CULTURAL ORIENTATIONS IN JAPANESE ELEMENTARY SCIENCE

Research Article

CULTURAL ORIENTATIONS AND SCIENCE TEACHING-LEARNING PROCESS IN JAPANESE ELEMENTARY SCHOOL: FROM AN AFRICAN SCIENCE EDUCATOR’S VIEWPOINT

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ABSTRACT

The study aimed at observing, interpreting and eliciting meanings to cultural and indigenous orientations from an African science educator’s viewpoint as they affect teaching and learning in elementary science classes in Japan. The African science educator (the first author) observed four science classes each week for a period of one school year in a public elementary school in Hiroshima Prefecture. Observations revealed that as a result of some aspects of Japanese culture and traditions, which characterized the science classrooms, pupils perceived their teachers as authorities, paid close attention in the class, but made few comments and asked few questions. Science teaching was mainly lecture and group method, while “Learning Together” the major cooperative learning strategy with the tradition of goal setting among the pupils, provided a source of interaction between science knowledge and the pupils’ desire and purpose. Language and information in textbooks are culturally oriented, however, classrooms are highly westernized, and resources for teaching and learning did not include much of Japanese traditional toys and games. Supplementary comments of a Japanese science educator (the second author) on the findings of the first author were added.

Key words: Cultural Orientations, Participant Observation, Japanese Elementary Science Classes, Border Crossing

INTRODUCTION

School science is often seen as an icon of prestige, as a result it is offered in schools all over the world. Researches in the past showed the importance of ‘misconceptions’ (Johnstone, MacDonald and Webb, 1977), ‘alternative framework’ (Driver, 1985) and ‘children’s ideas’ (Osborne and Freyberg, 1985), for science learning. It has also been recognized that ‘children’s ideas’ of the world around them, which are vital for science learning, are developed during the primary (elementary) school years whether they are taught science or not. This is probably one of the reasons why science at the elementary school level of education is an important background for the study at higher levels. In Japan, elementary science
known as "Rika" is taught only in grades 3 to 6. At grades 1 and 2 some parts of science is studied in combination with those of social studies and is known as Integrated Subject (Seikatsu). Emphasis is on nature study (Shizen education), while the study is activity oriented.

Japanese students have demonstrated a high level of science achievement, even at the elementary level, in the past International Association for the Evaluation of Education Achievement (IEA) studies like the Third International Mathematics and Science Study (TIMSS). Ogura (2000) suggested that there is need for much study, which focuses not only on science achievement but also on its relevance with other factors. One of such factors, which have been found to have relevance to science teaching and learning, is culture. Culture refers to norms, values, beliefs, expectations and conventional actions of a group (Aikenhead, 1996). This means that every indigenous culture has an orientation to learning. It follows, therefore, that culture and learning are intricately interrelated. Society, then, is comprised of many cultures and sub-cultures, each with an ideological agenda and each with a stake in what counts as knowledge in school science. Hence science exists in a cultural context and the teaching and learning of science is a cross-cultural activity (Hills, 1989). There are many aspects of culture that strongly affect the science classroom. These include attitudes, behavior, language, what is taught and how it is taught in science. Culture, therefore shapes and defines the educational system (Rosenthal, 1996). What is Japanese cultural orientation to the teaching and learning of science?

**BACKGROUND TO THE STUDY**

Awareness that for science education at any level to be effective, account must be taken of the cultural context of the society which provides its setting since the 1970s. Several researchers have presented arguments for multi-cultural science education (Aikenhead, 1997; 2000; Aikenhead and Jegede, 1999; Atwater, 1996; Cajete, 1999; Cobern, 1996, 1998; Cobern and Loving, 2001; Costa, 1995; Hodson, 1993; Jegede, 1995; Krugly-Smolska, 1995; Ogawa, 1995; Snively, 1990; Stanley and Brickhouse, 1994, 2001). Thus an emerged paradigm in recent science education research is on cultural studies as an integral part of the teaching and learning of science.

Ogunniyi (1988) suggests that it is possible to hold a scientific as well as a traditional view of the world. Consequently learners have to cross borders between Western and Traditional science (Aikenhead, 1996, 1997, 2000; Aikenhead and Jegede, 1999). It has been proposed that when the cultural context of science is used as a framework for teaching several conflicts arise in the classroom and especially in the minds of the learner (Jegede and Okebukola, 1991; Snively, 1990; Waldrip and Taylor, 1999). This, it has been argued, may contribute to the poor performance and low participation in science and technology by children, especially from non-Western cultures. By implication, it means that it is not just a simple thing to want to transfer Western science practices into another culture. Japan is a strong industrialized society and is said to be still strong in the indigenous culture. As a Non-Western nation evidence of learning science as multi-cultural science abounds in Japan (Ogawa, 1995, 1998; Kawasaki, 1996, 1997). Japan is said to retain many elements of her traditional and cohesive social order, yet Japan is technologically developed and Japanese students have continued to perform highly in international assessments especially in science and mathematics. What are these cultural orientations that exist in Japanese science classrooms? What are their implications for the Japanese science learner at constructing side by side and with minimal interference and interaction, (collateral learning. Jegede, 1995) Western and Traditional meanings of a science concept? What can other non-Western and
Western nations learn from the Japanese system? How does social context influence science teaching and learning in Japanese elementary schools? What are the cultural orientations in Japanese elementary schools and what impact do they have on the teaching and learning of science concepts? This paper is an interpretative approach to the impact of culture on the learning of science in Japanese elementary school.

**PURPOSE OF THE STUDY**

The field study examined teaching and learning of science in Japanese elementary school. Effort was made to elicit meanings from several cultural and indigenous traditions in the classrooms and to interpret their impact on science teaching and learning from an African science educator's viewpoint. The study specifically: (1) identified kinds of science classroom behaviors related to cultural or traditional values of Japanese society, (2) observed how science is taught through language and information in the textbook in relation to Japanese cultural orientations, and (3) interpreted the impact of culture and traditional activities on science teaching and learning, border crossing and collateral learning. And the following research questions guided the observation: (1) What kinds of science classroom behaviors are related to Japanese traditional and cultural practices? (2) Are there traditional and cultural implications to the teaching-learning strategies in Japanese elementary science classrooms? (3) How is language and information in elementary science texts culturally inclined? And (4) What are the implications for border crossing and collateral learning?

**RESEARCH DESIGN AND PROCEDURE**

The present paper adopts an innovative, but not so rare, format of reporting the research outcome. The first author, an African (Nigerian) science educator performed the field work, interpreted and discussed its findings exclusively by herself, while the second author, a Japanese science educator made supplementary comments to and discussion on the first author's interpretations and discussion based upon his own viewpoint, which might reflect those of Japanese science educators. We believe that this treatment does make the characteristics of Japanese science classes clearer to an international audience with different cultural backgrounds than a kind of 'adjusted' view after negotiation between the two authors.

The research design by the first author consisted of participant observation, formal and informal questioning and interviews, videotape analysis, and interpretive research strategy. It involved observing the activities in Japanese elementary school in general and in particular, science classrooms, as well as relying on pupils and teachers' accounts of their behavior (Hammersley and Atkinson, 1983). Thus the design employed both qualitative and quantitative techniques.

A Nigerian female science educator (the first author) from an equally traditional and non-Western culture carried out the observation at a public elementary school in Hiroshima prefecture. The elementary school comprised of one class each of grades one to four and six. Following the Ministry of Education rule of a maximum of 40 pupils per class, grade five had two classes of 22 and 20 students each. The school followed the national guidelines, the Course of Study, that served as the national standard. Typically, one school in Japan can be said to represent many in the country due to the centralized system of education. In addition, Japan is fairly uniform and does not have serious class or
racial problems that exist in many countries of the world.

The school was visited between April 2000 and February 2001 at least once a week. The school, which have been a pilot school of 'global learning' and of 'English classes for elementary kids', accepted the first author because she could also serve as an assistant of English learning activities. She sometimes attended to school special activities like school ceremonies and festivals. Within about the first several weeks rapport was established with pupils and teachers of the school for the purpose of collecting qualitative and quantitative data for interpretation. During the period, the observer also took part in an intensive Japanese language and culture program held at Hiroshima University. Thus, she could understand some spoken and written Japanese language. This could be helpful for her to communicate with the pupils and teachers of the school. On each visit, four science lessons were observed. The teachers of the lessons were non-science majors.

Observation initially focused on general, open-ended data gathering. Extensive field notes using paper and pencil were kept. This was followed by a more systematic program of informal interviews with teachers (some of who spoke some English), formal questioning of the pupils (often with the assistance of Communication or Foreign English Teachers as translators) and videotaping of lessons. Since the elementary school was a pilot school for elementary English education, the teachers were familiar with English. All classes were observed. Samples of observed lessons in three grades are presented in Table 1.

Table 1: Sample of Observed Science Lessons in a Japanese Elementary School

<table>
<thead>
<tr>
<th>Grade</th>
<th>Theme</th>
<th>Topic</th>
<th>Knowledge</th>
<th>Materials</th>
<th>Activities</th>
</tr>
</thead>
</table>
| 3     | Living things and their environment        | Life cycle of a butterfly          | Egg, Pupa, Larva and Adult       | Butterfly eggs on cabbage leaves, hand lens, plastic basins with air openings, clips | 1) Collecting of cabbage leaves with butterfly eggs  
2) Observation and documentation of the characteristics of the eggs  
3) Setting up of conditions for the egg for development  
4) Observation of developmental stages  
5) Drawing, recording of changes and inferences |
| 4     | Substance and Energy                       | Weights and Measures               | Fulcrum Effort Load              | Precision balance, equal arm balance, thread, wooden sticks and blocks, items (such as scissors, pen, cellophane tape, to be weighed), clips, paper napkin, weights of different sizes, metals, clay, plastic bottles and pans, different weights | 1) Observation of a weighing balance  
2) Improvisation of an equal arm balance  
3) Weighing using equal arm and precision balance  
4) Data recordings and interpretations |
| 5     | Earth and the Universe                     | The Sun                            | Sun’s rays Shadow Angles of Reflection | Plastic water bottle (improvised), mercury thermometer, protractor/compass, thread, telescope, graph sheets and white sheet of plain paper | 1) Parts of the thermometer  
2) Setting up of an improvised thermometer  
3) Observing Sun’s position at different hours of the day  
4) Measuring Reflected rays  
5) Collecting Data  
6) Plotting graphs  
7) Conclusions and Inferences |

The role of the second author (a Japanese science educator) in the field work stage of the first author was as an off-site adviser. He left her interpret what she observed by herself, and gave only minimum background information on specific scenes that she observed, even if he felt uncomfortable with her
interpretations or viewpoints. Thus, her interpretations could be actual reflection of an African science educator's viewpoint. Once her interpretations were finalized, the second author made his countercomments on or interpretations of the first author's interpretations.

**OBSERVATIONS AND DISCUSSIONS**

1) **Kinds of science classroom behaviors related to cultural or traditional values of Japanese society**

Several behaviors related to Japanese culture and traditions were observed in the science classrooms.

**Groups and Cooperativeness**

An important Japanese cultural and indigenous tradition is "group-living" (shudan seikatsu) and cooperativeness (kyochoosei). Japanese science classrooms were observed to characterize groups. Pupils are taught to work in small groups (han), they participate as classmates and members of the larger school. This creates a strong sense of identification with school.

Groups in most school contexts are based on criteria such as ability or intelligence. In many situations groupings observed in school settings are due to socio-economic factors. However, it was observed that there were no distinguishable social groups in the classrooms. There were no indicators to classify a group into privilege or under-privilege, rich or poor, bright or dull, intelligent or unintelligent. Teachers may know pupils' background but is not so exhibited in the treatment that each child receives in the class or school. Pupils wear the type of uniform (dress and shoes): use of the same books provided in the school, makes it possible for all pupils to have reading materials. It could be said that grouping in Japanese elementary classrooms brings more uniqueness than diversity among the pupils. This situation is different in many non-western and to some extent Western countries. In these other countries, parents provided pupils with a greater percentage of materials necessary for learning in school. The competitiveness that exists in many other countries has several implications. For example, some children feel more superior or inferior to others in the class. Eventually much of the energy for learning is diverted to other distractions. This feeling of superior or inferior affects cognitive thinking during science lessons and eventually affects the way a pupil thinks and what is learnt and understood. From observation, it is evident that marginalization is non-existent in Japanese classrooms, and if it does exist is not significant. Even though one is certain that not all the children come from high socio-economic homes, these are not used as a marginalization factor in class or school.

The relationship among members in the group was further observed since pupil-pupil interaction patterns have a lot to say about how well students learn, how they feel about school and the teacher, and how they feel about each other. There are basically three ways pupils can interact with each other in the classroom. These are: (1) by competing with each other to see who are the best students in the class, (2) students working individually towards an established criterion and (3) by working together, cooperatively, taking responsibility for each others learning (Johnson and Johnson, 1975). What was further observed are: (1) competing with each other is not common, (2) pupils working individually in the group and discussing with others exist minimally, and (3) in general, pupils could be said to be learning cooperatively in groups.

**Science Lesson Goals and Objectives**

A tradition observed in Japanese classrooms is the setting of objectives for daily activities by the
teachers and students. At 8.30 am, class meetings are held. The goals for learning for each class and lesson are set. The last lesson for the day in the school observed is at 15.35, and is followed by another class meeting to review the goals for the day’s lessons and for preparation for the next day. It is also the tradition to set the objectives by the teachers and pupils at the beginning of the term and school year. Interestingly and worth noting is also the entry ceremony to schools. These activities help to focus pupils’ desires and purposes. This is very important as it shows that access to western knowledge alone is not important but in addition the interaction which exists between such knowledge and the pupils’ desire and purpose.

Science Content

Japanese no doubt have their traditional world-view that relates to traditional beliefs and superstitions, traditional science and technology. Some science related lessons at the primary school that was observed included plants and planting, light, sun and shadow. Japanese are known to have some cultural beliefs about these topics. Although these beliefs exist, they are not seriously considered in school science. Therefore, systematic religious thought as a source of explanation of natural phenomena is not particularly important in Japanese science classrooms as in other non-western cultures. Consequently, differences exist between school science and indigenous traditions. The indigenous traditions have little or no influence on school science. This is what Ogawa (1995), described as the different types of science.

Organizations of Science Learning and Activities

The cultural and indigenous tradition of cleanliness (Seisoo) is essential to Japanese discipline. Darashinai (being untidy) is a sign of moral degeneration in the Japanese culture and tradition. These have almost religious meaning in Japan, but are highly translated into the teaching and learning of science. Japanese science lessons observed at the elementary school level are highly organized. Activities by students are organized and students have the habit of working not only in a clean environment but also make sure the materials used are cleaned at the end of the activities and returned to their proper positions. These are also observed in almost all activities in the school. Pupils remove their shoes at the designated place and change for the classroom or indoor shoes (uwabaki). There are shoe racks with rows of little cubicles for shoes for each pupil at the entrance (genkan). Teachers keep their indoor-shoes in the staff room while special shoe racks are available for the visitors.

Questioning Styles

One important word that re-echoed in the science classes when questions were asked was “minna” or all. This is in agreement to the culture of group living. There is much emphasis on calling individual names. The implication is that not many individual pupils answer questions. It was also observed that most often questions are answered by group leaders. Fewer girls than boys answered questions in the class.

Obedience (Sunao), and respect for elders is an old tradition of the Japanese. These were also observed as part of the teaching and learning in Japanese science classroom. Before a lesson, a student or two welcomes the teacher and reminds the class of the day’s lesson. Everyone stands to welcome the teacher. At the end of the lesson, a student also summarizes the lesson for the day and the whole class thanks the teacher for doing his or her work. Teachers are addressed as sensei (teacher), and not by
their names. When names are necessary for identification, the word sensei, must follow such names as a mark of respect. The school, by this, is also seen as a place for character development. Students learn to respect elders and to be obedient in school. This has implications on questioning in the classroom. From this observation I am of the idea that the silent recipient, which may be the result of marginalization or feeling of inferiority in many other countries' school environments, can be differently interpreted in the Japanese context. From my observations, I interpret a situation where Japanese pupils see their teachers as authorities. Since most teachers depend highly on textbooks for science teaching, what is contained in the textbooks may also be regarded as authority. This may mean that these pupils do not doubt their teachers and as a result may not have highly negative ideas of science concepts. Even though the students did not ask too many questions, they participated in many activities. Japanese pupils even at the third grade were observed to be actively doing experiments and observing. This would in no small measure improve their understanding of scientific concepts, ideas, knowledge and skills.

2) Traditional and cultural implications to the teaching–learning strategies in Japanese elementary science classrooms

Group living and cooperativeness is shown in the method of teaching science in Japanese classrooms. Science teaching was mainly lecture and group method, while "Learning Together" as a major cooperative learning strategy with the tradition of goal setting among the pupils for their science lessons provided a source of interaction between science knowledge and the pupils' desire and purpose.

Cooperative learning is the antithesis of the expository competitive classroom teaching approach. It is a method in which classrooms are structured into teams of cooperative learners, thus making learning together a way of life. It is a type of learning that interweaves cognitive academic behaviors with social skills such as active listening, responsibility, mutual respect, helping and sharing behaviors (Lazarowitz and Hertz-Lazarowitz, 1998). Analysis of past studies has categorized cooperative learning methods into different types such as - "Learning Together" (LT), "Jigsaw Method" (JM), "Student Teams and Achievement Divisions" (STAD) or "Team Games Tournaments" (TGT), "Group Investigation" (GI) and "Peer Tutoring in Small Investigative Groups". The major characteristics of "Learning Together" are that the team (usually four or five students), learn in order to accomplish a common goal. Each member of the group is accountable to the others. The "Jigsaw Method" requires members to treat each other as a resource. Learning goals are in the form of independent sub-units to be learned separately by the teams. In the "Student Teams and Achievement Divisions" the teacher presents new materials each week, teams work together on worksheets, followed by a quiz on the material, and scoring, which leads to team recognition. The "Team Games Tournaments" are similar to STAD except that the quiz is replaced by a game or a tournament. In the "Group Investigative" method, the groups are organized into research groups. They plan their investigations and presentations; in addition the projects are evaluated by the teacher and the students. "Peer Tutoring in Small Investigative Groups" is a combination of Jigsaw and Group Investigation (Aronson, Stephan, Sikes, Blaney and Snapp, 1978; Lazarowitz and Karsenty, 1990).

What type is practiced in Japanese elementary science classroom? Employing these characteristics, observations and videotaped lessons were analyzed to identify which characterized the Japanese elementary science lessons observed. Summary of analysis is shown on Table 2. Although STAD is a characteristic of the cooperative learning method in lessons observed, and
although previous studies have found this method as having significant impact on achievement, it was observed that there is non-use of the achievement aspect of this method in the lessons, i.e. not using the score of the quiz either for individual or group award. This may be as a result of policy against ability grouping and identification of pupils at this level of education. The motivation that pupils would have developed as a result of such rewards is therefore not heightened. Also, Team Games Tournaments, which are quite similar to STAD but for the fact that instead of a quiz pupils play scientific games, were never observed. Japan is known for her technology. Such scientific games, which could be in the form of computer games, are not available in the classrooms. Computers are only available for teachers use in the staff room. One ordinarily would expect computers to be toys for children in a highly technological country like Japan. This again has limitations to the amount of intellectual quests that pupils would have developed by use of such games. It may be argued however, that most of the pupils play such games at home, but they may not be directly related to the lessons at school. The importance of scientific toys and games has been stressed for many years in Japan. This could further be intensified as part of a cooperative learning strategy.

Cooperative learning is a relationship in a group that requires positive interdependence, considerable promotive (face-to-face) interaction, clearly perceived individual accountability and personal responsibility to achieve the groups’ goals, personal use of the relevant interpersonal and small-group skills and frequent and regular group processing of current functioning to improve the group’s future effectiveness. What interpersonal and group skills exist in Japanese elementary science classrooms? Several activities observed during Japanese elementary lessons provide for different interpersonal skills such as communications, trust, leadership and decision-making, which affect cooperative learning. There is less recognition of personal achievement but greater recognition as a group member.

Table 2: Characteristics of Cooperative Learning Method in Japanese Elementary Science Classrooms

<table>
<thead>
<tr>
<th>Characteristics observed most often</th>
<th>TCLM*</th>
<th>Characteristics sometimes observed</th>
<th>TCLM*</th>
<th>Characteristics not observed</th>
<th>TCLM*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group accomplish a common goal</td>
<td>LT</td>
<td>Each individual in the group has to show that s/he masters the learning materials</td>
<td>LT</td>
<td>Learning goals and materials divided into independent sub units to be learned separately so that sub-units do not depend on the mastery of others</td>
<td>JM</td>
</tr>
<tr>
<td>Each individual is accountable within the group</td>
<td>LT</td>
<td>Group projects done in the science room or laboratory</td>
<td>LT</td>
<td>Existence of experts and investigative groups</td>
<td>JM</td>
</tr>
<tr>
<td>There is group discussion and sharing of ideas</td>
<td>LT</td>
<td>Pupils treat each other as resource (peer-tutoring)</td>
<td>JM</td>
<td>Scoring system allowing members to earn points for their groups</td>
<td>STAD</td>
</tr>
<tr>
<td>Preparations for the activities is as a group</td>
<td>LT</td>
<td>Learning goal and material structured by pupils</td>
<td>U</td>
<td>Team recognition through individual and high team score</td>
<td>STAD</td>
</tr>
<tr>
<td>Every member of the group is expected to help and to be helped</td>
<td>LT</td>
<td>Team members work in pairs to master the materials</td>
<td>STAD</td>
<td>After team practices, members take a game or tournament on the material</td>
<td>TGT</td>
</tr>
<tr>
<td>Learning goals and materials are structured by the teacher</td>
<td>JM</td>
<td>After team practices each member takes a quiz on the material</td>
<td>STAD</td>
<td>Pupils compete as representatives of their team</td>
<td>STAD/TGT</td>
</tr>
<tr>
<td>Teacher first presents learning materials to the class in a lecture, discussion or video technology</td>
<td>STAD</td>
<td>Teachers and pupils evaluate projects</td>
<td>GI</td>
<td>Group plan and carry out their investigations and presentations</td>
<td>GI</td>
</tr>
<tr>
<td>Team members work together on worksheets written by teacher or textbook authors</td>
<td>STAD</td>
<td></td>
<td>GI</td>
<td>Groups work on different but related topics of investigation</td>
<td>GI</td>
</tr>
</tbody>
</table>

*TCLM=Type of Cooperative Learning Method, STAD=Student Teams and Achievement Divisions, U=Unique TGT=Team Games Tournaments, LT=Learning Together, JM=Jigsaw Method, GI=Group Investigation
3) Language and Information in Elementary Science Texts

Language and information in the textbook are culturally oriented, while classrooms are highly westernized; resources for teaching and learning do not include much Japanese traditional toys, games and crafts.

One way is through the representation of indigenous knowledge in science texts. Textbooks are important contributors to students' ideas about science. Students are known to consult textbooks greatly in the process of learning science. It has been argued that there is need to have greater representation of indigenous knowledge in science classrooms and curriculum materials as this will enable indigenous students to identify with science as well as enhance chances of success in science. Graphics related to indigenous knowledge are extracted from the texts.

There are many graphics on Japanese indigenous social lives. Some Japanese legends and myths are not part of indigenous knowledge in the school science curriculum. There is the tendency to keep some Japanese indigenous knowledge out of what is taught in the science classrooms.

4) Implications for Border Crossing and Collateral Learning

Pupils see their teachers as authorities, pay close attention in the class, but make few comments and ask few questions. Considering the characteristics of future scientists, many such students may not be inquisitive. They may not ask series of questions and may not become target students. This may result in the memorization of information passed on by teachers to pupils in science lessons. This has great implications for border crossing and collateral learning. Bases on these observations it was implied that border crossing in Japanese Elementary Science Classroom could be "managed" or "hazardously adventurous", while Western Science and Indigenous Knowledge exist in parallel.

A JAPANESE SCIENCE EDUCATOR'S SUPPLEMENTARY COMMENTS

1) Non-Science Major Teacher's Science Classes: An Uninvestigated Field

The science classes the first author observed were taught by non-science major elementary teachers. This is not so uncommon in Japanese elementary schools. Ogawa (2001) reports that the ratio of science teacher per elementary school is about 1.17. Since the average number of teachers in an elementary school is 16.7, virtually most elementary science classes are taught by non-science major teachers. In this sense, the observed lessons were regarded to be typical. However, Japanese science education researchers have been focussing on elementary science classes taught by science-major teachers. There are several reasons for this. For example, science education researchers are very much interested in finding out the best (or better) practices in science teaching and learning in elementary science classes, which can serve as an ideal model lesson, because they believe that among them there exist hints for making science teaching and learning significant and meaningful. Another reason may come from a kind of psychological barrier among elementary teachers as well as school principals. While Japanese teachers, in general, are rather open-minded about peer teachers to drop in their own classes in order to exchange ideas on the class (Ogawa, 2002), they are not prone to allow outsiders or researchers to come into their classes for the purpose of any kind of analysis. In particular, the door of the non-major subjects' classes are tightly closed. Thus, the reality of science classes taught by non-science major teachers has not been investigated or analyzed so far. Why, then, were this study possible? Several major reasons are estimated. The investigator was a foreign researcher, who had
always visited the school by herself (for example, without Japanese researchers). She served as an assistant in elementary English classes, and she was regarded as a member of the teaching staff. And since she did drop in on various kinds of occasions, not only science classes, but also other classes as well as festivals and ceremonies, peer teachers had little fear of being observed.

Thus, her observation of elementary science classes taught by non-science major teachers has successfully uncovered one aspect of the reality of Japanese elementary science classes, which has never formally been researched. This work shows Japanese science education researchers in an unchallenged research field.

For a Japanese science educator, who has been familiar with science-major teachers’ science class practices, one of the most striking findings in this fieldwork is that in the science classes done by non-science major teachers ‘pupils perceived their teachers as authorities, paid close attention in the class, but made few comments and asked few questions.’ This old fashioned teaching-learning style, which has been criticized and remedied through a tremendous amount of science education research done by Japanese science educators, is still alive in non-science major teachers’ classes. While we, Japanese science educators, have had confidence in our contribution to make science classes better or learner-centered, the science classes by non-science major teachers have remained unchanged. Emergent needs for struggling this issue are uncovered by the present work.

2) Japanese Science Educators’ Unawareness of Hidden Determinants of Science Classes

The first author focussed on factors not directly relevant to science classes; for example, ‘Groups and Cooperativeness,” “Authority of teachers and Obedience of pupils,” and “Cleanliness”. Why? Two answers are possible. First, she exaggerated, a small factors because she could not identify ‘real’ important factors directly relevant to science classes due to her unfamiliarity with Japanese science classes. Second, her strangeness made her see hidden determinants in Japanese science classes, which have not yet been recognized as major factors by Japanese science educators. The first answer seems improbable because the first author is an experienced science teacher as well as a science education researcher trained within a Nigerian university, and has also been familiar with not only African but also American school settings. She knows what science classes really are. Thus, the second author prefers the second answer. If this is true, Japanese science educators must pay more attention to such factors as possible important determinants of Japanese science classes. Though Japanese science educators have focussed on research on science classes by science major teachers, we should also give special attention to non-science major teachers’ science classes in terms of science education research.

NOTE

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REFERENCE


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