

## **MULTIPLE RESEARCH APPROACHES FOR RESEARCH IN ENVIRONMENTAL EDUCATION AND APPLICATION OF FINDINGS.**

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*A paper presented at the Australian Association for Research in Education conference, Fremantle, Western Australia, December 2-6, 2001*

### **Abstract**

The paper illustrates how an inquiry was conducted using multiple research approaches involving both qualitative and quantitative methods (case study, semi-qualitative grounded theory and quantitative statistical analyses) with data sources obtained from four groups - teachers, teacher trainees, secondary students and key persons for the environment and environmental education as well as document reviews. This inquiry examined four aspects of environmental education; influences on attitudes towards the environment, perceptions of existing provisions for environmental education, understanding of the aquatic environment - an environmental issue, and the status of people's environmental attributes, including their knowledge, awareness, attitudes, beliefs, action and sources of information. Results of the multiple components of the study provided baseline data to develop guidelines for policy making and curriculum development as well as improving the teaching of environmental education. Follow-up activities to attempt to apply the research findings and negotiate acceptance of the findings are described. The paper examines how multiple research approaches contribute towards research in environmental education.

### **Introduction**

The main purpose of this paper is to report a multiple research approach used to evaluate the status of environmental education in a small Asian Islamic nation. This study comprises 4 themes with data from a variety of samples and sources and thus asked different types of research questions. The four themes are "*Cultural and institutional structures influences on the environment and environmental education*", "*Perceptions of provisions for environmental education*", "*Conceptual framework of the aquatic environment*" and "*Environmental attributes of the people*". This paper will describe briefly the theoretical framework of the study, the methodology used and the results of the multiple study as well as attempt to report on how much progress developed to apply the research findings and to negotiate the findings of the study.

### **Theoretical framework and significance of the study**

The theoretical framework for this multiple research study are built on the theoretical framework and significance of each of the four themes of the study:

1. *Culture and institutional structure influences on the environment and environmental education*. Traditional research on environmental behaviour has focussed on the study of attributes such as knowledge, attitudes, beliefs, and values to work towards a sustainable environment. More recent research has considered other factors as influencing the environmental behaviour of people, including their situation, the physical – environment traits (Black, Stern & Elmworth, 1985) and their personal variable (Corraliza & Berenguer 2000).

Although some research is found to investigate the effect of (Judeo)-Christian beliefs on environmental behaviours (White 1967, Schultz, Zeleny & Daryl Imple, 2000), there is a paucity of such work on Islamic beliefs. The first part of this study investigated how the environmental behaviour of the people in a small Asian Islamic nation can be explained from the culture of a people and the institutional structures that govern them. Culture in this study included worldviews, beliefs, traditional and indigenous knowledge and ways of life of the people. Institutional structures in this study include the role of government and non-government organisations, particularly those responsible for formal and non-formal environmental education

*2. Perceptions of provisions for environmental education.* In the Earth Summit in Rio de Janeiro, many countries signed their commitment to Agenda 21 to re-orientate education towards sustainable development (Quarrie, 1992). Some research were found to be aimed at specific evaluation programmes carried out separately by individuals (usually academics) or groups of teachers (e.g. Zint & Meichtry, 2001) or by students and parents (Rovira, 2000). Much of the research looked at how environmental education is incorporated into school curricula or identified barriers. Part two of this study investigated the extent to which the environmental education aims such as those intended in Agenda 21 were achieved in the country from perceptions of science teachers, teacher trainees and students in order to come up with recommendations for improving environmental education in the country.

*3. Conceptual framework of the aquatic environment.* There are concerns that people are making decisions in participating in environmental actions without understanding the environmental issues they are acting for. If teachers are to help children in schools to participate in positive environmental action, their first step will be to ensure that they understand the environmental issues themselves.

Developing conceptual frameworks is one useful way to see the pattern of thinking and understanding of a group of people on a certain topic. The development of categories, referred to as conceptual frameworks, is identified from responses to open-ended questions on the topic. Two studies that fit into this area of research reported teacher trainees' understanding of the environment (Robertson, 1993), and middle school students' understanding of environmental problems (Wals, 1992).

In this study, the conceptual framework of science teachers and teacher trainees are determined by at the concepts and principles that are perceived as essential for student understanding in the environmental issues of aquatic environment.

*4. Environmental attributes of the people.* The quest to understand what environmental attributes in people encourage positive environmental behaviour has been the goal for environmental education. Deciphering studies of how environmental attributes, such as environmental knowledge, attitudes, beliefs, values, worldviews, environmental behaviour and environmental action are interrelated can be a major problematic task. Firstly the meaning of the individual environmental attributes can be misinterpreted.

Secondly, models of Hines et al. (1987), Hungerford & Volk (1990), Simmons (1991) and Emmons (1997) show how certain environmental attributes contribute to desirable environmental behaviours. However, issues of measurement of relationship between knowledge, attitudes and action are concerned with the specificity of the environmental issue to the environmental attributes. A multiple act criteria rather than one environmental behaviour should be used to measure general concern for the environment . General environmental attitudes for a number of environmental issues may not be substantially related to general environmental behaviour .

Part four of this study examined the environmental attributes (awareness, knowledge, beliefs, attitudes, and action abilities) of students, teacher trainees and science teachers in an attempt to provide a baseline measurement of environmental attributes of the people that can be compared with people of other countries. In this study, environmental knowledge is a range of environmental issues, beliefs fall either in the technological or environmental paradigm, attitudes is the desire to do something about the environment, and action abilities is the self reported behaviour.

### **Design and procedures**

The use of multiple research approaches in this evaluation of environmental education is assumed in this study to reduce any bias that may be inherent in a particular source and method used (Denzin 1978). Further, the study also assumes that the two types of triangulation in this study, data sources and methodological, does not result in a single convergent outcome and takes into account other possible outcomes such as inconsistency and contradiction (Mathison, 1988). The results obtained from the four themes in this study are presented as evidences and attempt to make sense of the findings in the effort to understand the status of environmental education in the country. Overall the study has been shaped initially by the aim to be informed of ways to improve environmental education and later in the process of the study, by the need to ensure that the right questions were asked and that trustworthiness, validity and reliability were maintained. It is hoped that, as Miles and Huberman (1984) suggested; by purposefully setting out to collect and double check the findings, using multiple sources and modes of evidence, and with reporting the method used in the study the value of the findings of this multiple research approach is enhanced.

#### *Study One - Cultural and institutional structures influences on the environment and environmental education*

Environmental issues in the data collected and submitted for an earlier report on the "Status of environment education in Brunei" (Bhandari & Abe, 2000) were analysed. From the pattern of data obtained for this report, the culture of the people and the institutional structure of the country emerged as the main influences on the environmental and environmental education.

Hence, study one was designed to answer the research question: **To what extent are the existing cultures and institutional structures affecting the environment and the provisions of environmental education?**

These two influences were considered and evaluated for positive and negative affects on the environmental behaviour of the people. Recommendations were drawn from these themes that had emerged from the data collected. Sources of data were multiple, from documents, interviews, observations and other archival materials. As such, there is no attempt to manipulate variables or apply treatments and the fieldwork play a major role in the study, features of a case study research (Merriam 1998, Yin 1989). In the process of the study, the researcher's role in this case study evolved from a teacher to an advocate to an evaluator and then finally an interpreter (Stake 1995). The philosophical assumption here is closer to an epistemological one where the author assumes that spending time with the respondents in the system has reduced the distance to the environmental education that is studied.

#### *Study Two – Perceptions of provisions for environmental education*

The second study was designed to answer research question 2: **How adequate are the provisions for environmental education?**

This part of the study starts with the stand that the education of a person is a significant life experience and therefore a critical examination of this significant life experience from the students and teacher trainees are warranted. This study is based on a semi-qualitative grounded theory framework where three groups of stakeholders of the environmental education were asked for their perceptions of the provision of environmental education in the country. The data obtained were in response to open-ended questions in questionnaires and focus group interviews. Patterns that emerged from the data were coded to respond to the research questions which together gave the overall perceptions of the provisions environmental education (Creswell, 1998). A scaffolding of questions were drawn up and used to obtain the scenario of environmental education in terms of the curriculum adequacy and the essential curriculum contents. The use of quotes in the words of participants provided evidences of the different perspectives that emerged.

### *Study Three - Conceptual framework of the aquatic environment*

The research question in study three is: **What are science teachers' and teacher trainees' existing conceptual framework for the aquatic environment?**

This study developed a conceptual framework of science teachers and teacher trainees on concepts and principles underlying an environmental issue - the aquatic environment, by using open-ended questionnaires. Analyses of the data were conducted by making sense of the data without imposing any expectations of the responses (Patton 1987). Categories were formulated from the raw data so that responses that were similar or were of the same underlying conceptual framework were put together. Quotations and or descriptions of the data that typify the same categories provided evidence of the developed conceptual framework. Frequency distributions of similar concepts were compiled to show the frequency of concepts that appeared in the responses of the respondents. To validate the data, a summary report of the findings was given to four of the original respondents to obtain feedback if the summary was an accurate version of the responses of the respondents.

### *Study Four - Environmental attributes of the people*

In study four the research question was: **What are the existing environmental awareness and knowledge, beliefs and attitudes and action abilities of students, teacher trainees and science teachers?**

This study investigated the environmental attributes (awareness, knowledge, worldviews, beliefs, attitudes, actions) of 420 students, 80 teacher trainees and 20 science teachers using a questionnaire and focus group interview protocols and procedures adapted from an international research project (Yencken, Fein & Sykes, 2000). The quantitative data from the questionnaire were analysed to provide a measure of the level of environmental knowledge, awareness, attitudes and action and statistical evidences of reliabilities as well as enabled comparisons and relationships of the environmental attributes. The qualitative data sourced from the focus group interviews conducted with students and teacher trainees provided more details of the environmental attributes of the students and teacher trainees. The assumption in this study is that these respondents' quotes and the themes that emerged provide the nature of the environmental attributes of the people.

## **Findings and discussions**

*Study One - Cultural and institutional structures influences on the environment and environmental education*

Assertions were drawn to highlight the extent of the influences of the existing culture and institutional structures on the environment and environmental education in the country. These assertions gave rise to five emerging conclusions, two resulting from the cultural influences and three from institutional structure influences.

The positive and negative cultural influences on environmental behaviour was explained in terms of "harnessing cultural practices to improve the environment" and how certain environmentally friendly or non-friendly behaviours arose from "holding on to traditional habits and practices".

*Harnessing cultural practices to improve the environment.* The religious influence in terms of the Malay Islamic Beraja (MIB) philosophy is unique and extraordinary for the environment. Values inculcated at home through experiences with parents and community can be harnessed for developing environmental values and action abilities. Many aspects of the cultural practices if harnessed could lead to improving the environment.

However, *holding onto traditional habits and practices* might contribute to harming the environment. Some old habits, which may not have been a problem in the past, are causes of environmental problems in modern times and could be detrimental to the economy, which depends on its resources and people. Attempts by the government to improve the environment do not seem to have impacted on the attitudes of the people. The high population rate, the high population density and the affluence of the people in the small state have not benefited the environment. The way of living of indigenous people might offer some pathways towards sustaining the environment but exploitation of the jungle as a means of short- term economic development may preclude this.

Changes in institutional structures that were perceived necessary to facilitate improved environmental behaviour and environmental education were suggested in terms of "hastening changes in institutional structures", "working towards a sustainable environment" and "co-ordinating from a higher platform for a sustainable environment".

*Hastening changes in institutional structures.* The commitment for a sustainable environment is recognised by the government but the policies drawn up, the funds allocated, environmental information quality and implementation are limited and progress is slow. If the environment and provisions of environmental education are to be improved effectively, institutional structures need to be changed at a faster pace.

*Working together towards a sustainable environment.* Curriculum development for provision of environmental education at all education levels is attempted but is not multidisciplinary nor based on a framework drawn for a sustainable environment and is not available to all students. Training for environmental education is dependent on individual initiative and is not followed up or planned from changes in policies for education for a sustainable environment. Participation in environmental activities is periodic and many of the non-formal activities are geared at improving environmental awareness with less impact for long term improvement of environmental attributes. Various institutions with responsibilities for environmental education need to work together towards a sustainable development.

*Co-ordinating from a higher platform for a sustainable environment.* Contributions by non-governmental organisations with the support of the private sector for environmental education are considerable but not sustainable as it is dependent on voluntary action of a few people, who are not representative of a largely unconcerned public. To work towards the common goal of a sustainable environment, co-ordinating bodies for these various institutions need to work from a higher platform.

### *Study Two - Perceptions of provisions for environmental education*

The findings suggest that the majority of respondents perceived the provisions for environmental education to be inadequate in that education *for* the environment is missing.

Concepts, skills, attitudes and values as well as action abilities that were thought by science teachers to be essential for achieving the aims of environmental education were highlighted. The concepts perceived to be essential in environmental education for school students, fell into the three categories, Environmental Conservation (the environment should be conserved to save resources for future generations and used for future source of revenue), Environmental Pollution (the causes, effects and control) and Environmental Responsibility (the role individuals should play).

High perceptiveness is shown by the teachers for enhancing students' attitudes and values but is limited to developing skills such as scientific processes, problem solving and communicating. Limited knowledge of and experience in teaching and learning methods for environment education were found. While students see the need for improvements in the teaching and learning situations in schools, teachers are not keen to provide such opportunities. They perceived secondary students need to be more skilful in thinking and reasoning and need high language abilities to be able to cope with teaching and learning approaches used for environmental education.

Although teachers perceived they are ready to use appropriate teaching and learning strategies they also perceived the need for more in-service training, better facilities, support from administration and help through action research reporting and dialoguing with experts or colleagues. A definite move away from summative assessment and towards alternative formative and diagnostic forms of assessment was considered imperative. Much of the assessment aims to distinguish students from other students for selection purposes rather than for an individual's achievement. Although there is a perceived readiness to use more varied and relevant assessment methods to develop attitudes and action abilities; better support was deemed necessary from school administration and parents.

### *Study Three - Conceptual framework of the aquatic environment*

The conceptual framework for the teachers' knowledge and awareness of the environmental issue - the aquatic environment fell into four main categories: Environmental Conservation, Environmental Pollution, Environmental Responsibility and Environmental Aesthetics. For the aquatic environment, Environmental Conservation was considered as the main reason for prioritising protection and management and Environmental Pollution was considered the main problem. Preventative actions suggested to solve the problem of the aquatic environment was to act for Environmental Responsibility, mainly by enforcing laws, educating and promoting awareness as well as attending to Environmental Pollution by improving the waste, drainage and sewerage disposal systems. Preventative measures on Environmental Conservation /Degradation and Environmental Aesthetics domain held a less important place.

The science teachers and teacher trainees are aware and knowledgeable of the environmental issues of the aquatic environment. However, there are gaps in their knowledge base, which seem to be limited to the syllabi that are used in courses with students.

The four constructs of Environmental Conservation, Environmental Pollution, Environmental Responsibility and Environmental Aesthetics that emerged from the data were consistently in evidence in response to all the questions asked in this phase of the study but brought out

the importance of Environmental Responsibility. Even though the majority of the science teachers had previously indicated that in order to solve the aquatic environmental problems, Environmental Responsibility would be needed, their responses in identifying essential features for the aquatic environmental did not identify Environmental Responsibility. In reality, these science teachers did not consider the Environmental Responsibility as their realm in educating children.

#### *Study Four - Environmental attributes of the people*

While the perceived awareness of environmental concepts is high in the three groups of people (students, teacher trainees and science teachers), their knowledge levels were found to be lower. "New" environmental concepts such as sustainable development, the precautionary principle and carrying capacity could not be defined by many science teachers. Even concepts that are normally found in science syllabuses are not defined correctly by half the students and teacher trainees. The high awareness but lower knowledge of environmental concepts in students and teacher trainees could be attributed to their main sources of information, the media. The role of schools and teachers are important in bringing the level of knowledge of environmental concepts towards a higher level. Causes of environmental problems were blamed on humans, who are greedy, selfish, with bad attitudes and humans who feel that they are ineffective, and are not willing to take time to act for the environment. This dissatisfaction with adults causing environmental problems has caused anger, helplessness, guiltiness, worries, wanting to act and wanting to run away in students. If the students are to be helped, these feelings have to be acknowledged and dealt with to provide them with the ability to cope with environmental problems.

The beliefs systems of the majority of the people in the study were found to be in the environmental paradigm rather than in the technological paradigm. This means they value the nature and environment more than what science and technology can offer. This pro-environmental attitude represents a good foundation for educating towards a sustainable environment. However, although the majority of students, teacher trainees and teachers indicated strong intentions for environmental actions, they have limited ideas about improving the environment and actual participation in environmental action is low.

The small differences between Brunei females and males students in their environmental awareness, knowledge, beliefs and action show results contrasting from other countries, where the females are usually found to be more knowledgeable. This contrast is even more accentuated with the teacher trainees where the Bruneian males achieve higher knowledge scores and are more desirous to act for the environment than females. The Bruneian female may be under performing considering the high knowledge levels of that their counterparts in other countries.

Although there were statistically significant relationships found in students' environmental knowledge, beliefs and action, these relationships were not found for the teacher trainees and science teachers. The influences of other factors (such as their religious beliefs, their educational background, personal significant life experiences) may be more contributory and more dominant in older persons such as the teacher trainees and science teachers.

#### **Application of research findings**

Results of the multiple components of the study is hoped to have provided baseline data to develop guidelines for policy making and curriculum development as well as improving the teaching of environmental education.

Much of education research findings are disseminated to audiences of academics and does not reach the audiences it should go to, either the school teachers and the policy makers and providers of education (Kaestle, 1993). The author's proposal for this paper to focus on applying the research findings is intentional to attempt to ensure the findings do reach the audience it needs to go to. The extent to what has been achieved so far (three months after completion of the research) is disappointing. In terms of dissemination of the findings, the author had only managed to present conference papers and contribute to a published textbook (Yencken, Fein & Sykes, 1979). Attempts to provide environmental education courses in her capacity as a university lecturer have been thwarted by many reasons such as the time it takes to propose a course and the reluctance to add more work into an already loaded teaching schedule of the author and learning schedule of students.

### **Contribution of multiple research approaches**

The utility of multiple research approaches in this study to inquire into environmental education in a particular setting, such as a country, is proposed to have presented a way forward towards a more trustworthy and authentic approach in environmental education research. This is particularly so in the evaluation and of environmental education provisions and searching for ways to improve the provisions. Many research studies in the evaluation of environmental education investigated a narrow issue, which is limiting towards the understanding of environmental education for a particular setting.

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