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Salima Begum
Aga Khan University

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A Secondary Science Teacher's Beliefs About Environmental Education and Its Relationship with the Classroom Practices

By

Salima Begum

Aga Khan University-Professional Development Centre North, Gilgit
Pakistan

Abstract

Global environmental issues are increasing due to the rapid developments in science and technology. To address these environmental issues there is a need to create awareness about environmental education among the masses. This can only be possible through teachers and teacher educators. It is assumed that science teachers are teaching environmental concepts as scientific facts, without creating awareness about environmental education. The ultimate purpose of this study was to explore the beliefs of a secondary science teacher about environmental education and how his stated beliefs matched with his classroom practices. The study was conducted in one of the co-operative schools of the Aga Khan University- Institute for Educational Development, in Karachi Pakistan and the sample for this study included one secondary science teacher. The research design was qualitative, which included multi-methods. The methods included semi-structured interviews, classroom observations, pre-post conferences, document analysis and the teacher's teaching/learning stories. The study employed different data collection tools such as interview guidelines, a classroom observation checklist, teaching/learning stories and pre-post conference guideline questions. The findings of the study suggest that the research participant believed in teaching environmental education in a science classroom. He also believed that students should be given free choice to get involved in environmental activities such as environmental management projects in the real environment. However his enacted teacher centred classroom practice was contrary to his stated beliefs. The factors that prevented him from enacting his beliefs were identified as his content knowledge, pedagogical knowledge and support from the administration. The study thus suggests professional development programmes and workshops must employ reflective practices. Moreover, constructivist approaches should be designed to help teachers to enhance their content, pedagogical content knowledge about environmental education, and that should develop them professionally.

Keywords: *Environmental Education; Beliefs*

Introduction

In Pakistan, environmental education is not taught as a separate subject. However, environmental education concepts like energy, greenhouse effect, pollution, micro organisms, food chain, carbon cycle, recycling, ecosystem, gases, interdependence of human beings and environment have been incorporated in the science curriculum of the primary and secondary classes. Moreover, textbooks on the subjects Urdu, English, Social Studies and Islamic Studies at the primary and secondary levels also carry some environmental education

concepts. The science textbooks, especially those of the secondary classes, include most of the above mentioned concepts just like all the other subject area concepts. There is very little attempt to make connections between concepts, especially between science and environment, and vice versa. The textbooks contain mainly the knowledge about these environmental concepts. There are no activities or guidelines in the textbooks for the teachers to create awareness, or for them to develop attitudes and skills among students to take any action in order to preserve the earth's natural resources, and to deal with environmental issues.

Environmental concepts in are taught without adequately relating them to environmental education because environmental education is seen as a separate branch of science. Teachers find it challenging to teach and teach environmental concepts as they were taught (Bashiruddin, 2002). Science teacher must consider the importance of environmental education in daily lives and develop understanding about environmental issues, which is a prerequisite of environmental education. One of the purposes of including environmental topics in the school curriculum is to develop the children's understanding of environmental issues and their impact on human beings (Zehra, 1997). This can only be possible by relating environmental topics to the real environment while teaching in a science classroom. It can help students to understand the topic effectively.

The solutions to environmental problems can be more easily achieved by creating awareness and developing attitudes and skills about environmental education among the masses. This can be possible by environmentally educating students who will become our future citizens and then educate others. Thus, the role of science teachers becomes crucial, and it can be expected of them to have sufficient environmental subject knowledge to teach environmental concepts in an effective manner since for the most effective teaching, teachers require secure subject knowledge (Summers, Kruger, Childs, & Mant, 2000).

Besides the environmental knowledge of the science teachers, their beliefs about environmental education can also influence students' learning. Teachers' beliefs about environmental education are likely to differ. This is because they develop these beliefs through different sources. For instance, the teachers' personal experiences as students and their experiences as teachers, how their teachers taught them environmental education can generally influence their teaching. Teachers may develop their own teaching experiences, which work best for them in the classroom, or some of the ways any other teacher who inspired them ultimately, become adopted as their classroom practices.

Statement of the Problem

With the advancement of technology and population explosion, environmental problems are growing rapidly. A greater level of awareness among the population about environmental concerns and a change in behaviour, attitudes and skills towards environmental education is required to solve these problems. It is worth mentioning that science teachers, who are the key elements in imparting awareness and developing a responsible attitude towards environmental protection, they themselves do not fully realize the importance of

environmental education. It is assumed that science teachers have different beliefs about environmental education. These existing beliefs of the teachers may not relate to their science classroom practices and with the real world environmental issues. They may not give adequate awareness to the students of existing environmental issues. Therefore, there is a need to explore the science teachers' beliefs about environmental education.

Research question

What are a secondary science teacher's beliefs about environmental education and how do they match with his/her classroom practice?

Subsidiary Questions

- What are the science teacher's beliefs about environmental education?
- What are the science teacher's current practices in teaching environmental education in his/her science classroom?
- How does the science teacher acquire environmental education beliefs?
- Does the science teacher's classroom practice match with his/her stated views about environmental education?

Relationship Between Science and Environmental Education

Meaning of Environmental Education

Science and environmental education have a strong relationship. To understand this relationship first we have to understand what environmental education is and what the philosophy of environmental education is. Environmental education has been defined in a number of ways by different organizations and authors. However, according to a document of UNESCO-UNEP (1985), environmental education is not a new discipline but a new dimension in the education system. This new dimension is developed because of the acceptance of the complexity and urgency of environmental problems. Environmental education is a broad field encompassing areas such as informing the general public about environmental issues, training factory workers about hazardous wastes, providing technical education at the tertiary level and teaching children about the environment through a formal and an in-formal education system. However, the definition of environmental education, which came out of the working meeting of IUCN/ UNESCO in 1970 on environmental education in the school curriculum in Nevada, U.S.A. is as follows:

Environmental education is a process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelationship and interrelatedness among man, his culture and his biophysical surroundings. Environment also entails practice in decision-making and self-formulation of a code of behaviour about issues concerning environmental quality. (Palmer, 1998; p.7)

Likewise, Wilke (1997); Palmer (1998); Rao and Reddy (1997) and Gough (1997) assert their ideas that environmental education is a way of implementing the goal of environmental protection. Environmental education is not a separate discipline, it should be carried out according to the principle of life long integral education.

Philosophy of Environmental Education

The philosophy of environmental education reveals that the relationship of human beings and the ecosystem is very strong and they cannot maintain a separate existence. Within this system, the human beings interact with their biophysical environment through culture, values, their organization, scientific and technological knowledge and social arrangement. Human beings use and exploit resources available in the biosphere towards their immediate gain. An understanding of the use and exploitation of such resources by humans is essential. Environmental education can help human beings to develop the understanding and a sense of protection of natural resources. This in turn can help human beings to get ideas of conservation of ecology (Gough, 1997; Rao & Reddy, 1997; UNESCO-UNEP, 1994; UNESCO-UNEP, 1986; Vashist, 2002; Wilke, 1997). The definition and philosophy of environmental education reveals that environmental education is not a separate discipline, it can be taught through science. It is about the natural resources and developing awareness about environmental education to protect the natural resources. Therefore, there is a need for science teachers to fulfil this responsibility.

Why is it that people in general and science teachers in particular, lack environmental education knowledge? Why do people not behave responsibly to the environment? What are the reasons which stop people from being environmentally friendly? Some studies in the field of environmental education have addressed the above questions, but the main problem is the peoples' attitude. Now the question is why the attitude is so important. The reason is that it leads to changing the practices and behaviour of people. However, there is hardly any study on the science teachers' attitudes and beliefs about teaching environmental education through science even though that some scientists and environmentalists have strongly emphasised the relationship between science and environmental education.

A number of educationists, environmentalists and scientists have presented papers on the Relations between Environmental Education and Science Education at a Symposium held in 2001, in London. The overall focus of this symposium was on how science educators and environmental educators faced challenges to distinguish the interrelationship of the two fields, namely science and environmental education. Some challenges discussed were as follows:

- Traditionally teaching of environmental education has occurred, without making its teaching learning connection to science.
- Scholarly work in the field of environmental education has often created a paradox for science educators.
- Science and environmental education are two separate fields under two separate professional organizations though they are related.

- Receiving support from science education to accomplish the goal of environmental education is a challenge.
- Multidisciplinary nature of environmental education has caused a fragmentation and inconsistent approach to this field, and hence the marginalisation of environmental education in the school curriculum.

The Key Aspects of Teaching Environmental Education in Science Classroom

The key aspects of environmental education are *knowledge, skills, attitudes* and *actions*, which emphasized to address the environmental issues and conservation of natural resources. Some environmentalists call these environmental objectives. Almost all human behaviour is closely linked with these four aspects. These aspects of environmental education are also discussed by Rao and Reddy (1997) under the domains of “Bloom’s Taxonomy of Educational Objectives” (p.24) such as the Cognitive domain, Affective domain and Psychomotor domain. The Cognitive domain includes the objectives, which deal with the recognition of knowledge. It also deals with the development of intellectual skills and abilities. It includes different behaviours such as remembering, problem solving, concept formation and creative thinking. It includes all conscious mental processes from ordinary recognition to higher level. Similarly, the affective domain includes the objectives that describe changes in interest, values and attitudes and development of appreciation and adjustment. The psychomotor domain of Bloom is mainly related with participation or action in environmental education. The psychomotor domain covers the manipulative or motor skill area. This area includes, neuromuscular coordination’s found in handwriting, speech making performing physical exercises such as planting and working on different projects such as waste management, vegetation management. It is a social rather than an information form of learning. Palmer (1998) cautions, “Environmental education should not be viewed as the ‘adopted child’ of science education” (p.18). Dillon (2002) expresses his views on the relationship between science and environmental education, the role of science teachers in teaching environmental education with respect to the issues. A number of environmentalists have argued that the aim of environmental education is to make individuals aware of their responsibilities for protecting and improving the environment. In this way, they could lead a healthy and progressive life. Environmental education can awaken communities to the dangers facing their environment. It can develop local capacities to understand and analyse this situation and arouse a sense of responsibility to face the issues. It can promote appropriate attitudes and behaviours, teach simple techniques and practices and promote action in favour of conservation, protection, restoration and improvement of the environment (IUCN, 2002; Palmer, Goldstein & Curnow, 1998; Shabizada & Ghaffar, 1995).

Saeed, Goldstein, Shrestha (1998), Palmer (1998) and Vashist (2002) have argued that the process of environmental education helps individuals gain awareness of their environment. They also acquire and exchange the knowledge, values, skills, experiences and the determination, which will enable them to act individually and collectively, to solve environmental problems in future. The general aim of environmental education is to

encourage the integrity and diversity of nature, and to ensure that any use of natural resources is equitable and ecologically sustainable. Gough (1997) contents:

We see around us growing evidence of man-made (*sic*) harm in many regions of the earth; dangerous levels of pollution in water, air, earth and living things; major and undesirable disturbances to the ecological balance of the biosphere; destruction and depletion or irreplaceable resources; and gross deficiencies in the man-made environment of human settlement. (p.3)

Therefore, there is a need of environmental education in the classrooms. In this way, students will get an insight into the environmental conditions in other geographical areas. They can examine major environmental issues from the local, regional and international point of view. Environmental education can enable students to develop many skills and strategies.

Dillon (2002) also puts light on current models of science, science education and their relationship with teaching and learning of environmental education in a practical context. He points out that the natural environment provides contexts for integrating science and environmental education. This environment supports effective learning by inclusion of social and cultural context and unique subject matter.

He further contents his ideas that environmental education offers conceptual richness through its multidisciplinary nature that challenges current thinking of science teaching. Therefore, it is necessary to know about the science teachers' thinking (beliefs) about environmental education, how they perceive environmental education and how their thinking (beliefs) influences their classroom practices.

Science Teachers Beliefs

What are Beliefs?

According to Haney and McArthur (2001), "Beliefs are often disguised behind a variety of aliases, including attitudes, values, judgements, opinions, ideology, perceptions, conceptions, conceptual systems, dispositions, implicit theories, explicit theories, internal mental processes, action strategies, rules of practice and perspectives, among others" (p. 786). Haney and McArthur (2001) have further argued that different types of beliefs form a cluster, and this cluster forms belief structures or systems. They compared this system of beliefs with an atom because an atom has a structure, a nucleus in the centre and orbitals around it. Beliefs have a similar structure of the central and peripheral beliefs. Central beliefs are strongly connected to each other, therefore, are more resistant to change. These central beliefs hold peripheral beliefs, and these beliefs are weakly connected to each other. Therefore, core beliefs (central belief) are defined as those beliefs that are both stated and enacted. For instance, *a science teacher should teach environmental education in the science classroom by using the environment as a teaching learning aid* because environmental education helps to develop relational understanding. This tends to undo the emphasis on rote learning which is the usual practice in our educational system. Peripheral beliefs are constructivist beliefs that are stated but not enacted. These beliefs followed by classroom practices where students are

not given such opportunities to construct their knowledge because according to constructivist approach students construct their knowledge by practical experiences and social interaction.

Beliefs are psychologically held understandings, premises or propositions about the world that are felt to be true. This means that a belief is an individual's perception of what s/he considers true, it does not need to be supported by other people (Haney & McArthur, 2001). Helle and Murtonen (2001) have argued that individual beliefs are understood to be composed of an individual's subjective experience based on implicit knowledge of science and its teaching and learning. All these show that beliefs are nonfactual, yet they are what guide many of actions in life. Despite the significance of the teachers' beliefs as a topic of study, the concept of beliefs, as Thompson (1992) claims, has not been dealt with in a substantial way. Researchers assumed that readers know what beliefs are but in reality, many teachers and teacher educators are not even aware of what they have been doing consistently for many years. Thompson (1992) and Seputro (1998) have argued that it is very difficult to distinguish between a teacher's beliefs and knowledge because of the close connection that exists between them. This sort of strong commitment may not be found in the knowledge system. A common stance among philosophers is that disputability (a perception or claim that may be questioned or argued about) is associated with beliefs where a truth or certainty is associated with knowledge. Knowledge about something needs to be proved but beliefs are independent of their validity. For example, two people might be expected to have the same or similar knowledge about a particular event or thing, but they may not be expected to have the same beliefs about the same event or things. Beliefs, however, are not isolated ideas or guiding principles that an individual has in his/her mind. Beliefs are linked to each other to form a network or clusters and hence we have belief systems.

Sources of Teachers' Beliefs

Where do the teachers' beliefs come from? Richards and Lockhart (1994) contend that the teachers' belief systems consist of both subjective and objective dimensions, which are built up generally over time. The writers have noted six powerful sources from which the teachers' beliefs are derived: (a) teachers own experiences as learners of the subject, (b) teachers own experience of what works best, (c) established practices that are preferred and valued within a school or institution, (d) personality factors, for example some teachers might have a personal preference for a particular action or teaching strategy or activity, (e) teachers may derive educational based or research based principles according to their understanding, (f) principles derived from an approach or method, that appealed to them and they had tested with some success. Thus, teachers are likely to have different beliefs about environmental education as well.

Environmental Beliefs

Poole (1995) argues that the peoples' beliefs and values about environmental protection vary from context to context, and it depends on the wants and needs of the people. What they want, they do the same. Now what are the things that are wanted by people? The answers people give are sometimes pragmatic ones, such as wanting the environment to be

self-sustaining and renewable. The peoples' wants may express aesthetic factors, for example, preserving the beauty of the countryside. Similarly, other people may want to preserve the endangered species. Underlying these various wants, explicitly or implicitly, are called beliefs and values. Environmental beliefs are peoples' beliefs about their ecology, their thinking about themselves in relation to their surroundings (environment).

Human ecology is deeply conditioned by beliefs about our nature and destiny. Beliefs are peoples' worldview, their interpretation about the world, which shape their perceptions of the desirable course of actions. The peoples' worldview may affect the environment, organisms of the world. Worldviews are particularly evident from the environment and beliefs about the environment take a number of different forms. Some believe in the concept of wilderness, advocating a return to some primitive state. Some people believe in preservation of organisms such as fossil fuels and metal for future use. This raises important questions 'what should be done'? 'Why should be done'? 'How should it be done'? Who should do it? To conserve and preserve these commodities, who will use the strategies of conservation and preservation? The answers to these questions vary from context to context and are very complex, and this is the main challenge of environmental education. Some people believe in exploitation of natural resources and some people believe in the conservation of natural resources. People have varied beliefs. These issues, which reflect the people's worldviews, their ideas about nature, should be part of science education. There is only one way, which helps to conserve and preserve the natural resources, and that is, integration of science and environmental education, and exploration of the science teachers' beliefs about environmental education.

Relationship Between Beliefs and Classroom Practices

Many studies have suggested a strong relationship between the teachers' beliefs and actions. One of the assumptions underlying the teaching principles is that the teachers' perceptions lead their actions of science as a project and as a subject to be taught and learned. Teachers' decisions depend on both their beliefs and knowledge of the teachers about the two disciplines: science and environmental education, regarding their educational practices. Different studies in the area of teacher beliefs point out that the teachers' beliefs may be a strong supporter of behaviour than knowledge. When teachers design or implement any program, their beliefs and behaviour influence it. The teachers' thinking processes indicates their beliefs about teaching and learning. Furthermore, beliefs about students have a significant influence on the behaviour of the teachers regarding the students' learning. Teachers give meaning to their educational beliefs through their behaviour in the classroom. A teacher's beliefs will guide his/her actions. Teachers' beliefs about teaching and learning affect their students' learning and interest in all subject areas (Levitt, 2001). What teachers teach may be determined by an authority separate from the teacher but the way the teachers interpret the curriculum or the syllabus, the way they enact the curriculum in the classroom context, is strongly influenced by their beliefs regarding what and how the students should be taught. The teachers' beliefs have been witnessed to influence their decisions such as grade maintenance, system of classroom rules considered when solving a problem (Tatto, 1996).

The importance of personal beliefs and values in teaching has become a major focus of many educational researchers in the last several years. Tatto (1996) holds that the teachers' personal beliefs and values have been shown to influence their classroom practices, classroom environment, students' learning, and performances.

Richards and Lockhart (1994) reinforce this view when they say "teachers beliefs and values serve as the background to much of their decision making and actions, and hence constitute what has been termed the 'culture of teaching' (culture of teaching embodied in the work related beliefs and knowledge teachers share)"(p.30). The authors claim that what the teachers do in their classroom is a reflection of what they know and believe to be more important for their students' learning, and these beliefs guide their further classroom actions. Richards and Lockhart (1994) go on to say that the school philosophy also has a strong influence on the teachers' practices "After all, it is the teachers' subjective school related knowledge which determines for the most part what happens in the classroom"(p.29).

Overall Research Design and its Rationale

The study was to explore the beliefs of a secondary science teacher about environmental education and his classroom practices. This needs an in depth understanding which was best achieved by using the qualitative paradigm. As Patton (1990) stated, "Qualitative methods permit the evaluator to study selected issues in depth and detail"(p.13). Furthermore, my research question needs an investigation, which was to capture the research participant's words and actions to explore a science teacher's beliefs about environmental education. Maykut and Morehouse (1994) stated, "The qualitative researchers attempt to capture what people say and do, that is, the products of how people interpret the world"(p.18). Within the qualitative paradigm *case study* approach was employed to explore a secondary science teacher's belief about environmental education because a qualitative case study helps not only to find out facts but also to go beyond the facts and look for what these facts mean for a researcher. For instance, it was not just enough to find out what the science teacher's beliefs were, but it was also important to know how he acquired these beliefs, what were the consequences of these beliefs for his classroom practices, and for the students' learning of environmental education. Patton (1987) has argued that to understand a particular problem or situation in great depth, the case study approach becomes particularly useful. This is because a case study is both a process and a product of inquiry about the case (Stake, 2000).

To achieve the purpose of this study, interviews and observation were conducted to elicit his beliefs about environmental education. Documents such as question papers, lesson plans, the teacher's diary, the students' notebooks and teachers' teaching learning stories were analysed. Informal talk with the students was carried out to clarify some ideas and to validate findings. Data was collected in the form of field notes, audio recordings, reflections, running descriptions and memos. Qualitative researchers study things in their natural setting without any intervention, and they interpret and make sense of phenomenon in terms of the meanings people bring to them (Gall, Brog, & Gall, 1996).

The data collected was triangulated to enhance the credibility of the findings, to clarify meanings, and to verify the repeatability of an observation or interpretation for example, interview vs. observation, learning stories vs. interview, observation vs. lesson plan and teacher diary (Stake, 2000). The study is critical for science teachers to integrate environmental education with science and reflect on pedagogical practices and beliefs regarding environmental education in secondary science classes (Robinson, 2002).

Summary of Findings

The findings of the study reveal that research participant believes that environmental education can be integrated with science. He also believes in the characteristic (value of natural resources, students' participation in environmental education activities, integration of environmental education with other subjects and problem solving) approaches (education *in*, *about* and *for* the environment) and key aspects (*knowledge*, *skills*, *attitude* and *action*) of environmental education. For teaching of environmental education in the science classroom, he believes in:

- giving a free choice to the students to participate in environmental activities; using the demonstration method as a teaching learning aid in science classroom; the inquiry approach while teaching environmental concepts, and in an ongoing and summative assessment in science classroom.
- addressing the environmental issues by creating an awareness among the masses, and for this a science teacher has a big responsibility.
- creating awareness among the students about environmental education, and its importance through the teaching of science because science and environmental education have a deep relationship.

However, the study reveals that there is a gap between research participant's stated beliefs and his classroom practices. Some hindering factors, which did not allow research participant to enact his beliefs into his classroom practice, were the:

- teacher's own insufficient content and pedagogical content knowledge, which was the main hindering factor for him to enact his beliefs in to practice.
- school's expectations to complete the course before the annual examinations enforced research participant to rush from one concept to the other whereas practical involvement in environmental activities demands longer time.
- school administration not allowing him to take students out of the classroom for conducting activities using the environment as a teaching learning aid. This is because of the hierarchal system commonly practiced by the government schools. In this system, the head of the school has to take permission from the Directorate of Education, even for a short outdoor activity.
- lack of appropriate professional development opportunities for the teachers either at school or within the system.

In addition to these findings about focus area of the study, the other study findings, which cannot be ignored, are as follows:

Analysis and Discussion

A Summary of the Teacher's Beliefs and Classroom Practices

Category of Belief	Evidence	Source	Interpretation
<p>-Environmental education as a Discipline</p> <p>-Characteristic of Environmental education</p>	<p>-“Environmental education is not a separate discipline, it is part of science it should be integrated with science and other subjects (i.e. social studies)”.</p> <p>-“It is the education about our planet earth (zameen Kay bhaaray main). Although environmental education is a broad subject that cannot be learned in a short duration, I believe that environmental education is not only scientific facts or information, but it has its own beauty (khobsooraty) of natural resources”.</p> <p>-“Environmental education... can only be learnt by doing practical work. While teaching environmental education teacher needs to take the students outside in the parks, garden, stream, street or sea side to show them the real situation of environment and environmental issues (mahooliaty masaail)”.</p>	<p>-Interview Episode, January 19, 2004</p> <p>Teaching/learning story, January 26, 2004</p> <p>-Interview Episode, January 22, 2004</p> <p>- Teaching/learning story, January 26, 2004</p>	<p>-Research participant considers environmental education as an integral part of science because science is exploring the environment so teachers need to integrate environmental education in science subject. This integration could help students to understand the connection between science and environmental education.</p> <p>-Research participant believes in the nature of environmental education, its characteristics (environmental education <i>is holistic, problem oriented, participatory and value laden</i>) approaches (education <i>in, about and for</i> the environment) and aspects (<i>knowledge, skills, attitude and actions</i>). For instance, in the interview, he favoured students participation, decision-making, problem solving, value of natural resources and integration of environmental education in science by involving students in different activities.</p> <p>- Environmental education is not entirely isolated from other subjects, it has some distinctive characteristics that make it different from other subjects. Because in environmental education, teachers aim to create awareness, to develop positive attitude and skills in order to participate in environmental activities/actions, which are very important, to minimize environmental pollution.</p>
<p>-Relationship Between Science and Environmental education</p> <p>- Science teachers responsibility</p>	<p>-“In science, we are teaching about plants, ecosystem, environmental pollution, animals, human, factories and different cycles of gases and water. These topics are also found in environmental education. So we cannot separate science from</p>	<p>-Interview Episode, January 27, 2004</p> <p>- Teaching/learning story January 26, 2004</p> <p>-Interview</p>	<p>-The articulation of research participant gives evidence that he has an understanding about the relationship between science and environmental education. He further believes that a science teacher can teach environmental education in science lessons and it is his/her responsibility. He believes that a science teacher can teach environmental concepts by creating</p>

<p>about teaching and learning of Environmental education</p>	<p>environmental education”.</p> <p>-“This is the responsibility of science teacher that he/she should teach environmental education in science classroom, because science and Environmental education has a deep relationship. A science teacher can teach it in science classroom”.</p>	<p>Episode, January 27, 2004</p> <p>- Teaching/learning story January 26, 2004</p>	<p>awareness, and developing attitudes and skills, it can help the students to understand the sensitivity and importance of natural resources.</p> <p>- Science teacher can play crucial role in imparting environmental education in science classroom. Because in the science textbooks there are some of environmental concepts, if a science teacher teach these environmental concepts by creating awareness about environmental issues among students then it will be helpful to address environmental problems.</p>
<p>-Research participant’s beliefs about environmental issues, problems and teachers role in environmental protection.</p>	<p>-“Environmental pollution is a serious issue... caused different diseases in human beings. Teacher can take part in minimizing these environmental problems such as land pollution, water pollution, air pollution. These problems are due to overcrowded population”.</p> <p>“A teacher can minimize the amount of garbage at local level ...different gases by incineration (Jalaany see)...produce Carbon dioxide gas...cause Global warming. Luxurious material produce different gases. Cause Depletion of Ozone layer...protect human from ultraviolet rays of Sun. We can show the example of water pollution, like in this, an oil ship was leaked in the sea and many fishes were killed”.</p>	<p>-Interview episode, January 27, 2004</p> <p>- Teaching/learning story February 26, 2004</p>	<p>-Research participant had an understanding and awareness about the effects of environmental issues that they are harmful for human being as well as for other creation. He believes that teachers can take steps to create awareness, among masses through students, which may lead to control of pollution. Research participant mentioned many strategies but he did not state which particular strategies are most useful in order to control water pollution, air pollution and land pollution.</p> <p>Whatever strategies he has mentioned, they are mostly about issues. He has said very little about the solutions of environmental issues. Research participant also believes that a teacher can take part in minimizing environmental issues and he mentioned an example of garbage management at local level but he did not mentioned how he will be managed garbage at local level. How he will help people to manage garbage and how he will educate people about these environmental issues.</p> <p>In addition to that it seems research participant have understanding about the harmful effects of air pollution and water pollution because he discussed the effects of depleted ozone layer and death of fishes by leakage of crude oil in the sea.</p>
<p>-Planning for developing -Knowledge -Attitude -Skills -Actions</p>	<p>-“I am planning lessons and keeping activities, for students’ participation. Such as planting, cleaning the school areas, visit of different polluted areas. It also helps to</p>	<p>-Interview episode, January 21, 2004)</p> <p>- Teaching/learning story February</p>	<p>-Research participant considers some ways to develop knowledge, skills and attitudes in students. He wants to give them free choice to participate in activities. Students can chose the activity according to their liking or interest. It reveals that Research participant</p>

Competencies.	develop positive attitudes (Musbith Raviaia) among students. In these lesson plans, I keep flexibility and free choice for students to participate in environmental activities”.	26, 2004	believes in free choice lesson planning, where students get freedom to participate in activities according to their interest.
-Instructional approaches For environmental education	<p>-“During teaching environmental education, demonstration method should be used to teach environmental education. In this demonstration environment should be used as teaching learning aid...For example, land pollution, water pollution, forest and deforestation. We can show to our students many real examples of land pollution or water pollution. In Karachi, we can show them garbage dumps (Ghandaghee Kay dheer), which make our land polluted”.</p> <p>-“...can be learn by physical activities...doing practical work...while teaching environmental education teacher needs to take his students outside in the parks, garden, street or sea side, forest and deforestation to show the real environment... to students participation”.</p>	<p>-Interview Episode, January 22, 2004)</p> <p>- Teaching/learning story February 26, 2004</p>	<p>-Research participant believes that demonstration about environmental education can make the students understand better as compared to other methods. By demonstration, he means use of environment as teaching learning aid. He thinks in demonstration teacher could explain the concept in detail by using any environmental material. He is also of the opinion that giving examples from real life might help the students to internalise the concept through close observation. For this purpose, he would prefer to take the student out of the classroom to observe the garbage and construct his or her own learning. He believes demonstration is an effective method of teaching.</p> <p>This is education “in” the environment approaches when advocated a large number of environmental educators. Through education <i>in</i> the environment, a teacher can give education <i>about</i> and <i>for</i> the environment. This is the main aim of environmental education because education <i>for</i> the environment deals environmental issues.</p>
-Questioning	<p>-“Teacher should give chance to the students to ask question in the classroom in order to clarify their idea. This strategy could help the students to develop confidence (khud aitimaadhi) and increased their learning”.</p> <p>-“...I allowed my students to ask questions and express their opinions (khialaat kha azhaar) in the classroom.... They can become aware environmental citizens”.</p>	-Interview Episode, January 24, 2004	-Research participant believes in the importance of questioning in the science classroom, where students clarify their ideas and develop confidence through this strategy. Researchers agree that while teaching about environmental concerns, questions are helpful for the students to understand the concepts. It also helps the students to develop attitudes, skills to take actions in environmental activities.

-Assessment	-“I want to take out my students in to real environment and show any environmental problem. I wanted to let them observe the problem, explore its reasons behind it and find its solutions. At the end, I want to explore their answers by inquiry (questioning) in the classroom... student will become responsible environmental citizens. In addition to that, at the end of the term I want to use paper pencil test where I wants to assess their knowledge. In this annual result I want to add the scores of ongoing assess”.	-(Interview Episode, January 26, 2004)	-Research participant believes in the use of both the summative and formative assessment to combine the process and product where students could bring their practical experiences and enhance their inquiry skills. The process he intends to follow is through the questioning method, but he also wants to use paper pencil test to assess the knowledge and understanding of the students. Research participant used the term <i>inquiry</i> for questioning in the science classroom. When researcher probed into this term <i>inquiry</i> , then research participant shared his ideas that, the inquiry method is actually asking questions, by teacher and students to clarify any idea and to develop their understanding about the concepts in the classroom.
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A Comparison of the Teacher’s Beliefs and Classroom Practices

Category of Belief	Beliefs	Classroom Practices
-Environmental education as a discipline	-Environmental education is not a separate discipline; it should be integrate with science and other subjects.	-Science classroom observations suggest that research participant tried to integrate environmental education in his science lessons. e.g. plantation, deforestation and global warming and ozone depletion. For example, during teaching forests, research participant brought a plant in the classroom and he explained the function and importance of plants in the environment. Such as plants help in reducing global warming. He also explained that plants use carbon dioxide while preparing their food and keeping balance in atmosphere.
-Planning for environmental education	-Lesson plan should have some “free choice” for the students. For example choice in different activities of environmental education. I am regularly planning the lessons once in a year to teach environmental concepts in the science classroom on every topic.	-Research participant could only produce two lesson plans about environmental concepts e.g. types of pollution, which did not seem to give any space for children’s free choice activities. In these lessons, only teacher transferring knowledge is reflected and students’ participation was confined only to the classroom. There was hardly any outdoor activity, where students could perform in the environment. There was no space, for the students to develop attitudes, skills to address environmental issues. Overall, his planning did not reflect the approaches (education <i>in</i> , <i>about</i> and <i>for</i> the environment) of environmental education. In addition to that his classroom practices did not reflect the characteristics of environmental education

		<i>(participation, value laden, problem solving and integration)</i> because there was no room for students participation in environmental activities, decision making, problem solving in order to protection of natural resources and addressing environmental problems.
-Instructional approaches to environmental education	-Demonstration should be used to teach environmental education where environment is used as teaching learning aid.	<p>-Observations revealed that he was using pictures and drawings to teach concepts of environmental education, which he called demonstration, but in the interview, he emphasized on using environment as a teaching learning aid. However there was no evidence of Research participant using environment as a teaching learning aid. His belief and practices were contradicting in the real situation.</p> <p>Research participant mostly used lecture method in the lessons where he read and rephrased the text from the textbook. For instance in a post conference research participant said, "I am delivering lecture to the students and I am explaining the concepts in detail. I believe this is the best method of teaching. This method is very useful for students to understand the concepts completely (<i>mukammal tore per</i>)" (post conference, February 11, 2004).</p> <p>In a classroom observation, For instance, while teaching about forest, he brought a plant in the classroom but he did not use it properly. He drew the picture of plants on the black board. Then he explained its function and importance. Research participant's understanding about demonstration seemed to means bringing a concrete material related to the concepts in the classroom and then draws a picture of that material.</p> <p>For instance, while teaching air pollution he drew the picture of vehicles and chimneys of the factories with smoke. In the post conference, he replied that he couldn't bring the polluted air in the classroom. Demonstration helps the students to understand the concepts in simple and easy way. Researcher agrees with his statement that it is challenging to use environment as teaching learning aid while teaching all concepts of science and environmental education. But the material (plant) he brought during teaching forest, he did not use it effectively.</p>
-Questioning in environmental education	-Research participant believed in inquiry approach (discussion and asking questions by students and teacher) in science classroom	<p>-There were examples of classroom questioning where both teacher and student mostly asked low order and close-ended questions. The responses of both teacher and students were limited to yes/no or were textbook oriented. For example, in one the lesson the teacher asked questions from students which are as follows: Teacher: Which gas do plants use while preparing food? Students: Sir, carbon dioxide Teacher: Which gas do animals use while respiration?</p>

		<p>Students: Oxygen (classroom observation Episode, February 18, 2004)</p> <p>Similarly in one episode students asked questions from the teacher such as:</p> <p>Student: Sir, what is a primary consumer?</p> <p>Teacher: Which has been mentioned first in the picture? See in the picture (Pahilay koon saa hay dhekho)</p> <p>Student: Sir, what is a secondary consumer?</p> <p>Teacher: The middle one (darmian waala). (Classroom observation Episode, February 11, 2004).</p> <p>The worth noting in the classroom observation is that the students neither were encouraged nor discouraged point for their questions.</p>
-Assessment in environmental education	-Research participant believed in ongoing assessment (Formative assessment) and Summative assessment (paper pencil test at the end of the term)	<p>-No evidence of ongoing assessment was witnessed during the observation period (except for some questioning which were to assess students memory)</p> <p>The examination of science papers revealed inclusion of some “content based” questions about some environmental concepts. In these questions, students could produce the answers by memorizing them from textbook. For instance, What is the Greenhouse effect? How does atmospheric Carbon dioxide affect green house? In this observation period, researcher could not find any evidence of practical activity to assess the students’ attitudes, skill and knowledge.</p>
-Environmental issues and problems.	-Research participant believed that environmental issues can be address by creating awareness among students in science classroom.	<p>-In the real classroom situation, there was no evidence of any practical activity to address the environmental issues, which research participant claimed in the interviews. In the classroom observation, researcher noticed that research participant identified many environmental issues. He also informed the students about the causes of these environmental problems. However, he did not discuss with them solutions of these environmental problems. The responses of research participant were just oral and there was no practical example to address environmental issues. For example, in the classroom research participant only explained that, “Vehicles and chimneys of factories produce different gasses such as carbon dioxide, carbon monoxide, ammonia, sulphur, nitrogen and small particles of carbon. These gases and particles are dangerous for human health and cause lung diseases, eye diseases and skin diseases. These gases also deplete ozone layer and increases global warming”. (Classroom observation Episode, February 20, 2004). Research participant did not go beyond it and he did not explain how these gases deplete the ozone layer and increase global warming.</p>

Conclusion

This study 'Science teachers' beliefs about environmental education and its relationship with their classroom practices' made me realise how science teachers' desire to teach may not happen in practice. In this study research participant's beliefs about what is environmental education and how it should be taught in a science classroom was more inclined towards environmental education approaches. He wanted to use environment as a teaching learning aid, and he wanted to involve the students' in environmental activities. However, he could not enact them. Some factors that prevented him were his own content and pedagogical content knowledge, the examination system, the parents' expectations, the lack of institutional cooperation, and the hierarchal system of the school and the coverage of the syllabus.

Teachers should be provided with opportunities to critically reflect on their own beliefs and practices and question them. Their critique on their own actions may provide a vehicle for their own professional growth. As teacher educators, we should explore ways and means to help the teachers to reflect on their current practices and beliefs about environmental education and to develop their intrinsic motivation for considering alternative ways of teaching environmental education. To deliberately prompt teachers to reflect upon and examine their own beliefs and practices may open possibilities for academic and social interactions amongst teachers through which they may begin, not only to comment on the findings of this study, but also to re-conceptualize their own beliefs and practices. This can be done through professional trainings of teachers.

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