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Original scientific paper
UDK: 37.015.3
DOI: 10.17810/2015.30
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FOSTERING CRITICAL THINKING PRACTICES AT PRIMARY SCIENCE CLASSROOMS IN NEPAL

Abstract: This article examines the socio-cultural activities that have direct and indirect impacts on critical thinking practices in primary science classrooms and what kinds of teachers' activities help to foster the development of critical thinking practices in children. Meanwhile, the constructivist and the socio-cultural theoretical dimensions have been taken as the conceptual bases for this study. This study has highlighted the major conceptual and methodological issues in identifying and assessing children's critical thinking as well as the educational implications for the promotion of children's original thinking. It used the qualitative research approach to pursue the objectives of the study. Science classroom observation and an interview with the science teachers were the major tools to collect the required information. Critical thinking is essential in critical science processes and practices. Hands-on, minds-on and hearts-on teaching learning strategies help to develop critical thinking to primary level children in science.

Key Words: Critical thinking, Paradigm shift, Hands-on activities, Pedagogy.

Introduction

In the primary level science classes in Nepal, students are not supposed to express their opinions before being permitted by the science teachers to do so, especially in the case of critical comments. Teachers take only obedient, compliant, dependent, and submissive children as good students. Those who are independent and express personal opinions different from teachers are regarded as showing disrespect. This suggests that Nepalese children (primary level students) face many difficulties if they want to be critical. In other words, science teachers of primary level in Nepal do not customarily seem to promote critical thinking practices in their pupils.

Learning in a pin-drop silent classroom is considered to be the best in the primary schools of Nepal. Classroom discussions are rarely encouraged by the science teachers. Students are expected to be passive receivers of the content knowledge poured by a teacher. In a classroom, the science teacher is usually found to be solving the problems and the students

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are copying the problem (Shrestha, 2011). Learning science needs an amicable blend of cognitive, affective and psychomotor activities through hands-on, minds-on and hearts-on activities that help develop critical thinking habits in students (Gardner, 2008 p. 1). A teacher-centered approach doesn't support adequately for classroom talk, discussion and thinking. Students sit in the neat, orderly and well-arranged rows in the classroom. The practice of a dogmatic approach to teaching science makes students feel monotonous and thus they are bound to memorize the procedures.

Teaching science in Nepal is predominantly more theoretical. The classroom environment only rarely brings in the real life situations. Thus, as Shrestha (2009) remarks, "most of the science classrooms do not deal with basic concepts" and "without linking to the real life problems" (Shrestha, 2011). Generally, classroom instructions do not deal with the practical aspects of science even though learning science can best naturally be internalized through practical hands-on activities. This shows that in the Nepalese context the deductive approach of teaching science is in full use at primary level.

Teaching science is based on the problems found mostly in the practice book (Lipman, 1988), and in the prescribed textbooks. Most of the teachers start their lessons with a problem from the exercise text book and select one of the problems, usually the first, as a model and show how to do a particular type of problem and demonstrate its solution showing how to solve it. Science text books are designed for a dogmatic approach resulting in the repetition of the same style of problems. Most of the difficult problems are solved by the teacher him/herself and 'given' to the students as examples so that they 'learn' through memory by heart and do the rest of the problems in a similar way.

Objectives of the Study

The study is based on the following objectives:

- to find out the socio-cultural practices that hinder critical thinking practices in primary level science classrooms.
- to perceive and practice the critical thinking applied practices by the primary level students in learning science.
- To develop approaches to teaching science by fostering critical thinking practices.

Literature Review

In this section, an attempt has been made to highlight the existing level of knowledge about learning and instructional theories with a special focus on the constructivist paradigm to develop critical thinking in primary science students. The perspectives overviewed and discussed in this section can be organized into three main theoretical categories – the behaviorist, constructivist and critical thinking.

The Behaviorist Perspective

As behaviorism was becoming increasingly implemented in educational practice, learning materials were explicitly designed in this regard. Systematic design procedures in the learning arena became inherently behaviorist. As Barden mentions, these procedures were derived from effective, efficient and relevant instruction by designing objectives, content, instructional methods and learner-assessment procedures in congruence with one another.

These traditional practices of instructional design were characterized by Skinnerian psychology, and were especially manifested in programmed instruction (Dick, 1996). Detailed work on instructional objectives and goals was undertaken by Gagne (1983).

Behaviorist learning theory suggests that learning outcomes are demonstrated by observable and measurable behavior. Instructional interventions, accompanied by selective reinforcement, are used to shape such learning behaviors. Skinner (1938), a classical protagonist of this theory, was reluctant to address the role of internal cognitive or conceptual activity as a part of learning process. Behaviorist learning is managed by environment stimuli, which resulted as responses from the learner. The stimulus-response pattern of behavior is manifested in the learner's overt reactions. Correct responses are rewarded with immediate reinforcement, leading to a stimulus-response-reinforcement paradigm.

Behaviorist instruction is generally accepted to be in line with objectivism. Objectivist epistemology defines knowledge that is separate from knowing (Reeves, 1997). Behaviorism emphasizes the design of instruction and the imparting of knowledge, with the goal of achieving effective and efficient learning. Learning, in this connection, is demonstrated by behavioral changes. The role of the instructor is paramount over the role of the learner. The learners tend to receive instruction in a passive manner.

The Constructivism Perspective

Constructivism originates from Bruner's theoretical framework for instruction (Bruner, 1998). The framework is based on the study of cognition. It postulates that learning is an active process in which learners construct new ideas or concepts based upon their past and current knowledge

Vygotsky (1978) on the other hand, introduced the social aspect of learning in constructivism. According to him, students solve problems beyond their actual developmental level. They remain under adult guidance or in collaboration with more capable peers. Vygotsky's claim is known as the dialectical constructivism.

The Critical Thinking Perspective

Critical thinking is an ability to think outside the 'box' or to look at the situation from another point of view and to think beyond the limits that will result in very useful creative solutions. Critical thinking can also be understood from the characteristics of critical thinkers. Bouland argues that reasonable and reflective thinking are the main features of critical thinking. She claims that reasonable thinking leads to deduction and sound decisions justified and supported by acceptable proofs and reflective thinking shows a complete awareness of thinking steps that lead to deductions and decisions.

Classroom activities in teaching science and the environment play a vital role in developing thinking skills through psycho-motor development. Practical activities in science are very important for such development. Perhaps the simplest explanation is offered by Gellin (2003), who suggests that critical thinking means making reasoned judgments with original logic (p. 8). The classification varies from person to person based on different perspectives. To memorize the information is of low level thinking and to stimulate more sophisticated

thinking is high level thinking (Erickson, 2007, p. 10). On the basis of the types of thinking skills, Kagan (2003) divides thinking skills into three types: understanding, manipulating and generating information. Thinking is related to intellect and on the basis of the focus on the divergent coherent, they are of four categories: 'creative thinking, critical thinking, reflective thinking (Erickson, 2007) and conceptual thinking.

In higher order level of science questions, the students engage in checking, hypothesizing, critiquing, experimenting, judging, testing, detecting, monitoring, etc. In the classroom, the student judges, disputes, compares, critiques, questions, argues, assesses, decides, selects and justifies in the process of critical thinking. Critical thinking skills encompass comparing, contrasting, conjecturing, inducing, generalizing, specializing, classifying, categorizing, deducing, visualizing, sequencing, ordering, predicting, validating, proving, relating, analyzing, evaluating and patterning.

Critical thinking is also critical inquiry. Critical thinkers investigate problems; ask questions, pose new answers that challenge the status quo, discover new information that can be used for good or ill, question authorities and traditional beliefs and challenge received dogmas for the transformation of the society. Critical thinking is a reasonable, reflective, responsible, and skillful thinking that is focused on deciding what to believe or do.

Methodology

This section is about the plan for study which explains the procedures for analyzing and interpreting the cases determined by the purposes of the study. This study uses the qualitative research design. The behaviourist, constructivist and socio-cultural critical theoretical perspectives are using in this study. Critical constructivist research paradigm is especially focused. This study highlights the conceptual and methodological issues in identifying and assessing primary children's critical thinking practices. As a qualitative research design, this study demands data from two sources namely science classroom observations and in-depth interview with science teachers' of the primary level.

These sources helped the researcher get a better understanding of the subject matter. They also helped him to investigate the reality, while the data were collected through multiple methods and yielded the same results. This type of combination of data collection compensated the weaknesses of another approach to data generation.

For this, the researcher started with classroom on what Denzin and Lincoln argued that in qualitative research, there are no fixed rules and regulations to start the study by using tools. It means the researcher was aware of the flexible nature of the tools. That is why the researcher selected the in- depth interview with the primary science teachers about critical thinking practices in the science classrooms and the cultural effects to develop criticality among their students. The open-ended questions were used to explore the perceptions of those teachers.

Result and Discussion

The researcher found that classroom activities in science and environment play a vital role in developing thinking skill through psycho-motor development. Practical activities in science are very important for such development. Critical thinking means making reasoned judgments

with an original logic (Gellin, 2003 p. 8). The classification is based on different perspectives, thus may vary from person to person. To memorize the information is of low level thinking and to stimulate more sophisticated thinking is high level thinking (Erickson, 2007, p. 10).

The researcher points out that critical thinking is an ability to think outside the 'box' or to look at the situation from another point of view and to think beyond the limits that will result in very useful and creative solutions. Critical thinking can also be understood from the characteristics of critical thinkers. Critical thinking has been tied to analysis, reflective thinking and experiential assignments, which highlight the creative element of critical thinking.

The field of science education comprises science content, pedagogy and evaluation. Teaching science in itself tendts to become a very joyful job if the hands-on activities are conducted in collaboration with the primary-level learners. For the teacher, it becomes very interesting to do activities in which the students are interested. However, in the Nepalese context, this kind of rigid and formal educational system very likely kills creativity and destroys curiosity of the learners in the name of learning. It doesn't permit them to make mistakes.

It is a duty of a (science) teacher to ensure that the child knows that he or she is loved. If so, their imagination and original thinking are fostered. Fear and disappointment of the children if any, must be addressed with an apology, and/or an explanation. A child must never be disciplined with harsh words. When disciplining a child, it is always better for the teacher to stay calm and collective. It was found during this study that, the teachers have taken science training to stay up to date with science pedagogy and attended professional development courses to enhance their knowledge in the field of science. Despite this, it was found that they follow the same stereotyped approach to teaching science. Primary science teachers were in the state of transition from an instructionist to a constructivist approach to teaching. In the course of the study, the researcher discovered that the science teachers were instructing rather than facilitating science lessons.

One of the teacher participants from a Brahmin family, he reflected upon his experience during the interview and expressed his discontent regarding how Nepalese families and societies do not support children in fostering critical thinking practices. He remembered his past experiences and said, "I am from a Brahmin family and I realize my parents killed my critical thinking when I was a child". He further said, “When I probe to my childhood, I remember how I used to be full of critical thoughts. I used to make jokes, ask questions, and have plenty of ideas. However, my parents discouraged me from making jokes stressing that people who make jokes are stupid. My parents were annoyed with it, discouraged me particularly when I questioned some cultural and religious beliefs/practices. They warned me not to go against things like the culture, values and family norms. After a while I stopped asking many questions in spite and hesitation fear. I used to have plenty of ideas for all sorts of things but my parents discouraged me because they thought that their manner was the best and any other suggestions were stupid. Now I feel as though it were a tradition of Nepalese parents to rear their children in such a way that we do not become critical and creative.”

The result of this research revealed that those science teachers' perception on critical thinking was positive. They tried to apply critical thinking to the classrooms despite their workload. They argued that critical thinking is one of the important 'methods' of teaching to enhance students' knowledge and make them more logical and creative in the future as well. On the

surface, they said that they considered applying this approach in the classroom to a certain extent because they believe science is based on logic and reason. The opinion can have a different interpretation to have critical thinking widely accepted in the Nepalese context (because of societal and cultural values) seems to be a great challenge despite its use and importance in the science classroom.

The learners' critical thinking ability was related to integration of behaviors, language patterns and value oriented beliefs of the teachers and friends. The teachers' emotional and cognitive behaviors were found essential to develop children's critical thinking. However, in contrast to the theory, science teachers used the controlling approach, which was prevalent, due to the lack of knowledge of critical thinking.

Self-reflection and Paradigm shift in Pedagogical Practices

The researcher's situatedness in this research lies on the qualitative socio-critical self-reflective inquiry. The researcher believes that the science teachers can/should change their pedagogical practices along with the changes in time and context, experience, study and training. It was found that such changes in the practices of teaching and learning from behaviorist to constructivist or traditionalist to modernist and postmodernist mark some paradigm shifts within the teachers as well as the researcher himself and in the entire science education system. It seems a shift in science pedagogy. In the traditional paradigm of teaching and learning science, teachers perceived that teaching as a part of the reproduction and perpetuation process of the existing science knowledge. The new paradigm emphasizes that science teachers and their teaching should be facilitated in such a way that all science teaching activities can/should utilize in local and global resources, supports and networks together to maximize the opportunities for their developments in teaching science and their contributions to the students' learning.

The researcher's teaching and learning practices in science have changed a lot across time. The concept that the higher order thinking and learning grows through social interactions and the context of learning is highly significant, whether at home or in the community. Vygotsky (1978) has extended this kind of understanding in the importance of creating knowledge together in the social context. The researcher thinks that when children begin to engage in practices, or what Bourdieu refers to as 'exchanges', they bring their excellence and receive distinctions. Then they become members of an exchange to be recognized as 'members of a culture'. For Bourdieu, literacy is a form of cultural capital in which knowledge is defined as competence that can be converted into status, wealth and mobility (Fisher, 2003, p.7).

For the researcher, the teaching of science is part of a socio-cultural phenomenon. So students should be given opportunities to learn science from home, the community and society as a whole, in which school forms a part of the system. Culture is a very powerful means to construct knowledge in science.

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