Anchoring Science Education Towards Scientifically Literate Malaysian Society: An Exploration of Children's Affective Psyche

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Objectives and Significance of Study

This paper takes as it starting point the document Vision 2020, inspired by the former Prime Minister of Malaysia, and examines the way in which the science curriculum might make a material contribution to the future Malaysian society. In particular, it argues that the science curriculum is in a unique position to take up the challenge of *"establishing a scientific and literate society, a society that is innovative and forward-looking, one that is not only a consumer of technology, but also a contributor of the scientific and technological civilization of the future."* Such characteristics of Malaysian society must be produced by its education system, particularly science education so that Malaysians are capable of competing in all aspects of human civilization, not only at national level, but also

in an international setting. In an effort to establish such scientific and literate society, this paper argues that children's scientific attitudes as well as their attitudes towards science must be nurtured. By possessing positive scientific attitudes and attitudes towards science, it is argued that children will have strong inclination towards science and hence have strong tendency to embark themselves in science related careers.

Underlying Theoretical Framework

In the field of attitude research, there is a significant debate between two schools of thought regarding the meaning of attitude itself. Attitude, as conceptualised by Krech, Crutchfield and Ballackey (1962) embrace three distinct components: the *affective*, the *behavioural (conative),* and the *cognitive*. More recently, another school of thought, represented by Fishbein and Ajzen (1975) contend that attitude measurement should be concerned solely with the *affective* domain, and that the *behavioural* (*conative*) and *cognitive* components should be assessed separately. Nevertheless, as pointed by Koballa (1989), regardless of whether it is the age-old trilogy or monology of attitude one has accepted, what is important is that attitudes are learned either actively or vicariously, and therefore, can be taught.

Essentially, attitudes towards science involve feelings, opinions, beliefs, and appreciation, which individuals have formed as a result of interacting directly or indirectly with the various aspects of the scientific enterprise (Hasan & Bileh, 1975, Munby, 1983). It also covers emotional reactions someone exhibits towards science (Gardner, 1975). The term "scientific attitudes" on the other hand is perceived as desirable attributes of scientists in professional work and could be categorized as interests, adjustments, appreciation as well as values. These attributes include open-mindedness, critical mindedness, suspended judgment, curiosity, intellectual honesty, skepticism, rationality, objectivity, and questioning attitudes (Kozlow and Nay, 1974; Krynoiwsky, 1985). Gauld refers to scientific attitudes as the execution of that particular approach to solving problems, assessing ideas and information and making decisions. Cognizing the wide array of definitions of scientific attitudes, this paper offers a different insight to these definitions of scientific attitudes; viz. it refers to attributes needed in executing higher order thinking, especially solving problems, judging ideas and making decisions. It could therefore be argued that having such attributes could ensure someone not merely being able to interpret the scientific knowledge and method as well as other things concerning their daily lives experiences.

In this paper, the prime aims are twofold: the first segment will focus on the concept of attitude towards science and scientific attitudes. In this section, extensive literature review on those concepts will be conducted, which ultimately bring about authors' unique conceptions of attitude towards science and scientific attitudes. In line with the definition, relationship between scientific attitudes and critical thinking dispositions – dispositions needed to inspire someone to think critically will also be highlighted and discussed. The second segment will present empirical finding about students' attitudes towards science and scientific attitudes. In this final section, discussion will focus on the differentiation in students' attitudes towards science and scientific attitudes with respect to gender, race and educational level.

Research Design and Procedures

The respondents involved in this study survey study comprise 493 Form Two, Four and Matriculation students from several secondary schools. The sampling technique used is stratified sampling (Neuman, 1999). By employing stratified sampling approach, the researcher first divides the population into strata (Form Two, Four and Matriculation). The second step involved is systematically draw sample from each strata. By employing this type of probability sampling, the relative size of each strata can be controlled and monitored by the researcher.

The Instruments

The main data-gathering instrument in this study is questionnaire, which includes: i) an adaptation of attitude towards science questionnaire developed by Gogolin and Swartz (1992) and ii) an adaptation of scientific attitude questionnaire developed by Kozlow and Nay (1976). The attitude towards science questionnaire comprises of 48 items and generates six distinct scores rather than a composite attitude towards science scores, viz. perception towards science teacher, anxiety towards science, the importance of science in the society, self-concept in science, enjoyment and motivation in science. The scientific attitude questionnaire comprises of 23 items, which measures students' critical mindedness, suspended judgment, respect for evidence, honesty, objectivity, and willingness to change opinions. The instruments used in this study have been justified in terms of its validity as well as reliability.

Main Findings

Mainly, it was found that students' attitude towards science is high and there exist significant difference in terms of students' attitude towards science with respect to level of educational experiences. As for the scientific attitude, analysis reveals that overall, Malaysian students possess strong inclination towards respect for evidence and honesty. However, their objectivity and

suspended judgment are very low. Detail analysis reveals that students' cultural background has significant impact in shaping their attitudes towards science as well as scientific attitudes. It is interesting to discuss how their cultural and psychological environment shape and orient their perceptions towards science and hence their scientific attitudes. To conclude, the attitudinal profile provides viable information about the status of science education in Malaysia. This is because, the attitudinal profile generated, tacitly reflects not only the effectiveness of the Malaysian science curriculum in resulting attitudinal changes in the students, but also to science teachers whereby they need to reflect upon their content as well as pedagogical content knowledge so that the end product of children's formal science experience is not only students' acquisition of scientific knowledge *(cognitive development)* but also changes in terms of students' attitudes *(affective psyche)* – an aim which is boldly written in the Malaysian science curriculum.

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