions of learners. Such views and perceptions may position us better as science educators need to think critically and constructively about alternatives and improvements. By introducing a sound science education program, we could attract the interests of all learners, regardless of social or geographical background or gender. When such interests are known and considered; when science curricula are

constructed or designed according to students' needs and wants and related to their daily practices, then school science is likely going to be relevant to the needs of all.

According to Ahmad Nurulazam et al. (2010), students' participation in learning increased with science constructed with live experiences than their classroom science. It gives a significant effect on their attitude and awareness of learning science by creating an enjoyed experience for future participation in science. Moje, Collazo, Carillo and Marx (2001) assert, students develop positive attitude and awareness if teachers are able to show the connection between students' daily life experiences with science discourses in the classroom. Lee and Fradd (1998) suggested a learning process mediating student's cultural and home experiences to make the science content accessible, meaningful, and relevant to the diverse group of students.

In addition, our science curriculum emphasizes application of science knowledge and skills in everyday lives by nurturing a science and technology culture in science education. Form Four Biology Syllabus, for example, encompass four main themes: Introducing Biology, Investigating the cell as a basic unit of living things and investigating the physiology of living things and investigating the relationship between living things and the environment (MOE, 2005). Despite the context based approach is encouraged, the suggested learning outcomes and learning activities for the listed themes are not really connected to the students' home life experiences and their background, culture, beliefs and needs (Ahmad Nurulazam Md Zain et al., 2010). It lacks cultural learning styles and characteristics of the students within the community, learning that emphasis culturally and spiritually appropriate and locally relevant science.

Therefore, this study proposes the essentially of incorporating TK in science with history, philosophy, technology, connections of unifying themes in science, and a personal and social perspective for a relevant science education. Addressing cognitive, effective and socio-cultural domains contribute to the bridging the gap between knowledge and action in science curriculum to confer a holistic approach in science (Littledyke, 2008). Application of situated learning with sensitivity to local culture by integrating action, thought, feelings and values from the students' collective, cultural, spiritual and historical forms presents a rationale science learning instead of application of mere scientific and technological knowledge. They may even be more important than the cognitive factors (Sjoberg, 2000c) to influence students' eagerness, interest and motivation in learning science. Changes in learning science through meaningful learning experiences will conceptualize in to achieving the sustainability goals.

Furthermore, the transformation of teaching and learning process by pedagogical idea based on the TK incorporated science will abandon the notion of a common and more a less universal science curriculum in favor of curricula. The learning process that involves students 'fund of knowledge' with a context-bound pedagogical methods and sources by involving both gender and cultural diversity (Basu & Barton, 2007) is a key factor to infuse a relevant science for he or she actively participate in meaningful life. Thus, the study aims to investigate gender influence and locality of the school in a cultural diversify context to see the relevance of their classroom science that relating to the characteristics of their daily activities (Gonzales & Moll, 2002).

In addition, as the identity formation of children are constructed based on gender and background influence, such as parental, societal, and cultural influences (Anderson, 2006), therefore, they are culturally, socially and geographically dependent to their parents. Their lifestyle, life values and aspiration are influence by their parents (Quoss & Zhao, 1995). Thus, this study brings in the parents' views on their children's attitude towards science and awareness of the relevance of science to validate the children's actual need and wants in science education for them to participate effectively in society to address sustainability.

The study also paves way for the teachers of science to behave sensitively and have sufficient information on students' daily lives practices and home culture (Diamond & Moore, 1995). Students' cultural and spiritual knowledge and values incorporated classroom science able to strengthen the relevance of science. Furthermore, it is an indicator for our Curriculum Development Centre to re-evaluate and re-orientate our Science Curriculum to foster sustainability.

1.7 Significance of the study

This is a pioneer study made in our country on the Indian students' attitude towards science and awareness of the relevance of science in daily lives and the parents' perceived views on their children's classroom science and the relevance of science by incorporating ITK for sustainability. A questionnaire was developed as an attempt to seek their awareness of the relevance of science in daily lives. The 'insight' of their actual need and want for relevant science knowledge has also been studied using a qualitative method. Hence, the study paves ways to the constructive

educational approach to manage cultural border crossing and collateral learning (Jegede & Aikenhead, 1999) face by minority groups in learning science and cognitive conflict face by them in dealing with different worldviews in multiculturalism. This approach to science curriculum development is relatively new and there is much scope for further work in this area for our multi ethnic country.

This study is a resourceful contribution the educational planners and educational researchers to rethink and reform Science curriculum and pedagogy with TK incorporated methods and techniques for a meaningful science learning. The findings of the study will also strengthen the collaboration between science and local knowledge researchers and educators to brace formal and non-formal education for the students to relate science in their daily lives. It also helps empower teachers to take responsibility for planning their students' learning experiences (Effandi Zakaria & Zanaton Iksan, 2007) by being knowledge and cultural sensitive for the students to successfully negotiate their space in border crossing to participate effectively in the interests of sustainable development. As suggested by Fullan and Stiegelbauer, (1991) a meaningful and effective educational achievement should include (i) the preparation and adoption of new curriculum guidelines, syllabuses, teaching activities and educational materials, (ii) changes in teachers' familiarity with, and use of, new forms of pedagogy and assessment, and (iii) the reflective development of teachers' beliefs or practical theories of education.

Furthermore, this study is much aligned to the vision of the Malaysian Education as embodied in the National Educational Blueprint (MOE, 2007). One of the 6 core strategies of the Educational Development Master Plan 2006-2010 to

achieve ‘Quality Education for all’ is through the development of our *National Unity (Negara Bangsa).* This in turn is accomplished by way of national unity and integration and taking pride in our local knowledge and heritage by way of *'populace/patronized our art, heritage and culture' (merakyatkan seni, warisan dan budaya bangsa)* (MOE, 2007).

1.8 Theoretical framework

This study is based on Ahlberg’s tentative theory. Ahlberg (2004) had constructed a tentative theory pillaring the idea of Donalson and Donalson (1958) as a working definition of sustainable development. As for him, sustainable development is development in which real long term needs of both present and future human generations are met as optimally as possible. This means that not only the basic individual biological needs, but also real economical, cultural and social needs ought to be met.

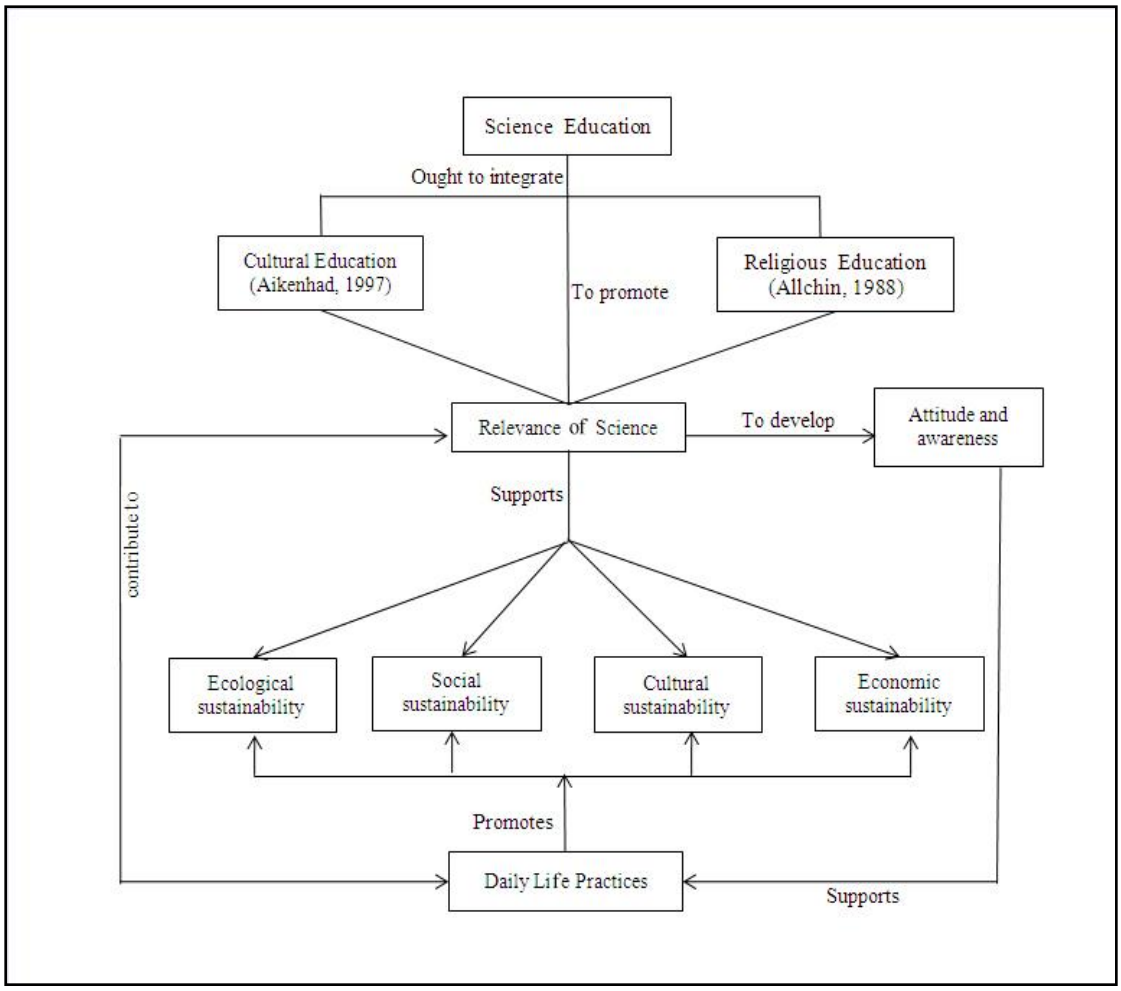

Figure 1.1 Theoretical Framework of the study adapted from Ahlberg (2004)

In this study, the author had adapted the theory by Aikenhead (1997) and Allchin (1988) to fit in to the aim of the study to see the relevance of science based on Indian students' daily life practices and their parents' views on them. It also intended to seek their views on the relevance of science by incorporating ITK in science for sustainability.

Aikenhead (1997) bringing in the new perspective in science education which conceptualizes a transition between students' home culture and their classroom science as he illustrates as "cultural border crossing" for a minority group of students.

According to him, generally there is a clash between students' home culture and foreign 'western science' that being taught in schools. In classroom science, students are expected to construct scientific concepts meaningfully even there is concept conflict with their cultural norm, beliefs, values and daily life practices. Jegede (1999) also akin to Aikenhead, that students face conflictual science learning where there is a clashes in worldviews between students' culture and the science culture. Hence, there is a need to incorporate culturally sensitive science curricula for them to access to a relevance science education for their future use.

Allchin (1988) endorses the necessity of providing healthy intellectual community by appreciating science in peoples' historical context. He verifies that peoples' religion, belief and spiritual values are cognitive resources that contribute positively to knowledge internalization to address sustainability. Hence, he strongly asserts the need to incorporate religious and spiritual values in science to make good science. Relevancy in science is developed by a balanced science values which are derived from coupling it with these complementary values. Educational researchers like Weinburgh (1995) and Bloom (1992; 1995) also verify students' affective, social and value domains affects their science learning outcomes.

Incorporating TK in science through cultural and religious education induce students' behavioral changes that develop a positive attitude and awareness of their classroom science which promote meaningful science learning for a sustainable human future. Changes in attitude and awareness facilitate the development of a healthy and self-sustaining society. Learning the values, behavior and lifestyles is an essential requirement for a sustainable future and for positive societal transformation. Hence,

the study proposes a students' traditional knowledge incorporated science education. It enables knowledge internalization among the students to develop positive attitude and awareness to address sustainability.

1.9 Definition of the terms

(a) Sustainable development/Sustainability

The Bruntland Commission defined SD as "development that meets the needs of present without compromising the ability of the future to meets its own needs" (WCED, 1987). Hence, SD is a development that guarantees the social well being of human society without negating a quality environment and a sturdy economic progress. It emphasizes the interaction between people, resources, environment and development. In this study, it focuses on application of sustainability idea in daily life practices by Form Four Malaysia Indian science stream students.

(b) Science curriculum

Malaysian Science curriculum (primary/secondary) has been designed to provide opportunities for students to acquire scientific knowledge, skills and noble values. The curriculum guides students to observe, ask questions, formulate and test hypotheses, analyze, interpret data, report and evaluate findings for a meaningful learning (MOE, 2004). In this context, it refers to a learning process towards developing a future generation who are literate in science, innovative, and able to apply science knowledge in decision-making and problem solving in everyday life.

(c) Relevance of science

Relevance of science is defined as importance, usefulness and meaningfulness of science to the needs of the students (Levitt, 2001). It refers to students' perception of whether the content or instruction satisfied his/her personal needs personal goals and career goals (Keller, 1983). In this study, it refers to the Form Four Malaysian Indian science stream students' ability to relate their daily life experiences with their classroom science and satisfy their need to link science in their daily life practices.

(d) Attitude towards science

Attitude towards science can be referred as the degree of liking that students have for science (Oliver & Simpson, 1988) and their classroom science. This can be based on their interest, concern, priority, belief and opinion on science and technology. It involves cognitive, affective and behavioral components (Salta & Tzougraki, 2004). In this context, it refers to the Form Four Malaysian Indian science stream student's tendency to think, feel and act positively or negatively to the environment and environmental issues.

(e) Awareness of the relevance of science

Western culture links science, classroom science and everyday practices in a hierarchical order where it place the cognitive and knowledge as the goal to create awareness among students. But, recent science and science educational researches emphasis cognitive, effective and behavioral elements to be interrelated in creating

awareness among students to see the relevance of science and their classroom in their daily practices, where it involves cognitive functioning that triggers the emotional reactions (Lewicki, Czyzewska & Hoffman, 1987) to participate in preserving and protecting the environment, socio-economic and humanities well-being. In this context, it refers to the magnitude of influence in Form Four Malaysian Indian science stream students to the commit, participate and perform on nature management and environmental issues.

(f) Indian traditional knowledge

Indian traditional knowledge (ITK) represents knowledge and experience acquired over thousands of years of direct contact with the environment by people lived in the land of India (Shiva, 2000). ITK and lifestyles is believed should able to offer modern societies many lessons in the management of resources and to solve economic, social and environmental problems to achieve sustainability. According to Brahmananda (2011) ITK is a holistic knowledge that constituent into cultural, religious and spiritual practices. It is expressed through their cultural practices, artifacts, cultural property including symbols, archaeological, sacred sites and objects, language, music, legends, religions, beliefs, thought system and wisdom. In this context, it refers to Malaysian Indians' home practices that still intact with their traditional knowledge in managing and sustaining the world natural resources.

(g) Culture

In early anthropological literature culture is defined as the "knowledge, belief, law, morals, and customs" (Tylor, 1871, p.46) that are passed down from one generation to another within a particular society or group of people. As Aikenhead (1996; 1997) claims, culture refers to the background of the students which are embedded in the racial and ethnic identities. It provides a frame of reference that classifies one's heritage, values and social traditions. In particular, culture constitutes of beliefs, customs, traditions, languages, ceremonies, arts, values and the way of life. In this context, it refers to Malaysian Indian culture that develops through rich day to day experiences that been safeguarded by beliefs, values, virtues, knowledge and customary acts for a long period of time.

(h) Religion

Religion teaches humanity to lead a life in a God's physical manifested world in meaningful manner. It saves man from destruction and gives the desire for life which is shown in their self-contained acts. It assures the victory of the traditions and culture to integrate solidarity of a community and establish its morale (Malinowski, 1954). It gives meaning for the human continuity with a well guarded tradition to manage the material world. In this context, it refers to religious and spiritual practices in Indian Hindu community.

(i) Malaysian Indian students

Malaysian Formal Education System offers two types of streaming for secondary school students. They are relatively Art stream and Science stream. The science stream emphasizes pure science subjects such as Biology, Physics and Chemistry. The Pure Science subjects are the core subjects of the course which are being taught from Form Four to Form Five. For this study, the term Malaysian Indian students refer to the Malaysian Indian ethnic students studying in government aided secondary schools and in Form Four science stream classes in Kuala Muda/Yan and Kulim/Bandar Bahru districts.

(j) Malaysian Indian parents

Malaysian Indian parents refer to people those their children are studying in Form Four science stream classes in government aided secondary schools in Kuala Muda/Yan and Kulim/Bandar Bahru districts currently. They lead an ordinary life and non-expert and non authorized in the knowledge related to the field of research. They will describe a complex and technical issues using words and terms that could be comprehend without much effort.

(k) Food and diet

Birch (1999) stated that early determinant of food and diet preference and choices is readily shaped by the situations in which food is available due to parental guidance. Family background and cultural influence is the main determinant in the

food choices and preference in a child's growth in early stage. Peer influence and the surrounding environment and their classroom science will be an influencing factor in as they get older. In this context it refers to type of food that raised, processed, preserved, cooked and consumed in a practical and cultural way in Indian families to promote health and long life for their children and food practices that children's imply in their daily lives.

(l) Disease prevention and healing activities

It can be defined as practices prior to the biological origin of a disease, practices made after disease is recognized to hinder further sufferings and practice after the sufferings to avoid further deterioration that practiced by families and communities that includes socio-economic, cultural-religious and functional concern (Like, Steiner & Rubel, 2010). In this study, it refers to the Indian students and their parents' daily practices on culturally sensitive and competence disease prevention and healing activities in maintaining physical, mental and emotional health and how science and the students' classroom science is relevant for them to see the link between their cultural practices and science knowledge.

(m) Environment friendly practices

Current practices and nature values of a society formulate the goal and intention to save the biodiversity (Ferraro & Simpson, 2005) and improve the quality of the environment. In this context, it refers to ecologically conscious Indians daily life practices that inflict minimal or no harm to the environment. It focuses on

environmental friendly practices and environment friendly lifestyles by Indians parents and their children in their daily life. It also meant to show their understanding of how their daily life practces are interconnected with everything around them and how they develop the right attitude and awareness for better management of natural resources for sustainability.

(n) Daily practices

According to de Certeau (1984) daily practices refers to the habitual performance of students or their family members of what they do, how they do it, their preference, goal and belief in life or application of what they have learn from outside world. In this study, it refers to the science teachers, science and classroom science that being the centre for the Form Four Malaysian Indian science stream students to seek the relevance of their classroom science in their daily activities and to develop new or creative thinking to find meaning for what they have learn with their daily lives.

1.10 Conclusion

The chapter disscussed about background of the study, research problem, purpose of the study, research questions, research hypotheses, rationale of the study, significance of the study, theoretical framework and definition of the terms. The aim of the study was to investigate the Form Four Malaysia Indian science stream students' attitude towards science and awareness of the relevance of science in their daily practices on food and diet, disease prevention and healing activities based on

gender and locality and their parents' views on them. The study also intended to seek the students and their parents' views on incorporating ITK in science to address sustainability. The findings of the study could contribute to enrich our present science curriculum.

The following chapter will describe the literature review of the study.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter presents the studies related to sustainable development (SD), education for sustainable development (ESD), science education, traditional knowledge, Indian traditional knowledge, research variables and some major works by researchers related to the study. This study ends with the conceptual framework of the study.

2.1 Sustainable development (SD)

"…It is time to understand 'the environment' for so called, the national security issue of the early twenty-first century…", exclaimed Kaplan (1994). His saying is due to the threatening environmental deterioration for humanities prospects for achieving satisfactory living standards. According to Holdren and Ehrlich (1974), environmental transformation for human development produces permanent damage to the earth's capacity to sustain life. Thus, the deteriorating environment emphasizes the urgent need to evaluate the available environmental resources and how they relate to the requirements of our earth's carrying capacity (Hardin, 1993; Cohen, 1995).

A great increase of awareness all around the world came with the publication of the report of the United Nations World Commission on Environment and Development, the Brundtland Report (Brundtland, 1987). The report has brought in

SD as an alternative means to improve human and ecological conditions, with a special reference to create positive attitude and awareness of the future conditions in a harmonious means. As said in Brundtland Report, SD is about achieving the sustained economic growth needed to meet human needs, improving living standards and providing the financial resources that make environmental protection possible. In specific, Markandya (1990) wrote that SD is more about 'balance development', the balance between the man, nature and economic escalation. A healthy, prosperous society relies on a healthy environment and social achievements (McKeown, 2002) which are the results of economic advancement. According to Korten (1996), SD is about creating equitable economy which manages the environment carefully to sustain human institutions that assure both security and opportunity for social, intellectual and spiritual growth.

It resulted in the Rio Declaration which set out 27 principles for achieving SD which is complemented by Agenda 21. Agenda 21 viewed education as an essential tool for achieving SD and identified four areas of action for education. These are; to promote and improve the basic education; to re-orientate existing education at all levels to address sustainable development, to develop public understanding and awareness of sustainability and to train all sectors of the workforce to contribute to local, regional and national sustainability (UNESCO, 1991).

However, the goals laid out in Rio to succeeding SD for well being of humanity worldwide were floundered (WSSD, 2002). The crisis happening worldwide is less a cognitive problem than it is a behavioral and social one. It can therefore be resolved only with the help of behavioral and social solutions. As humans

are gifted by the potential for right conduct, self-awareness and intelligent choice and knowing the circumstances is an invitation to change. Hence, educating people to reenact the idea of SD formulate an urgent need to rethink education (Rahman, 2000). Education for Sustainable Development (ESD) paves the way for this “rethinking”.

2.2 Education for Sustainable Development (ESD)

The idea concerning ESD was captured in Chapter 36 of *Agenda 21*, "Promoting Education, Public Awareness, and Training." ESD encompasses a vision that integrates environment, economy, and society for SD. To achieve that, we need to rethink and reorientate education (Rahman, 2000). By reorienting education, teaching and learning knowledge, skills, perspectives, and values will be used to guide and motivate people to pursue sustainable livelihoods. In actuality, ESD carries with it the inherent idea of implementing a locally relevant and culturally and spiritually appropriate education programs.

Therefore, people need basic knowledge from the natural sciences, social sciences, and humanities to understand the principles of SD, how they can be implemented, the values involved, and implications of their implementation. Since, principles of SD are not woven into peoples’ daily life practices, the emergence of ESD could become an important tool in devising a locally relevant and culturally accepted SD goals. ESD could shape and encourage skills, behaviors and ethics that support an informed, knowledgeable citizenry to achieve a sustainable future. Orr (1996) proposed that the views about modern education be changed and that the goal of education should not just be mastery of subject matter but of one’s person. It

should emphasize shaping the values and worldviews that drives an individual. For that, the teachers need to exercise a real influence towards a change in favoring sustainability (Miranda, Alexandre & Ferreira, 2004).

In here, ESD is seen as a real and effective form for students to acquire skills, perspectives, values and knowledge to live sustainably in their surroundings. At the same time, true education is not indoctrination or inculcation, but carries with it the inherent idea of implementing programs that are appropriate to students' need and want. For a meaningful education, learning science should be something that students do, not something that is done to them (NRC, 1996).

There are many studies done related to implementing programs that are relevant with the social context of the students to succeed ESD. Ladson-Billings (1995), for instance, encourage teachers to use subjects from students' home culture as "vehicle for learning". Pameroy (1994) finds that the use of science content situated in the local culture plays a major part in multi cultural education. Banks (1994) insists, "…curriculum should reflect the cultural learning styles and characteristics of the students within the community…".

Nieto (1999) advocates the teachers' attitude and behaviors can make an astonishing difference in students learning. Teachers' attitude in placing value on their students' home culture and teach according to their worldviews can make classroom more equitable places in increasing students' engagement, attitude and awareness of science and relevance of science education, he added. Other strategies like self-directed, inquiry based learning (Banks, 1994; Lee & Fradd 1998; NRC, 2000) and

cooperative learning (Ascher, 1983; Sutman, 1993; Brown, 2001) enable to bring in culturally relevant curriculum, though there is an uncertainty in its application for all populations. Besides, selecting pedagogical strategies that reflect the cultural norms of students, a good supervision by teachers ensure the development of positive values about science subject. Banks and Banks (1995) claims, in order to understand the norms, knowledge and cultural wisdom that students bring into the classroom, the teachers must spend time understanding the students' home culture and their community.

In addition, Jegede and Aikenhead (1999) believe, science teachers who understands the amount of congruence between school and home worldviews are able to assist students in a better way. A study made by Valenzuela (1999) using Mexican American students, explains that teachers who negate students' home culture and try assimilation in to Western Science, face negative outcomes in their students' performance. To enable teachers to use cultural referents to impart knowledge, Ruiz (1999) suggests teachers become students to their students. By doing this teacher see their students' culture as valuable, informative and part of the curriculum. Pomeroy (1994) regards highlighting the scientist from the culture of the students as a good strategy. Sutman (1993), too, hails this idea because it could provide historical role models for the students. According to Martinez and Ortiz de Montellano (1988), using examples from cultural background of students, promotes the students' enthusiasm to go further into seeking the relevance of their science education. Gay asserts that teachers should learn about "…histories and heritages…and interactional styles to bridge the gap between the cultural values and behavioral codes of themselves and their students…" (cited in Cristol, 2001, p.163). McIntyre, Roseberry and Gonzalez

(2001), once had used parents' expertise in gardening in their math project and made a finding that students were able to transfer the math concepts they learned from gardening to new situations.

Ahlberg (2004) is the first to develop the first tentative theory of ESD. The theory highlights ability, competence, expertise, intelligence, creativity and wisdom for all aspects of sustainable development. He stated that ESD able to budge towards a correct direction if it is integrating best theories and best practices, testing constructed new tentative theories both theoretically and empirically when it is possible (Ahlberg, 2005). Therefore, teachers ought to first learn how to make their students learn meaningfully and reflectively.

However, McKeown (2002) places students' preference in their learning as the main goal in succeeding ESD. He opines ESD depends on well-designed learning that offers students, choices about what they want to learn. By reorienting to a locally and culturally relevant curriculum that is based on the students' worldviews should be given equitable partnership with our current education to achieve ESD. As with many educational reform movements, the success of reorienting education to address sustainability will in part depend on the capability of those who lead the effort and the readiness of those who wish to implement it.

Fien, Sykes and Yenken (2002) claim that existing education failed to develop environmental knowledge, beliefs, values and behaviors which is central to ESD. They suggest that education be reformed in terms of curriculum and pedagogy, i.e.