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NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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The NCERT encourages original and critical thinking in education. The JIE provides a forum for teachers, teacher educators, educational administrators and researchers through presentation of novel ideas, critical appraisals of contemporary educational problems and views and experiences on improved educational practices. Its aims include thought-provoking articles, challenging discussions, analysis, challenges of educational issues, book reviews and other related features.

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The views expressed by individual authors are their own. They do not necessarily reflect the views of the NCERT or the views of the Editors.

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Editor's Note

In recent times, there has been a gradual shift in the approach to education as a result of the successful implementation of flagship programmes like *Sarva Shiksha Abhiyan (SSA)* and *Rashtriya Madhyamik Shiksha Abhiyan (RMSA).* There is change in focus from the quantitative expansion of educational institutions to the qualitative approaches of student-centric teaching and hands-on learning practices. This theme has been emphasised by four articles in this issue. The paper by Seema Shukla Ojha proposes a shift in teaching social science, especially history from a mere collection of facts and rote memorisation to an effective student-centred measure, integrated at the elementary stage to enhance critical thinking skills and student engagement. Sunaina K. explores the impact of social writing on the participation of children in the classroom, and tests the theoretical concepts of the 'zone of proximal development' and 'collaborative learning'. Dey et al. have attempted to facilitate the understanding of the earth and its dynamic processes by engaging in various activities and tools from a science kit through hands-on minds-on approach to learning in schools. Lastly, Behera and Mohalik present the effectiveness of the 5-E approach — Engage, Explore, Explain, Elaborate and Evaluate to develop higher order thinking skills like analysing, evaluating and creating among students.

In the current socio-economic environment, the significance of mindfulness and self-reflection have increased multifold to ensure the well-being of an individual. This has been addressed by Nitika Bose in her paper, which highlights the relevance of reflections as an integral part of pre-service teacher education programme, enabling critical self-awareness and informed education practices.

In 2015, the Government of India launched the *Beti Bachao, Beti Padhao* campaign which aims to generate awareness and improve efficiency of welfare services intended for girls. This has given an impetus to the contemporary issue of gender. Abhilasha Bajaj, in her paper discusses gender, and the implicit messages and values embedded in school culture impacting the student's understanding and perception. The ability to view society from the perspective of gender roles and to understand how this has affected women's needs in comparison to the needs of men has been crucial in building a constructive foundation for equality in our society.

Another government initiative is the economic model of private public partnership (PPP) which has proved to be efficient for the better avenues in

investment, infrastructure and accountability, and has been widely practised by the governments around the world. Devesh Baid proposes a concept paper on developing model residential schools with a PPP model as a way forward to overcome the barriers of socio-economic status.

Realising the importance of including Peace Education in Teacher Education curriculum, the NCTE in January 2015 has made a provision to integrate Peace Education as a component in content designing of the Diploma in Elementary Education (D.El.Ed.) curriculum and to add Peace Education as an independent course in the list of optional courses in the Bachelor of Education (B.Ed.) programme. Niradhar Dey in his article has created a suggestive course outline for peace education which could provide the Teacher Educators a design for their course at the higher education level.

Some researches show that at the end of elementary schooling, students cannot read the text books of their junior classes and some fail to distinguish between capital and small letters. Making spelling and grammatical errors along with an inability to write correct sentences or a short paragraph on their own are some of the challenges in the way of improving students' learning performance. According to several reports, low learning achievements of learners in English language in elementary schools is a major concern and challenge. Manoranjan Pradhan in his study attempts to investigate the factors responsible for low learning achievements in English language in elementary schools from the Block Resource Group members, who are master trainers in the block.

In the study by Mohapatra and Parida, the possible episodic structures which the pupils are likely to auto-generate while being taught about graphs in kinematics, have been identified. The effects of this episodic conceptualisation on the responses of pupils of Classes X and XII, and practising higher secondary teachers, to comprehend problems related to construction and interpretation of graphs in kinematics have been investigated. The authors also suggested a focused teaching point to be noted while teaching graphs, so as to minimise the generation of alternative conceptions.

As the global community reels under the effects of climate change, Kiran Singh, through the paper addresses the urgency of sustainable development practices through disseminating awareness, and developing curricula and environmental stewardship through geography education. A book reviewed by Ranjita Dawn on the *India: Social Development Report 2016: Disability Rights Perspectives* is also included in this issue.

This edition of the journal provides articles and research papers on a variety of issues and themes under School Education and Teacher Education. We hope that our readers will be able to relate their personal experiences with the issues and concerns discussed by the authors of these articles and research papers. We invite our readers from different levels of School Education and Teacher Education to contribute to the journal by sharing their knowledge in the form of articles, action research reports, theoretical papers, book reviews, etc. Your valuable suggestions and comments for improving of the quality of *Journal of Indian Education* are welcome.

Academic Editor

Development of Critical Thinking Skills in History

Seema Shukla Ojha*

Abstract

History is a written record of human experiences across time and space. The learners of history need to relate various kind of available sources to understand historical events and concepts. It is however observed that the classroom teaching in history is blended with a collection of facts, rote memorisation leading to boredom, leaving very little space for critical thinking among students. It is pertinent for teachers to evolve effective ways of learning history to generate and retain interest in the subject. How we can make the teaching-learning of history effective in schools, is a question frequently asked in different forums. This paper is the outcome of an educational intervention, with an objective to explore the effectiveness of integrating student-centred measures in a social science classroom at the elementary stage as a medium to enhance critical thinking skills and student engagement.

Introduction

The students of history need to know and understand historical events and concepts. They are also expected to apply different critical thinking skills that are commonly used in the study of history. However, the component of knowledge and skill in this context is often carried forward, posing the two as different. History, as a subject, is therefore taught as a collection of facts woven into a narrative. But the way history is taught—as a series of lectures, textbook reading, rote memorizing, and test taking—is not only boring to students, but also ineffective in garnering real historical learning (Waring & Robinson 2010, p. 22). Truth be told, if students are not taught to acquire and make use of

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critical thinking skills to interrogate historical information, they cannot have historical knowledge. To link critical thinking skills to content, the instructional focus should be on the process of learning. Research supports the premise that lecture and memorization do not lead to long-term knowledge or the ability to apply that knowledge to new situations (Snyder & Snyder 2008, pp. 91–92). It is the application of the content that stimulates thinking. Referring to various researches, Sayre states that the teacher-centred approaches contribute little to promote critical thinking skills, motivation or the love of the social studies (Sayre 2013, p. 1). So, it is important for teachers to move away from teaching history as 'given' and allow students to construct their own knowledge by following vivid and creative methods of learning.

Defining Critical Thinking

Critical thinking is often defined as the 'intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action' (Snyder & Snyder 2008, p. 90). In other words, it implies questioning that is, not to accept without evidence, and search for the reasons as to why statements are being made. The importance of critical thinking skills lies in the fact that these skills enable students to deal effectively with social, scientific, and practical problems. Simply put, students who are able to think critically are able to solve problems effectively.

Critical thinking is not a new concept. Savich (2009, p. 4) informs that the impetus for improving critical thinking skills gained momentum in the 1980s when many schools, districts, and states in the United States of America began placing a greater emphasis on critical thinking skills in teaching, curriculum design, and testing. He further states that the United States National History Standards, 1994 encouraged critical thinking skills, active learning, and the use of primary sources and documents.

Critical thinking is not an inherent ability. It is a learned skill that needs to be developed, practised, and continually integrated into the curriculum to engage students in active learning. Once students acquire these skills, they can become confident in their reasoning and apply their critical thinking ability to any content area or discipline (Snyder & Snyder 2008, p. 92). But to learn the process of thinking critically, focused attention needs to be placed on the application of content, the process of learning, and methods of assessment (Snyder & Snyder 2008, p. 92). The acquisition of critical thinking skills should take place in the formative years so that children become more fair-minded and learn to think innovatively in their later life.

Instructional Strategies that Promote Critical Thinking

Critical thinking is considered to be an indispensable part of the twenty first century curriculum. Today, teachers are required to prepare students to live and work in a complex and interactive society, therefore a major emphasis is placed on the development of students' minds (Zachary 2011, p. 15). Zachary further says that though many schools claim to teach critical thinking, there is very little evidence to support such claims. He holds patterns of classroom instruction, characterised by text-oriented, whole-group, and teacher-centred instruction with an emphasis on memorisation of factual information, responsible for this failure in implementing critical thinking (Zachary 2011, p. 15).

Referring to various researches, Sayre points out that student-centred methods of teaching, which incorporate several learning styles, cooperative activities, simulations, technology and so much more, have the potential to promote critical thinking skills (Sayre 2013, p. 1).

Many engaging strategies exist for teaching social studies and critical thinking skills. One such method to implement critical thinking is the use of primary sources.

> *'Using primary sources enables students to make connections to history that memorizing facts cannot do. Inquiring about various primary sources requires critical thinking skills: extracting information, interpreting, analyzing and making inferences, compiling and organizing information, evaluating information, and drawing conclusions'.* (Sayre 2013, p. 9)

Sayre considers simulation as the second important strategy.

> *'Simulations are a useful method of using cooperative learning to engage students, connect to history and promote critical thinking by having students take on the role of individuals or groups from history, and make decisions that those people would have had to make in a particular historical time period'.* (Sayre 2013, p. 9)

Other tools mentioned by him are debates, role playing, Socratic or higher-order questioning, project-based learning, and incorporating various interactive technologies. Similarly, graphic organisers, mind maps, graphs, diagrams, cooperative learning, discussion projects, and authentic assessments are some other important strategies mentioned by others to enhance critical thinking. Acknowledging the absence of conclusive data about the best strategies to promote critical thinking, Zachary informs us about researches that suggest basic principles to implement critical thinking and emphasises on providing a supportive environment in classroom which encourages discussion, questions,

probing, and pondering to foster critical thinking (2011, p. 19).

School Curriculum and History Teaching

In India, broad guidelines regarding content and process of education at different stages are formulated by the national government. These guidelines are further elaborated by the National Council of Educational Research and Training (NCERT) in the form of Curriculum Frameworks. So far, four Curriculum Frameworks have been prepared by the NCERT, and all these frameworks have emphasised the need to equip students with the knowledge, skills, attitudes and values necessary for leading a productive and happy life.

The Curriculum for the Ten Year School–A Framework (NCERT 1975, p. 32) states that, 'the child learns better by doing, by discovering and not by merely listening submissively to a display of factual knowledge'. In addition to this, *National Curriculum for Elementary and Secondary Education–A Framework* (NCERT 1988, p. 8) calls for the need to replace the existing teaching methods based on rote learning, with interactive methods of teaching which would focus on 'learning' and which would stimulate curiosity and independent thinking, and develop problem solving skills. The *National Curriculum Framework for School Education* (NCERT 2000, p. 18) considers 'problem solving' and 'critical thinking' among others as some of the core skills important for successful living. *The Position Paper on Teaching of Social Sciences* (NCERT 2006, p. v) outlines the indispensability of social science in, 'laying the foundations for an analytical and creative mindset'. *The Position Paper* (NCERT 2006, p. viii) calls for the need to revitalise social science teaching, 'towards helping the learner acquire knowledge and skills in an interactive environment'.

Following the concerns of social science teaching, the *Syllabus for Classes at the Elementary Level* (NCERT 2006, p. 164) clearly mentions that '…students need to see history not simply as a set of facts about the past—economic, social, political, and cultural — but that they have to learn to think historically'. Accordingly, the syllabus aims to introduce students to different type of sources and encourages them to reflect on them critically. By building discussions around these sources, the history textbooks allow the learners to develop analytical skills.

Viator rightly asserts that social science classrooms can and should be the place where students learn critical thinking skills (2012, pp. 198–200). In addition to this, he argues that the space most conducive to the development of these thinking skills is the history classroom (2012, p. 200).

NCERT's Academic Attachment to Schools

This study was part of the NCERT's academic attachment to schools where the faculty working in different constituents of the NCERT undertook field work in different schools of the country for a minimum period of three months. The objective of this academic attachment included teaching in the school along with carrying out research; try-out of educational materials, advocacy, or any other such intervention in accordance with the mandate of the NCERT in general, and underlying philosophy of the *National Curriculum Framework* 2005 in particular.

Selection of School

The premise for the selection of school for field work was that the school be adhering to the principles and approaches towards teaching and learning as delineated by the NCF 2005, while using the textbooks and teaching-learning materials designed by the NCERT. Additionally, selecting a school that catered to the needs of the rural children was also thought of, so as to gain an understanding of the nuances of teaching and learning therein. Thus, the Government Middle School, Sikandarpur, district Gurugram, Haryana was identified for a three-month academic attachment from December 2013–February 2014.

About the School under Study

The school under intervention was a small, rural school with merely 10 rooms, including a kitchen and a computer room. Out of these, only three rooms are used for teaching. The total school population was about 100–115 students. The computer room, though equipped with a number of computers, was rarely in use for learning. Hardly any form of teaching aid was seen in the classroom.

The majority of students belong to the poorer communities in the surrounding areas, particularly children of migrant labourers from Uttar Pradesh, Bihar and Jharkhand. Very few students are from Haryana. The students in the school are being served mid-day meals.

The medium of instruction is Hindi, although many students' home language is different. In this school, teachers generally teach using the transmission method that is, 'teachers talk and learners listen'.

Motivation for Educational Intervention

My motivation to undertake this research stemmed primarily from my own experience of interacting with students and teachers during various programmes conducted by the NCERT and other agencies. Students usually report apathy and boredom in history classes where the emphasis is on rote memorisation and the regurgitation of accepted facts and conclusions. They show little interest in the content in history textbooks, are not able to relate to any of the content in a meaningful way and find the

subject monotonous. It was realised that much of the distaste for social sciences, particularly history, stems from the way it is taught.

Purpose

The purpose of this study was to empower students in the classroom to become critical of, and not merely recipients of, the knowledge conveyed to them. The research objectives for this study are —

1. To develop the critical thinking skills of students in history
2. To improve classroom teaching practice in history to make it more participatory

The educational intervention answers the following research questions.

1. How student-centred teaching methods can be used to improve the critical thinking skills of students in a history classroom?
2. How can teaching practice be improved in the classroom?

Research Design and Methodology

The research design model used in this study was action research. This method was used because this study focused on implementing student-centred teaching methods to determine its effects on students' critical thinking skills. Both qualitative and quantitative data collection and analysis were utilised. Qualitative methods included an instructional plan and a reflective journal. The reflective journal was kept to record the successes and challenges of implementing critical thinking. Quantitative methods included the use of questionnaires and a survey. Questionnaires were used to see if students were able to answer questions that tested their understanding of the critical thinking skills. A survey was administered to the students to determine the impact of critical thinking skills and students' attitudes about the use of critical thinking skills. A pre/post-test was administered to decide whether the use of critical thinking skills improved after the intervention. The research stretched over a period of five–six weeks during academic attachment.

The initial interaction with the Head and other teachers of the school helped to establish the purpose of the field work, which generated an understanding of the needs of the students. This also included meeting the subject teachers with regard to the specific stage, class, timetable and topics.

The first week of the intervention in school was devoted for familiarisation with the school environment and students in different classes. The first session was taken with Class VI. The following conversation took place in an informal manner —

1. Which subject do you study in this period? (The children loudly responded—'history'.)
2. Do you like studying history? (The children reluctantly said—'yes'. This may be because the teachers might have cautioned them.)

3. Why do you think history is taught to you?
4. What is history?
5. What good and bad do for think about the way your teacher teaches you in class?

The students' responses were quite varied, but they served two purposes. First, it gave the students an opportunity to delve more with the subject, gain confidence and a familiarisation with a new way of learning history, which is away from lecturing. The students provided the following responses.

1. History is learning about our past.
2. They like history because it tells them how people lived in the Stone Age.
3. History is taught to them so that they can know about what happened in the past.
4. The teachers do not explain things to them. They make us read our books and instruct us to answer the questions given at the end of the chapter.

The exercise was fruitful and provided valuable feedback and insight to ascertain their level of understanding in history. A pretest was conducted, and the response so obtained formed the basis for the present educational intervention.

Pretest

The purpose of the pretest was to determine the students' prior knowledge of history, and application of critical thinking skills. The pretest was administered to the students in the second week of intervention. The first instruction for the pretest was that the students must read the questions and not refer to the textbook for answers. They were also told that they could discuss questions with the student sitting next to them. Each student had to complete a worksheet without worrying about the right or wrong answers. They were assured that there were no correct or incorrect answers. Hence, they should submit their responses freely, drawn from their own experience and understanding, and without any fear of failure. The activity contained the following questions and instructions.

1. What is history?
2. Why do you think the study of history is important?
3. What did you enjoy about the study of history? You can give any example/s.
4. Do you know what critical thinking is? If you do not know, just say No. If you do, give a short explanation.
5. Have you ever been asked to think about your school work in a critical way?

Many students' responses for question 1. — what is history? were similar, or revolved around the same idea of what the study of history is about. A few other students, however, provided different responses. The following sentences below are a sample of the responses of students that provided similar answers. Their responses are typed verbatim.

- 'It teaches us about what happened in the past'.
- 'It teaches us about what happened in the past before we were born'.
- 'History tells us what happened years ago, our history of lives'.

There was a common understanding amongst most of the Class VI students that history is about a study of the past. From the very beginning, it was apparent that students in Class VI were taught history as a subject that contained information about the past. It seems that students had no idea that history can be critically studied or that questions do not necessarily have to be about understanding content.

The responses of many learners for question 2. — why do you think the study of history is important? showed a similar pattern of how they understood the study of history. The following are the answers of some students that answered question two. The students' answers are written verbatim.

- 'The study of history is important because it tells us about our life of many years ago and where it started'.
- 'Yes it's important, because I need to know what happened long ago'.
- 'It is important because it help us about the things that happened in the past'.

Again, we see a common pattern emerging, of how students understand history. At this stage, it also became clear that most students in class did not think that the study of history can involve critically thinking about the content in textbooks.

The students' responses for question 3. — what did you enjoy about the study of history? were varied, but still revolved around the same theme. The word 'past' was not used by students in their answers to question three, but a reference was made to some past event of a particular country, or famous individuals such as leaders of countries. What is also significant about many learners' responses for question three was that they wrote about the content of history they remembered from the earlier grades and some learners even wrote about the content found in books other than the prescribed history textbook.

Almost all the students did not write any answers for question 4. — do you know what critical thinking is? The intention of this question was to discover if students understood what the term critical thinking entails or means in the general sense of the word. Most students simply did not write any answers, and those who answered question 4. simply wrote, 'No, I don't know'.

In the fifth question, many students wrote that they have never been asked to think about their school work in a critical way. Some learners wrote that other people have told them to be critical, but did not provide any detail about exactly what critical thinking entails.

The responses of the participants showed from the start that they were not able to think independently and merely recalled the content learned. There was definitely a pattern that emerged in the answers provided by all participants. There was nothing in their answers to suggest that schooling stimulated students to develop independent thinking about the content of history lessons. The findings at this early stage of research revealed what was stated by Hester (1994, p. 6) in his book about school improvement in which education or schooling is expected to teach or develop critical thinking skills across the curriculum.

The answers students provided, showed clearly that students understood the study of history to imply the study of 'facts' found in textbooks, which is mainly about the past, and of heads of states. It did not matter if students came from different states; they all responded to questions in similar ways.

It seems that it was the first time that students were given questions to answer, in which they had to use their own understanding. They could also not use their history textbooks to find answers. It appeared that many students engaged with the questions and did not seem too concerned if their answers were correct or incorrect.

It appears that teaching and learning in schools continues to revolve merely around the transmission of knowledge, which is not the purpose of schools (Hester 1994, p. 6). Hester further argues that a 'learningful' school is a place where teachers and students must find meaning in their 'intermingling' experiences, a task which is both creative and self-generative. The study of History is more than the collection of facts, as explained in *What is History*? (1987, p. 1). The acquisition of critical thinking skills not only benefits young students in schools and students at the university, but will also help when they leave school and enter the world of work or perhaps in confronting problems in daily life (Flores, Matkin, Burbach, Quinn & Harding 2012, p. 212). Thus, in an attempt to inculcate critical thinking in students, it was decided to take up an action research project.

Stages in Educational Intervention

Activity 1 — Discussion/ Question and Answer

(Understanding 'history', 'historian' and 'primary source' through questioning)

Various researches emphasise the importance of asking the right questions to stimulate students' critical thinking skills. These researches call for the need to integrate questioning techniques into class discussions to support an educational environment where students can demonstrate and practise critical thinking skills (Snyder & Snyder 2008, p. 95).

Initial discussion with students, and their responses on the pretest gave an idea to start the educational intervention with a brief presentation on 'what is history'. The intention of this presentation was to dispel the idea that history is merely the study of long-past events and long-dead people. The topic was introduced by explaining that history does not have to be about such events or people, but that it can be about the events in the students' own lives, or events that happened in their States that are important to them.

The students were then encouraged to gain a better understanding of the role of a historian and the sources historians use to construct historical narratives through questioning. First the words 'historian' and 'primary sources' were written on the blackboard. Students were then asked to explain these terms using their own words. After a few minutes, students were asked, 'Who is a historian'. A couple of students suggested that—

- 'a historian is an actual historical personality or a person that historians would study'.
- 'a historian is someone who knows about history'.

Next, the students were asked to think about 'what primary sources are?' They had a wide range of answers, but the most common were 'sources we use', 'sources we get', 'sources used long ago', and 'sources that historians need'.

Students were then asked to think of all the activities in which they were involved during the previous 24 hours. The students were asked to provide any evidence that proves they existed during the last 24 hours. Several answers were given, such as—'My father saw me doing my homework yesterday at my house'. This student suggested that his father could vouch for his existence. Another answer was, 'I left my book at my friend's house yesterday'. In this case, the book would be the proof of the student's existence. At this stage, the students were asked—'Are there any answers that do not involve or depend on people as proof of your existence'? To this, one student responded—'I went to a doctor yesterday and he prescribed some medicines for me' as proof of existence. Another answered, 'My attendance has been marked in the attendance register'.

Then there was a discussion on how these answers tell a story about a past event or place and are primary sources. The discussion about primary sources continued, as students were shown different primary sources from the period of ancient Indian history that they were studying. Artefacts were discussed, and the students were asked why each source was relevant to the period of ancient Indian history. While reviewing the artefacts (for example, replicas of goddess, seals, pots, etc.), the students began to discover, through instruction and open discourse, how primary sources are the tools that historians use, to tell a story.

Activity 2 — Analysing Primary Sources

Written by real people dealing with complex issues and problems of their times, primary sources have a unique capacity to engage students in the study of the past (Maloy & LaRoche 2010, p. 52). The use of primary sources is one of the most engaging ways to support students' higher order thinking skills (Woyshner 2010, p. 36).

In keeping with the previous theme, an excerpt was shared with students from the lesson 'Ashoka, the Emperor who Gave Up War' in the prescribed social science textbook in history '*Our Pasts I*'. The students' task was to analyse the account of 'Ashoka's inscription describing the Kalinga War'.

Before the lesson started, the students were divided in groups. In a class of 34 students, there were seven groups — six groups consisting of five students and one had four students. When the students were seated, it was explained what the activity is about and what is expected of them. It was also explained that a historian who wanted to know more about this excerpt would ask questions about it and critically analyse the elements within the excerpt.

The students' first task was to read carefully the excerpt given in the textbook, then discuss the words or ideas that occurred to them when reading the excerpt, and finally, write down answers to the questions provided to them. One person in each group had to write down the words and another student had to read out the answers. The students had to make a list of all the words or ideas they collected by reading the excerpt. The following questions were posed.

1. Is the excerpt a primary source or not?
2. Who wrote it/got it written?
3. When was it written—at the time of the event described or later?
4. To whom was it written? Why was it written?
5. What does it say? What does it tell about the past?
6. What are the keywords and what do they mean? What is it about?
7. Can we trust what it says? Was the person there?

Many students' responses for question 1. and 2. were similar. The students believed it to be a primary source, as the description in the excerpt is from Ashoka himself. It was then revealed to them that the excerpt is from an inscription by Ashoka in which he expresses his remorse over the Kalinga war.

With regard to question 4. most of the students said that the massacre perpetrated during the Kalinga war, left deep impressions on Ashoka, and that he was full of remorse. As a result, he decided to get his ideas inscribed for both, the future generations, as well as for people in general, so as to keep them away from war.

The students' responses for question 5. were varied, but it still revolved around the same theme.

One student said, 'It tells us that kings fought wars and annexed other areas, and that wars affect everyone in the land'. Another student pointed out, 'It also tells about the repentance of king Ashoka who, after seeing a lot of bloodshed, decided not to wage war anymore and instead work for 'dharma'.

The two questions that seemed to be the most challenging to the students were question number 3. — when was it written — at the time of the events described or later?, and 7. — can we trust what it says? Was the person there? At first, the students did not seem to know where to begin their investigation for this question, so their attention was focused on the line where it is mentioned that Ashoka defeated and conquered Kalinga eight years after becoming king. Then, the students were given a clue that Ashoka's formal coronation took place in 269 BCE. Then they were asked, 'Based on the information, can you figure out when was it written?' The students then made educated guesses about the time with responses such as, 'I think the inscription was written somewhere after 261 BCE'.

With regard to question 7. one student said, 'The inscription is about the conquest of Kalinga by Ashoka and his repentance thereafter'. Another student said, 'Ashoka is addressing people in this inscription in the first person and expressing his remorse for unleashing terrible violence against Kalinga'.

The lesson was concluded by saying that since this is Ashoka's own edict where he is saying what he himself experienced, it is more trustworthy and genuine than any other later textual account of the same event.

An assessment of the activity entails that the students managed to respond to the given excerpt and gave their understanding of what happened during the period. It is also evident that students can apply logic to the historical events by studying excerpts and discussing ideas with fellow students.

As the lesson concluded, the students were asked, 'How would we change the definitions of historian and primary sources, knowing what we now know?' As a whole class, the students co-constructed a new definition for historian as 'someone who looks at excerpts to learn about history'; and the new class definition for primary sources became 'the things used to prove that something exists, and that give us details or provide evidence about the past'.

As the lesson came to a close, a final effort was made to authentically relate the content of the lesson to the students' lives by asking them to compare the role of a historian to certain television shows with investigative formats. The students came to realise that in certain television shows, the characters conduct investigations and analyse evidence sinilar to the way historians do.

Activity 3 — Multiple Perspectives

Citing various works, Savich (2009, p. 2–3) finds the use of multiple texts, which allow students to see different viewpoints and perspectives on historical issues and problems, as an effective strategy for improving the critical thinking skills. But at the same time, he cautions that the use of multiple texts be supported with specific instruction by the teacher.

The next lesson opened the students' minds to different perspectives of historical events and taught them to think more critically about historical information and sources. The purpose of the lesson was to show that people see things differently from different standpoints.

To build on this idea, the students were introduced to the topic — 'Revolt of 1857'. In this lesson, the students were expected to understand and identify that there can be different viewpoints on the same topic and that different viewpoints can send different messages to those who read it. For this, a reading of selected translated extracts from *Our Empire Story, Told to Boys and Girls* (H.E. Marshall, 1912) was done by the investigator followed by watching parts of the movie The Rising: Ballad of Mangal Pandey (K. Mehta 2005).

During this lesson, the students were to arrange themselves in groups of four or five. In this lesson, first excerpts were read to students. Thereafter, they had to read the extract and discuss among themselves the questions given to them. The next day, first they were shown the movie and were given time for discussing the questions and writing down their answers. The third day was allocated to listening to answers from the individual learners in the groups.

The activity for this lesson contained the following questions.

1. What is the content of Marshall's text and the movie the Rising: Ballad of Mangal Pandey?
2. How is the issue of the greased cartridges dealt with in these?
3. How is the outbreak of rebellion depicted in these?
4. How are the rebels depicted in each of these?
5. What acts of violence are depicted in Marshall's text and The Rising?
6. Who are the heroes and villains in the two representations of 1857?
7. How are the results of 1857 depicted?
8. Can you think of a reason to explain the viewpoints of the two—the writer and the director?

The group work was successful in many ways. Even though the questions were short and required short answers, some students in their respective groups argued about what to write down. For the investigator, that was a positive outcome because students felt confident to express what they thought were the correct answers. It did not matter because students were debating possible answers to questions. Although many groups worked diligently on trying to find out the answers, individual learners in certain groups were

playful and not willing to participate in the activity.

However, the group work seemed to work well and most students participated in the lesson. The students in each group jotted down the responses and read it out to the class. It appeared, judging from the way students responded to the questions, that most of the questions were answered, or attempts were made to answer all the questions. The answers provided by the students differed but it was again clear that students struggled to interpret information.

Many students found the last question challenging. In order to facilitate, the investigator had to explain that the two accounts of 1857 offer very different versions of the historical events, their causes and implications—Marshall's history is a part and parcel of the imperialist venture and is an unabashed celebration of the British rule in India, while the Rising: Ballad of Mangal Pandey is a contemporary Indian take on the same event, but from the exact opposite point of view, depicting the legitimate struggle of the Indians against the British oppressors. One student answered, 'Well, the British administrators have one side to the story, and the people in India have another side to the story'.

When asked if every rendition of every historical event would be the same, the students all agreed that they would differ—that every historical event would be remembered or interpreted differently by the people who rule and people who are ruled upon. Finally, the students were asked, what they should do when looking for credible information about historical events? The class reached a consensus that they must search in multiple places to find information and then evaluate this information carefully. The students learned that they can confidently use historical information only after they have considered multiple perspectives and evaluated information critically.

At this stage of the research, it appeared that the students were beginning to learn how to think critically about the historical content given to them. Some authors regard the ability to think independently and autonomously as an indication of a critical person (Paul, Binker, Martin, Vetrano & Kreklau 1989, p. 2). The students were beginning to show these dispositions to think critically when given the opportunity to do so. They may have written the words directly from the extract but their ability to identify or distinguish between fact and opinion was significant in their development to becoming autonomous thinkers.

The students were also able to identify that what was written or shown is not necessarily the truth. In discussions about these two after the class, many students said that they are starting to understand that the content of history is not necessarily a fact, but someone's 'opinion' or interpretation of events. It was an

indication that some students could see that two different viewpoints were expressed.

Reflection on Educational Intervention

This action research project was aimed to instil critical thinking skills among the students of elementary stage of school education. The experience, nevertheless, made the investigator more sensitive to the needs of students and much more critical and reflective of one's own teaching practice.

During the process of educational intervention, it was observed that while a majority of the learners actively participated in the discussion, some of them were trying hard to cope with the classroom activities at their own pace, and a remaining few giggled and were quite distracted. But during the course of intervention, the children in these two categories keenly involved themselves in the ongoing activities. The students seemed to respond much better to Activity 3 relating to multiple perspectives, as they did not have to rely on textbooks, and were given the opportunity to respond spontaneously. This was, however, not the case at the beginning of the intervention. The fact that they were willing to ask probing questions about the textbook is evidence that they started to think more autonomously and critically.

When reflecting on the methods of teaching employed to improve critical thinking skills in the classroom, one can conclude safely that students welcomed the change from passive memorisation of content, to analysis and comprehension.

Given an opportunity to ask questions, and their engagement in group tasks, apparently helped evolve a new and a creative history classroom, strengthening critical thinking skills among elementary stage children. The following responses of students, upon completion of the study, support this.

- Madam wants us to think for ourselves.
- We must not accept everything we read in textbooks.
- We can write our own history.

On the closing account, this educational intervention offered a new way of looking at learning—that learning about an idea is not the same as living with that idea. It is viewed as a means to feel and think about a way of life.

Reflecting on intervention helped to understand that it is possible to construct knowledge in collaboration with teachers acting as facilitators of learning.

Limitations of the Study

This study is confined to one school and one specific stage of education with which the investigator was attached for three months. The techniques that were used to collect and analyse data were applied within a particular time period, with limited resources.

Findings

This research study showed that the student-centred teaching methods provided a better understanding of history, resulting in improved critical thinking skills. When the results from the pretest and post tests were compared, the student-centred teaching method resulted in higher average test scores. The results demonstrated that majority of the students in the class preferred this method of instruction. It was learnt that students were more assertive and could relate to history and historical issues much more meaningfully in the classroom. Through this method, they could not only comprehend the issues but also relate them to their own lives. Students made efforts to articulate and to express their own ideas and responses to historical events and conducted small projects independently, rather than solely relying on textbooks. The inquiry approach was more effective than memorising facts. Students were able to view history as constantly evolving and changing, and recognise that history is not dead and static. This research project demonstrated that students learned to appreciate the complexities, uncertainties, and ambiguities inherent in historical issues and problems.

Conclusion

The findings of the study showed that when critical thinking skills were integrated in lessons, students gained a deep and meaningful understanding of history. Students find history as an interesting subject. Based on the test score results (pretest to post test), one can conclude a substantial difference in the level of understanding of students. The history teachers should be encouraged to implement similar activities that stimulate historical inquiry.

By employing the activities delineated here, teachers can help students to develop genuine historical and critical thinking skills. More importantly, the students who enhance their historical and critical thinking skills today, will be aware of, and prepared for the academic, civic, and societal challenges that await them in the years ahead.

This study was an attempt to teach Class VI students to think critically about the content in history textbooks. The findings of the study cannot be generalised in a wider setting. The study, however, has a potential to give directions for further researches in the area of history education, in general and school education, in particular. When the intervention was being conducted, the changed classroom atmosphere was visible. Students appreciated the different forms of teaching methods and were open for discussion. The reflective pedagogy with the idea of stimulating critical skills amongst Class VI students made the action research project very fulfilling. Teachers are placed in a unique position to develop the critical and creative abilities of all learners. This

research project highlights the idea that action research is a viable option that teachers and other practitioners can use to improve their practices.

As a learning model, the inquiry-based intervention provided an environment, encouraging children to extrapolate learning from their experiences and ability to apply them, as much as the historians do. Piaget (1952) shaped our understanding of the thought processes of children. Children search for reason and often ask questions related to causality and justification. This is equally important to learn history because stimulating 'why' and 'how' questions at an early age encourage children to think about the objective of teaching history in schools. However, the responses from the learners signified that bringing change in one's classroom is not impossible if one is determined to bring change.

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A Study on Social Writing and Zone of Proximal Development

Sunaina K.*

Abstract

The present study explored the impact of social writing on the participation of children in literacy activities in the classroom. Conducted on Class IV students from a rural government school in Kerala, this study adopted qualitative methods for data collection and analysis. Vygotsky's theoretical concepts, 'zone of proximal development' and 'collaborative learning' were used to design and experiment a new pedagogic approach called the 'social writing programme'. The findings of the study support a shift from the 'traditional, mechanical classroom writing activities' to a social writing activity, as it offers a space to children who can use writing as part of their social life. Participation in this social writing programme either individually, allowed the child to select his/her own text for writing, write at his/her own pace, write in small groups, where he/she could use writing as a tool for engaging with the self and negotiate her/his positions as well as identity. She/he is found to be benefitting from the reifications of his/her identity to write and what she/he finally writes. The social writing programme created a new set of semiotic and personal resources that motivated students more than the traditional writing activities.

Introduction

Writing received tremendous attention of the researchers and school education experts after the publication of Emig's Composing Processes of Twelfth Graders in 1971. His book brought the attention of researchers to writing, as a distinct social-cognitive activity, than reading. This increased attention to writing research led to the movement 'Writing to Learn (WTL)' in 1970s. It claimed that writing could serve

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more modest roles in learning, through articulating, understanding and rehearsing material to fix it in memory. The WTL literature produced only a micro theory of the writing process and lacked a macro picture. It had a predominantly cognitive orientation and failed to see writing as an emotional, social and cognitive activity.

The WTL literature ignored the writing that promoted critical thinking, the development of a positive identity among learners and motivated the learners to continue education for longer periods of time. Ball (2006) noted in one of his articles that, during the course of the development of WTL, there was an uprising feeling in the research community that most school curricula and research on teaching-writing continue to reinforce the values and interests of the middle-class European and American parents and their culture, and omit the experiences of the racially, ethnically, and linguistically diverse students. These discomforts led writing research to turn to sociocultural theories and methods emerging from psychology, anthropology, sociology, linguistics and semiotics. The sociocultural approaches to writing reject the simple equation of writing with material texts or acts of inscription, and treating writing as chains of short and long term production, representation, reception and distribution. Writing, on the other hand, was seen as an activity that involves dialogic processes of invention. Texts, as artefacts in the writing activity, and the inscription of linguistic signs in some, are parts of streams of mediated, distributed and multimodal activity.

This approach asserts that writing is not something like tracing out letters and making words out of them; instead the writing pedagogy should be designed in a way that it can encompass the enormous role that writing plays in children's cultural development (Vygotsky 1978). When you write something, you are actively engaging in a semiotic system, and an important feature of this system is that it is second-order symbolism, which gradually becomes direct symbolism. This means that the written language consists of a system of signs that designate the sounds and words of the spoken language, which in turn are signs for real entities and relations. Gradually, spoken language—the intermediate link—disappears, and written language is converted to a system of signs that directly symbolise the entities. It is clear that mastery of such a complex sign system cannot be accomplished in a purely mechanical way; rather it is the culmination of a long process of the development of complex behavioural functions in the child. Rico's studies (1983) on cerebral hemispheric correlates of writing, comply with this argument. She refutes the established left brain focused literacy pedagogic approaches of our curricula by

arguing that children are inherently more right-brained, more creative, more imaginative, more curious, more concerned with connecting the wholes, more natural, visual and more emotional. Since the right hemisphere is more responsible for these things, our literacy activities, especially writing, should be designed in a way that it could be produced by right brain stimulation. Dehaene's (2010) studies on human interaction with written language and enhancement of brain functioning conclude that written language engagement is highly dependent upon neuronal recycling. It further enhances brain responses at least in three different ways. Firstly, it strengthens the organisation in visual cortices. Secondly, literacy allows the written language to activate spoken language network in the left hemisphere. Thirdly, literacy refines spoken language processing through enhancing a phonological region called *planum temporale,* and by making available an orthographic code in a top-down manner. This active dialectical relationship between the brain and written language largely contributes to the cultural development of an individual.

By taking the above mentioned concerns into account, the present study analyses the scope of a pedagogic approach, the social writing programme developed from collaborative learning principles. Adopting from Vygotsky (1962), the principles of collaborative learning widen the space for joint intellectual efforts among the students, and between the students and teachers through engaging individuals in interdependent learning activities, ensuring writing activities to take place within the zone of proximal development of students. When a teacher works on a student's zone of proximal development in writing, she/he gives a supportive hand to expand the student's actual level of development into potential level of development. In this process, the teacher considers the student as a social and cultural being and together, they engage in more challenging learning tasks designed for the cultural development of the student. It provides a learning atmosphere loaded with positive emotions and supportive peers. In traditional classrooms, the child is a lonely learner. These learning tasks bring various social contexts and cultural knowledge into the activities. For children, it should be a part of the most important social activities of their age, such as play, drawing and oral language activities. It requires a supportive social context and a supportive presence of adult members, whereas traditional classroom writing narrows down these possibilities. When traditional classroom writing views writing as mere text production to express what the children have been taught and

what they have learned, it denies the students the opportunities to master an important cognitive and cultural tool. It would not consider the idiosyncrasies of the individual members of a classroom, instead it applies a uniform model. It is mostly a silent and solitary activity. In the social writing programme, a mature, interactive adult group member replaces the role of a traditional teacher who holds a superior position in the power hierarchy in the classroom. The mediational process, set in by providing challenging tasks in the 'social writing programme' will be effective if the adult member has a clear understanding of the children's zones of development. In a regular classroom, a very small percentage of children may get special attention and care from the teacher. As a result, few children participate and enjoy the identity of a participant (which accords power to them), while others remain at the periphery of this activity and develop an identity of a non-participant, a slow learner, a non achiever. So, this study is based on the argument that we do not need to design writing pedagogies in view of stimulating both the hemispheres separately. What we need to do is to connect writing activities to their natural life and natural development through collaborative learning activities.

Methods

Sample

The sample of the present study consisted of 32 students (17 boys and 15 girls) from Class IV of the Government Senior Basic School, Pazhaya Lakkidi. For this study, Kerala was chosen because despite the state's high literacy rate, the rural government schools lag behind in developing literacy skills among the primary school children. Class IV was chosen because, it is the terminal stage of primary education and the children are expected to have gone through the necessary classroom interventions for developing adequate reading and writing skill. There was only one division of Class IV, and all 32 students were used for this study. The students were divided into experimental and control groups using the fish bowl random sampling method. The experimental group comprised eight girls and eight boys each. The control group consisted of seven girls and nine boys.

General Procedures

I had chosen three general methods for data collection using qualitative research techniques—the interview method, observation method and focused group discussion.

The whole process of data collection began with an attempt to understand the ongoing practices of classroom writing through reading of the textbook and handbook of

Class IV of SCERT syllabus, followed by classroom observation and intervention. The first week was spent in Class IV for classroom observation. Since my focus was to observe the classroom writing activities of Malayalam language, I attended the Malayalam class everyday. As a non participant observer, I sat in one corner of the classroom without making any deliberate interaction with the students and the teacher inside the classroom. After five days of classroom observation, in the second week, I divided the 32 students of Class IV into two groups— experimental group and control group. After the group formation, members of both the groups were subjected to a pretest. The pretest was an individual activity in which students were asked to write on two themes— (1) an unforgettable event or incident that happened in their life in the last month, (2) share the most memorable day you had in school in the last month. These same themes were given in the post test also.

The pretest was an individual test on writing activity. An analysis of the Malayalam textbook and hand book provided directions to design the pretest. An analysis of children's performance in the pretest was carried out with the help of a checklist framed according to the insights I gained through the classroom observation of children's writing activities. The aim of analysis of the pretest was to understand their actual level of development in relation with writing activities. After the evaluation pretest of both the groups, the intervention programme in social writing was carried out for the experimental group only. I, the researcher, took the role of the adult member in the intervention programme. The control group was not a part of the intervention programme. Hence, they did not get any special treatment in writing skills apart from the conventional classroom training. Both the groups were attending their regular school classes during the period of this study. Members of the control group named the intervention programme as *ezhuthu kalari*. There were seven writing activities in the programme module. The first activity was designed before entering into the field, with the help of the theoretical understanding received from the literature of previous researches and established theories that is, Vygotsky's theoretical concepts. The other six activities were evolved out of the classroom observation, my experiences with the first activity and a primary analysis of students' participation in the same.

It took six weeks to complete the social writing programme. Each social writing activity developed in a way that it incorporated both individual and group activities.

Focused discussions with the class teacher were conducted throughout these seven weeks of data collection.

Parents' interview was scheduled in the last week of the programme. With the permission of the school head mistress, letters were sent to each parent through their children to inform them about an unofficial parents' meeting. Very few parents turned up for the meeting. Majority of them were mothers. In most of the cases, both the parents were going for manual labours. There was an annual cultural event organised by the school on the second last day of the social writing programme. The parents were invited for that. I utilised this opportunity to meet the parents of the children in the experimental group for the purpose of an interview. The approach of the parents was positive and they co-operated well with the interview. A post test was conducted on all 32 students and the performances were assessed using the same parameters. The findings of pre and post tests were compared. Among the various qualitative data analysis methods, content analysis is selected for the present study. The data generated through interviews, observations and focus group discussions were content analysed.

Example of Social Writing Activities

Chithra-natakam (Drama Evolved out of Children's Drawings)

This activity aims to establish a link between the children's drawing, with playing and writing. It comprises 10 steps. The design of this activity offers enough space for individual activities, group activities, sharing of knowledge and to scaffold the young group members' potential by the adult member.

Step 1. Providing a space for free drawing for children (individual activity)

Step 2. Discussion and interpretation of each individual's drawing (collective activity)

Step 3. Space to prepare a story out of these discussions or narrations

Step 4. Preparing a story out of the children's narratives by the adult member

Step 5. Making children write the story (individual activity)

Step 6. Discussion, so as to write a script from the story

Step 7. Preparing a script

Step 8. Making small groups and practising the play

Step 9. Enactment of the play by each group

Step 10. Evaluation of each group's play by other groups

Analysis

This table shows the linguistic analysis of the written scripts of control group and experimental group in pretest and post test.

Table 1

Linguistic Analysis of Written Scripts of Control and Experimental Groups in Pretest and Post Test

Control Group			Experimental Group	
Criteria	**Pretest**	**Post Test**	**Pretest**	**Post Test**
Spelling	Mistakes are very common	Improved to a minimal level	Mistakes are very common	Improved
Punctuation	Absent	No improvement	Absent	Using full stops
Paragraphing	Absent	No improvement	Absent	Absent
Ideas in a logical order	Less evident	No significant improvement	Less evident	Improved
Proper sentence structure	Mistakes are common	No significant improvement	Mistakes are common	Improved
Evidences of self-editing	No evidences Careless writing	No improvement	No evidences Careless writing	Evident with correcting pen marks and usage of eraser
Main idea carried through	Present	No changes	Present	Improved
Closing paragraph	Concluding sentences are present in very few students' scripts	No changes	Concluding sentences are present in very few students' scripts	Written in a lengthy, single paragraph; concluding sentences are present in almost all students' scripts
Use of dialogue or quotations	Absent	No changes	Absent	Present but limited
Number of words	Less	No improvement	Less	Increased but substantially
Number of sentences	Not following proper sentence structure	No improvements	Not following proper sentence structure	Improved substantially
Number of paragraphs	No paragraphs	No changes	No paragraphs	Written in a lengthy single paragraph
Number of sentences per paragraphs	Idea of paragraph is absent	No improvement	Idea of paragraph is absent	No improvement

Use of 'I'	Present	No changes	Present	Frequency has increased
Use of 'We'	Present	No changes	Present	Frequent and use in appropriate situations
Use of 'She' and 'He'	Absent	No changes	Absent	Present, but less frequent; mostly use names

Discussion

'School, a good school
Here I learn,
I play and eat my midday meal with curry
School, a good school.'

(School nalla school
Padippund schoolil.
Kaliyund schoolil
Schoolil chorumund
Kootanumund schoolil
School nalla school)
(in Malayalam)

An eight-year-old student composed these lines as his contribution to the wall magazine. In these lines, he is trying to portray what the school meant for him. What turned this child who was sitting in a corner with little attentiveness to the classroom activities, (always engaging with only one of his classmates, drawing many pictures on small pieces of papers whenever I asked him to write) producing not more than one line in the initial stage of the writing programme, to become the one who writes freely with lots of emotion, without any external compulsions? In this section, I intend to present and theoretically interpret, the similar findings arrived at in the analysis of data, thematically.

Self and Writing—From a 'Non I' Activity to an 'I' activity

- *'We do not know writing…', 'we do not like writing, it is very difficult…', 'I do not like writing…, my hand pains while writing', 'do you have any plan to make us write? I will not come here then...'*

These were the responses of the children in the first focused group discussion conducted on the first day of the social writing programme. In contrast to this, the last focused group discussion revealed the following responses.

- *'Give us papers to write, than to draw…. we like to write…'*
- *'Why are you coming late for the class…give me stories to write… can I write my own story…'*

These responses indeed reflect a new attitude among children towards writing. They started using 'writing' to carve out a space for themselves in the act of writing. They showed increased willingness to spend time in school; the children started asserting, negotiating and defending their voice through writing. They often extended

the writing activities to home. A student's response, *'I pronounce it as "enthra"... So I am going to write it as "enthra", not as you said'* reveals the development of the autonomous self around writing. In another incident, a student demanded her autonomy as 'why do you want me to first write on this butterfly and draw later... actually I want to draw this beautiful butterfly's picture first and will be writing a poem on it later... I am going to do that'.

These observations show how the members of the social writing programme come closer to the act of writing—the act once they kept as an 'external' entity. We can understand this phenomenon by comparing with Boesch's (1993) explanation on the ontogeny and phylogeny of violin.

'As a boy, I used to tighten a blade of grass between my thumbs and by blowing into the gap formed in this way, produced a sharp, oboe like sound... each time doing so, I transformed nature into "culture", shaping natural raw materials into forms apt at producing sounds which did not occur in "pure" nature... it made me a creator. Making object's sound, thus is a bit like taming animals; it transforms a resistant non I into a compliant extension of the "I".'

In the case of learning a violin, once the individual is able to produce a sound that he is striving for, the artist and the violin form a symbiotic whole. In Boesch's (1993) words, 'the individual is blending into the object and the object is melting into the *"I"*.' If we replace 'writing' with violin, the writing activity becomes an object which was external to the self in traditional classrooms. Participation in a social writing programme created a new social space with a new set of rules for the child. The child here could select his own text for writing, write at his own pace and write in small groups. In this new space, it was considered normal to take the help of peers, raise questions and assert one's unique writing styles. The child could use the text from his own community without undermining the everyday knowledge, advance his own as well culturally rooted meanings and participate in the meaning negotiation process with the group members as well as the researcher from his own position. He did not have to reject his own idiosyncrasies except, that he had to allow it in a contester terrain he could produce something of his own where, writing becomes both a skill and a tool for self expression. He received appreciation for acquisition of the skill and was congratulated for the product. He could use writing as a tool for establishing a positive identity and for negotiating his positions. He gradually identifies with the writing activities and owns products. Such a process of engaging in the social writing activity reduced the 'I'-'non I' gap by making writing, which was once an external entity, to become writing a part of his self. He

starts to produce and realise his own voice through this object.

The scene of children engaged in self editing and self correction of their text was initially a surprise for me. They were doing it on their own without my instruction (observation note, 26 February 2013).

Careless writing and incomplete sentences were replaced by well organised text and complete sentences. Spelling mistakes gradually decreased. The marks of using eraser and, cutting pen marks told the effort children took to edit and correct their text. The willingness and interest they showed over my recommendation for peer reviews, self editing and peer editing also spoke about the children's strife for more 'perfect', 'beautiful' and 'appropriate' written work and it showed substantive involvement of children in every aspect of writing and also a desire to produce a good written piece. This tendency had grown in the group gradually as the programme proceeded. S1 was a very active boy inside and outside the classroom. But, he wrote slowly, and most of the time left his work incomplete. Close observation during intervention revealed that, he was highly confused with spelling and lacked confidence in spelling. He was told by the adult member, 'Do not worry about spelling. Whatever you are writing is not wrong. Finish your work first and later we can make your spellings perfect'. Subsequently, his writing speed increased. He could produce his ideas on paper and could complete his work. He was found enjoying writing activities. He started writing with pencil and corrected the mistakes with an eraser by taking help from his friends.

Drawings-symbolic plays-writing

Once I inquired to know the children's interest in writing and other classroom activities. The responses were not very surprising as they were exactly proving the theoretical assumptions and the findings of other researches.

Children enjoy drawing and playing. Among other academic activities, they prefer reading first. Their least preference goes to writing. All the social writing activities were designed, based on this understanding and the theoretical findings such as the history of written language enters through the appearance of gestures as a visual sign in a child's developmental trajectory. 'Gestures are writings in air, and written signs frequently are simply gestures that have been fixed' (Vygotsky 1978).

The opening session of the social writing programme was designed with a free drawing session. Drawing and painting activities were included in the successive activities too. Drawing equipment was also made available to children. It created ample space for me to engage with children's favourable social activity. It also made a tension free atmosphere within the group. These drawing activities further led me to peep into children's

various zones of development. Later, the platform opened for 'make believe plays' and free play activities, which had a positive impact in creating collaborative social activities. I observed a replication of the theoretical conclusions and previous research findings in the field.

The curriculum design and the pedagogical practices of the contemporary Kerala education system are founded in Kerala Curriculum Framework (KCF) 2007, which is based on the NCF 2005. It is theoretically rooted in the social constructivist paradigm. The analysis of the handbook, other resource books and textbook showed that it gave very little attention to 'writing' by all means, as a literacy, a cultural and as a social activity. An analysis of the textbook for understanding the nature of writing activities shows that there was only one activity which connects writing with drawing. Other possibilities of encouraging free writing and social writing have not been taken into consideration. The curriculum, pedagogy, and the teacher who completely depends on textbook instructions, are together closing the opportunities to experience writing as an activity which can enhance children's social life.

Development of Linguistic Competence—A Close Textual Level Analysis

An analysis carried out to understand the effect of linguistic features of children's writings brought out by the experiences in the social writing programme steal our attention back to the implication of Vygotskian theories in the literacy development of children.

An improvement in spelling and punctuation can be interpreted as the influence of peer collaboration in learning literacy skills. I, as an adult did not prepare any instruction module to intervene in children's surface level linguistic skills. Correcting or pointing out the spelling mistake in children's note book, which is a common practice in classroom, was completely avoided in the intervention programme. Instead, I first observed children who are less confident in these linguistic features. I grouped those students who came to me for checking their spelling, with children who are more competitive in respective language skills, to create an environment for helping each other. This peer collaboration was very effective. Incidents of self-correction and self-checking were also observed in the intervention programme. The playful writing activities were helping children to develop these linguistic skills. These findings are supported by the arguments of Cazden (1976) on the development of metalinguistic awareness through playful language activities.

Cazden (1976) has argued that play with language helps children develop 'metalinguistic awareness'—the awareness and understanding that language is a system that can

be manipulated and exploited in a variety of different ways. It seems likely that play with written language can help children develop greater awareness and understanding of how it can be manipulated, of what can be done with it.

Feeling of an authority over one's own writing was observed when I avoided surveillance, and imposing the ideas of right and wrong in the activity they were exposed to. These strong feelings of connecting the 'self' with the activity, leads to a constant strife for improvement in the same activity. The amount of text produced by the children increased drastically as the social writing programme progressed. We can read this finding with the statement of a child during a discussion.

'Here, we write what we know and what we want to write. In classroom, writing is very difficult. The teacher asks us to write about things which we do not know'. (observation note, 6 March 2013)

Initially when they presented their self in writing, it was only 'I'. Gradually, when the sharing behaviours increased and children started engaging and enjoying group activities, they started using 'we', 'they', etc. The children rarely used the forms 'he' or 'she'. Instead, they used names.

Children's Autonomy

All the individual members who were included in the social writing programme were given pretest to understand their actual level of development in the domain of writing, by the adult member. Each child was provided with various degrees of support and multidimensional facilitation to stretch their actual level of development to their potential level of development in writing activities.

To work on each member's zone of development, the social writing programme created a context—a space created for collaboration with peers and adult. It developed and implemented an instruction model, where the adult's instructions merge with the collaborative action, and children and the adult can engage in dialogues which open possibilities for even negotiations and debates. It avoids a correction process of children's writing and other activities by the adult, which is a common and normal practice in formal classrooms. It creates a platform for self-correction, self editing, and correction and editing with the help of peers. Throughout this process, the adult provided an assistive and facilitative support. Therefore, along with learning the adult's meanings, behaviours and technologies in the process of collaboration, the role that children played in the interaction also gets recognised and emphasised. Rogoff and her colleagues gave attention to this phenomenon of the ways in which young children influence the adults who try to intervene in their zones of development (Rogoff, Malkin & Gilbride 1984). Here, it is not a mechanical process of

socialising children to the cultural norms of the society and adult's meanings; rather it aims at the stimulation of development of critical consciousness of children to learn about the society, culture and meanings through dialogues.

The intervention programme gradually worked, and each child's development in using 'writing' as a tool for learning bloomed within their zones of development. When the children started enjoying the writing activity as any other socially-celebrated activity, they could extend 'writing' automatically into other social environments. At home, they themselves reached out to collaborate with parents (especially the mother) and the siblings. They extended this collaboration their classmates and friends. The two excerpts from the dialogues between the adult member and the students given below exemplify it.

Excerpt 1

(Dialogues with students during the second activity—Daily Diary Writing)

Me: Okay… S1, why didn't you write?

S1: (did not say anything for a while and later when I probed, he said) I don't like this activity.

Me: Why?

S1: I do not want to write anything at home. I will write here with my friends. I will not get anything to write at home. I rarely remember things you said, at home.

Me: Okay…fine…you write it from here. No problem. Does everyone want to write it here?

Students (together): We will write it at home, but we like to sit and write here together.

Me: Why do you like to write it here?

S2: Then we can clear our doubts with you…we can ask our friends also.

Me: So, did you try to write at home?

S1, S2, S3, and S4: Yes, we tried. But we forgot many things.

Me: Why didn't you take help from your parents or other family members?

S3: They don't have time for this.

S4: They don't know how to do this.

S2: Uh…our teachers always scold us if we take help from others in our homework.

Me: Okay, no issues…You can write from wherever you are comfortable.

This shows students' reluctance in seeking help from their family members. They seldom shared their school experiences with their parents and siblings. These dialogues reflect the role of school in disconnecting their classroom from home.

Excerpt 2

(Dialogues with students towards the end of the second activity)

Me: Very good S1, usually you write very less. But how could you write this much yesterday?

S1: I wrote it at home and my mother helped me.

Me: Do you like taking help from your mother now?

S1: Yes, that is why I could write more and my mother also liked it. She asked about you and our *ezhuthu kalari* (a Malayalam term for old, traditional village schools in Kerala).

I congratulated him for taking help from his mother and for writing it at home. It had a serious impact on others. In the following days, I could observe that most of them discussed their diary notes with their family members and wrote the diary at home.

The fifth activity, storytelling (*katha kathanam*), had a great impact on connecting the school work with the home. This activity consisted of storytelling sessions by each member of the group. After every storytelling session, the members decided to write that particular story in their notebooks. Each of the members was expected to narrate these stories to at least one person at home and to note down the listener's responses. On the third day of this activity, I observed in S1's notebook that she narrated some stories to her younger sister other than the ones we discussed in *ezhuthu kalari*. I noticed in S2's and S3's book that they have made some changes in the story when they wrote it down. It not only shows their increased involvement in the activity but the growing connectedness between their school activities and home. Children's willingness and increased initiative taking behaviour in writing activities proclaimed that they were able to consider the writing activity as a part of their social life and as something meaningful. This finding is being supported by the observation made by Mc Lane (1990) in a small community of an after-school programme in Chicago, their children discovered playful and communicative uses of writing, which they found interesting and personally meaningful. He said, 'Children attained this achievement in a supportive social context in which children can obtain the kinds of assistance they need to learn to communicate with writing'.

Social Writing and Emotions

Activities of the intervention programme were designed and carried out by taking specific care to create positive affective plane in the instructional practices. Relating Vygotsky's understanding of the importance of collaboration in education, we can see that a successful teacher-student relation that serves as a solid platform for successful learning begins when teachers exhibit a sense of emotional openness, especially at the initial stage of teaching. The rapport building session of this intervention programme was an icebreaking session for the students and the adult member. One week was spent to develop a positive relationship and connectedness between the adult member and the students in the experimental group as well as among the students. The gender-based role divisions and the hierarchy formed

on the basis of 'good student-bad student' concept in their classroom were the obstacles in developing an atmosphere of positive emotions, sharing behaviour and mutual respect in the programme. Those who were considered as the 'good students' were trying to be authoritative at the initial stage. They were trying to control those who were in the lower strata of this hierarchy. Since the power distribution in the intervention programme was different from that of the classroom, initially the students seemed a little confused in performing their new roles in the intervention programme. Those who were getting less attention in the classroom looked puzzled when they were expected to come to the forefront of the activities, even if they wished to. A gradual shift was observed in students' overt emotional expressions and sharing mentalities as the intervention progressed. Students started sharing their personal experiences with me and with their group members. A trust was built gradually among the members. Boys and girls participated in the activities with increased feelings of togetherness and mutual respect. Incidents of throwing abusive words with gender connotations were negligible towards the end of the intervention sessions.

These findings of this study reiterate that effective Zone of Proximal Development (ZPD) can be established and maintained through culturally developed emotions. These emotions act as motivators and lead to the child's higher mental functions and to cultural development, as a whole. A mastery of learning activities (tools) leads to a mastery of environment, while the mastery of environment, in turn, leads to the mastery of one's own behaviour. That is, whatever was experienced by the group is later experienced by the individual. Similarly, in the words of Vygotsky (1982), 'what the child can do in cooperation today, he can do alone tomorrow.' From these findings it can be said that the collaborative instruction model and approach of ZPD opened enormous possibilities for enhancing the students' overall development. An observation from the parents' interview given below shows the way in which students' critical thinking developed that they can analyse the concrete conditions to raise the voice for their rights.

A student's mother said, 'He gets a storybook from the madrasa every week which includes some moral and religious content. Now he is demanding us to get other children's magazines to read'. She added that, they can not afford these expenses (this student is the boy who always asks for children's magazines we keep in *ezhuthu kalari,* to take home). Once his mother scolded him for his disturbing persistence for getting child magazines which were provided in the training programme. He argued by saying, '*Here father gets a newspaper daily, then why can't you get me at least one storybook that I love to read*'. It proves that participation

in a collaborative learning system enhanced the students' self-awareness, self-confidence, self-esteem and critical thinking.

Vygotsky was always a strong opponent of treating the intellectual and affective aspects of human life as separate. In his view, emotions play an important role not only in the process of students' learning, but also in the process of teaching (Vygotsky 1982). Hence, the educational advantage of facilitating appropriate culturally developed emotions during the process of teaching and learning is not limited to students. The increased friendliness and positive emotional bondage with the students elated my own motivation level and helped me to play the role of the adult member more effectively. My daily diary notes show that the closeness and the increased willingness of the students led me to explore more about various developmental aspects other than literacy skills. This exploration further helped me in designing the rest of the activities in the intervention programme more effectively.

Emergence of a Community of Readers

Since reading and writing are considered as two interdependent literacy skills, it is important to check the impact of the social writing programme on the reading behaviour of children.

The reading corner *(vayana vedi*) arranged in one corner of the room was always found crowded with children. Changes in the reading behaviour were observed not only in their increased willingness to read but also in the selection of books and text content. For example, during the first week of the social writing programme, children showed interest in reading children's magazines and storybooks that were provided in the programme. They were eager to read the stories with lots of pictures and very little text (*chithra kathakal*). When the training programme progressed, children also changed their reading habits. They started reading long stories and initiating discussions with other children and the adult member; started asking the meaning of words, clarifying doubts, etc. Their curiosity in reading was aroused. For instance, a student came with the book he got to read. He was reading about the different varieties of tortoise in the world. He showed me the different varieties and started talking about them. After sometime, the other children gathered around and everybody wanted to know about the different varieties of tortoise. That student explained to everyone by reading the content.

These are the evidence for the natural development of a community of readers. When the social writing training programme is designed, even though it wanted to test the impact of the writing programme on the reading and other learning activities of children, it did not frame a well-structured instruction module for reading activities throughout

the training programme. Reading activities were subsumed to each writing activity. Indirectly, these children were exposed to the act of reading. Once they found it as enjoyable and serving the needs of their social activities, they started participating more and were able to engage spontaneously. They could break the barrier between the activity and the self.

Children's increased reading interest was reflected in their writing. They used different characters from the stories they read, in their writings. They could expand and write different versions of the story they read.

The interdependence of two literary activities can be found here. Apart from this, in a daily activity—'reading in groups', children are asked to read aloud what they have written, in the whole group and to the small group in order to create a collaborative learning programme. I, the adult member of the group, also read my writings for the groups and in turn read out children's writings for the others in the group. I utilised children's relatively increased interest in reading than writing, to form a community of readers. I designed this aspect of social writing from the findings of an empirical study conducted by Graves. Graves and his colleagues (1999) have developed a collaborative approach to teaching-writing. The teachers implementing Graves' approach emphasise writing as a complex process. Graves urges teachers to 'publish' what children write, in order to make it available to the classmates, so that children can write with the expectation that they will be read by their peers.

There were similar research conclusions. Gundlach (1983) stated, that children like to read each other's writing, and they are likely to write with more purpose, and try to write more effectively, if they know their writing will be shared. Children, like most writers, need some kind of interested audience to read and respond to what they write; they need as Gundlach (1983) has put it, to be part of a 'community of readers and writers'. Here, the present study proved it again.

Major Findings of the Study and Conclusion

A noticeable increase was found in the quantity of the written text produced and in the willingness to spend time on writing activities. Significant improvements at the surface level linguistic characteristics, such as 'spelling' and 'punctuation', improvements in the inner layer linguistic characteristics, such as 'presentation of ideas in a logical order', 'following proper sentence structure', 'evidence of self-editing', 'carrying main ideas throughout the scripts', 'writing concluding sentences' were found to be some of the signs of positive impacts of the social writing pedagogy on children's writing skills. The way the children, of the experimental group engaged in writing activities changed, as

they were more responsive, reactive, interactive and spontaneous in seeking help from the adults as well as peers in the writing activities. It was found that students were ready to spend their scheduled playtime in the social writing programme. Another phenomenon observed in this study was, that when the children started enjoying the activity of writing as any other social activity, they extended this activity to other social environments, like home and classroom. Moreover, children started asserting, negotiating and defending their voices through writing. They could use writing as a tool for establishing a positive identity and for negotiating their positions. The gradual development of positive emotional plane in the intervention programme further opened many possibilities for the overall development of the students. A community of readers had emerged within the experimental group.

The overall results of the study recommend that social writing activity, grounded in collaborative learning principles, has a potential to approximate the formal learning to the culturally situated learning styles and processes. Unlike those learning activities which are based in conventional learning styles where children are expected to attain equal level of skills in writing from the beginning of the academic year and they are exposed to uniform sets of instructions, the social writing approach began with an understanding of each student's unique developmental zone in writing skills. A positive and dynamic relationship developed between the adult member and children, while exploring the possibilities of 'scaffolding' in social writing, led the children to engage in writing activities in novel ways. It creates fearless, self-engaging learning spaces. It provides adequate space to children, their voice and creativity. The seven major activities used in the study which evolved through a constant interaction between the students and adult members helped the children to expand their writing skills from their actual level to the potential level. Exposure to a set of self-evaluation methods, devoid of rigid concepts—right and wrong, conventional exams, dictation and rote learning—helped many children to accept their less developed actual level in writing without any inferior feelings and further helped them to move towards the potential level in a self-motivated way. Inclusion of 'teacher's version presentation' not only helped to break the teacher-student hierarchies but reduced children's inhibitions as a learner.

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Understanding the Natural World through the Use of the Earth Science Kit

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Abstract

School Science is an agglomeration of the three basic disciplines of science viz., physics, chemistry and biological sciences. Little attempt has been made so far in the curriculum, specifically to understand the dynamic processes of the Earth to comprehend and appreciate the wonder and awe of nature, observations of which have led to conceptualisation of the intricacies of science itself in human history. The inclusion of Earth Science in science curriculum can be a strong option to understand science holistically. The National Curriculum Framework 2005 highly recommended the use of the science kit for effective learning, through hands-on, minds-on learning approaches. In this regard, an attempt has been made to facilitate an understanding of the earth and its various processes of dynamism by developing an Earth Science Kit. This Earth Science Kit helps in understanding the many facets of nature and phenomenon of Earth. Different activities related to the Earth's behaviour have been compiled in the kit to quench the thirst of insatiable minds.

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Introduction

Humans have always been curious about the world around them. The inquiring and imaginative human mind has responded to the wonder and awe of nature in different ways. One kind of response from the earliest times has been to observe the physical and biological environment carefully, look for any meaningful patterns and relations, make and use new tools to interact with nature, and build conceptual models to understand the world. This human endeavour has been conceptualised as Science, (*NCERT Position Paper on Teaching of Science* 2005, p. 1). Yet, school science is basically an agglomeration of three basic disciplines of science viz., physics, chemistry and biology. Very little attempt has been made so far to understand the dynamic processes of the Earth and the universe to understand science holistically at the school level. A closer look for example, at one of the basic disciplines of science, say physics, reveals that its foundation revolves around the general analysis of nature. Physics is a branch of fundamental science because the subject of study of all branches of natural science like chemistry, astronomy, geology and biology are constrained by the laws of physics.

Geology or Earth Science as a subject, however has been neglected over the years as a part of the school curriculum, although many concepts of science have evolved from observation of the Earth and Nature itself. It is felt that a better understanding of the Earth, universe and its processes even at the school level would do wonders in helping students conceptualise science.

It will always be better if a student knows and comprehends certain geological or natural aspects. For example, while the universe evolved around 16 billion years ago, our Earth was born 4,600 million years ago. Our Earth also took a long time in terms of millions of years, to generate the lithosphere, the hydrosphere, the atmosphere and finally, the biosphere. As soon as life sprouted on Earth, biological evolution was also triggered. Our Earth is still dynamic, both internally as well as externally. As a consequence of internal dynamism, we experience earthquakes, plate movements, volcanism, while climatic variations for example, are manifestations of external dynamism. When a common man enjoys the beauty and awe of nature, seldom does he/she realise how much time and pain it took for the Earth to evolve and shape its splendour. It is felt that if this effort of nature is realised by the students, our future generations will act reasonably and the goals of sustainable development will definitely be attained.

In this backdrop, the designing and development of an Earth Science Kit was conceptualised at the North East Regional Institute of Education, NCERT with the help of a few Earth scientists of the region.

Science Curriculum

Science is a dynamic, expanding body of knowledge, covering ever new domains of experience. The curriculum should engage the learner in acquiring the methods and processes that lead to the generation and validation of scientific knowledge, and nurture the natural curiosity and creativity of the child in science. To ensure holistic understanding of the physical world, the integrated curriculum of science should highlight the dynamic processes of the Earth under a different unit of science as earth science or geology and thus, portray the unified nature of science. The curriculum, in the process will provide opportunities to the learners to attain some basic levels of scientific literacy on Earth Science.

Development of the Earth Science Kit

To ensure that science plays an emancipative role in the world, students should be engaged in learning science as a composite discipline at the secondary stage. Compared to the upper-primary stage, more advanced technological modules need to be designed so that learning can be joyful, and achieved by engaging the mind, hands and tools. Science education in India is still far from achieving the goal of equity, enshrined in our Constitution. The development of science corners and providing access to science experimentation kits and laboratories, in rural areas are also important ways of equitably provisioning for science learning (NCF 2005). No reform, however well motivated and well planned, can succeed, unless a majority of teachers feel empowered to put it in practice. To empower the teachers to handle Earth Science effectively, an Earth Science Kit was developed at the North East Regional Institute of Education, NCERT.

Special Features of the Earth Science Kit

Keeping in mind the standard of readers, a total of 37 activities (Table 1) are incorporated in the Earth Science Kit.

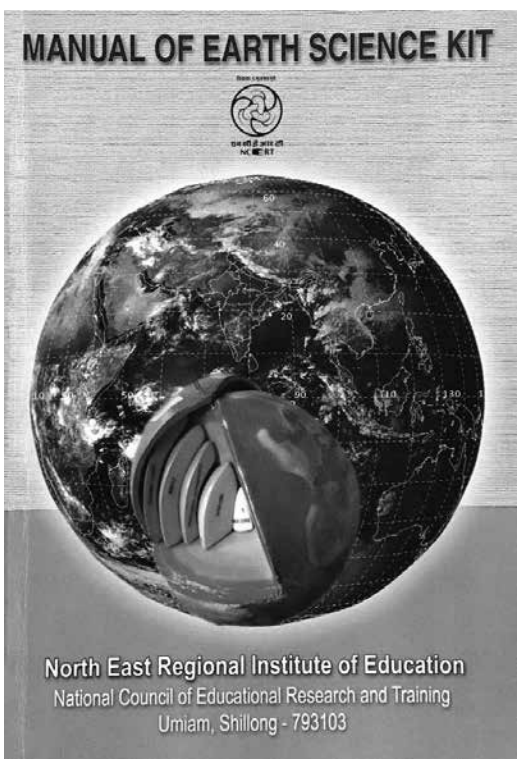

Figure 1. Manual of Earth Science Kit developed at NERIE

Table 1

List of Activities Incorporated in the Earth Science Kit

S.No.	Activity
1.	Appreciating the beauty of our Earth from space
2.	Looking at Earth from different elevations
3.	Viewing various natural Earth features from space
4.	3-D view from stereophotographs
5.	Understanding the Earth and its interior
6.	Earth as a magnet
7.	Did the continents drift?
8.	Plate tectonics theory
9.	Knowing about earthquakes
10.	Volcanoes—windows to the interior of Earth
11.	Locating a point on the Earth's surface
12.	Determine the geographical north-south direction and locate yourself
13.	Sketch, map and directions
14.	Scale of maps
15.	Overlapping maps
16.	Understanding time
17.	Understanding natural crystalline and amorphous substances
18.	Understanding common rock forming and ore forming minerals
19.	Understanding the types of rock: igneous, sedimentary and metamorphic
20.	Identifying sandstone, limestone and shale
21.	Understanding rock structures
22.	Geological time scale
23.	Let us make fossils
24.	Let us play with fossils
25.	Understanding fossils
26.	Petrified wood—what is that?
27.	Understanding drainage pattern
28.	Understanding watershed
29.	Deserts: the abode of sands
30.	Climate zones of the world
31.	Climatic regions of India
32.	Soils of India

33.	To determine pH of the soil and level of acidity in soil
34.	To determine the 'available nitrogen' status of the soil
35.	To determine the 'available phosphorus' status
36.	To determine the 'available potassium' status
37.	Knowing crude oil and its by-products

Activities are drawn from the space and the Earth's external as well as internal dynamism and related phenomenon. This Earth Science Kit helps in understanding the Earth's three layers that is, below the surface, on the surface and above the surface. A manual (Figure 1) has also been developed to carry out the different activities with the equipments in the kit.

The activities in the manual are structured in such a manner that the students can question, explore and finally, discover the concepts involved. The manual is based on an approach, wherein attempts are made to inculcate scientific enquiry and understanding of the subject matter among the students. In the process of doing the activities using the Earth Science Kit, not only will the students feel the excitement, but it will also give them the opportunities to comprehend subject matters which may not be achievable by a reading of the textbooks alone. The success and usefulness of the kit with the manual will depend on how best the teachers can motivate the students to use the items, rather than a mere demonstration by them. Of course, this requires time and keen interest on the part of the teachers as well as the students, to know the unknown and the science behind the natural phenomenon. It is hoped that the teachers would also enjoy making use of the kit and the manual.

Enlisted herewith are a few activities to reflect the attributes and objectives of the manual. Shown

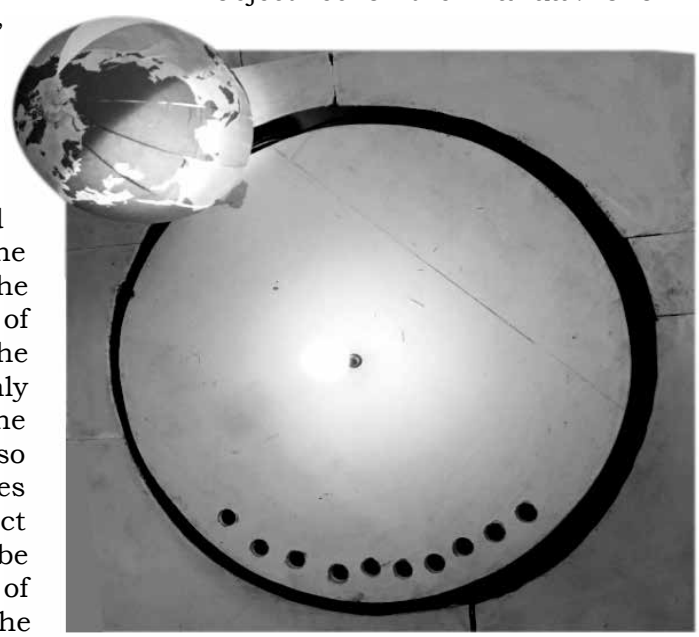

Figure 2. A mechanised model to explain the Earth's rotation and revolution

below for example, in Figure 2 is a model to explain the rotation and revolution of the Earth around the Sun in a slightly elliptical orbit. When the model is switched on, the Sun at the centre remains stagnant and the Earth rotates as well as revolves around it. The tilt of the Earth's axis is also shown. This model explains the variations in solar insolation on the Earth's surface. The Sun is shown as a small body here as it is 150 million kilometres or 0.000016 light years away from the Earth. The concept of time variations across Earth can also be worked out from this model.

Above the Surface

Under this, the activities have been prepared in such a manner that the students would identify how the topography of the Earth looks like from the space or atmosphere, and why it looks so.

Activity—3-D View from Stereophotographs

Objectives of the activity

- To visualise the 3-D view of an area using a stereoscope
- To understand the depth perception which is visualised through the stereoscopes

What is required to perform this activity?

- A lens stereoscope and a stereo pair
- Preliminary knowledge of what a lens stereoscope and a stereo pair are

How will we proceed?

- Let us check the lens stereoscope given in the box along with the stereo pairs. We then try to describe the lens stereoscope and stereo pairs (stereophotographs).
- Let us fix the given stereo pair in a flat surface (on a table).
- We open and place the stands of the stereoscope on the stereo pair.
- Let us look into the stereo pair through the stereoscope and adjust the eye piece according to your eye base (distance between both the eyes).
- Then we look into the stereo pair for sometime till we get the 3-D view of the terrain.
- Once we get the 3-D view, we can describe the features with regard to the area and slopes.

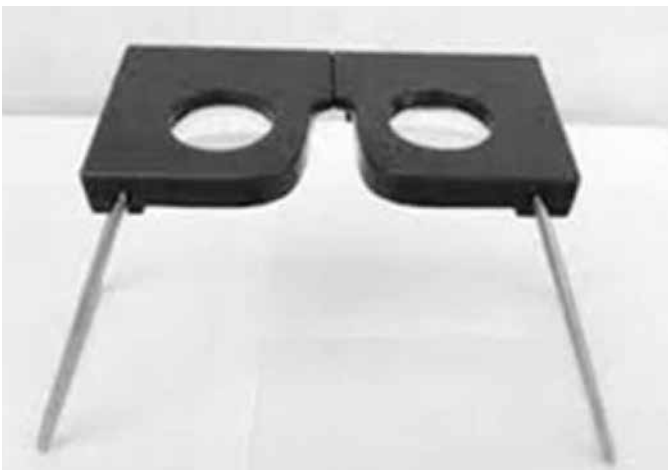

Figure 3. A simple lens stereoscope

What have we learnt?

- When we look at two photographs of the same area taken from two different points using a stereoscope, a three-dimensional model of the area can be viewed.
- The same principle is applied when we view the 3-D film in a cinema hall by wearing 3-D glasses.
- The depth perception which is visualised through the stereoscopes can be explained by the principles of parallax.

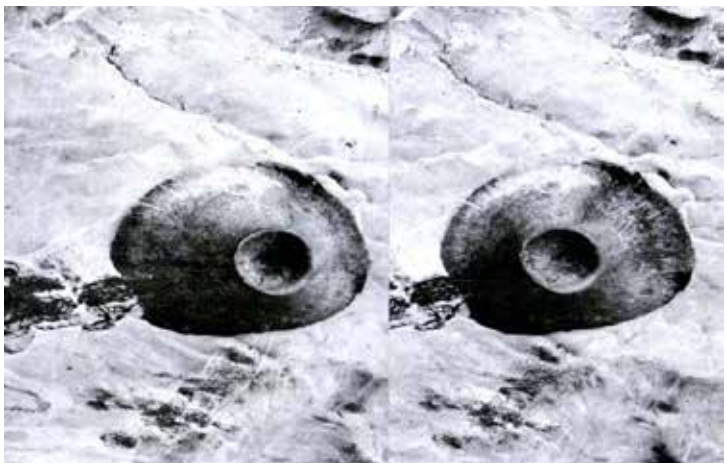

Figure 3(a). Stereophotograph of a volcanic cone
(Source: Miller and Miller 1961)

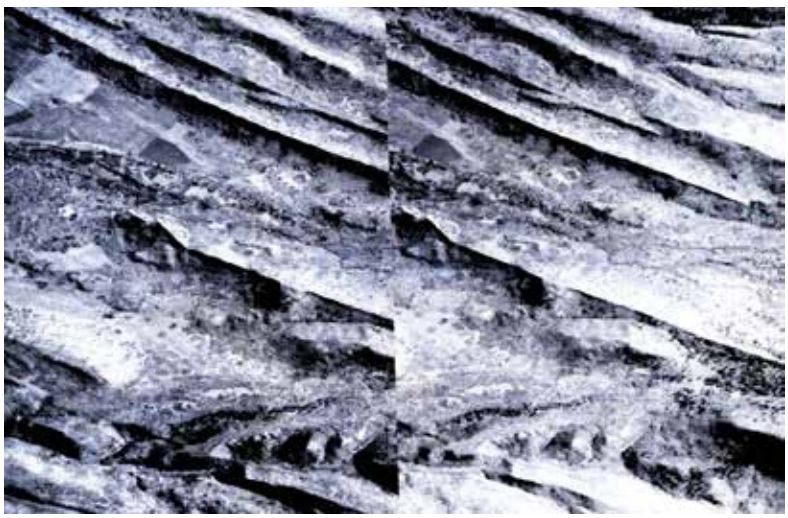

Figure 3(b). Stereophotograph of an area having ridges and valleys
(Source: Miller and Miller 1961)

Below the Surface

Under this, activities have been prepared in such a manner that the students would identify some attributes of the Earth's interior.

Activity—The Earth as a Magnet

Objectives of the activity

- To identify that the interior of our Earth comprises three big units—crust, mantle and core
- To understand that the rotation of Earth at a very high speed produces a magnetic field
- To identify that the magnetic field of the Earth trends north-south

What is required to perform this activity?

- We need to have a magnetic 3-D globe model. A magnetic 3-D globe has been developed and given in the kit.

How will we proceed?

- We need to know that our Earth has three major layers—crust, mantle and core. The core has a lot of iron and nickel and its outer part is liquid. We know that our Earth revolves around the Sun as well as rotates around its axis at a very high speed. Do you know the speed of rotation of our Earth?
- You must have seen a bicycle fitted with a head lamp. Have you noticed how the lamp glows? The more you speed up your bicycle, the more will the light glow brilliantly. Try to understand the mechanism with your science (physics) teacher's help. Have you heard about the Oersted experiment? Observe the figure given below. In figure 4(a), the magnet is aligned parallel to the Earth's magnetic field when the circuit is not switched on. As soon as the current flows, the magnet gets deflected. Now observe figure 4(b). This means that when an electric field is generated, a magnetic field is also triggered at right angles. Let us now relate this with our Earth. Our Earth rotates at a very high speed similar to a generator producing electricity. As such a magnetic field is also generated within the Earth, which is very important.

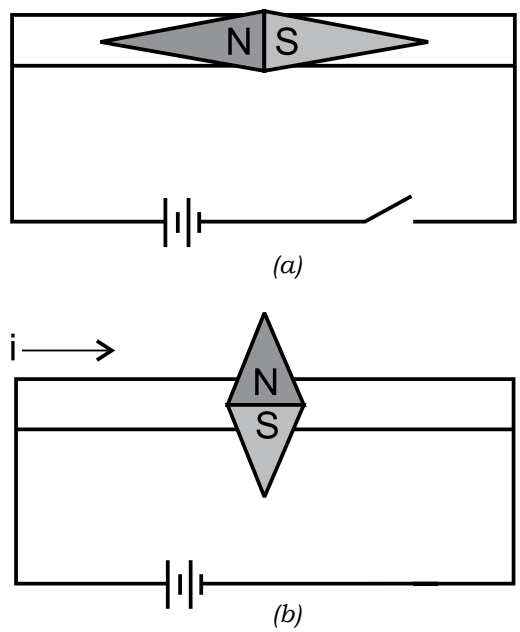

Figure 4(a–b). Electromagnetic framework to carry out Oersted experiment

- You will find it interesting to know that our Earth has two poles—the geographic north-south and the magnetic north-south. Both the poles do not overlap with each other in the sense that the magnetic pole is a little deviated from the geographic pole. When you place a small compass on your palm, it points to the magnetic north.

- You may do another small activity. Bring two bar magnets close to each other. What do you observe? Both the magnets may be parallel to each other but they are aligned opposite to each other, isn't it? This is because, like poles repel. Now, when we place a compass and note the north direction, is it the actual north of the compass? In fact, what the compass needle points to is the geographic north and that end is the south end of the compass.
- Let us take the 3-D globe provided in the kit and hold the metal rod with our right hand. With your left hand, put a small compass on top of the globe very close to it. We observe that the magnet is almost parallel to the north-south trend of the globe. Now let us swing the

Figure 5. Magnetic globe of the kit

globe on a soft surface left and right. We will observe that the magnet also gets deflected. This model has been prepared to help one understand that the Earth is a big magnet which deflects magnetic material.

What have we learnt?

- The interior of our Earth comprises three big units—crust, mantle and core.
- The Earth rotates at a very high speed and like a generator, it produces a magnetic field.
- The magnetic field of the Earth trends almost north-south.

Activity: Let us Play with Fossils

Objectives of the activity

- To understand the fact that fossils of different ages are not seen within a single rock layer
- To understand that fossils and the rock layers within which the fossils are found, are of the same age
- To estimate the age of the rock layers from the embedded fossils and identify the beds chronologically

What is required to perform this activity?

- Pottery clay or plasticine
- Container to make dough
- Water
- Fossils that you had made
- Permanent marker pens or colours of different shades
- Small plastic toys of different creatures, preferably as shown in the geological time scale chart under Activity 22 (see Table 1) may be used.

How will we proceed?

- Use the fossils that you made in the earlier activity.
- Let us make pottery clay dough by mixing requisite quantity of water in the container or plasticine, in good amounts.
- Now let us flatten the dough and make layer(s) as shown (Figure 6(a) and (b). We can add different colours to the clay layers too.
- Let us insert the fossil toys within the clay layers as shown in Figure C. We have to be careful while inserting fossils into the layers.
- Look at the pictures of organisms shown below. Check their names and their age from the geological

Figure 6(a). Layers that can be made out of pottery clay or plasticine.

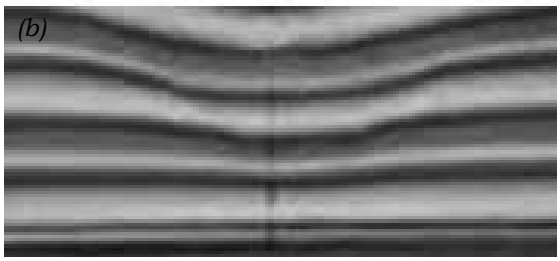

Figure 6(b)

time scale chart. Can we put all these organisms in a single layer?

- Let us try to make fossils of different ages and repeat this game.

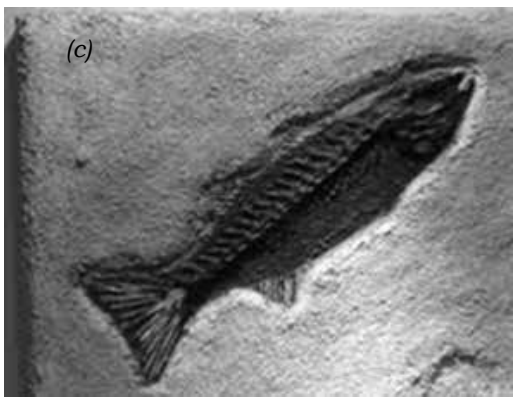

Figure 6(c). Shows how fossils may stay embedded in rock layers.

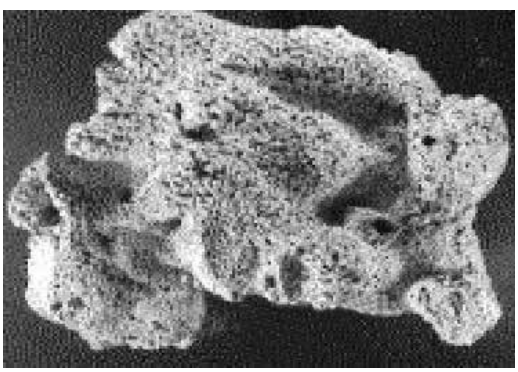

Figure 6(d). Sponge

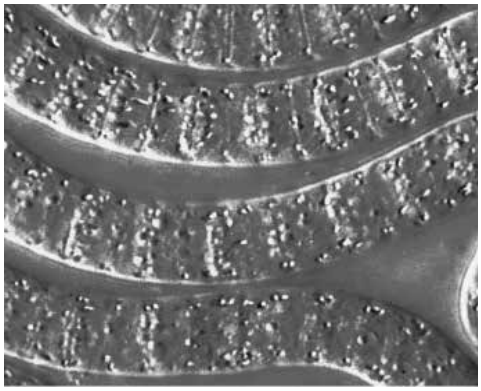

Figure 6(e).Cyanobacteria

Figure 6(a–e). Different fossils which inhabited our Earth in the geologic past

- Can we try to know what is meant by the concept 'superposition of strata'?

What have we learnt?

- Usually, fossils of different ages are not seen within a single rock layer usually
- Fossils, and the layers of rock within which the fossils are found, are of the same age.
- The age of the layers of rock may be known from the embedded fossils.
- In layered sedimentary rocks, the lowermost layer is usually the oldest.

On the Surface

Under this, activities have been prepared in such a manner that the students would identify some attributes of the Earth's exterior.

Activity—Overlapping maps

Objectives of the activity

- To understand that soil is a degraded product of rocks

- To understand that hilly areas (in the present case) are composed of hard rocks while there is soft alluvium near the river.
- To understand that there are different soils in different regions because of differences in the nature of the underlying rocks

What is required to perform this activity?

- We need to know that functionally, maps can be of different types.
- We need to have different functional maps of the same scale, tracing paper, scale and pencil, eraser, etc.

How will you proceed?

- We have with us three maps of Kamrup district of Assam—relief and slope, rocks and minerals, and soil [Figures 7(a), 7(b) and 7(c)].
- Let us trace the soil map on a tracing paper.
- Let us overlap the traced map over the relief map and the rocks' and minerals' map.

What have we learnt?

- The soil is a degraded product of rocks.
- Hilly areas (in the present case) are composed of hard rocks while near the river, there is soft alluvium. Accordingly, the distribution of rocks and minerals vary.
- You find different soils at different regions because of differences in the nature of the underlying rocks.
- *Note for teacher: A student may ask about transported soil.*

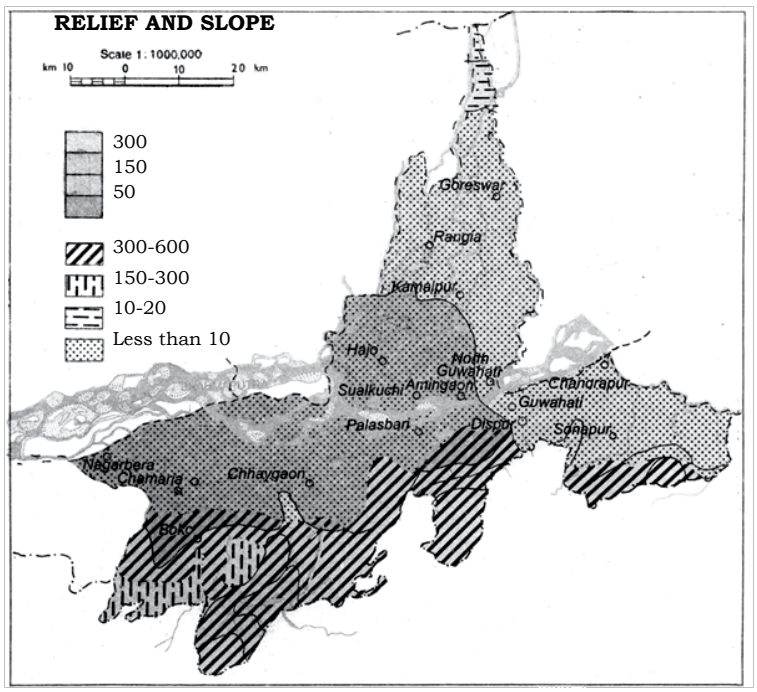

Figure 7(a). Relief and slope map of Kamrup district, Assam
Source: National Atlas and Thematic Mapping Organisation (NATMO), Geological Survey of India and Directorate of Geology and Mining, Assam

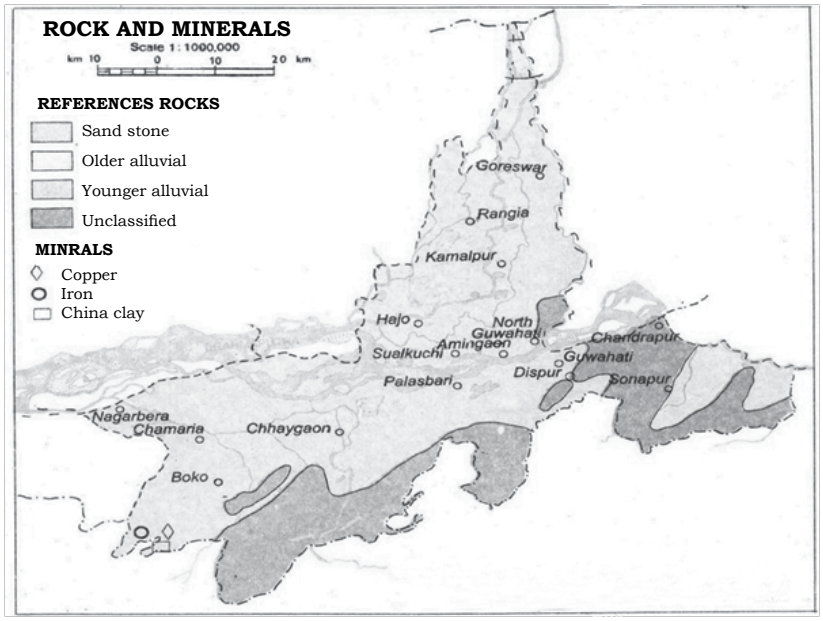

Figure 7(b). Rocks and minerals map of Kamrup district, Assam
(Source: NATMO, Geological Survey of India and Directorate of Geology and Mining, Assam)

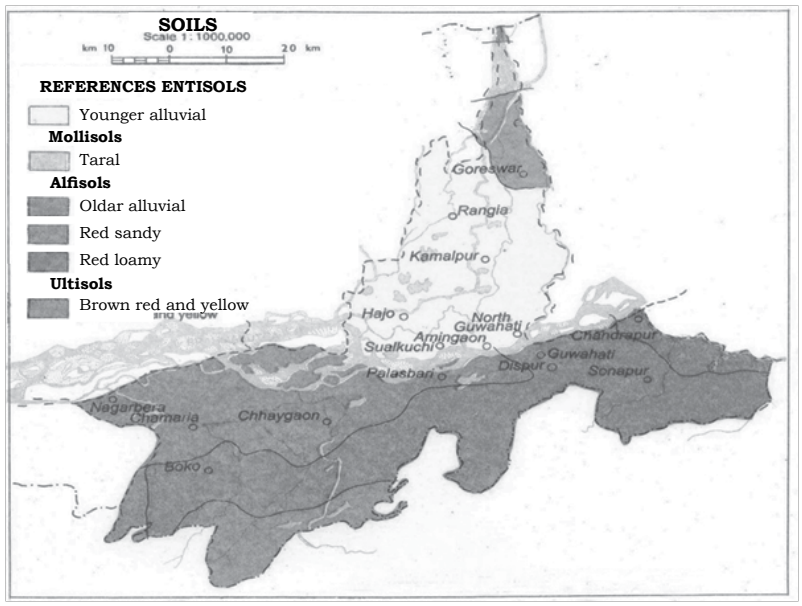

Figure 7(c). Soil map of Kamrup district, Assam
(Source: NATMO, Geological Survey of India and Directorate of Geology and Mining, Assam)

Conclusion

The process of education and attainments thereof, has an impact on all aspects of life. The use of the science kits has been highly recommended in NCF 2005 for effective learning through hands-on, minds-on learning approaches. The focus on improving learning levels would need improvement in classroom processes, child-centric activities in classrooms, larger recruitment of better educated younger teachers and cluster level leadership created among teachers, rather than relying on school administrative support structures and personnel.

The Earth Science Kits will be an essential alternative to the lack of any equipment to comprehend earth science in the schools and will serve as a supplement to the textbooks for introduction of Earth Science as a part of composite science at the secondary level. The kits have the following advantages—

- understand and apply the basic concepts of Earth Science;
- learn scientific enquiry skills of gathering information;
- user-friendly;
- portability from one place to another; and
- low cost and use of easily available resources.

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Effect of 5-E Model of Teaching on Higher Order Thinking Skills in Science at the Upper Primary Level

Ramakanta Mohalik* and Subhashree Behera**

Abstract

This study intended to find out the effectiveness of the 5-E model of teaching on higher order thinking skills (analysing, evaluating and creating) in science at the upper primary level. The pre test-post test single group experiment was conducted on 22 Class VII students of Nayagarh Girls' High School, Odisha, India. The investigators taught 15 lessons based on the 5-E Learning Model for the Chapter—Light, of Class VII, Board of Secondary Education, Odisha. The self developed test on higher order thinking skills in science having 30 items was used as the tool. The study found that there is a significant improvement in the higher order thinking skills of students taught by the 5-E model of teaching at 0.01 levels. The study has suggested many implications for the teacher, Teacher Educators, textbook writers and policymakers.

Conceptualisation of the Problem

Science is considered to be an essential part of the curriculum at the school level, as it affords the knowledge of facts and laws, and helps in achieving the main goal of education. It allows the learners to explore their world, discover new things and enhance their curiosity level. Hence, science has been given a core place in the school curriculum. So, the learning of science has become an unavoidable

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part of general education. The Kothari Commission (1964–1966) recommended that science should be taught on compulsory basis to all pupils as a part of their general education during the first ten years of schooling. The vision of science involved three factors—the learner, the environment (physical, biological or social environment) and the object of learning (science). Learning science includes learning scientific ways of thinking and knowing. This involves the development of conceptual and procedural knowledge, and scientific reasoning skills.

The National Curriculum Framework (NCF) 2005 recommended that science education is bridging the world of home and school so that children cognitively interact with each other. The aim of science education is to know the facts and principles of science and its application, acquire the skills, and understand the methods and processes that lead to the generation and validation of scientific knowledge cultivate scientific temper, critical thinking and freedom from fear and prejudice. It provides opportunities for the learners to make sense and enhance their understanding of the disciplinary concept. The basic aim of teaching any subject is to provide opportunities to the learners so that they can think, and are able to connect with their experiences. The aim of science education is comprehensive and stage-specific. At the primary stage, the aim of science education is to develop psychomotor skills; at the upper primary stage, science education is based on the hands-on experience, and emphasises on the acquisition of knowledge. The NCF 2005 mentioned that the main aim of science education at the upper primary stage is to develop a scientific attitude and thinking, creative ideas and problem solving among the learners.

According to constructivism, teaching is no more concerned with the mere process of imparting knowledge, but it is a process of constructing knowledge. In the constructivism approach, the learners are always at the centre. They are not empty vessels that we can pour our knowledge into; knowledge is situated inside the soul that they themselves have actively created. The formalisation of the theory of constructivism is generally attributed to Jean Piaget, who articulated mechanisms by which knowledge is internalised by learners. The theory suggested that through the process of accommodation and assimilation, individuals construct new knowledge from their experiences. Constructivist theories in science education focus on the question as to how an individual learns and find the ways to facilitate that learning in the context of a science classroom (Mintzes and Novak 1998). Constructivism is a theory of knowledge that argues that humans generate knowledge and meaning from an interaction between their experiences and ideas.

Constructivism is often associated with pedagogic approaches that promote active learning or learning by doing. Based on the constructivist approach, there are three major models—the Learning Cycle Model, the ICON Design Model and the 5-E Model of Teaching–Learning are in practice. Among them, the 5-E Model of Teaching-Learning is widely used in classroom teaching. This model was developed by R.W. Bybee in 1997 based on experiential learning. According to this model, instruction happens through five phases that is, engage, explore, explain, elaborate and evaluate.

Engage

The purpose of this introductory stage, 'engage', is to capture students' interest. Here, you can uncover what students know and think about a topic, as well as determine their misconceptions. Engagement activities might include a reading, a demonstration, or other activities that pique students' curiosity.

Explore

In this stage, the teacher provides students with cooperative exploration activities, giving them common, concrete experiences that help them begin constructing concepts and developing skills. Students can build models, collect data, make and test predictions, or form new predictions. The purpose is to provide hands-on experiences that can be used later to formally introduce a concept, process, or skill. In this phase, the learners get an opportunity to explore through all their senses.

Explain

In this stage, the learners articulate their ideas in their own words and listen critically to one another. The teacher clarifies their concepts, corrects misconceptions, and introduces scientific terminology. It is important that the teacher clearly connects the students' explanations to the experiences they had in the engage and explore phases. In this phase, the learners explain their understanding of concepts and processes. New concepts and skills are introduced, as conceptual clarity and cohesion are sought.

Elaborate

At the 'elaborate' point in the model, some students may still have misconceptions, or they may understand the concepts only in the context of the previous exploration. Elaboration activities can help students correct their remaining misconceptions and generalise the concepts in a broader context. These activities also challenge students to apply, extend, or elaborate upon the concepts and skills in a new situation, resulting in a deeper understanding. In this phase, the learners are allowed to expand the concept that they have learned, make connections to other related concepts and apply their understanding to real life situations.

Evaluate

In this phase, the teacher evaluates students' understanding of concepts, and their proficiency with various skills. The teacher can use a variety of formal and informal procedures to assess the conceptual understanding and progress towards learning outcomes. The evaluation phase also provides an opportunity for students to test their own understanding and skill.

This 5-E model is a recurring cycle of experience learning to the construction of knowledge. It is a systematically organised cycle that gives real science experiences that leads to the construction of knowledge. The 5-E Model of Teaching–Learning is an inquiry based constructivist conceptual change model (R.W. Bybee 1997). This model helps the learners in developing higher order thinking skills. Higher order thinking skills can be defined in terms of transfer, critical thinking and problem solving skill. Transfer means the students not only remember the things that they have learned, but can also make sense and are able to use those things. Critical thinking refers to reflective and artful thinking which includes reasoning, questioning, investigating, observing, finding and exploring the viewpoints. In terms of problem solving skills, the students must use higher order thinking skills to recognise the proper way to reach the desired goal. Problem solving skills enable the learners to find a solution that can not be solved by simply memorising. For the first time in 1956, Benjamin Bloom created the taxonomy with the aim to promote higher order thinking skills in education. This taxonomy provides a way to organise the thinking skills into six levels, from the simplest to the complex level of thinking. Anderson and Krathwohl (2001) revisited the taxonomy and made some changes. They divided the taxonomy into six categories, but named it differently that is, remembering, understanding, applying, analysing, evaluating and creating. This taxonomy reflects the different forms of thinking. Among the six, analysing, evaluating and creating come under higher order thinking skills.

Analysing

The analysing skill is the ability to visualise, articulate, conceptualise or solve, both complex and uncomplicated problems. Such skills include the ability to apply logical thinking to breaking complex problems into their component parts.

Evaluating

Students having evaluating ability can make judgment in science, based on certain criteria and standard. They can appraise, argue, judge, select, support and evaluate something.

Creating

Students having analysing ability in science can create a new product or point of view; can assemble, construct, create, design, develop, formulate and

write new things in new ways, and can put elements together to form a meaningful, innovative product.

The purpose of teaching science is to develop scientific process, attitude and temper among learners. This purpose can be realised only by following learner-centred methods of teaching. As per the NCF 2005, the constructivist approach of teaching must be followed in classroom teaching as it can develop higher order thinking skills.

Rationale of the Study

Learning is the process of using appropriate methods and material in order to reach in the most effective manner to achieve the predetermined goals. The 5-E model of Teaching–Learning is an appropriate model which provides a comprehensive idea and develops understanding on a concept. Grounded on the constructivist approach, the 5-E model of teaching–learning promotes higher order thinking skills by stimulating the students to explore, inquire and get experience. The 5-E Model transmits the critical thinking skill to students. It is a learning cycle model that facilitates learning and creates beneficial opportunities for students while learning.

Most of the study found that the 5-E Model of Teaching–Learning is an appropriate strategy to increase the level of achievement, scientific aptitude, scientific skills and critical thinking skills among students. Sen and Oskay (2016) found that there was a significant effect of the 5-E Model of Teaching–Learning on students' achievement in chemistry. Chowdhury (2016) reported that students taught through the constructivist approach score higher than those taught through the traditional approach and a significant difference was found between the mean scores on understanding, application and skills. Tuna (2013) found that a significant effect of the 5-E Model of Teaching–Learning on students' academic achievement in trigonometry. Bera and Mohalik (2013) revealed that there is a significant difference in the mean achievement score of students taught by concept mapping and convectional method of teaching at 0.05 levels and a majority of students expressed that concept mapping is really helpful for learning science and understanding the structure and interrelations of the concept. Raval (2012) found that the constructivist instructional programme was significantly effective on the entire sample as compared to the traditional approach. Verma and Tyagi (2012) found a significant difference between the mean scores of the experimental and control group on achievement, creative thinking and academic motivation in science. Walia (2012) conducted a study to examine the effect of the 5-E model on mathematical creativity on Grade 8 students, and found that the experimental group has higher post test scores than the control group. Tyagi (2010) revealed that the use of

constructivism in teaching affected elaboration, flexibility and creative thinking, but it was found to the no significant effect on originality. John (2005) found that when students were actively engaged in a computer stimulation of a science task, there was a promotion in higher order thinking skills among the students.

From the above research, it is found that studies were conducted on the effectiveness of the constructivist approach of teaching and its different models in enhancing achievement and thinking skills. But limited studies were conducted on the effectiveness of the 5-E model of teaching on higher order thinking skills (Chowdhury 2016, Walia 2012, Raval 201 and Tyagi 2010). Further, most of the studies were undertaken in English medium schools and few at the regional medium school (Sen and Oskay, 2016, Bera and Mohalik, 2013). In this context, the study on the effect of the 5-E Model of teaching on higher order thinking skills in science at the upper primary level is relevant.

Statement of the Problem

The present study would be stated as 'Effect of the 5-E Model of Teaching on Higher Order Thinking Skills in science at the upper primary level students of Odisha.

Objectives

1. To study the effect of the 5-E model of teaching–learning on higher order thinking skills (analysing, evaluating and creating) in science at the upper primary level.

Hypotheses

1. There will be no significant effect of the 5-E model of teaching on higher order thinking skills in science at the upper primary level. This hypothesis has the following sub-hypotheses—

1.1 There will be no significant effect of the 5-E model of teaching on analysing skills in science at the upper primary level.

1.2 There will be no significant effect of the 5-E model of teaching on evaluating skills in science at the upper primary level.

1.3 There will be no significant effect of the 5-E model of teaching on creating skills in science at the upper primary level.

Methodology

The investigator used the pretest-post test single group experimental design having 5-E teaching model as the independent variable and higher order thinking skills as the dependent variable for conducting this study. The Class VII students of Nayagarh Girls' High School, Odisha were taken as sample. The investigator prepared 15 lesson plans based on the 5-E Learning Model for the Chapter—Light of Class VII, Board of Secondary Education, Odisha. The sub chapters are—reflection of light; types of images; plane, concave and convex mirror. In order to measure the level of higher order thinking skills among students, the investigator prepared a test in science on higher order

thinking, having 30 items which was used for both pre and post test. The content validity of the tool was ensured by taking expert comments and suggestions during the tool development. The reliability of the test is .68. The collected data were analysed by using both descriptive and inferential statistics.

Analysis and Interpretation

For determining the effect of the 5-E model of teaching–learning on higher order thinking skills (analysing, evaluating and creating), the investigator compared the pre test and post scores by using t-test, which is given in the tables.

Table 1 indicates that the difference between the means of pre and post test analysing score is 3. The t-value is 8.060, which is significant at 0.01 levels. The p-value indicates that there is a significant difference between means of pretest and post test score of analysing. Hence, the null hypothesis 'there will not be significant difference between means of pretest and post test score of analysing' is rejected at 0.01 levels and we accept the alternative hypothesis. So, it can be concluded that teaching through the 5-E model significantly enhances the analysing skills among students. The pre and post test score of students in analysing skill is graphically shown in Figure 1.

Table 1
Comparing Pretest and Post Test Scores in Analysing

Group	N	Mean	Standard Deviation	Mean Difference	df	t-value	p-value
Pretest score in analysing	22	2.727	1.202	3	21	8.060	0.000
Post test score in analysing	22	5.727	1.420				

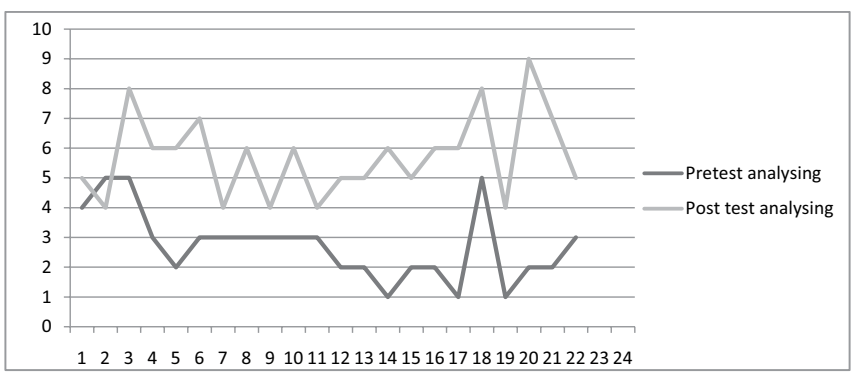

Figure 1. Pretest analysing score and post test analysing score

Hence, it is concluded that there is a significant effect of the 5-E Model of Teaching–Learning in enhancing the analysing skills among learners.

The investigator also compared the pretest and post test evaluating scores by using t-test, which is given in Table 2.

Table 2 reveals that the difference between the mean of pretest and post test scores in evaluating is 1.545. The t-value is 4.106, which is significant at 0.01 levels. The p-value indicates that there is a significant difference between the means of pretest and post test score of evaluating. Hence, the null hypothesis, 'there will not be significant difference between the means of pretest and post test score of evaluating' is rejected at 0.01 levels and we accept the alternative hypothesis. So, it can be concluded that teaching through the 5-E model significantly enhanced the evaluating skills among students. The pre and post test scores of students in the evaluat skill is graphically shown in Figure 2.

Table 2
Comparing Pre and Post Test Scores in Evaluating

Group	N	Mean	Standard Deviation	Mean Difference	df	t-value	p-value
Pretest score in evaluating	22	3.318	0.839	1.545	21	4.106	0.001
Post test score in evaluating	22	4.864	1.699				

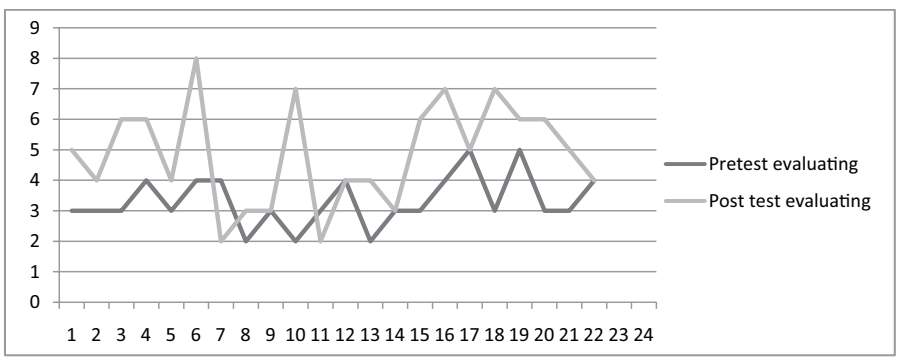

Figure 2. Pretest evaluating score and post test evaluating score

Hence, it is concluded that there is a significant difference between the pretest and post test evaluating scores. So, we can say that teaching through the 5-E Learning Model significantly enhances the evaluation skills among learners.

The investigator compared the pretest and post test creating scores by using t-test, which is given in Table 3.

Table 3 reveals that the difference between the mean of pretest and post test scores in creating is 3.409. This table also indicates that the standard deviation of pretest creating group is 1.181 and post test creating group is 1.716.

The t-value is 9.209, which is significant at 0.01 levels. The p-value indicates that there is a significant difference between the means of the pretest and post test scores of creating. Hence, the null hypothesis, 'there will not be significant difference between means of pretest and post test score of creating' is rejected at 0.01 levels and we accept the alternative hypothesis. So, it can be concluded that teaching through the 5-E Model significantly enhanced the creating skills among students. The pre and post test scores of students in creating skill is graphically shown in Figure 3.

Table 3
Comparing Pre and Post Test Scores in Creating

Group	N	Mean	Standard Deviation	Mean Difference	df	t-value	p-value
Pretest score in creating	22	1.818	1.181	3.409	21	9.209	0.000
Post test score in creating	22	5.227	1.716				

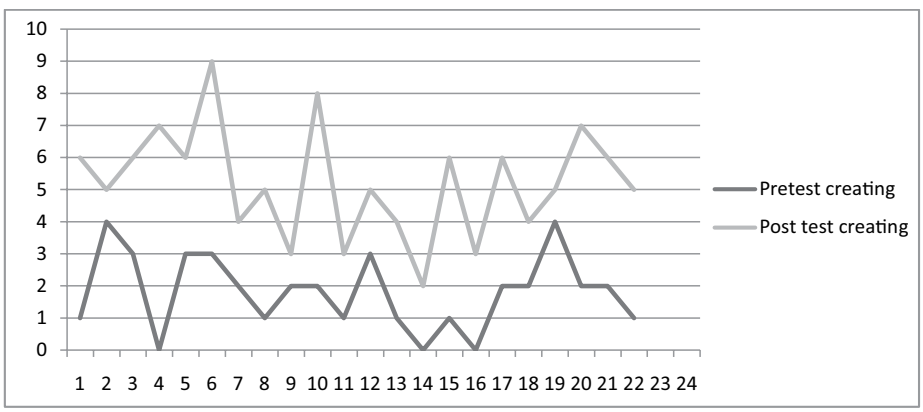

Figure 3. Pretest creating score and post test creating score

Hence, it is concluded that there is a significant difference between the pretest and post test creating score. So, we can say that teaching through the 5-E Model of teaching-learning significantly affect the creation skills of learners.

To study the effect of the 5-E Model of Teaching in learners' higher order thinking skills, the investigator compared the pretest and post test scores by using t-test, which is given in Table 4.

Table 4 reveals that the mean score of the pretest group is 7.818 and post test group 15.818. The difference between the means of the pretest and post test score is 8. The standard deviation of pretest group is 2.015 and post test group is 4.031. The t-value is 9.114, which is significant at 0.01 levels. The p-value indicates that there is a significant difference between means of pretest and post test score of evaluating. Hence, the null hypothesis 'there will not be significant difference between means of pretest and post test scores' is rejected at 0.01 levels and we accept the alternative hypothesis. So, it can be concluded that teaching through the 5-E Model significantly enhanced the higher order thinking skills among students. The pre and post test scores of students are graphically shown in Figure 4.

Table 4
Comparing Pretest and Post test Scores in HOT Skills

Group	N	Mean	Standard Deviation	Mean Difference	df	t-value	p-value
Pretest score	22	7.818	2.015	8	21	9.114	0.000
Post test score	22	15.818	4.031				

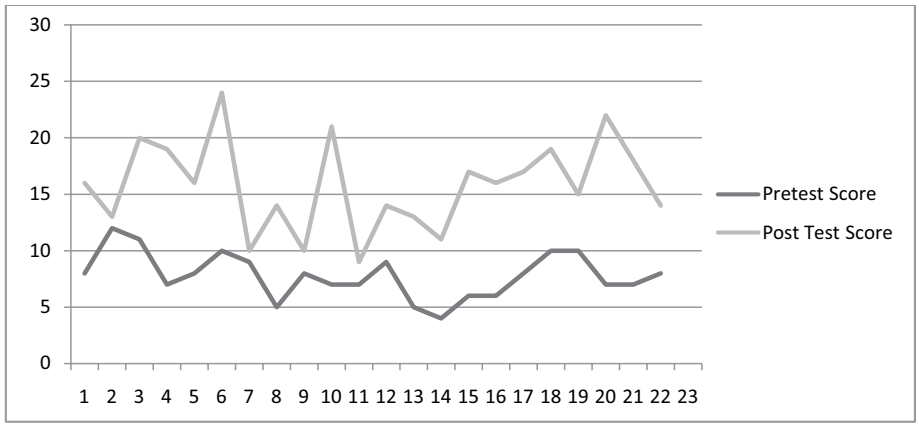

Figure 4. Pretest score and post test score

Hence, it is concluded that there is a significant effect of the 5-E Learning Model in developing higher order thinking skills in science.

Major Findings

1. There is a significant difference in the means of pretest and post test analysing scores at 0.01 levels. Hence, teaching through the 5-E Model of Teaching-learning is effective to enhance students' skill of analyzing in science.
2. There is a significant difference in the means of pretest and post test evaluating scores at 0.01 levels. Hence, teaching through the 5-E Model of Teaching–Learning is effective to enhance students' skill of evaluating in science.
3. There is a significant difference in the means of pretest and post test creating scores at 0.01 levels. Hence, teaching through the 5-E Model of Teaching–Learning is effective to enhance students' skill of creating in science.
4. There is a statistically significant difference in the means of pretest and post test scores in higher order thinking skills at 0.01 levels. This indicates that the 5-E Model of Teaching–Learning significantly helps to improve students' higher order thinking skills in science.

Discussion of the Result

The present study is different in the sense that it was conducted in government schools having Odia as the medium of instruction and the students are from rural areas. The investigators intended to study the effect of the 5-E Model of Teaching–Learning in the regional medium schools. The study found that the 5-E constructivist model of teaching has significantly contributed to the development of higher order thinking skills (analysing, evaluating and creating). This result is supported by Chowdhury (2016), Walia (2012), Verma & Tyagi (2012) and Raval (2012), but Tyagi (2010) reported that the 5-E Model of Teaching–Learning has no significant effect on the originality of participants. It can be said that students taught by the 5-E Model of Teaching–Learning will develop better higher order thinking skills than students taught by the conventional method. It may be due to the fact that the 5-E model of teaching actively engages the learner during the entire duration of teaching, by providing opportunities to explore, discuss, debate and work in groups in the learning situations. Here the teacher acts as a facilitator and the student as an independent learner. The 5-E Model of Teaching–Learning is very useful in the teaching of science as it stresses on the process of learning science such as enquiry, observation, manipulation, problem solving, recording and reporting. Finally, it can be concluded that the 5-E Model of Teaching–Learning is very effective in enhancing higher order thinking skills in science.

Educational Implications

The study found that the 5-E Model of Teaching–Learning has a significant impact on students' higher order thinking skills (analysing, creating and evaluating) in science. The study has many implications for the teachers, Teacher Educators, as well as textbook writers.

- The teachers teaching science need to be oriented in the process of teaching by following the 5-E model of teaching. Because the 5-E Model develops higher order thinking skills among students, so the educational administrators and policymakers may organise in-service training programmes and workshops for teachers on the 5-E Models of Teaching–Learning. The science teachers need to be motivated to use the 5-E Model in their regular teaching.
- The pre-service teacher education courses must include the 5-E Model of Teaching–Learning in their pedagogy course so that the trainee can develop the skills and competencies for using the 5-E Model of Teaching–Learning. Teacher Educators may use the 5-E Model of Teaching in their regular classes so that trainees can get first-hand experience on it.
- The existing science textbook may be revised in the light of the constructivist approach, especially on the 5-E Model of Teaching. The textbook can be written based on the steps and principles of the 5-E Model of Teaching–Learning. Similarly, teachers' handbook may be written based on the 5-E Model of Teaching–Learning which can be of great use for teachers.
- Researchers can explore the process of integrating ICT and the 5-E Model of Teaching–Learning for teaching different subjects. Training modules and programmes can be organised for integrating ICT and the 5-E Model of Teaching–Learning, so that teachers can get familiarity and orientation in it.

Conclusion

The 5-E Model of Teaching is effective in developing higher order thinking skills among students in science. It is an appropriate method to actively engage the students in the classroom process. Hence, it is time for all the stakeholders in education to use this model of teaching in classrooms. Teachers need to be oriented and motivated to follow this model in their classes. The educational planners and administrators must plan in-service training programmes on the 5-E Model of Teaching–Learning at the school, block, and district levels so that the maximum teachers can be covered. The success of this model is largely dependent the on motivation and training of teachers.

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Knowing and Experiencing the Practice of Teaching

Journey towards Becoming a Critically Reflective Teacher

NITIKA BOSE*

Abstract

Pivotal to teacher development is the practice of reflection and therefore, its importance in a Teacher Education programme cannot be undermined. Unless teachers foster the practice of critical reflection, they remain engulfed in parochial values, unexamined assumptions and biases, and prejudices emanating due to unquestioned judgments and interpretations. The present article explores the student Teacher's experiences while pursuing Bachelors of Education (B.Ed.) programme, to understand the ways in which reflective practices nurture their professional identity as teachers. Data were collected from observations, personal diaries, reflective journals and narrative accounts of student teachers. An analytic framework of Dewey and Schön were used to interpret the narratives of the student teachers. It was found that the professional knowledge of teachers was intricately linked to what teachers thought and experienced before and while teaching. Also, evidence from the narrative accounts illustrated the student-teacher's capabilities to learn, and the ways in which they were able to construct meaning by interrelating the practice of teaching to their own life experiences. They were thus able to extend reflective learning beyond themselves to wider group of individuals. The article therefore highlights the relevance of reflections as an integral part of preservice Teacher Education, enabling critical self-awareness and informed educational practices.

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Introduction

The relevance of reflections in Teacher Education programmes has been widely acknowledged in recent researches. This is because in a diverse country like India, the phenomenon of schooling is not devoid of complexities and challenges. Diversity related to cultures, caste, class, religion and ethnicity in our society makes the experience of going to schools, and participation in the teaching-learning process different for students from different backgrounds. For instance, students from the economically weaker section have experiences that are different from students who belong to affluent sections (Lott 2001, Mallica 2005). Similarly, girls and boys experience participation in school-related activities differently (Bhattacharjee 1999). Therefore, today's teachers need to be more aware, sensitive, flexible and open to change. Keeping this in mind, the teacher cannot view schools and the teaching-learning process in isolation from the larger social and political milieu. Moreover, the school personnel simplistically assume that students' performance is based on merit and individual capabilities. This meritocratic myth leaves issues related to inequality and injustice unexamined within the school context. Teachers pay more attention to curriculum transaction and greater focus is given to achieving desired learning outcomes. In the given scenario, an understanding of and engagement with actual classroom processes, those that involve the relationship of students with teachers, authority figures and peers, is ignored. Moreover, learners are socially situated and knowledge is socially constructed; therefore, school processes have to be viewed in their entirety. Pre-service Teacher Education programmes therefore need to pay urgent attention towards enabling future teachers' abilities to reflect upon the socio-economic, political and cultural realities of the everyday life.

National Curriculum Framework for Teacher Education (NCFTE) 2010 envisions a Teacher Education programme that prepares today's teacher to be more dynamic and flexible to the changing contexts. It proposes the development of reflective practice among teachers therefore, to be the central aim of Teacher Education. The *NCFTE, 2010* (p. 54) highlights that, 'Teacher Education programmes at all stages should provide opportunities to the teachers for understanding their self and others, develop sensibilities, the ability for self-analysis and the capacity to reflect…Professional opportunities need to include reflection on their own experiences and assumptions as part of the course and classroom enquiry; critical observation and reflective analysis of the practice of teaching'. It further necessitates a need for feedback and continuous dialogue between student teachers and Teacher Educators for the enhancement of the capacities to

reflect. However, Teacher Education programmes all over the country are insufficiently prepared for this, and the major focus of teachers still remains on time-bound transaction of the curriculum through structured lesson plans, classroom management strategies that impose strict discipline and adherence to rules, gearing the learner towards examinations conducted at the term's end. Due to the routine of such activities in schools, Teacher Educational institutions are compelled to develop capacities that will enable student teachers to fulfill these assigned duties once they enter schools.

No time and attention is devoted towards enabling the student teachers to reflect on the existing school practices and their relevance in the light of researches that emphasise on child-centred pedagogy for enhancing the quality of teaching-learning. School knowledge and community knowledge or out-of-school experiences are not allowed to penetrate through the school walls, compartmentalising knowledge into legitimate and official. Children's ways of learning in their communities are held irrelevant and inconsequential to the teaching-learning process within schools. Nor are attempts made to shift the process of learning from rote memorisation to develop students' abilities to search for meaning out of personal experiences, enabling them to construct knowledge through self-reflection during the process of learning.

Sole emphasis on teacher-directed activities therefore can be detrimental to the implementation of progressive ideas in education. Teacher Education programmes therefore must endeavour to provide ample space and opportunities, wherein Teacher Educators engage with student teachers to develop criticality towards textbooks, curriculum, syllabi and teaching practices, rather than taking them as a 'given'. Also, by constantly drawing a link between psychosocial theories of students' development potential, teachers will be able to step into the shoes of their learners and understand their motivations and intentions of behaving in a certain way. Dialogues between student teachers and Teacher Educators should facilitate the development of critical consciousness, whereby learning to become a teacher will involve critically thinking about one's own experiences in families, schools and colleges and linking the same to understand others within their professional context. This will enable student teachers to become socially sensitive and conscious about finer human sensibilities.

From Knowing to Experiencing the Practice of Teaching

In this paper, I draw from the works of John Dewey and Donald Schön to develop an understanding of the reflective practices in Teacher Education programmes and the centrality of reflections for the

development of the professional identity of a teacher.

John Dewey's text *How We Think* (1933) is frequently cited for understanding reflective practice in Teacher Education. According to Dewey, 'reflective thinking' involves 'turning a subject over in the mind and giving it serious and consecutive consideration' (Dewey 1933, p. 3). This type of thinking is systematic, as it focusses on the problem or situation at hand and aims at understanding it in its entirety. Reflective thinking, according to Dewey, should be carried out sequentially following the methods of the sciences and attentively, wherein justification for belief should be based on sound proof and backed by evidence. Reflective inquiry, according to Dewey, begins 'in a state of doubt, hesitation, perplexity, mental difficulty' (Dewey 1933, p. 12). This thinking involves analysing and exploring situations and arriving at possible solutions. 'Data, (facts) and ideas suggestions and possible solutions, thus form the two indispensable and correlative factors of all reflective activity' (Dewey 1933, p. 104). For Dewey, after gathering appropriate data related to a problem, the reflective practitioners chart out ways of acting, keeping in mind the logical conclusions that can be attained from the given data. Hébert criticizes Dewey's formulation for being an 'ends-based model initiated by a problem that must be solved… It privileges rational knowledge over practical knowledge' (Hébert 2015, p. 363). Dewey points, 'the demand for solution of a perplexity is the steady and guiding factor in the entire process of reflection… The nature of the problem fixes the end of thought, and the end controls the process of thinking' (Dewey 1933, p. 14–15). Dewey has given primacy to the removal of doubt that practitioners encounter in their professional endeavours. This, according to him, will enable reflective thinkers to move as close to certainty as they can, and thereby enable them to solve the problem at hand through well thought out plans. Technical rationalists maintain that all knowledge can be attained through rigorous application of scientific method and systematic and methodic study, and all propositions can be verified for its truth value through either observing them empirically or analysing them rationally or through a combination of both. Dewey's model therefore underlines segregation between thought and action. Therefore, the knowledge attained through practice is viewed instrumentally, and is held as a means to reach the well thought out and previously desired end. Dewey's emphasis on the need for reflections emerging due to 'a shock or an interpretation needing to be accounted for, identified or placed' (Dewey 1933, p. 12) has been criticised for not taking into account situations that are uncertain and do not induce doubts (Hébert 2015, p. 364). Situations that are a part of the routine and those that adhere

to societal norms and values are excluded from Dewey's model for conceptualising reflection. Reflective thought therefore means to operate within given set of norms and the foundations of these norms will never be questioned, unless they emerge as interruption, shocks or dilemmas.

This rationalist-technicist orientation of John Dewey is criticised for being limited in its understanding of and explanation for reflective practice in Teacher Education. Donald Schön in his work *The Reflective Practitioner* (1983) and *Educating the Reflective Practitioner* (1987) propounded the Experiential-Intuitive model, criticising Dewey for his overreliance on rationalism. Schön introduced types of reflection as 'reflection in action' and 'reflection on action'. Schön describes 'reflection on action' as the act of thinking critically about one's initial understanding of a phenomena and arriving at a new understanding, dismissing the previously held beliefs, and verifying this new understanding by applying it to real life situations. It is only when the participant is no longer undertaking an action and moves away from it to mentally reconstruct a situation whereby his/her actions or situations can be analysed, 'reflection on action' takes place. 'Reflection in action' refers to the process of thinking that an individual undertakes while doing a certain task. According to Schön, knowledge in action does not emanate from rational thinking or 'prior intellectual operations' (Schön 1983, p 51); knowledge rather is gained intuitively while working on a certain situation through experience. Knowledge attained in this way, according to Schön, cannot be spelt out or observed empirically. Only the individual who acts knows and simply has 'feel for' how to act (Schön 1983, p 19). Schön points that such knowledge cannot be explained by clear and precise means, given that it is 'tacit, implicit in our patterns of action and in our feel for the stuff with which we are dealing' (Schön 1983, p. 49). Therefore, Schön's conceptualisation of 'reflection in action' provides epistemological supremacy to experience and intuitive knowledge that proficient practitioners develop (Hébert 2015). Schön points out that 'reflection in action' is based on phenomenon that is unknown, 'when intuitive performance leads to surprises, pleasing and promising or unwanted' (Schön 1983, p. 56). For instance, a teacher after delivering her lesson may step back from the situation to reflect on how to improvise her teaching methods for greater class participation; she is then said to be engaging in reflection on action. On the other hand, a teacher may feel that not too many students in her class are participating and therefore she spontaneously makes changes in her lesson plan to enable students to engage in classroom processes; then she is said to be engaging in 'reflection in action'. Although 'reflection on action' and 'reflection in action' is

a crucial analytic categorisation, it is difficult to segregate the two in practice. However, Schön gives primacy to knowledge based on experience and guided by practical action, reinstating thought and action to be interrelated.

Dewey's contribution towards understanding reflective thinking in Teacher Education cannot be undermined. He is credited to have introduced systematic ways of thinking about classrooms, schools and teaching, therefore questioning the taken for-granted assumptions about them. Therefore, the technical-rationalist model makes it imperative for the teacher to draw out logically designed plans for organising classrooms and teaching. It mandates the use of resources, materials and space within schools in the most efficient ways to achieve the desired ends. Also, planned thinking should be justifiable by assessing students suitably, to verify if the desired ends have been achieved. Reflective thought for Dewey is a product of the intellect, wherein a person solves a problem through what he/she already knows thereafter being able to justify one's own thought if solutions are arrived at in a given situation. However, not all ways of knowing about teaching can be based on the intellect. Therefore, Schön points that thought cannot be divorced from action. For him, reflective inquirers may not have to step back from a situation to analyse it, but they are capable of spontaneously knowing while working on a situation at hand. Schön privileges the experiential realm of individual subject, wherein thinking redesigns what an individual is doing while he/she is doing it. Reflection in action therefore enables an individual to produce knowledge while engaging in situations and tasks. This renders teachers as agents who not merely respond to a given situation but intuitively arrive at knowledge while engaging in the teaching-learning process, which modifies and guides their action and also enables them to construct knowledge. Van Manen illustrated the importance of reflections within the context of schools. Teaching, according to Manen, is a form of a 'tact' or 'capacity for mindful action', wherein the pedagogue becomes, 'immediately active in a situation: emotionally, responsively and mindfully, engaged, sensitively, reflectively with a child' (Manen 1991, p. 122). According to Hébert reflections for Manen are closely related to the pedagogy defined as, 'the practice of living with and responding to children' (Hébert 2015, p. 367). According to Manen, teachers intuitively know what to do in a given situation and act quickly and confidently. Therefore, rather than engaging in reflective thought, knowledge is embodied and tact becomes their 'second nature' (Hébert 2015, p. 368). This enables teachers to act immediately and reflectively in a given situation.

Context and Methodology

The school experience programme (SEP) organised approximately for a duration of 16 weeks is a crucial component of the B.Ed. programme. This takes place during the second year of the B.Ed. programme, providing student teachers the opportunity to be a part of the actual school system and enrich themselves through interactions within and outside classes. During the first year of the B.Ed. programme, students engage theoretically with key ideas and concepts in education. A combination of Foundation and Pedagogy courses helps the student teachers in building perspectives related to researches and progressive ideas within education. The first year of the B.Ed. Programme also includes practicum courses such as Field Observations and Tutorials which enable the student teachers to visit schools or organisations functioning in different educational settings and understand the diverse learning experiences of children. The tutorial provides a space to students wherein they can closely interact with their mentors and carry out reflections that enrich their observations related to the field. This enables the student teachers to build linkages between theory and practice, and reflect on the existing gaps by identifying the reasons for practice and working on ways that can solve problems or make the current practices more meaningful. The second year of the B.Ed. programme provides the student teachers the opportunity to directly engage with students in schools through the School Experience Programme (SEP). All the students, during the SEP, regularly go to schools for teaching in classes allotted to them. They are guided by mentors from the university who help them to plan their lessons and enable the facilitation of actual teaching-learning within the classroom. Apart from this, the School Experience Programme provides opportunities to student teachers, wherein they can immerse themselves in the field through invigilating during examinations, participating in parent-teacher meetings and conduct of morning assembly, sports and cultural events and other co-curricular activities. Mentors regularly provide feedback and scaffold student teachers, enabling them to improve their practice of teaching. Therefore, SEP not only provides student teachers a platform where they get to teach, but also gives them an experience wherein they understand about the school culture and ethos. This helps the student teachers in bridging the gap between theory and practice and this is a crucial step towards the formation of their professional identity.

While reflections during the first year of the B.Ed. programme resemble Schön's conceptualisation of 'reflection on action'; it is during the second year that, the student teachers get an opportunity to undertake 'reflection in action'. In

order to understand the nature of reflections undertaken by the student teachers during SEP, the researcher in the current study was both an insider-participant and a researcher. The researcher participated in the study as a mentor where she guided students on the different aspects of the School Experience Programme, such as classroom teaching, school activities and research projects. The participants in the current study were five student teachers undertaking practice teaching in Kendra Vidyalaya located in the west zone of Delhi. The age range of participants in the study was 21–24 years. Four of them were graduates and one of them was a postgraduate. The study spanned for a period of approximately five months, wherein the researcher provided mentorship to the student teachers from the starting day of SEP till its end. Being an insider provided an opportunity to the researcher to observe the student teachers inside and outside their classrooms. This enabled the researcher to interact and observe student teachers in the staffroom, playground and activity rooms. Many times, informal conversations with student teachers in such spaces enabled the researcher to analyse the ways in which they thought about their teaching and other school processes. Informal conversations in different school settings therefore helped the researcher to bridge the gap between the researcher and the researched, and enabled the student teachers to freely interact with the researcher without the fear of being observed. The data for the current study was drawn from such conversations, observations, and students' reflective journal files that had detailed accounts of their professional experiences within the school. The researcher also maintained a diary where observations carried out within the school setting were recorded and this was later used for analysing the findings of the study. In order to ensure anonymity and confidentiality to the participants, pseudonyms have been employed throughout the study. The data was analysed using qualitative methods, wherein the student teachers' reflective journals were carefully studied to find out about the nature of reflections carried out by them. The researcher, as a mentor, provided guidance at regular intervals through critical questions, scaffolds and narrations of her own professional experiences to enable the student teachers to think, and areas where they needed to reflect further were identified and worked upon. Such interactions were crucial for the study as they provided an opportunity for the researcher to step into the shoes of the student teachers and derive insights related to what they thought and felt, and analyse the reasons behind their actions. Analysis was thus an ongoing process, wherein both the mentor-researcher and the student teachers participated within the naturalised settings of the school to understand

the ways in which reflective thinking takes place or is carried out.

Becoming a Reflective Teacher

The process of becoming a reflective practitioner cannot be imposed. It is a process of discovery through personal awareness and critical analysis. Therefore, the School Experience Programme is a crucial juncture, wherein student teachers, for the first time, get to be in schools as insiders taking part in activities, classroom teaching, interactions with students and staff. This provides them an opportunity to think about school practices deeply, spread over a considerable duration of time.

During the initial phase of the School Experience Programme, the student teachers reflected on the diverse aspects of the school, especially those which they thought were in non-alignment with their previous ways of thinking and imagination about teaching-learning. Student teachers reflected on the ways in which whatever they read in theory was in contrast to actual practice within schools. One of the participants reflected about the non-secular messages that the school building communicated, and how he thought this opposed the way he imagined schools should be. Ravi wrote—'All around the school and in classrooms, you find Hindu gods and goddesses. As soon as you enter school, you see this. I think this was because majority of the people in school were Hindus. Schools should instead, respect all religions'. On probing further as to why he thought this, Ravi stated that he had read about how schools should foster democracy and secularism whereas he was witnessing a paradoxical situation as he realised that his theoretical assumptions were in direct contrast to the actual practice. In another incident, Sheetal another participant expressed worry over inadequate resources within the school for teaching-learning. She wrote—'I was told by my pedagogy teacher to use a spring balance while teaching the topic on buoyant forces, but here in school, lab equipments are not to be touched. Only the senior students go to labs. There are labs for juniors also, but no one can go there. I asked if I could carry some of the equipments for demonstrating an experiment in my class, but the lab attendant refused. I think the students' learning suffers a lot due to non cooperation on the part of the school staff. If I have to carry out demonstrations, then I can only do it when I have my personal equipments. Otherwise, there is no option but to rely on the textbook and teach in the traditional way.' Therefore, the student teachers' reflective journals provided evidence related to the ways in which they were thinking about teaching-learning. It is evident that instead of simply observing a given phenomena within the schools, the participants were engaged in a process of understanding it by inquiring and reflecting upon the reasons behind

actions and situations, and analysing or thinking about why a situation exists or carries out in schools. This was evident in yet another participant Ashok's reflective journal. He wrote—'Today the P.T. teacher started hitting three students from class ninth with a wooden bat. They had misbehaved in his class. This shocked me, as no one is allowed to punish students corporally as per the Right to Education Act. The students were saying sorry again and again but the teacher did not care to listen. Later, the principal came and asked him to stop and issued a green slip to the students which meant that they were suspended for a few days. I think teachers feel that they need to control students by creating fear in their minds. Instead it is important to inquire the reasons for misbehaviour and counsel them after doing so'. The reflective journal of the students therefore gives an account of the ways in which the student teachers were getting to understand school-related processes by 'reflecting on action'. Similar to Dewey (1933, 1938), the capacity to reflect is initiated after recognition of a dilemma or uncertainty. This dissonance created due to mismatch between prior expectations related to how situations ought to be and how they were in reality, became a focal point of inquiry, wherein the student teachers reflected in order to critique the current situations, draw conclusions and generate new hypothesis. According to Dewey, reflective thinking involves continual evaluation of beliefs, assumptions and hypotheses against the existing data. As the student teachers were engaged in the process of solving their dilemmas encountered within the school, reflective thought for them had become a means to do so. The student teachers therefore systematically and logically worked upon probable solutions to the problems that they encountered. These well-thought out solutions would then act as a guiding force towards their actions and not the other way round. Rational thought was found to be the premise on which the student teachers based their actions, and systematic and logical thinking became pivotal to the formation of their professional identity during the initial weeks of the School Experience Programme. These instances of reflection carried out by the student teachers suggest that reflective thinking primarily means 'cognitive problem solving' (Larrivee 2000, p. 295).

It is difficult to separate 'reflection on action' from 'reflection in action' as both these analytic categories given by Schön worked simultaneously while the student teachers engaged with the process of meaning-making in their professions. However, during the initial weeks of SEP, there was predominance of 'reflection on action' as the student teachers had to step back from a paradoxical situation in order to work out alternative ways in which problems could be solved. Initially, the student teachers

reflected on situations after dilemmas were encountered, but gradually, they started reflecting during their practice, and while participating in the teaching-learning process. 'Reflection in action' was observed during the last few weeks of SEP as students no longer needed to step out of a situation to think about it but could think simultaneously while acting and participating. Reflections, thus became an ongoing process wherein the student teachers thought before, during and after participating within the teaching-learning process.

Critical Reflection and Self-Inquiry

The process of becoming a reflective teacher is a continual and an ongoing discovery. However, developing as a reflective teacher not only encompasses critical inquiry but also self-reflection. Reflective teachers therefore develop the ability to step into the shoes of students and understand the consequences of their decisions and classroom practices for them. They are able to think, therefore, not as teachers but as students and understand how their routine judgments will impact the learners. Self-reflection therefore goes beyond critical inquiry 'by adding to conscious consideration, the dimension of deep examination of personal values and beliefs, embodied in the assumptions teachers make and the expectations they have for students' (Larrivee 2000, p. 294). Therefore, reflective thinking cannot be merely equated with 'cognitive problem solving' but significance should also be attached to the role of self.

The capacity for self-reflection and critical inquiry does not occur at once. Even in the present study, the student teachers were initially used to an inquiry about the school processes as outsiders. The ability to immerse themselves into the learning situation by stepping into the shoes of the learners for understanding their world views only took place at a later phase of the School Experience Programme. Also, such transformation did not happen on its own. It was mediated by constant interaction and discussions with the supervisor and peers. Student teachers were given regular feedback on their reflective journals. The researcher found that based on this, many student teachers modified their reflective journals. They were gradually able to look at a given situation in depth and incorporated multiple viewpoints to analyse their professional endeavours. The most significant transformation, however, was the ability of the student teachers to modify their existing practices by overcoming self-imposed limitations and preconceived notions. The student teachers who were earlier used to carrying out 'reflection on action', were gradually seen reflecting while acting. However, not all student teachers experienced this transformation, as only some felt that becoming critical of their ownselves was crucial for their professional

development and identity as teachers. Ashok therefore said—'Sometimes, you have a good and well thought out plan, but you suddenly realise that students are confused. You just feel something is wrong. Although you thought you would be supportive, but you realise that it is not working and you must rethink about what to do next'. This resembles Schön's conceptualisation of 'reflection in action', wherein the student-teacher undertakes the process of thinking while performing a task. The term 'feel' and 'realise' resonate with the student-teacher's capacity to intuitively know experientially while performing an action, rather than prior thinking or planning about it. For the practitioner, in this case, participation within the teaching-learning situation gave rise to surprises and uncertainties which were unknown to the student teacher prior to performing the act. Becoming an effective teacher therefore does not simply mean a combination of strategies ensuring that students do the tasks assigned and classes are managed adequately, but it requires the teachers to remain fluid and to develop capacities, wherein as teachers they can move in any direction depending upon the situation. Therefore, 'effective teaching is much more than a compilation of skills and strategies. It is a deliberate philosophical and ethical code of conduct' (Larrivee 2000, p. 294). This was evident in a participant—Payal's reflective journal. She says, 'While teaching the concept of density, I gave the students some questions. While they were working on the sums to calculate density. I suddenly felt that although I was teaching, but the students were not learning. Everything was fine, but I felt the class was not the way it usually is. I quickly demonstrated how a heavy object sinks in water and a light object floats on it. The students became curious and started asking questions. As the class became interactive, I felt more satisfied'. Critical reflection therefore enabled the student-teacher to move beyond her existing mental habits, and she was able to adopt new ways of perceiving and interpreting experiences. Advocates of reflective practice emphasise on experience as the starting point, however they also stress on critical analysis for the reformulation of that experience (Brookfield 1995, Larrivee 2000). This was evident in Payal's journal wherein she is modifying her skills to invent new strategies while teaching and she developed 'a sense of self efficacy' to create personal solutions to problems (Larrivee 2000, p. 294). Reflections, therefore are a crucial aspect of a Teacher Education programme. The study also revealed that reflective practices not only enabled the student teachers to think rationally about the most appropriate decisions that they should take in order to teach effectively in a given situation but also reflection and affection were

found to be closely related. During a conversation that the researcher had with Taruna — a participant in the School Experience Programme, she revealed—

Taruna: I was constantly trying to figure out why Jyoti did not respond in my class. Initially I thought she had a fear related to mathematics but I was wrong.

Reasearcher: Why?

Taruna: I found out from her teachers in the previous grade. She was quite okay in mathematics. Actually, she had problems at home.

Researcher: What kind of problems?

Taruna: Her parents were going through a divorce and her father thought that she should get married right after school. They were looking for a suitable boy.

Resarcher: How did you know?

Taruna: Jyoti told me, while I was discussing with her the courses that are taught in B.Ed. She told me that she too wanted to become a teacher, but she was not sure if she would be able to.

Researcher: What did you do?

Taruna: I counselled her and told her about all the challenges that I had faced as a girl. I told her not to give up. We talk about our personal lives and I help her with her studies also. We are almost like friends now.

Similar to Schoffner (2009), reflection and affective domains were found to be closely linked, as student teachers are required to analyse complex classroom situations which often involve personal feelings. Student teachers therefore not only develop the capacities to visualise the lessons from students' perspectives and make modifications in their teaching to suit the situation, but also are able to empathize with their learners. Emotions and the affective domain, play an important role here. Reflective processes therefore not only help the student teachers to understand their students but they are able to understand themselves better while developing their identity as teachers.

Discussion

Today's classrooms have students from diverse backgrounds, and it is imperative for teachers to be thoughtful about diverse the teaching-learning situations. Becoming reflective is a worthwhile disposition for the student teachers to acquire. The present study focusses on how the reflective practice enables the student teachers to adapt and operate as professionals and teach effectively. The ability of looking back enabled the student teachers to reflect on their teaching and the ways in which they would improve.

In order to study the reflective practices of teachers, the analytic lens of Dewey, Schön and Manen have been used to interpret the ways

in which thinking and experience come together during everyday practices of teaching and learning. It was found that during the initial days of the School Experience Programme the student teachers focussed on thinking about how their classrooms could be managed better, how to manage resources in classes, how to improve teaching and their participation in day-to-day school events. Also, student teachers reflected on whether students could understand what they taught, work on different methods of teaching, and evaluate whether the objectives that they planned at the onset, were achieved. However, at the later stage of the School Experience Programme, the student teachers were able to step into the shoes of the learners and understand their world views. It is during this time that reflections enabled the student teachers to empathise with their students and it is here that the student teachers were not simply thinking about teaching but were articulating affective concerns related to their learners.

Reflective practices are crucial for the development of professional identity of a teacher. Each teacher, however, must discover her own way in the process of becoming a reflective practitioner. Practitioners in their journey must adapt to an ongoing growth process through critical inquiry of classroom practices. The trajectory of reflective teachers often involves conjoining of personal beliefs and values with one's professional identity and this leads to critical action. However the path towards becoming a reflective practitioner cannot be predetermined. It has to be learnt through engaging in the process, and living through it. Thus, critical reflection is not just a way of approaching teaching practice but it is a way of life.

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Engendering Gender in School Curriculum

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Abstract

This paper aims to study the nature of hidden curriculum with specific reference to gender-related issues in primary schools. It also talks about the consequences of all the implicit messages and values embedded in school culture on students' understanding of gender. The data in this regard have been collected using participant and non-participant observation of the activities assigned to students. For this purpose the students were observed in classrooms and the playground. It was found that girls were more focussed towards household chores and liked to play in all-girl groups only, whereas the boys were inclined towards the tasks that demands physical strength and valued individuality. It was also found that the teacher's cultural expectations also influence such gendered behaviour of students in schools.

Introduction

Many of the educational thinkers and philosophers believe that school is an extension of the society. Just as there are a number of factors affecting and controlling the functioning of the society, similarly there may be a number of hidden factors which influence the pedagogic practices in schools. So, it would be interesting to know how the teachers, school practices and curricula influence gendered behaviour and stereotype among students.

The concept of curriculum is as dynamic as the changes that occur in the society. It can be taken as the course of study in an educational set-up that is composed of the organisational methods along with pedagogic skills for communicating

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the course content to the students. A curriculum is not merely a listing of the subjects to be taught, rather it reflects the overall learning experiences of students in the educational process. Dewey (1902) stated that educational process is nothing but 'reconstruction and reorganization of experience'.

The educational system of every society is not unconcerned with implicit and explicit transfer of norms and its various approaches towards the learner. While explaining hidden curriculum Jackson (1968), stated that 'classrooms are special places… The things that make schools different from other places are not only the paraphernalia of learning and teaching and the educational content of the dialogues that take place there… There are other features, much less obvious though equally omnipresent, that help to make up "the facts of life" as it were, to which students must adapt'. Students spend the most influential period of their life in schools. The experiences they get inside the school premises affects their life and the effectiveness of these experiences is much more than the direct educational endeavour. Often referred to as 'by product of schooling' (Apple 1995), this hidden curriculum consists of all those implicit messages in the social environment which are unformulated, but are felt by everybody. Students learn many unintended messages deeply rooted in the school culture. The teacher is a role model for most of them. So, they learn from their teacher's behaviour also.

Clarricoates (1978), talked about the hidden curriculum in primary schools on the basis of sex discrimination. The article (Dinosaurs in the Classroom) discussed the difference in the behaviour between boys and girls inside classrooms, with male students requiring more constant disciplinary censure from the teachers than female students, who are easy to keep under control. It further states that student's sex is an important variable in determining the teacher's behaviour towards them. Even if a girl student is excellent in studies and other co-curricular activities, she will be always considered as 'soft' and 'fragile' as compared to her opposite sex.

Gender socialisation is a process of learning where pupils are told to behave and articulate gender-specific norms. The teacher encouraged girls to remain quiet while boys were encouraged to be outspoken.

Methodology

A sample size of 80 students was taken—40 students each from Classes IV and V. The sample was selected by using purposive sampling technique. The students' class teachers were also interviewed. The students were observed in classrooms and the playground while doing routine activities along with the activities assigned by the researcher. The collected data was analysed by using thematic analysis.

Results and Discussion

The data collected was analysed qualitatively. Some major findings are classified as follows.

In the Classroom

The sitting arrangement in the classroom being observed was not shared between boys and girls. The teacher made them sit on separate benches, and in separate rows. On several occasions, punishment was given to those who did not follow this arrangement. According to the teacher, this was the only way to keep boys and girls under 'control'. Many a times the girls were praised for being calm and quiet while the boys were encouraged to act or behave as per their choice.

One of the commonly found practices inside the classrooms was that the teacher always asked the girls to clean the classroom on those days when the regular sweeper was not on duty. During one of the observations, the teacher instructed three-four girls of the class to sweep the room as it was very dirty. When the researcher asked her why every time the girls were called for this work, she replied. '*Ghar sametne ka kaam to ladkiyan hi theek se kar sakti hain, aur vaise bhi aage ja kar inhe yahi to karna hai. Chahe kitna bhi padh likh le, ya naukri karen, ghar to sambhalna hi padega'.* (Only girls/females can do the household chores efficiently. No matter how much education they take or get employed, ultimately they will have to manage the chores at home). On the other hand, when the researcher asked why the boys were always sent outside the school building to bring things, the teacher replied, '*Ladkiyon ko to baahar samaan lane bhej nahi sakte. Agar kahin gir gayi ya kuch aur ho gaya to mushkil ho jayegi, ye to ladko ka kaam hai, ye hi theek se kar sakte hain*'. (We cannot send the girls outside school. If some unpleasant incidents happen, then it would be problematic for us. Otherwise also, boys can do this kind of work effortlessly). The researcher observed that while sitting in the same classroom and reading the same textbook, with a teacher who was common to both the students (boys and girls), they received totally different education. The researcher also observed such differentiation between boys and girls while collecting data in a primary school.

In the Playground

It was also observed that both the boys and girls had their own separate groups in playgrounds too—while the boys played cricket or *gilli-danda,* the girls were busy talking to each other in a corner. After sometime, they started playing *stapu* among themselves. When the researcher questioned them, the girls said that their class teacher had strictly told them not to play or make any group with the boys as they could hurt or push them while playing. Moreover, clear instructions were given to the boys and girls that they

should play their 'own' games only. The teachers' cultural expectations guided the behaviour of the students. It could be visibly observed that gender socialisation had affected the personality of children in such a manner that they started to think it was not 'wise' and 'acceptable' to form groups with the opposite sex.

Outside the Classroom

Such phenomena are not limited to the classroom alone, as gendered behaviour was also observed when the teacher instructed her class to make separate rows at the water taps. The boys were strictly instructed not to push the girls and let them fill their water bottles first. The incharge of the school justified this situation by saying that '*ladkiyon ko water bottle pehle bharne dete hain, kyonki itni tez dhoop mein agar inhe chakker aa gaya to problem ho jayegi, vaise bhi ye itni kamzor si to hoti hi hain. Ladko ka kya hai, inhe to poora din dhoop mein khade rakho, sah lenge, yeh to hote hi maj boot hain*'. (We send the girls to fill the water bottles before boys. Since girls are very delicate so they may faint in the scorching heat and it may create a problem. On the other hand, as boys are physically strong, they can stand under the sun also.) So, the task and responsibility being assigned to boys cast them as physically strong and tough whereas girls are always seen as soft or '*naazuk*'. The social myths prevailing in the society do influence the teachers' belief about what girls and boys are like.

Influence of the Family and Peers

In one of the interactions with the students, the researcher asked them to close their eyes and think of any role and then, they would have to enact the same. Most of the girls enacted a teacher, mother or elder sister, whereas the boys preferred the role of a father, elder brother or doctor. Enactment of these roles is a part of their socialisation process and its continuity can be seen in the peers, family and school as well. Students perceive what they observe and what they are being taught. During a discussion, one of the girls said that cooking food or washing clothes and utensils is a 'girlie job' as she has never seen her father, brother or any male relative do 'this'. This stereotype got reinforced when the class teacher did the same by asking her to wash the tea cups. In a way, knowingly or unknowingly the school practices played a crucial role in making a strong impact on the young minds.

So, girls generally have a mindset that they are meant for doing household chores only; on the other hand, boys considered themselves to be strong and well-built. Another activity was done with students in which they were asked to think what would happen if one day they woke up and found themselves to have turned into an opposite gender? To this, one girl immediately replied, '*Agar mai ladka hoti to ghar jaate hi sabse pahle khelne chali jaati kyonki ladko ko koi kisi bhi time khelne se nahi rokta. Abhi*

to ghar jaate hi mujhe mummy ki help karni hoti hai'. (If I were a boy, I would have gone to play immediately after reaching home, as nobody stops the boys to play any time of the day. But, as a girl, I have to help my mother in the household chores). *So* visibly some tasks are still aimed at specific gender group. During the discussion, one boy said *"Agar mail adki hota to apni friends se bahut saari btein karta aur make up bhi lagata." (*If I were a girl, I would have talked a lot with my friends and applied make up also). This boy might have heard that girls are talkative and they use makeup to look good. Moreover, in school premises, whenever the teacher found boys talking to each other, she always pointed them out and shouted, *'Kya ladkiyon ki tarah saara din bolte rehte ho, tumhe bhi ladkiyon ki aadat pad gayi hai'.* (You talk like girls the whole day, this is girlish behaviour). This kind of a statement made the students think that talking with friends is girlish behaviour and boys should not talk endlessly among themselves. To be 'girl-like' is not an accepted norm for boys in the society, and the school communicated these messages to students, covertly.

Conclusion

The school, as an institution reinforces larger cultural messages and sometimes, such messages are so covertly transmitted in the classrooms that student accept that in one particular direction only. Since the curriculum is a sum total of all the experiences the child gains in school, he/she not only learns the prescribed text but also learns certain values, beliefs, norms, along with various hidden messages. Many a times, the teacher conveys these messages in the class in an overt or covert form. Somewhere, it becomes an unstated agenda that decides the nature of discipline, the notion of authority and whose order has to be followed in the school. Students observe and internalise these notions as they perceive them. So, teachers need to be more sensitive while dealing with issues like gender socialisation. The organisation of the school also influences the learning of the student. So, the whole functioning of the institution should be in a democratic manner and there should be no differentiation on the basis of gender among boys and girls, as it may affect their interaction with other people from the society as well. The teacher must adopt those classroom practices that can give both boys and girls an equal platform for exploring their potential. Through these practices, a sense of self-confidence should be built among learners. Gender is an important element of curriculum so there should be no gender discrimination in an overt or covert form as it may leave a lasting impression on the learners. Moreover, teachers need to be cautious about the pedagogical practices being used in classrooms and its impact on students.

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Achieving Education for All
A Thought

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Abstract

A study of the management control policies and Class X grades of schools affiliated to a state board was conducted. The study revealed that the school fee the only significant variable explaining school performance. Since Colleman's report, socio-economic status (SES) has been found as a significant variable explaining students' performance. The society and the government have taken numerous steps to overcome this barrier to learning. The Right to Education Act 2009 was a milestone to achieve education for all strata of the society. The 25 per cent reservation in private schools for the lower income group has to be especially appreciated as this is a step towards inclusive education. But, this is not sufficient. Over time, we have realised that there is a need to do a little more. Residential schools, with the Public Private Partnership (PPP) model may be a way ahead to overcome the barriers of SES.

Introduction

This is a thought paper, on developing a model for school education, especially for children from the lower strat in of society. The motivation for this comes from the findings of a study which was conducted to identify the relationship between school policies and school performance. The results show that school fee as a measure of socio-economic status was the only significant variable. Section two provides details of that study. This again emphasises beyond the school environment, is an important determinant of students' school performance. Various efforts have been made over time to provide

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additional support to the children from needy families. These efforts have been made by individuals and private organisations. Section three enumerates some of them. The government has also achieved a milestone by enacting the RTE Act; however, private residential schools were kept out of it. Section four briefly discusses why they were kept out and how these could have been included. Section five, which is the heart and soul of this paper, gives a new model for school management, based on participation from the society, the government and the corporate sector. The model revives the Gurukul education system which was followed in ancient times in India. The last section provides a conclusion to the study.

Management Controls and School Performance

A study of school management controls (policies), socio-economic status (effective annual tuition fees for Class X students) and the performance of a senior secondary, private unaided school was conducted. The school performance was measured as the three-year average grade scored by students in Class X exams conducted by the state board of examination. Data regarding the school fees were collected from the school management, while grades for each student for the main board examination were collected from the Gujarat Secondary Education Board.

Out of the 57 schools that participated, 36 used Gujarati as the medium of instruction (including one Hindi-medium school), while remaining 21 schools used English as medium of instruction. All of these were private trust schools except one, which was a religious trust. The total students from kindergarten to Class XII varied from a low of 100 to a high of 3,500 with a median of 911.5 students, an average school size of 1,018 students and standard deviation of 706.79. The number of students in Class X varied from a low of 5 to a high of 484, with a median of 54 students and an average school size of 77 students. The school covered started the 10th standard as early as 1987 and as late as in 2013 with the median year being 2004. The effective fees charged to the Class X students varied from a low of ₹1,200 to a maximum of ₹35,000, with an average fee of ₹8,896 per year and standard deviation of ₹7,192.5.

The school fee was used as a proxy for the students' socio-economic status. It very well represented parents' qualification, occupation, and income, kind (quality) of tuition classes that children go to, the number of siblings, parents' aspirations, and child's aspirations at the school level. In private unaided schools, the fee is also a good indicator of the school infrastructure. It was observed during data collection that the quality of infrastructure, such as toilet facility, drinking water facilities, class room furniture, playground, smart board

varied with the amount of fees the school charged from their students. The correlation between the fees and the performance was found to be 0.57 and was significant at 0.01 levels. A regression was also conducted with the fees and management control variables to explain school performance. Management controls were measured as the latent constructs of action control, results control, personnel control, and cultural control for both teachers and students, using multiple items on a five point Likert type scale. Multiple responses were sought from Class X teachers of each school to measure the management control variables. In total, 241 responses were collected from 57 schools. Responses from two schools were dropped on account of missing value and outlier analysis. Reliability and validity analysis of the constructs were conducted and found appropriate. Summated scores were calculated for each school. These scores largely met the tests of normality, linearity, homoscedasticity and multicollinearity. The results showed that school fee was the only significant variable explaining school performance.

After-school Engagement—the Key to Student Success

I neither negate nor undermine the role of schools in pupils' learning and development. I have a different point of argument here. Today, a parallel support system has developed to overcome the barriers of socio-economic status which has an important bearing on the students and school performance. For example, one aided school associated with a church organises evening classes for children from poor families. Another aided school which has a hostel facility provides additional academic support to students that come from rural areas. IIMA students' club *Prayaas* also engages in providing additional teaching and learning support to the disadvantaged children in the vicinity. Visamo Kids in Ahmedabad gets children from rural areas and provides them with food, stay and additional academic support. These kids go to the best schools of Ahmedabad city and have performed remarkably well. All these services are being provided on a voluntary basis without any additional charges to parents. The residential schools run in Gujarat by devotees of Swami Narayan sect are also a similar case. This provides an environment of support to the children and helps them to overcome the limitations faced by the families.

All evidence points that beyond-school-support is very essential. An informal correspondence with the officials at the Right to Education Resource Centre, IIMA, showcased new information in support of seeking admission in private schools under section 12(1)(C) of the RTE Act 2009. They are also planning a tracking system through a network of volunteers to help students that require additional support to cope

up with school studies, so that they do not drop out at year-end. The efforts of Government of India in opening Eklavya Model Residential Schools for tribal children, Kasturba Gandhi Balika Vidyalaya (KGBV) and Navodaya Vidyalaya also strengthens the argument for creating an environment beyond school as a necessary condition for children to perform well in schools.

Residential Schools and the RTE Act

Including private residential schools would have led to inclusive education in the true sense. The logic which I could see is a resource crunch on the part of the government to finance these children's food and stay. To me, food does not seem to be a big problem. These children are entitled to the Mid Day Meal Scheme and also subsidised food, for which the government is giving (Direct Benefit Transfer) D.B.T. to their families. This money can be provided to schools for the food of these children. Hostel facilities have to be provided for these children. If the government provides loans for constructing or renovating schools and hostel facilities (maybe under priority sector lending) at subsidised rates, then this will encourage private players to build residential facilities. Priority sector lending will not increase the government's burden as it is a reallocation of the existing funds available. The amount of subsidy has to be written off over the life of the hostel building (say 30 to 40 years) by spending money over the stay of the disadvantaged children. The money not spent will have to be returned with interest to the government. Transfer for fees, food and writing off of subsidy has to be linked to the learning levels of students which are in line with the priority set under the twelfth Five-Year Plan.

New Model of Schooling for Disadvantaged Children

Since the New Education Policy 1992, private participation in education has increased and calculations put forth by Jain and Dholakia (2009) has made it clear beyond debate that the low fee private schools will play an important role in achieving universal literacy. Definitely, the low fee private schools including models like Gyan Shala, Ahmedabad has shown high levels of students' achievement at very low cost. Gyan Shala currently incurs approximately ₹ 3,500 per annum, per child at the primary level which goes up to ₹ 5,000 at secondary level. However, the criticism of Jain and Saxena (2010), Sarangpani (2009) and others cannot be overlooked. So, there is a need for a modified model for schooling in India, especially with respect to the disadvantaged section. This model which I am proposing is not new, but somewhere, it has been missed out in the discussion on the current schooling system in India. I feel that residential schools with government, private, and community partnership are a way

out of this problem. These schools, apart from cognitive learning, will provide children with a place to play sports, learn music and dance, and involve in various extra-curricular and co-curricular activities. This will overcome the drawbacks of the Gyan Shala model and meet the objectives of the *National Curriculum Framework –2005* as given by the NCERT.

These schools will be located outside the city areas, where land is easily available or existing municipal schools, which need extensive renovation. The government has to provide these lands on a long term lease of 40–50 years at a token amount to the private players interested in building and managing schools. Preference has to be given to the corporates which take this venture as part of their CSR (Corporate Social Responsibility) activity, or social entrepreneurs whose main objective is to contribute to the society and do not take this as a business venture for profit making. The money for construction of school and hostel can be provided through the CSR funds available with both public and private sector organisation and other donations. All donations to this category of schools should also be made 100 per cent tax free. The residential status will be compulsory for the students admitted in these schools. Today, state governments are reimbursing up to ₹ 17,000 per annum, per child on account of fees, books, etc., to the private schools (*The Times of India* 2015). Now, if the cost of education for these schools is around ₹ 3,500–5,000 per child, per annum, then an additional amount of ₹ 10,000 per child will be sufficient to meet the cost of stay per child once infrastructure and money transfer for food subsidy is provided by the government. In this case also, transfer for fees and food has to be linked to the learning levels of students. The expenditure incurred by residential schools run by government is around ₹ 45,000 per child, per year for KGBV. Other government-run residential schools also have a similar cost structure. We expect that this model will be able to provide much better results in terms of school performance at a lower cost.

These schools will provide education for Classes I–VIII as provided under the RTE Act. It will function full day, working six days a week and the medium of instruction will be the mother tongue (regional language). This will make possible the additional support required by students to be provided in school only. The proposed model is better suited for schools working in two shifts. Though such schools make efficient use of resources, but at the cost of students' learning the disadvantaged students who need additional support but do not have the environment at home lose interest in studies resulting in increased absenteeism and eventually higher dropouts.

Based on the principles of school-based management, school

management committee will have full authority and be responsible for managing the school affairs. There will be no interference from government bodies with respect to the school functioning, as long as the students admitted are from the lowest strata of the society and the students' results meet pre-defined learning targets. There will be a separate school for boys and girls. Each school will have 16 classrooms (two each for Classes I–VII), one lab, one staffroom, one library room and one for the principal room. Class rooms, lab and library rooms should be with a sitting capacity of 40 students. This school structure will be built on the ground and first floors. The second floor will house the kitchen, dining area and indoor playing room. The kitchen will be managed by an outside contractor. The third to sixth floors will be used as a hostel with 10 rooms on each floor, accommodating 16 beds in each room. The seventh floor will have four flats for the teaching staff who will also be mentors for students on each hostel floor. In the first two years, admission will be given to students in all classes for one section, provided they possess class-specific learning levels. However, year three onwards admission will be given in Class I only. This is based on the presumption that the school will be able to attract 120–140 students in Class I from the third year onwards.

Schools will also have an open ground, and the infrastructure will meet the minimum requirements of the RTE Act 2009. Initially, schools may have to start without chairs, tables and beds for children. These resources will have to be arranged by the school management committee by garnering funds from the society through donations and sponsorship. *Prayaas* at IIMA, Visamo Kids and others generate lot of funds through these measures. Even family members and relatives of the children will be encouraged to donate in the donation box kept in the schools.

Teachers' salary and working conditions in these schools will be better compared to low cost private schools. Teachers will have free accommodation and food for them. They will also have free schooling for their children. This will restrict them to shift jobs for small increase in salary (Tooley and Dixon 2007). Further, teachers will be incentivised for children securing above the minimum learning levels. This has been recommended by many studies. (Muralidharan 2013). Learning levels will be tested by an independent body. This will keep them motivated to work hard. Also, the selection process and training will focus more on building a culture of service for humanity and not on monetary gains.

This model is based on the traditional Indian gurukul system. Here, the society is largely responsible for running the school. This system is part of the Indian culture since ancient times. Parents will be more inclined to send their children to

these schools. They find it difficult to meet additional expenses which they have to incur when the child goes to high fee charging schools. Children, after Class VIII may join the labour market, opt for vocational education or go for secondary and higher education. This model will not meet the objective of inclusive education. In any case, 100 per cent inclusive education was never an agenda of the Act, as residential schools were kept out. An example of a close model is Shri Sant Nilobaray Vidyalaya run by social activist Anna Hazare.

Conclusion

Numerous studies have found a strong positive association between the socio-economic background and students' performance. While we cannot change the realities of a child's birth environment, but we can definitely provide them with an environment where they are given an equal opportunity to learn and take decisions in their best interests. This model is meant particularly for those who are at the bottom of our social strata. Even children of people like construction labourers and others who keep on moving from one place to another for their jobs will be able to admit their kids here. Here, admission of students will be granted even if parents do not agree, provided this is in the interest of children and somebody (maybe a person or an organisation such as Kailash Satyarthi's Bachpan Bachao Andolan or the NGO by Harsh Mander for street children) becomes a guardian to the students. This will go a long way in reducing child labour also. Harsh Mander has also advocated building residential schools to solve the increasing problem of street children in big cities. Rainbow houses built in few cities of India provide for shelter and education of girl child living on the streets. The initial outcomes seem positive. So, we advocate that the government should make a provision for such residential schools where all stakeholders of the society join hands and come forward to provide basic education to the most neglected section of the society.

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Peace Education in Teacher Education Programme

A Suggested Curriculum

NIRADHAR DEY*

Abstract

The concept of Peace Education is not new, but its practice in our education system is a challenge. Global institutions like UNICEF and UNESCO have been initiated to make Peace Education a component of our school as well as Teacher Education long before. Accordingly, Indian institutions like the NCERT, NCTE, and the UGC have also tried to include Peace Education in Indian school, teacher, and higher education system. NCTE, the apex regulatory body for Teacher Education in India has recently come out with a revolutionary Curriculum Framework for all the levels of Indian Teacher Education Programmes. It is expected to have a complete qualitative revamping of Indian Teacher Education programmes if truely the curriculum will be implemented in the Teacher Education institutes. In its new resolution (January 2015), the NCTE has made a provision to integrate Peace Education as a component in the content designing of Diploma in Elementary Education (D.El.Ed.) curriculum, and has also made a provision to add Peace Education as an independent course in the list of optional courses in Bachelor of Education (B.Ed.) programme. Realising the importance of including Peace Education in Teacher Education curriculum, the author here tried to develop a curriculum of Peace Education which could help the Teacher Educators to design their curriculum for Peace Education at the Diploma, Bachelor, or at the Master level.

BACKGROUND

Realising peace and harmony is the ultimate aim of any system of education. Peace Education has been considered as essential and important component of every stage of education.

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L. Navarro Castro and J. Nario Galace speak about the levels of peace, which should be realised through integrating the same with education of different levels of education viz., elementary to Higher Educational. Let us see Figure 1 to understand the comprehensive concept of peace at different levels. As it shows the personal and interpersonal peace conveys the message of harmony with the self. Self-respect and respect for others, love, hope, justice, and tolerance are the key to resolving conflicts and violence, and Help to establish peace within the individual and at the interpersonal level. Global and inter-group peace focusses on keeping harmony with others. Respect for other groups within the nation, and with other nations is the key to establishing justice, tolerance, and cooperation. Peace between humans and the earth and beyond, spreads the message of harmony with nature and the sacred source.

Through Peace Education practices in School Education Curriculum, it is evident to have the 'process of promoting the knowledge, skills, attitudes and values needed to bring about behaviour changes that will enable the children, youth, and adults to prevent conflict and violence, both in overt and structural; to resolve conflict peacefully; and to create the conditions conducive to peace, whether at an intrapersonal, interpersonal, inter/group, national or international level' (Fountain Susan UNICEF, 1999).

UNESCO (2001), in its document on Peace Education, 'A Teachers' Guide to Peace Education' has described that Peace Education could be taught as an integrated concept in school curriculum and the content alignment in a subject should be central to the value of peace and harmony. 'It suggests ways of making every lesson a peace and every teacher a peace teacher.' Peace Education is not an independent discipline. The concept of Peace Education can be better understood by discussing the perspectives of various disciplines like anthropology, economics, sociology, education and teacher education, history, psychology, environmental studies, etc. (McElwee, et al. 2011).

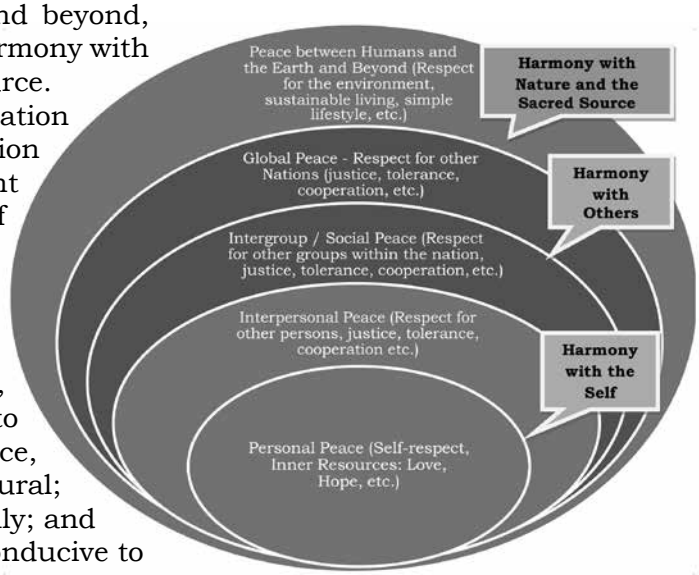


Figure 1. Levels of Peace
(***Source:*** *Peace Education: A Pathway to a Culture of Peace, Navarro-Castro, L. and Nario-Galace, J. 2010)*

Peace Education is keenly related with the children's right and value patterns, education for development, gender training, global education, life skills' education, economic and educational awareness, and psycho social rehabilitation.

To cater to the above relations with Peace Education and to establish better peace education practices in the schools, it is essential to have Peace Education as an important component in the Teacher Education Programme. Though the concept of Peace Education is not new in Teacher Education programmes, still its practices are very limited in our education system. Many global initiatives on Peace Education have been taken by UNICEF, UNESCO, and the Commonwealth of Learning (COL) for making it an inclusive and integrated part of school and teacher education institutes. According to UNESCO, 'Peace Education not only provides knowledge about a culture of peace, but also imparts the skills and attitudes necessary to defuse and recognise potential conflicts, and those needed to actively promote and establish a culture of peace and non-violence.'

Indian Initiatives

If we focus on the Indian practices in Peace Education, we find that Peace Education has also a definite place in our school and Teacher Education curriculum. The components of Peace Education in the Indian School Education curricula have been practised as an integrated content alignment with various disciplines since years. In the Position Paper National Focus Group on of National Focus Group Education for Peace, it has rightly pointed out that 'peace, as an integrative perspective for the school curriculum, is an idea whose time has come;' and 'if implemented with vigour and vision,' it 'can make learning a joyful and meaningful experience' (NCERT 2006). Accordingly, the *National Curriculum Framework (NCF-2005,* NCERT) has also pointed out that 'the potential of peace education for socialising children into a democratic and just culture can be actualised through appropriate activities and a judicious choice of topics in all subjects and at all stages.' Peace education as an area of study is also recommended for inclusion in the curriculum for teacher education'. *National Curriculum Framework for Teacher Education (NCFTE 2009*, NCTE), has also focussed on 'Peace Education as an integrating principle for the value-orientation of education. Education for peace is education for life, not merely training for a livelihood'.

Recently, the Indian Teacher Education Programmes have changed in a revolutionary way. The most appraised documents in the Indian Teacher Education Programmes relating to School and Teacher Education that is, the *National Curriculum Framework-2005 (NCF-2005)* developed by the National Council of Educational Research

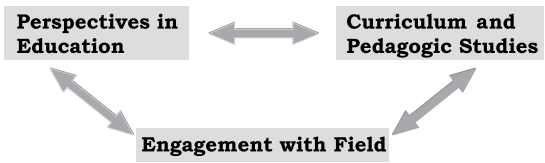
and Training (NCERT), and *National Curriculum Framework for Teacher Education 2009 (NCFTE-2009)* developed by the National Council for Teacher Education (NCTE) have equally focussed on the integration of the component Peace Education in school as well as teacher education curriculum. It is rightly reflected on the content of the prescribed books published by the NCERT after implementation of the NCF-2005 in school education starting from the elementary to the senior secondary level. It is very much evident to keep Peace Education as an essential component in its curriculum for children's and the youth' development.

In January 2015, the NCTE has come out with a revolutionary Curriculum Framework for two-year Teacher Education programmes at the diploma, bachelor, and master of education level. The face-to-face Diploma in Elementary Education (D.El.Ed.) has been kept two years as it was earlier, but both Bachelor of Education (B.Ed.) and Master of Education (M.Ed.) have been changed from one to two years. The NCTE's new initiatives have been appreciated across the country for the effective measures to control quality in Teacher Education programmes. It is expected that the implementation of the new curriculum regulations could completely revamp Indian Teacher Education and teacher preparation system. However, some doubt persists the minds of the intellectuals to implement the changes in Teacher Education, starting from designing the curriculum to the classroom practices within a short period of time. Many institutions/universities have started the process of designing the curriculum for implementing the new regulations. The NCTE is also making an effort for sensitising the Teacher Educators by organising workshops on the implementation issues of new Teacher Education regulations across the country.

At present, if we talk about the NCTE's New Curriculum Framework in the context of Peace Education, we find that there is no independent course for Peace Education in the two year-face-to-face Diploma in Elementary Education curricula. The component of Peace Education has been included in some of the courses like 'Education in Contemporary Indian Society', 'Emerging Gender and Inclusive Perspectives in Education' and 'Towards Self-Understanding', both in the first and the second year of D.El.Ed. programme. It is worthwhile to note here that no complete course on Peace Education has been suggested by the NCTE in its D.El. Ed. Curriculum Framework, but the component of Peace Education has been realised as an important theme to be included in various course contents in the programme.

Again when we talk about the NCTE's two year face-to-face New Curriculum Framework for the Bachelor of Education (B.Ed.) programme, we find that Peace

Education gets a definite place in the New Curriculum. The NCTE's B.Ed. curriculum is designed in three broad curricular areas; that is, 'Perspectives in Education', 'Curriculum and Pedagogic Studies', and 'Engagement with the Fields'.



(***Source**: Curriculum Frameworks, NCTE 2015)*

'Perspectives in Education' discusses the core component Courses in Teacher Education that is, Childhood and Growing Up; Contemporary India and Education; Learning and Teaching; Gender, School and Society (1/2 course); Knowledge and Curriculum; and Creating an Inclusive School (1/2 course). Curriculum and Pedagogic Studies discusses the course components like Languages Across the Curriculum (1/2 course), Understanding Disciplines and Subjects (1/2 course), Pedagogy of School Subject, Assessment for Learning, and the optional courses such as Vocational/Work Education, Health and Physical Education, Peace Education; Guidance and Counseling, or an additional pedagogy course taught at the secondary or the senior secondary level. The third component 'Engagement with Field' discusses the practical aspects of education like school internship, assignments, and Enhancing Professional Capacities (EPC) like reading and reflection on texts, drama and art education, critical understanding of ICT, and understanding the self.

In NCTE B.Ed. Curriculum Framework, we find that peace education is included in one area of its entire curricula that is, 'Curriculum and Pedagogic Studies', which is also as an optional course, not compulsory. In this regard, it can be said that, though 'Peace Education' is included in the NCTE B.Ed. Curriculum Framework, still it is in the hands of the university institutes whether to practice Peace Education in their B.Ed. curriculum or not. Again, in case the universities include Peace Education in their B.Ed. curriculum as an optional course, it is still in the hands of the students to opt for it or not. Moreover, the NCTE has come out in a detailed the course outline for the areas of the courses in 'Perspectives in Education' but not discuss in detail, the curriculum, outline for optional courses like Peace Education. That is why, it is a challenge before the University and the Institutes to design a 'Peace Education' curriculum for the B.Ed. students, if they want to keep 'Peace Education' in their curriculum as an optional course.

Again when we talk about the *NCTE New Curriculum Framework for the Master of Education (M.Ed.)* programme, we find that the component of Peace Education is included neither in common core

areas of the studies nor in the specialisation branches.

Keeping in view the above facts, here the author has tried to develop a detailed curriculum outline on Peace Education which could be considered as a course for teaching either in Bachelors or Masters level of Teacher Education programme. This is only a suggested curriculum outline; it might be further discussed, debated, and modified. Let us discuss the detailed course outline on Peace Education.

Detailed Course Outline on Peace Education

Total Weightage—100% (Theory—70% and Practicum/Assignment—30%)

Objectives of the Course

At the end of the course, the trainee teachers will be able to

1. define the concept of Peace Education practices in School and Teacher Education.
2. explain various initiatives relating to Peace Education including the practices of various life skills.
3. practice the approaches of Peace Education in classroom teaching–learning situation.
4. adopt various methods of teaching in Peace Education.
5. understand various perspectives of practising Peace Education across the curriculum.
6. analyse the global and Indian initiatives on Peace Education and Research.
7. identify Peace Education components integrated with various disciplines/subjects being taught at the school level.
8. identify the conflicts present within themselves and the methods of its resolution and transformation.
9. evaluate Peace Education programmes undertaken at the school as well as at the Teacher Education level.
10. review the researches conducted earlier on Peace Education and also be able to conduct research on Peace Education. and
11. conduct and analyse various cases and action research on Peace Education.

Course Outline (70% weightage)

Unit 1 Understanding Peace Education

- Defining the concept of Peace Education
- Aims and Objectives of Peace Education—Knowledge, Skills, and Attitudes
- Importance of Peace Education in School and Teacher Education Curriculum
- Approaches to Peace Education
  - Within the School—Improving the School Environment, Curriculum Development, Pre-service Teacher Education, and In-service Teacher Education Programme
  - Outside the School—Children's and Youth Camps, Sports and Recreation, Training for the Community Leaders,

Workshop for Parents, Channels of Communication (Magazine, Travelling Theatre, Puppetry, Television and Radio Programmes, Cartoons and Animation, Peace Campaign, Contests and Exhibition, etc.)

Unit 2 Global and Indian Initiatives on Peace Education and Research

- Global Initiatives on Peace Education—UNICEF, UNESCO, and COL
- Indian Initiatives on Peace Education—UGC, NCERT, NCTE, RCI
- Researches on Peace Education conducted since last one decade
- New areas on Peace Education—Identifying gaps for Research

Unit 3 Peace Education in Disciplinary Perspectives

- Anthropological Perspective
- Economics Perspective
- Sociological Perspective
- Historical Perspective
- Psychological Perspective
- Environmental Studies Perspective

Unit 4 Mainstreaming Peace Education

- Children's Right and Human Rights Education
- Education for Development
- Gender Training
- Global Education
- Like Skills Education
  - Self-awareness, Empathy, Critical Thinking, Creative Thinking, Decision Making, Problem Solving, Interpersonal Relationship, Effective Communication, Coping with Stress, and Coping with Emotions
  - Psychosocial Rehabilitations

Unit 5 Conflict Resolution and Transformation for Peace Education

- Defining Conflicts—Personal, Socio-psychological, and Professional
- Conflict Resolution—Ways and Means
  - Through Negotiation, Mediation, Cautious Optimism, Introspection, Fact Analysis and Readiness to Change
- Conflict Transformation
- Reducing Conflicts in the School and Building Peace

Unit 6 Suggested Teaching-Learning Methods and Techniques in Peace Education

- Participatory Learning Methods
- Peer and Group Learning Method
- Activity based and Problem Solving Learning Method
- Slogan and Essay writing, Poster and Cartoon Presentation, Debates and Quizzes, short plays & drama, etc.
- Projects, Action Research and Case Studies

Unit 7 Evaluation of Peace Education Programme

- Steps of Evaluating Peace Education Programme
- Survey, Questionnaire, and Rating Scales

- Interviews
- Observation
- Focus Group Discussion
- Textbook / Content Analysis
- Review of School Records
- Experimental Procedures

Practicum and Assignments (30% weightage)

A list of practical activities is suggested herewith for assigning assignments and semester activities to the students. It can be evaluated either internally or both, by the internal and external examiners. Weightage to the practicum will be 30%. It can be assigned to the students individually or in group. A student should undertake at least one assignment/activity out of the proposed ten activities/assignments.

- Conduct an Action Research on the practice of Peace Education among the identified students in your class and prepare a report on it.
- Conduct a case study on any Institute or School providing Peace Education and prepare a report on it.
- Conduct a survey (by using questionnaire/interview) to identify the nature of conflicts faced by the students and suggest the methods of resolution and transformation of the conflicts.
- Analyse an Elementary or Secondary curriculum textbook and find out the components of Peace Education elements/ contents are integrated in the text.
- Conduct a project in the community to make the community members and the parents aware about the conflict resolution and Peace Education concept. Record the opinions/ suggestions of the community members on conflict resolution and Peace Education and also suggest them the methods of conflict resolution and achieving peace.
- Conduct a programme on Peace Education in an Elementary or Secondary School and prepare a report on it. (slogan and essay writing, poster and cartoon presentation, debates and quizzes, short plays & drama, etc.)
- How does the Life Skill Education help to resolve conflict among the students and to achieve Peace among them? Analyse critically by citing suitable examples.
- Write a note on the disciplinary perspectives on the practice of Peace Education in schools.
- Analyse and review the researches conducted in India and abroad on Peace Education in the last one decade.
- Prepare and discuss a plan of Peace Education approach suitable in the Elementary/ Secondary class teaching within the school.

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Discussion on Peace Education Course Outline

The proposed course outline of Peace Education has been designed keeping both the components of theory as well as practicum. Out of the total weightage of 100% to the course, the theory portion of the course has been credited to 70% wightage and practicum/assignments cover 30% weightage. The theory part of the course is further designed in seven units and 10 activities are suggested in the practicum area. Let us discuss the main key issues or themes, that cater to the theoretical as well as practical aspects of the course.

Unit	Discussion
Unit 1 Understanding Peace Education	The Course outline of 'Peace Education' has started from the conceptual framework of Understanding Peace Education. Understanding the details of peace education depends upon how one has conceptualised it in view of the purposes it has included in teacher education curriculum. Teachers need to have been sensitised about its practices within and outside the school environment. Keeping in view the above, a detailed conceptual input is given in Unit-1 for discussions and deliberations between the trainees and Teacher Educators about the need and importance of including peace education in teacher education curriculum. The Unit will further help the trainees to understand the subsequent units of this course.

Unit 2 Global and Indian Initiatives on Peace Education and Research	Understanding the developments and history of any academic discipline enables the learners to understand the discipline better. In view of this, Unit-2 of this course discusses the development of peace education and researchers undertaken on various themes on peace education across the globe, including India. We believe that peace education can be addressed better in an inclusive curriculum set-up. We therefore advocate to make peace education practices an inclusive practice of the curriculum, but at the same time, a detail course on peace education can also be advocated for the group of learners who want to know more on it. The above aspects are addressed in this Unit while discussing the global and Indian initiatives on peace education fix window.
Unit 3 Peace Education in Disciplinary Perspectives	Peace education is not an independent area of study. The practices of peace education are interdisciplinary in nature. The issues relating to human development, culture, custom and costume, racial-lingual-religious unity, privileged and unprivileged sections of the society, inter and intra-personal relations, well-being, conflicts, emotions, attitudes, personality, acceptance, and the environmental ecosystem are necessary to be highlighted in peace education practices. Hence the importance of interdisciplinary subjects in understanding Peace Education its application in life need to be considered in the curriculum. Keeping in view the above, Unit-3 is designed to elaborate upon many critical discussions among the learners on understanding and practising peace education on various disciplinary perspectives.
Unit 4 Mainstreaming Peace Education	So far, we have understood that peace education is not an isolated aspect of study. It goes with many subjects, disciplines, and themes studied in school and higher education curriculum. For making its effect significant in educational practices, there is a need to words mainstreaming peace education. It means to include peace education not only as a part of school and teacher education curriculum but also to practise it in life skill development, rehabilitating people, addressing gender, child, and other such issues, through peace education programmes. Therefore, mainstreaming peace education and not keeping it isolated from human living is the necessity of the time.
Unit 5 Conflict Resolution and Transformation for Peace Education	Conflicts and violence are the main constraints to Peace Education. Often, we experience conflicts in our personal, social and professional life. Students should know the reasons for conflict and disharmony, and the ways of its resolution and transformation for a better living. It is said that there is a solution to every problem. Therefore, we can say that if and when there is a conflict, there is definitely a way to resolve it. We generally try to resolve our conflicts in our own way and understanding. This can be done through certain standard methods and techniques. Transforming conflicts into peace is a challenge before us. Therefore, the ways and methods of resolving conflicts and establishing peace need to be studied. The present Unit addresses all such issues.

Unit 6 Suggested Teaching-Learning Methods and Techniques in Peace Education	For practising a better method to learn and teach Peace Education, a good teacher likes to adopt the child-centred approach, especially at the elementary and the secondary level. A teacher needs to conduct various activities for realising the goal of Peace Education. 'A teacher is not only concerned with imparting knowledge but also concerned with developing social and life skills, moral attitudes and learning skills of children (UNESCO, 2001). For introducing Peace Education in Teacher Education Programme, we should know the methods and techniques to be used in the teaching-learning process of Peace Education. Teaching peace education can not be done like other theoretical subjects. This can be done better by practising participatory, peer and group discussion methods. This can also be better taught by presenting various success stories on peace education, projects on peace education, case analysis, and conducting action research on Peace Education. The other techniques of learning Peace Education for sensitising the learners can also be conducted through various activities such as slogan and essay writing, poster and cartoon presentation, debates and quizzes, short plays and drama, etc. Students usually get active in such activities. Unit-6 addresses all such methods and techniques.
Unit 7 Evaluation of Peace Education Programme	Evaluating academic programmes and courses are a regular activity of institutional functioning. For realising the need and to know how far the course satisfies the need and queries of the learners, there is a requirement to analyse and evaluate the programme or courses, starting from the beginning of its development. Generally for evaluating any academic programme, we involve the stakeholders associated with the programmes. Opinions and views of the stakeholders are taken, to know how the programme works. For this, tools are used to get their reponses. Usually, questionnaire, interview, observation, rating scale, focus group discussion, reviewing school record, and textbook analysis, etc., are done to evaluate the programme. This Unit will give the learners an overview to evaluate a peace education course.
Practicum / Assignments	Besides the theoretical aspects of the Course, a detailed practicum is also suggested as a compulsory component of the Course. Doing is better than listening or seeing. Therefore, an effort has been made to involve the learners in various activities related to Peace Education. 10 activities/assignments under the practicum have been suggested. It can be assigned to the students individually, in peers or in a group. The students should be given opportunity to undertake one assignment/activity out of a total of ten. The major practical aspects of Peace Education like conflict and conflict resolution & transformation, practising life-skill education for peace building, conducting action research, case studies, projects, organising school activities on Peace Education, community awareness programmes, organising and presenting cases of importance relating to Peace Education and critically analysing various themes on Peace Education are the suggested practicum areas.

Conclusion

To conclude, it can be said that the proposed course outline of Peace Education can be further discussed and modified for the practice of including it in the Bachelor or Master of Education Programme in Teacher Education. The suggested thematic units and the practicum/assignments have their own strengths to make the Teacher Educators aware and acquainted with the concepts and practice of Peace Education in schools and Teacher Education for peace. The inclusive and integrated approach of the themes of Peace Education in various academic disciplines could be further identified and exemplified to the Teacher Educators for their learning and practice. Moreover, the Teacher Educators should be motivated to conduct meaningful research, case studies, and projects on Peace Education. The Teacher Educators should also be acquainted with the methods and techniques to teach Peace Education in an interactive and participatory way. The hierarchy of transforming the concept and practices of Peace Education, i.e., from the Teacher Educators to teachers, and from teachers to students needs to be maintained. It is therefore important to understand the concept and practice of peace Education by the Teacher Educators first, and then only could it be better transformed to the teachers and students.

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Low Learning Achievements of the Learners in English Language in Elementary Schools of Tribal Areas

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Abstract

According to several reports, low learning achievements of learners in English language at the elementary schooling is a major concern and challenge. Despite the interventions and constructive strategies are being taken to promote quality education to all children between 6–14 years of age it is seen that at the end of elementary schooling, students cannot read the textbooks of their junior classes. Some of then even fail to distinguish between capital and small letters. Making spelling and grammatical errors, inability to write correct sentences or a short paragraph on their own, are several challenges in the way of improving students' learning performance. This study is an attempt to learn from the Block Resource Group members, who are master trainers in the block about the factors responsible for the low learning achievements of the learners in English language at the elementary level of schooling. For that, 49 BRG members from Blocks (out of 14 in Koraput—a tribal dominated socio-economic and educationally backward district of Odisha) were taken as sample of the study. Besides, efforts were also made to know the major problems that teachers are facing during teaching English in class, and remedies to alleviate the problem in order to improve the learning achievements of the learners at the elementary level.

BACKDROP

The Position Paper of the National Focus Group on Teaching English for NCF 2005 makes it clear when it addresses the 'English language question'. English, in India, today, is a symbol of people's aspiration for quality in education and a

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greater participation in national and international life. English is introduced in Class I or III by 26 States or Union Territories, out of 35 and seven States or Union Territories introduce it in Class IV or V (NCERT 2005).

Today, English has become a global language with a very high demand in the job market. Across the world, competitive examinations are conducted in the English medium/ language. The candidates of several competitive examinations conducted in English can easily collect their study materials from the market. Irrespective of the abundance of English dailies and journals across the country, the performance of school students in the English language, particularly in rural and tribal pockets of Odisha is found unsatisfactory. We shall refer to the observation of Annual States of Education Report (ASERs) regarding the statistics on learning achievements of children in the English language in Odisha.

ASER, 2014 reveals that a large majority of students in Class V are not able to acquire the basic reading skills both in the English language and their mother tongue. Similarly, the report states 25 per cent students enrolled in Class VIII were found incapable of reading textbooks prescribed for Class II. Again, the report reveals 25 per cent children in Class V could read the simple sentence in English. Similarly, in III–V, 59.85 per cent children in 2014 could read Std. I level text or more. But this status was 61.39 per cent in 2010. This implies that there has been no improvement in students' learning. The report says that except Tamil Nadu, there is no significant improvement in the reading skills of the learners at the elementary stage during the last five years in other states.

As shown in Table 1, in Class V, 11.7 per cent children cannot read capital letters, 24 per cent children can read small letters, 29.7 per cent children can read words, but not sentences, and 22.9 per cent children can read easy sentences.

Table 1
Percentage of Children by Class and Reading Level in English
(All Schools, 2014)

Std.	Not Even Capital Letters	Capital Letters	Small Letters	Simple Words	Easy Sentences	Total
I	54.0	19.9	13.7	9.9	2.5	100
II	38.6	18.1	22.8	15.1	5.3	100
III	23.7	19.9	26.3	22.1	8.0	100
IV	16.4	15.9	26.7	26.0	15.0	100
V	11.7	11.7	24.0	29.7	22.9	100
VI	7.0	10.6	21.0	28.6	32.9	100
VII	5.0	6.4	19.2	29.8	39.7	100
VIII	4.8	5.6	17.2	26.6	45.7	100
Total	20.3	13.6	21.5	23.5	21.1	100

Source: ASER-2014

Table 2
Percentage of English Comprehension Level of Children (All Schools, 2014)

Std.	Of those who can Read Words, % Children who can Tell Meanings of the Words	Of those who can Read Sentences, % Children who can Tell Meanings of the Sentences
I	68.0	—
II	62.1	—
III	67.9	54.0
IV	58.9	52.4
V	55.8	55.3
VI	63.8	56.0
VII	68.2	61.7
VIII	64.2	62.6
Total	62.9	58.1

Source: ASER-2014

Keeping in view the performance of students in the English language at school and other levels, several researchers and commissions have shown their dissatisfaction. Tickoo (1996) states, 'Unfortunately, despite repeated recommendations by different commissions constituted by the Government of India, the position of English in the curriculums and methods of teaching have always been in a state of flux. English today is simultaneously a sought after and suspected phenomenon'. (Rout and Behera 2012).

While on the one hand, the importance and demand of the English language in the global market is increasing; the quality of English language education in majority of Indian schools is an appalling picture. The paradox of demand and suspicion (Tickoo 1996) mentioned above could be further reflected through the paradox of access depicted by the report of the National Knowledge Commission (NKC 2007). It states, 'There is an irony in the situation. English has been part of our education system for more than a century. Yet English is beyond the reach of most of our young people, which make for highly unequal access. Indeed, even now, more than one percent of our people use it as a second language, let alone a first language... But NKC believes that the time has come for us to teach our people, ordinary people, English as a language in schools. Early action in this sphere would help us build an inclusive society and transform India into a knowledge society' (NKC 2007, p. 27).

Keeping in view the role and importance of the English language in the present era at all levels on the one hand, and the gloomy picture of Indian schools as regards the performance of their learners in the English language on the other hand, the present study was conducted.

The study endeavours to discover the major factors accountable for the low performance of children in elementary schools in English language education from the Block Resource Group members. These members are master trainers in the English language and have been teaching English for many years in schools at the elementary level.

Objectives of the Study

The major objectives of the study were—

1. to identify the factors accountable for the low learning achievements of the learners in English language in the elementary schools of the district.
2. to find out the major challenges and problems faced by the teachers while teaching English at elementary level.
3. to study the suggestive remedies given by the BRG members addressing the issues related to the low learning achievements of children in the English language in the schools of Koraput district.

Operational Definitions of the Key Terms

- **Low Learning Achievement**

  Low learning achievement means the lack of minimum competencies or foundation knowledge which is needed for the class (es) in which students are enrolled or studied. For example, to enrol and sustain in Class IV, one should have minimum foundation knowledge or competencies to understand the concepts in various textbooks like language, mathematics, social studies, environmental studies, etc. But according to several research studies and reports, particularly in the govt. schools, most children at the elementary level do not possess minimum competencies. Even students in Class V cannot distinguish between capital and small letters; students in Class VIII cannot read English textbooks of their lower classes. The students of these categories are operationally called students with low learning achievement.

- **Tribal Areas**

  The districts where population sizes of the Scheduled Tribe communities are comparatively higher, are considered as the tribal dominated districts. For example, according to the Census of India, 2011, the ST population constitutes about 22.85 per cent of the state population (Odisha), but in nine districts of Odisha including Koraput—the sample district, the population of ST category was 45 per cent or more. Keeping in view the dominance of the ST population, Koraput (sample district) can be called a tribal dominated district.

- **BRG Members and their Perception**

  BRG stands for Block Resource Group. They can also be called master trainers at the block level. Experience a teachers who are teaching the English subject in primary schools at least for the last five years and having fluency and leadership qualities were selected as BRG members for the training. It is a regular practice of DIET to identify Resource Persons at the block and district level by organising several activities, training programmes and during monitoring to primary schools. The purpose was to train BRG members who will in turn train teachers at the block and cluster level, in the English subject in both, content and pedagogical areas.

Delimitation of the Study

- The study was conducted on the views of the 49 BRG members of the English language only.
- All the BRG members belonged to Koraput district.
- It was confined to 13 blocks of one tribal dominated district of Odisha–Koraput.
- The sample size was small for a broad generalisation.

Design of the Study

The design of the study comprises population, sample, methodology, data collection procedure, data analysis and discussion.

Population and Sample

All the Block Resource Persons in the English language of Koraput Odisha were the population of the study. As per the instruction of the District Project Coordinator, *Sarva Shiksha Abhiyan (SSA),* Koraput, only four BRGs had to attend the training from each block. 49 BRGs from 13 blocks were the samples of the study who attended the training. The distribution of the sample is presented below in a tabular form.

Table 1
Distribution of Sample

S. No.	Blocks	No. of BRG	Social Category in terms of Caste (s)				Teaching Experience (in Years)		
			UR	OB	SC	ST	Below 10	11–20	21–30
1.	Jeypore	03	01	02	–	–	01	01	01
2.	Koraput	04	04	–	–	–	01	–	03
3.	Kotpad	04	01	01	01	01	03	01	–
4.	Nandapur	04	01	02	01	–	03	01	–
5.	Kundra	04	01	02	–	01	–	03	01

6.	Borriguma	04	04	–	–	–	–	01	03
7.	Laxmipur	04	02	01	–	01	–	04	–
8.	Boipariguda	04	02	02	–	–	02	–	02
9.	Bandhugam	03	01	01	01	–	02	01	–
10.	Lamtaput	03	02	–	01	–	01	01	01
11.	Semeliguda	04	02	–	01	01	02	01	01
12.	Dasmantpur	04	–	02	01	01	–	04	0
13.	Narayanpatna	04	02	02	–	–	01	03	–
	Total	**49**	**23**	**15**	**06**	**05**	**16**	**21**	**12**
	Grand Total	**49**	**49**				**49**		

Data Collection Procedure

A five-day training programme for the capacity building of the BRGs in English Language Training Package for Primary Teachers of English was organised by the District Institute of Education and Training (DIET), Koraput at Jeypore, Odisha. The module, prepared by the English Language Training Institute (ELTI), Bhubaneswar, Odisha is meant for capacity building of teachers who are teaching English at the elementary level up to Class VIII. The module is specially prepared for focussing on the current context of teaching English in Odia medium in the primary schools of rural and tribal areas. As per the instruction of the Directorate of Teacher Education and SCERT, Odisha, four Block Resource Group members from each block were invited to the training. The purpose was to train the BRG members who will in turn train teachers at the block and cluster levels, for better teaching and organising learning activities in the English subject at the Elementary level. Out of 14 blocks in the district, 49 BRG members from 13 blocks participated in the training. Due to some local problem, Pottangi block could not participate. To know the opinions the of BRG members, a self-prepared questionnaire was administered for data collection, after formal inauguration and self introduction.

- The self-prepared questionnaire consists of three parts. Part I was for data relating to personal information of the BRG members (reflecting their name, age, gender, caste, designation, educational qualification, total experience in years as teachers of English and RP, the block they belong to and their contact number. Part II, consisted of three open-ended questions— (1) write a short paragraph about your school. (simply to know about their schools and writing skill), (2) state the major problems or challenges you are facing while teaching English to your students at the

primary level, (3) suggest remedies to improve the performance of your learners in English language, (4) it carries 21 questions in the form of statements. The teachers were asked to mark or tick the five point scale (Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree) relating to the issues, challenges and problems responsible for the low learning achievements of the learners in English subject at the Elementary level.

- Focus group discussion, with selected BRG members from all the sample blocks, a few State Resource Persons who were training them and researchers from ELTI, Odisha, was conducted on major problems, challenges and remedies for low learning achievements of the students at the primary level, particularly in the schools of Koraput district.

Data Analysis Procedure

The required data, collected for the present study was analysed in the descriptive way using mixed research methodology (both qualitative and quantitative). Simple statistical techniques like percentage and frequency distribution were employed for the study.

Discussion and Findings

Addressing the objectives of the present study, the participants were asked three open-ended questions and 21 questions to be simply ticked against a five point scale. The purpose of the three open-ended questions was different in nature. The first question asked the teachers to write a short paragraph about their own school. The purpose was to know the location, faculty position, physical facilities, etc., available in the school and to identify the writing skills of the teachers. All participants responded to question 1 by writing a short paragraph within the stipulated space provided to them. As the teachers (sample) are teaching the elementary children, an attempt was made to assess their handwritings, spelling errors, grammatical mistakes (use of capital or small letters at the proper place, tense, preposition, articles used, gender, number, etc.), slip (careless error), margin and space problem (left and right sides, gap between two words or sentences, etc.), contextual writing, paragraph problem (unity and order not maintained), etc.

The inefficiency of teachers can also be a major factor responsibility for low learning achievements of the learners in elementary schools in the tribal pockets of Odisha. On evaluating their short paragraphs, it was observed that the handwritings of around 50 per cent teachers were not good. The writings of some teachers could hardly be read. But most of the BRG members were able to write correct sentences, maintaining proper sequence and connectivity. However, almost all the teachers failed to maintain proper space between two words or sentences. They were not

sensitive to context. So, they failed to write context-based relevant information in the paragraph. They should be conscious enough to know what they have been asked to write, whats to be written and where, while writing a paragraph on a particular topic or context. Besides, some common spelling and grammatical errors (perhaps due to slip which can be avoided through revision or reading) were also identified. Above all, the writing skill of the teachers was satisfactory. But, they have to follow the basic steps while writing paragraph or short essay (e.g., Think, Write, Revise and Re-write).

The second question was to mention the major problems and challenges they are facing while teaching English to children in their schools. Responding to the question, they said the following major issues and challenges.

- The children have a strong perception that English is a very difficult language, so it is difficult to learn it on their part.
- They are not interested to learn English language due to several reasons.
- Severe impact of their regional language or mother tongue is a challenge for developing speaking skills with correct pronunciation.
- Most of the learners cannot read their prescribed English textbooks individually.
- Some learners do not participate in group activity.
- They hesitate to ask their teachers regarding their study. Even they do not like to clarify their doubts.
- Students know the answers of the questions asked by their teachers but are not ready to speak, due to excessive shyness and fear.
- Poor word power or stock of vocabulary is a major challenge.
- Inadequacy of teaching-learning materials in schools is also a constraint.
- Irregular attendance of learners in schools discourages teachers to take any initiatives for innovations for these better learning.
- Some state that an overcrowded classroom environment is a challenge to giving individual attention to each child in terms of checking their notebook, giving individual attention, etc. (more than 50 students are also seen in some classes)
- Multi-grade class (a teacher has to manage more than one classes) is a great challenge which adversely impacts the quality of education.
- Excessive workload of teachers is also a concern to focus on the academic improvement of children.
- Single teacher schools cannot help the students for better learning achievements.

Factors Responsible for Low Learning Achievements in English Language

To know the factors responsible for low learning achievements of

the children in English language in elementary schools of Koraput (a tribal dominated socio-economically and educationally backward district of Odisha), the teachers were asked to give their views, responding to 21 questions in a questionnaire form. The responses of the teachers were critically analysed, as below.

Only two questions concerning material and human resources were asked to the participants. Out of this, 14 per cent BRG members (primarily teachers) strongly agreed and 57 per cent agreed on the non-availability of sufficient teaching-learning materials to teach English in schools as a factor accountable for low learning achievements of the learners in English language in primary schools. In short, about 71 per cent Block Resource Group members think poor infrastructural facilities, in terms of essential TLMs,

Table 2
Institutional Issues

S. No.	Factors Responsible	SA(%)	A(%)	UD(%)	DA(%)	SD(%)
1.	Sufficient TLMs are not available to teach English language in schools	14	57	06	Nil	23
2.	Adequate number of language teachers are not available in schools	39	49	02	Nil	10

SA—Strongly Agree, A—Agree, UD—Undecided, DA—Disagree, SD—Strongly Disagree

Table 3
Issues related to Learners

S. No.	Factors Responsible	SA(%)	A(%)	UD(%)	DA(%)	SD(%)
1.	Children are the first generation learners	46	26	08	06	14
2.	Impact of home language is a potential factor	34	44	04	10	08
3.	Poor attendance of students in schools	18	62	12	08	Nil
4.	Parental support to students is not satisfactory	34	52	04	02	08
5.	Children are not interested to learn English	08	18	08	44	22

SA—Strongly Agree, A—Agree, UD—Undecided, DA—Disagree, SD—Strongly Disagree

is discouraging teachers to promote quality education in English language which brings about poor performance of the learners. Whereas, 6 per cent BRG members could not take their decision and 23 per cent strongly disagreed to the issue as a factor of degrading learning achievements of the learners in English subject at primary level. Similarly, around 88 per cent BRG members confessed that deficit of language teachers is a major challenge for promoting quality education in English subject while 10 per cent strongly disagreed.

Responding to the issues responsible for the low learning achievements of the learners at the elementary level, the BRG members said most of the learners in tribal areas are first generation learners. So, they cannot get proper guidance and support in their families. Of course, 20 per cent teachers disagreed to the issue but 72 per cent teachers supported, while 8 per cent could not say anything. Similarly, 78 per cent participants said the impact of home language is a potential factor which causes low performance in the foreign language, while 18 per cent do not feel it as an obstacle for learning the English language. On the other hand, 80 per cent teachers agreed that poor attendance of students in schools is a major cause of low learning achievements of children in English. Similarly, almost all teachers agreed to the issue that lack of parental support is a major challenge in the way of better learning achievements of children in the English subject at the elementary level. Responding to the question of whether children are uninterested in learning English, 66 per cent participants disagreed, 26 per cent agreed and 8 per cent could not give their view.

Table 4
Factors Associating Teachers and Pedagogy

S.No.	Factors Responsible	SA(%)	A(%)	UD(%)	DA(%)	SD(%)
1.	Teachers using traditional methods of teaching	38	40	02	08	12
2.	Poor vocabulary stock of teachers	26	42	16	10	06
3.	Emphasis is on students attendance, not participation in learning activities	24	46	12	04	14
4.	Teachers do not give individual attention to the learners	32	38	04	14	12
5.	Teachers take class without planning and preparation	08	40	02	18	32
6.	Teachers need orientation for development of competencies in teaching English	44	46	Nil	04	06

7.	Work loaded teachers cannot get time for innovations	28	40	08	16	08
8.	Teachers are concern about completion of syllabus/course	14	42	02	24	18
9.	Wrong pronunciation of teachers in English	22	50	08	12	08
10.	Teachers teach for the sake of teaching	10	40	24	16	10
11.	Irregular correction of home work	22	38	06	22	12
12.	Teaching English can be joyful through activity method	60	40	Nil	Nil	Nil
13.	Teaching English language is a difficult task	10	16	26	02	46

SA—Strongly Agree, A—Agree, UD—Undecided, DA—Disagree, SD—Strongly Disagree

Associating the issues of teachers and pedagogical aspects, 13 questions were asked to the BRG members. Responding to the first question, 78 per cent participants agreed that till now the teachers are using traditional methods of teaching in their classes, while 20 per cent discarded it. On the other hand, they were asked whether poor stock of vocabulary of teachers is a factor affecting the performance of the learners in English at the elementary schooling. 68 per cent supported the issue and 16 per cent disagreed, while the rest 16 per cent could not take any decision. Similarly, 70 per cent BRG members said teachers at the elementary level focussed on students' attendance, instead of active participation of the learners in learning activities, but 26 per cent did not agree with the issue. Like that, 70 per cent said teachers do not give individual attention to the learners which adversely impacts students' learning. Responding to the question on the teachers' preparation to take the class, 50 per cent responded in the affirmative while 48 per cent said that they do not go to the class with planning and preparation. On the other hand, 90 per cent BRG members are in favour of need-based training and orientation to the teachers for developing their competencies and for capacity building. Besides, 68 per cent said owing to heavy workload, the teachers cannot think and give time for innovation. Whereas 56 per cent said completion of syllabi is the prime objective of teachers 42 per cent teachers did not agree with the statement. On the other hand, 72 per cent teachers said that wrong pronunciation of teachers who are teaching English is a major concern bringing low achievements of learners in English subject at the elementary level. Irregularity in evaluating

home task of the learners is also a factor responsible for low learning achievements of the learners in the tribal and rural schools of Odisha. Responding to a statement regarding the methods of teaching, almost all teachers (100 per cent) admitted that in order to make the classroom environment joyful, activity-based learning (ABL) is the best method. Giving their view on whether teaching English language is a difficult task, 26 per cent participants agreed, 26 per cent remained undecided and the rest 48 per cent disagreed.

Suggestions and Recommendations

In order to improve the learning achievements of children in the English language at the elementary level, the following suggestions and recommendations are suggested by the stakeholders (experienced teachers, headmasters, Cluster Resource Centre Coordinators and education authorities, working in the rural pockets of Odisha). The major suggestive remedies are as follows.

1. The four major skills of learning any language are listening, speaking, reading and writing (in short L-S-R-W). Listening is the primary receptive skill on which development of other skills depends on. But, the teachers in government schools give more emphasis on reading and writing instead of listening and speaking. In fact, they directly start English teaching from writing the alphabet and reading books. But it is a fact that one cannot learn to read and write well in a language unless one first learns to listen and speak a language. So, special attention should be given at the primary level to develop the listening and speaking skills in English in the primary schools before teaching learners how to read and write.
2. In the government schools (Odia medium schools in Odisha), learning English language starts from Class III. But, English medium schools, it is started from Nursery classes, providing one or two years of pre-primary education in English. This practice of these schools helps the children to develop their listening and speaking skills as they perfectly focus on these two primary skills, least focussing on writing and reading. So, pre-primer activities may be started in Class I or II after training teachers at the school level (books are prepared and supplied by ELTI with clear instructions on giving necessary training to all teachers), which may help the learners to develop listening and speaking skills in the English language.
3. It is observed that the speaking skill (in English language) of children in Odia medium schools is comparatively poor. It is due to three important reasons—fear and shyness of children, no learning environment at home and

overemphasis on structure and grammar by teachers. In English medium schools, the students are allowed to speak freely without any fear and hesitation. But in Odia medium schools, while on the one hand, the learners do not get ample scope to speak, on the other hand, the teachers compel them, directly or indirectly, to speak complete sentences with correct structure and grammar. So the attitude of teachers should be changed. Once, the children are allowed to speak freely and gradually, the grammatical or structural mistakes may be checked.

4. The teachers who are teaching English should be empowered through frequent orientation, workshop and training, particularly by organising interesting learning activities to develop the four basic skills of language learning of the learners at the primary level. So, it will be helpful to the teachers to use less of the stereotyped chalk-talk method, and adopt learner(s)-friendly innovative pedagogy. On the other hand, the learners too will be interested towards learning English without fear and become skilled by actively participating in several activities organised in the class, instead of sitting and doing their assignments alone.
5. Ample scope and complete freedom to be given to the teachers to develop their own teaching strategy instead of the time-bound and book-specified learning practices. So, the teachers can develop new and need-based activities keeping in view their learners' interest, ability and resources available in schools.
6. The schools should be equipped with adequate and relevant teaching–learning materials (audio, visual and audio visual) to teach the English language comfortably. The materials should be developed keeping in view the contents of the textbook and bases of children.
7. Keeping in view the Student–Teacher Ratio (STR) as per RTE, adequate number of teachers should be appointed, justifying their subject specialisation. For example, if a school needs three teachers according to STR, so, one teacher should be from humanities, one from languages and another from the science background. So, they can do justice to all children in all subjects. But, the reality is that while in some schools, all are from the science background, in other schools, only those from arts background are teaching. Besides, education authorities say there is no need of specialisation at primary schools. Each teacher can teach any subject. But it is always better to have a teacher specialising in a subject to teach it to the students. So, this issue

can be re-examined or taken into account even at the level of primary schooling.

8. While developing textbooks in English language, instead of simply giving importance to the teaching experience of the writers, focus is to be given to their expertise in the subject and the class for which the textbook is being prepared. For that, experts from the English Language Training Institute (ELTI), child psychologists, expert artists, the practitioners (teachers teaching at the elementary level) from different regions may be involved.
9. The interventions to strengthen elementary education like SAHAJA/UJWALA programme in Odisha should be perfectly implemented providing remedial teaching to poor performers in English language through interesting activities.
10. The schools should provide ample scope and privilege to the children to speak, share and communicate with peers, teachers and other stakeholders freely and confidently without fear and pressure, so they can develop their communicative skills better.
11. Co-curricular activities like debate, essay, elocution, extempore speech, slogan writing, role play, drama, poster preparation, project works relating to different socio-cultural issues are to be organised in the English language, so the learners can develop their outlook and get exposure.
12. Besides, educational games like vocabulary games, grammar games, etc., may be employed during classroom transition, so the learners will be able to develop positive attitudes and interests to learn the English language.

Conclusion

The low learning achievement of learners at the elementary schooling in the English language is a major challenge not only in the tribal pockets of Odisha but throughout rural India. There is an urgent requirement of schools with well-equipped, congenial learning environment. The fear among the learners and the attitudes of the parents and teachers towards the English language as a difficult subject, needs to change. To achieve this, regular orientation programmes for the teachers to teach English through organisation of various activities like chain drill, showing pictures, riddles and grammar and vocabulary games, role plays, dialogue, etc., are required. Besides, regular monitoring by education authorities and DIET faculties is useful to assess the accountability of teachers and to provide needful academic supports to them respectively.

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Episodic Conceptualisation as Genesis of Pupils' Alternative Conceptions about Graphs in Kinematics

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Abstract

In the present study, the possible episodic structures which the pupils are likely to auto-generate while being taught about graphs in kinematics, have been identified. The effects of this episodic conceptualisation on the responses of pupils of Classes X and XII, and practising higher secondary teachers to comprehend problems related to the construction and interpretation of graphs in kinematics have been investigated. We have suggested focused teaching points to be noted while teaching graphs so as to minimise the generation of alternative conceptions.

INTRODUCTION

In the last several years, motivated by Constructivism, an active research programme has been established to study pupils' alternative conceptions (hereafter referred to as ALCONs) and their implications for teaching-learning of science. Overviews as well as critical and interpretative reviews of the works in this area can be obtained from the papers of Mohapatra (1997), Driver (1995), Wandersee et al. (1993), Mohapatra (1989), Driver (1989), Hashweh (1986), Gilbert and Watts (1983), Driver and Erickson (1983), from the books by Treagust et al. (1995), Glynn and Duit (1995), Fensham et al. (1994), Driver

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et al. (1993), Osborne and Freyberg (1985), Driver et al. (1985), and from the conference proceedings (Novak 1993, 1987; Archenhold et al. 1980) during different periods. Some recent works include Agarwal (2014), Taber (2014), Mohapatra, Mahapatra and Parida (2015).

In a constructivistic framework (Glasersfeld 1995), it is now conclusively established that (a) knowledge is constructed by the cognising subject, and (b) pupil's ALCON is the single most important factor (Ausubel 1968) that determines the degree and quality of this construction. However, the full potential of the findings and conclusions of the research studies about pupils' ALCONs in helping the classroom teachers to improve or modify their teaching strategies so that pupils construct their knowledge in the form in which they are expected to construct, is yet to be realised in our country though suggestions have been offered, for example, in the National Curriculum Framework 2005 (NCERT 2005). Such attempts seem to have achieved partial success elsewhere (see Palmer 2005; Wenning 2008).

We argue that the individualism in the form and structure of pupils' ALCONs about specific concepts is one of the major hindrances for taking the research findings and teaching models into the classroom. Within the classroom, a teacher can hardly afford the luxury of simultaneously handling a number of different ALCONs of a group of pupils about a single concept. However, a group of pupils having the same or similar ALCONs can possibly be exposed to a single, well planned treatment for effective modification of the ALCONs. But associated with this is the issue that a treatment will be as good as the diagnosis of the genesis of the ALCONs. Hence, to diagnose the genesis process that is likely to lead a group of pupils to common ALCONs could possibly be the first step towards functionally taking the research findings about ALCONs vis-à-vis constructivism into the classroom.

There have been attempts to identify the possible origins of pupils' ALCONs on the basis of field-based studies (see Mohapatra 1988). Based on the findings, the genesis has been classified into the following three categories.

Induced Incorrect Generalisation (IIG)

Due to repeated reinforcement of the validity of a concept in a limited zone of the domain of its validity, there is a high possibility that pupils will auto generate (through self construction) a generalisation which is incorrect (Mohapatra and Bhattacharya 1989). Five discrete processes through which IIG operates, at least in the concept domains investigated in the above studies, have also been located (Mohapatra 1988a). They are—

- the process of 'conceptual reversibility'

- the process of 'conceptual continuity'
- the process of 'conceptual extrapolation'
- the process of 'conceptual myopia'
- the process of 'conceptual incongruity'

Connotative Relativity

A label, specifying a concept, may convey a meaning to the pupils which is different from what the teacher desires to convey through the transaction of formal science (see Barman and Mayer, 1994; Mohapatra and Das 1996). This leads to a state of connotative relativity.

Episodic Conceptualisation (Epi-Con)

It is observed that in many cases, the chapters in textbooks are written and arranged like independent episodes. We use the term 'episode' in the conventional sense of distinctive incident or occurrence. Even the classroom teaching follows an episodic pattern of presentation as very often, the teachers say, for example, we have completed 'Optics', next we go over to 'Electricity'. It is argued (Mohapatra 1990, online 2007; Arora et al. 2010) that such an episodic nature of presentation of different units and sub-units is likely to induce the pupils to develop isolated, unconnected islands of equilibration. Three discrete processes through which ALCONs manifest due to Epi-Con, at least in the concept domain investigated (Mohapatra 1990, online 2007) have also been located. They are—

- the process of 'non-use' of an episode
- the process of 'misuse' of an episode
- the process of right use of wrong episodes

The Questions

In the present study on episodic conceptualisation, we attempt to seek answers to two questions.

1. In the context of graphs, what are the possible episodes the pupils might have internalised?
2. What are the likely effects of these episodes, in so far as generating ALCONs in the concept domain of graphs in kinematics is concerned?

Relevant Literature

Graph (also called a chart), as a symbolic diagram or pictorial representation of the relationship between two or more variables, has widespread application in many different domains. A large number of the Internet-based resources on the use of graphing in teaching learning are available (for example, www.csulb.edu/~thenrique/Run.pdf for middle and high school students; www.mathgoodies.com/lessons/toc_vol11.html for data and graphs; www.teach-nology.com> Free Teacher Worksheets > Math; www.teach-nology.com >Teacher Resource> Lesson Plan

Center> Math; www.inspiration.com/visual-learning/plots-and-graphs). In India, the National Curriculum Framework 2005 (NCERT 2005) stipulates that pupils ought to learn graphical technique in mathematics in the early years of schooling, so that they can appreciate relationships between quantities, not in mathematics alone but in science and other areas also (NCERT 2005, p. 44). This is reflected in the Learning Outcomes relevant to Class VII (Mathematics) and Class VIII (Mathematics), recently designed by the National Council of Educational Research and Training (NCERT 2017).

In the secondary level school science, graphs are used to teach concepts in kinematics—a branch of science that deals with motion of bodies. Graphs also help the students to derive kinematical equations for different kinds of motion such as, motion with uniform velocity, motion with uniform acceleration, etc. It was but natural that researchers divert their attention to diagnose and map pupils' ALCONs about graphs in kinematics.

Most of the studies have aimed at assessing pupils' abilities in constructing and interpreting graphs. One of the earliest attempts in this regard was by Trowbridge and McDermott (1980), wherein they hit upon the potentially rich area of pupils' misinterpretation of 'velocity' as 'displacement/time' and not as 'change in displacement/change of time'. Saltiel and Malgrange (1980) concluded from their study that graphical representations can easily be misleading—decomposition of a velocity vector (pertaining to a unique frame) into its components (vertical and horizontal, or radial and tangential) leads to a figure which may be easily confused with a velocity composition diagram illustrating the change in velocity from one frame to another. Shaw et al. (1983) made a longitudinal study of the graphing ability of students in grades VII through XII. McDermott (1984) opined that because many relationships, implicitly assumed by teachers, are not obvious to students, and teachers need to help students make explicit connections among physical concepts, their mathematical representations like graphs and the physical world are beset with difficulties. McKenzie and Padilla (1986) investigated the problems associated with graphing skills in science. McDermott et al. (1987) identified some common errors exhibited by students in interpreting graphs in kinematics. They observed that the errors are not idiosyncratic but cut across students belonging to different populations and different levels of sophistication. Brasell (1987) studied the effect of real time laboratory graphing on learning graphic representations of distance and velocity. Continuing in the same line, Berg and Phillips (1994) investigated the relationship between logical thinking structures

and the ability to construct and interpret graphs. They were able to classify pupils' responses in to three types—'right answers/right reasons', 'right answers/wrong reasons', and answer scored 'wrong' but correct for 'valid reasons', in the context of students' abilities to construct and interpret line graphs. Recently, a study examined the use of graphs by teachers as a part of professional development (Bautista et al., 2015).

In the Indian context, a mention may be made of a study conducted in 1997 in which 500 valued answer scripts of Class XII physics pertaining to the 1995 Annual Examination of the Council of Higher Secondary Education, Odisha were examined by a group of experts to unearth common errors committed by students in answering the paper. The findings related to the graphs states that students have a poor perception of graphs in general, including nature of the graph expected, procedure for plotting the graph, interpreting it, and extracting information from it (Parida 1998).

Episodes in the Teaching of Graphs

In a Brunerian framework, the essential attributes of a graph are its slope and its intercept on any axis, whereas the non-essential attributes are the coordinates of a point on the graph and the scales. However, the essential attributes of a straight line graph are global in nature in the sense that at every point, the slope is the same and there is a fixed intercept on an axis, as for example, the straight line given by the equation $y = m x + c$, where 'x' is the independent variable, 'y' is the dependent variable, and 'm' and 'c' are constants denoting the slope and intercept, respectively. But the essential attributes of any other curve are local in nature because the slope may vary from point to point and/or a curve may have several intercepts on an axis.

Keeping the above framework in mind, the textbooks and curricula of various classes were analysed and actual classroom teaching was also observed. It was seen that pupils are taught and instructed to use graphs in various contexts over a period of four years comprising Classes VII, VIII, IX and X and reinforced during the two years of higher secondary or +2 stage. The contexts and the associated expected learning outcomes may be described in the teaching activities as follows.

T1 How to draw a graph

This is discussed in the secondary classes in mathematics and science. Pupils are given a set of points and asked to represent the same by a graph. The activity enables the learners to appreciate the important aspects, such as the relationship between two quantities, deciding which of the two is an independent quantity and which one is dependent, identifying and drawing coordinate axes, choosing

appropriate scales, plotting of points and marking of their positions on the graph.

T2 Given a set of points, how to draw a graph that possibly describes the situation best

The pupils are exposed to this while doing practicals in the secondary and higher secondary classes, where they are to plot the observations taken by them and draw the graph that describes the observations best, when, for example, the graph does not pass through all the data points.

T3 How to calculate the slope of a straight line graph

This is usually practised by the pupils at the higher secondary stage, where for example, (a) they compute the value of acceleration due to gravity by plotting L-T^2 graph (L denoting the length of a simple pendulum and T, the time period of oscillation of the same) and finding its slope, or, (b) obtaining the resistance of a conductor from the slope of V–I graph (V being the potential difference across the conductor and I, the current flowing through it).

T4 How to find the value and significance of the intercept of a graph with any of the axes

This may for instance be illustrated in the context of 1/u – 1/v graph for reflection of light by a spherical mirror (u and v being the object distance and image distance, respectively), a task for higher secondary students.

T5 Extrapolation and interpolation of graphs

Graphical extrapolation is a good way to determine, for example, the focal length of a convex lens from the 1/u – 1/v graph referred to above. As an illustration of interpolation, students are asked to find the length of a second's pendulum from the relevant L-T^2 graph. Such exercises are usually assigned to the higher secondary students.

T6 Pictorial representation of theoretical formula

Pictorial representation of a theoretical formula through graph often leads to a better perception and better appreciation of the relationship between physical quantities. Pupils at the higher secondary stage are initiated into this by graphically showing how displacement, velocity, and acceleration of a body executing simple harmonic motion, change with time.

T7 Obtaining equations from graphs

At the secondary and higher secondary levels, pupils are introduced to the displacement-time and velocity-time graphs for bodies moving with uniform velocity or uniform acceleration.

The graphs are then used to establish the kinematical equations.

If one analyses the above teaching activities and the consequent learning experiences of the pupils, one can discern the following episodes or sub-episodes in operation—

E1 Episodes which consider the non-essential attributes as essential attributes. This is so because due to T1, T2 and partly T3, there is a reinforcement to put emphasis on the non-essential attributes, like the coordinates of points, choice of scale to draw the graph. Thus, a distorted episode construed from faulty teaching structures is likely to get imprinted in the minds of the pupils.

E2 T4 and T5 may be grouped together as an episode, as in these the pupils learn how to find out the value of one coordinate when the other is given. It may be noted that in this episode again, the non-essential attributes are unintentionally emphasised by intentionally designed applications.

E3 T6 is itself treated as an episode. Since the shape of the graph has similarity with the actual shape of, say, a wave in the real world, the pupils may develop the cognition that shape of the graph is the shape of the path taken by the particle during its motion.

E4 T3 and T7 may be combined together as T7 also involves the calculation of slope. In this case, from the observation of classroom teaching, it was seen that the pupils are guided to see the beauty and ease of derivation of the kinematical equations, and the physics involved in the graphs are rarely emphasised. Graphs other than those given in the textbooks, and depicting novel physical motions, are rarely discussed.

E5 During T7, the difference between (a) velocity and speed, (b) instantaneous velocity (from the slope as in T3 and T7, and average velocity, (c) displacement and distance are hardly discussed in the context of graphs. As a consequence, the distinction between the members of each pair is obliterated in the minds of the pupils, thereby leading to an episode where each pair of concepts is treated as a synonymous pair.

The Method Adopted in the Investigation

The method adopted in the present study comprises the following components.

The tool

It was felt that the tool should have such items which would try to identify the effects of the Epi-Cons on pupils' comprehension and ALCONs as regards

1. the construction of graphs, and
2. the interpretation of graphs

In the above framework, it was noted that graphs in kinematics are taught in the secondary classes to

1. explain the nature of the graphs between kinematical variables under various conditions of linear motion.
2. derive kinematical equations for linear motion under uniform acceleration.

The graphs are then discussed again in conjunction with calculus at the higher secondary stage to derive the same equations. However, as stated earlier, the pupils are also exposed to graphs in the units on thermodynamics, waves, oscillations, optics, and electricity and magnetism. This is likely to produce latent effects on the pupils' comprehension about graphs in kinematics.

The tool used is described below in the form of 13 questions—

Q.1 Look at the velocity-time (v-t) graph (Figure 1) of a body and answer the following questions.

(a) Does it describe the motion of a body? Yes/No

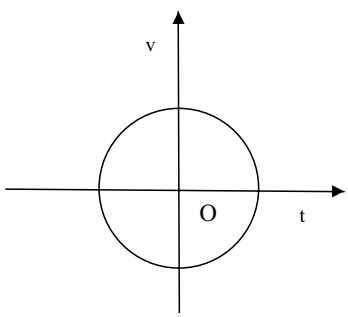

Figure 1

(b) If your answer is YES, then describe in one sentence the type of motion the body is executing.

Q.2 Look at the distance travelled-time (d-t) graph (Figure 2) of a body and answer the following questions.

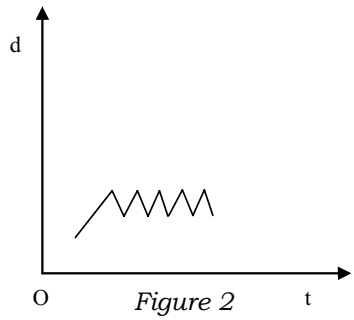

Figure 2

(a) Does it describe the motion of a body? Yes/No

(b) If your answer is YES, then describe in one sentence the type of motion the body is executing.

Q.3 Look at the displacement-time (s-t) graph (Figure 3) describing the motion of a body. What is the shape of the path traversed by the body?

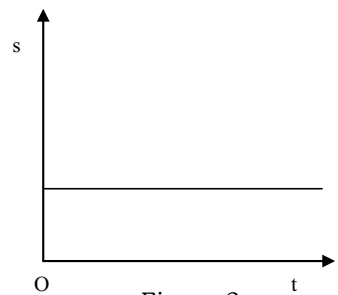

Figure 3

Q.4 Look at the displacement-time (s-t) graph (Figure 4) describing the motion of a body. What is the shape of the path traversed by the body?

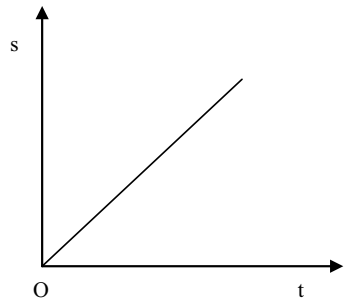

Figure 4

Q.5 Draw the velocity-time graph for a body moving with uniform velocity.

Q.6 Draw the velocity-time graph for a body at rest.

Q.7 Figure 5 shows the displacement-time (s-t) graph of a moving body. At which of the lettered point/points on the graph,

(a) is the body at rest? Explain your answer in two sentences.

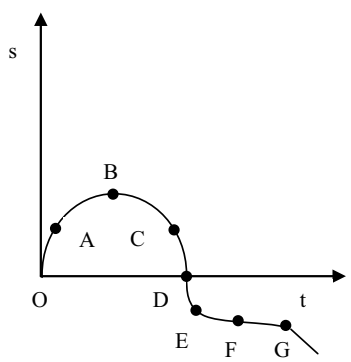

Figure 5

(b) does the body have maximum velocity? Explain your answer in two sentences.

(c) is the body turning around? Explain your answer in two sentences.

Q.8 Figure 6 shows the displacement-time (s-t) graphs for two bodies, A and B, moving along the same straight line. The unit of time is denoted by sec.

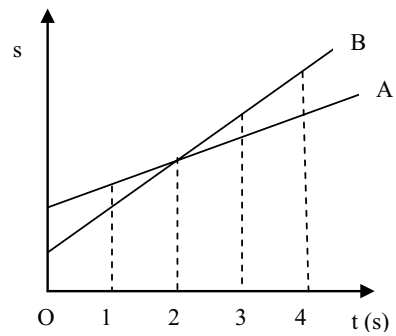

Figure 6

(a) At t = 1 sec, is the speed of A greater than, less then, or equal to that of B? Explain your reasoning.

(b) Do the two bodies, A and B, ever have the same speed? Yes/No

If your answer is YES, state at what time their speeds are equal. Explain your reasoning.

(c) At t = 4 sec, is the speed of A greater than, less than, or equal to that of B? Explain your reasoning.

Q.9 Figure 7 shows the displacement -time (s-t) graph of an oscillating simple pendulum. At which of the lettered point/ points on the graph

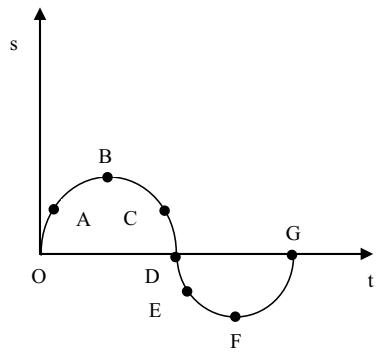

Figure 7

(a) is the pendulum at rest?
(b) is the pendulum speeding up?
(c) is the pendulum turning around?
(d) is the pendulum slowing down?

Q.10 A body was at rest at the position of 3m (marked A in Figure 8) from the origin O at time t = 0. Then it moved with a constant velocity for 1 second. At the end of 1 second, it remained at rest for 2 seconds. Then it came back to the starting point, A, in 2 seconds with a constant velocity. Draw in Figure 8 the displacement-time (s-t) graph depicting the motion of the body.

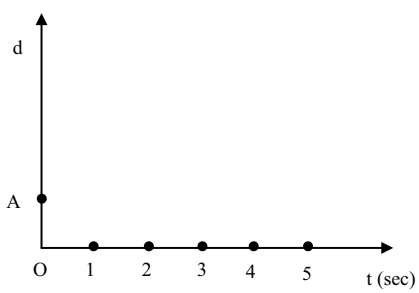

Figure 8

Q.11 In the above case, draw in Figure 9 the velocity-time (v-t) graph for the motion of the body.

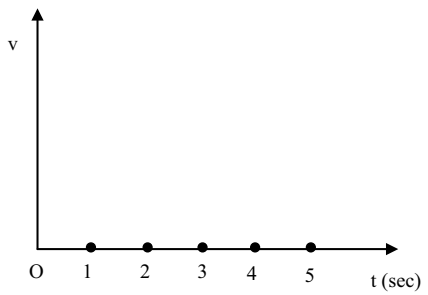

Figure 9

Q.12 A rubber ball is released from a height h. It takes 2 seconds to reach a marble platform. Then it rebounds and reaches the same height in 2 seconds. Draw the velocity-time (v-t) graph in Figure 10 for the

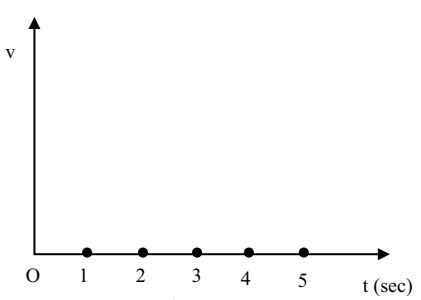

Figure 10

motion of the ball, taking the upward direction as positive.

Q.13 Figure 11 shows the velocity-time (v-t) graphs for two bodies, A and B, which are moving along the same straight line after starting from the same point.

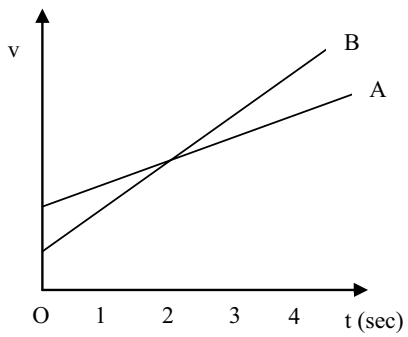

Figure 11

(a) At t=1 sec, is the acceleration of A more than, less than, or equal to that of B?

(b) Do the two bodies, A and B, ever have the same acceleration? Yes/No

If your answer is YES, state at what time their accelerations are equal.

We need to point out that Figures 5 and 6 of the tool are taken from the work of McDermott et al. (1987), although the questions, that are asked, are not exactly the same. Also, some of the diagrams may be found in the Physics Textbook for Class XI Part I (NCERT 2014). For example, Figure 1 of the tool appears as Figure (b) in Exercise 3.16 on page 57 of the textbook and Figures 3, 4 and 6 of the tool appear as Figure 3.2(a) on page 41, Figure 3.2(b) on page 41 and Figure 3.17 on page 52 respectively though in the textbook the graphs correspond to position-time (x-t) rather than displacement-time (s-t), as in the present case.

The Subjects

Table 1 summarises the subjects involved in the study. Keeping in view the fact that graphs in kinematics are taught in the secondary and again in the higher secondary (+2) classes, the pupil subjects were taken from Classes X and XII. 36 postgraduate teachers (PGTs) teaching physics to the higher secondary pupils in Kendriya Vidyalayas (KVs) and Jawahar Navodaya Vidyalayas (JNVs) who attended an orientation workshop conducted at the Regional Institute of Education, Bhubaneswar were also used as subjects. As may be seen from Table 1, we selected students from both English and Odia medium schools to discover differences, if any, arising out of linguistic considerations.

Administration of the Tool

In a trial administration, it was observed that the pupils of Class X took about 40 minutes to answer the 13 questions. However, lest the shortage of time for completing the tool items might force some pupils to give hasty responses resulting in

Table 1
Break-up of Sample Selected for the Study

Type of Subject	Details	Number
Pupils	Odia Medium Schools	
P1	Class X (age group 15–16 years), Capital High School, Unit III, Bhubaneswar	72
	Class X (age group 15–16 years), Govt. Girls High School, Unit IX, Bhubaneswar	51
	Class X (age group 15–16 years), B.M. High School, Old Town, Bhubaneswar	66
	Total	**189**
P2	English Medium Schools	
	Class X (age group 15–16 years), Govt. Boys Senior Secondary School, Port Blair, A & N Islands	56
	Class X (age group 15–16 years), D.M. School, Bhubaneswar	42
	Class X (age group 15–16 years), KV1, Bhubaneswar	36
	Total	**134**
P3	Colleges (+2 Wings)	
	+2 2nd year (age group 17–18 years), B.J.B. College, Bhubaneswar	116
	+2 2nd year (age group 17–18 years), R.D. Women's College, Bhubaneswar	98
	+2 2nd year (age group 17–18 years), Rajdhani College, Bhubaneswar	107
	Total	**321**
Teachers		
T1	PGT, KVs	27
	PGT, JNVs	9
	Total	**36**

noises, it was decided to allow a time of one hour to both Classes X and XII second students to complete the test. Teachers were also given the same amount of time for test completion.

Results and Discussion

The teachers expressed the view that they were being exposed to such a type of test for the first time in their career. This lack of experience

was a bonus for the investigators because in the above circumstances, the teachers had to fall back upon their comprehension and not rote memory to answer the questions, thus opening up greater probability of their ALCONs getting reflected in their responses. The pupils, on the other hand, definitely enjoyed answering the questions. On the completion of the test, a few pupils as well as teachers were engaged in group discussions so as to have indicators of their thought process.

An analysis of the test-cum-answer sheets showed that the pupils as well as teachers gave discernible ALCONs or simple combinations of them against each question, as detailed below. The asterisked responses are the correct ones. The responses are indicated by the symbol R, followed by the question number.

In case of Question 1 (Q. 1), the responses were as follows.

R.1(a).1: *No (correct use of E5)

R.1(a).2: Yes (misuse of E3 and E5)

R.1(b).1: Circular motion (misuse of E3)

R.1(b).2: Simple harmonic motion (misuse of E3). In the class, simple harmonic motion is taught by using the motion of a particle on the circle of reference and analysing its displacement projected on any diameter of the circle.

In case of Question 2 (Q.2), the responses were as follows.

R.2(a).1: *NO (correct use of E5)

R.2(a).2: YES (misuse of E3 and E5)

R.2(b).1: Zigzag motion (misuse of E3)

R.2(b).2 : Simple harmonic motion (misuse of E3). A response like 'to and fro motion' has been clubbed with R.2(b).2.

In case of Question 3 (Q.3), the responses were as follows.

R.3.1: *The body is at rest (correct use of E1 and E4)

R.3.2: Straight line path (misuse of E3 and even E5, non-use of E1)

In case of Question 4 (Q.4), the responses were as follows.

R.4.1: *It is a straight line path (correct use of E1 and E4)

R.4.2: Straight line path from one corner to another corner (misuse of E3 and non-use of E1)

R.4.3: Shape of path cannot be known (non-use of E1 and E3)

In case of Question 5 (Q.5), the responses were in the form of graphs as specified below.

R.5.1: *A straight line parallel to t-axis (correct use of E1 and E3)

R.5.2: A straight line inclined to t-axis with a positive slope (misuse of E1 and E5 and non-use of E4)

R.5.3: A straight line inclined to t-axis with a negative slope (misuse of E1 and E5 and non-use of E4)

At this point, it is worthwhile to record the discussion that ensued with a pupil opting for the response R.5.2.

Interviewer: (showing the graph drawn by the pupil) In this case, you have drawn a straight line graph inclined to t-axis.

Pupil: Yes, sir.

Interviewer: Why this shape of the graph?

Pupil: It has to be so.

Interviewer: Why has it to be so?

Pupil: Because…

Interviewer: (coaxing) Yes, because…

Pupil: Sir, because, you see, in this case the distance of the body from the origin will go on increasing.#

Interviewer: Yes, so…

Pupil: So, the graph has to be as I have drawn.#

The responses marked with # clearly show an utter confusion and chaos in the application of the episodes. The pupil confuses between the distance travelled and the velocity. This is an outcome of the misuse of E1. Then, in his mind, he has supportive flashes of such a graph (of course between displacement and time and not between velocity and time when the body is moving with uniform velocity) studied in kinematics. But, it seems he has forgotten the essential attributes of the graph, like the variables.

In case of Question 6 (Q.6), the responses were in the form of graphs as specified below.

R.6.1: *The t-axis itself (correct use of E1 and E4)

R.6.2: The v-axis itself (misuse of E1 and E4)

R.6.3: A straight line parallel to t-axis (misuse of E1 and E3)

In case of Question 7 (Q.7), the responses were as follows.

R.7(a).1: *B and F (correct use of E1 and E4)

R.7(a).2: O and D (misuse of E1 and E4)

R.7(b).1: *O (correct use of E4)

R.7(b).2: B and G (misuse of E1 and E4). Responses like 'only B' are clubbed under R.7(b).2.

R.7(c).1: *B (correct use of E1 and E4)

R.7(c).2: D (misuse of E1 and E4)

At this point, we record the conversation that took place (in respect of response R.7(a).2) with one of the pupils as a part of the structured interview, once the test was completed.

Interviewer: In this displacement-time graph of Fig. 5 describing the motion of a body, you have answered that the body is at rest at the points O and D.

Pupil: Yes, sir.

Interviewer: Why did you feel so?

Pupil: It has to be so, it is obvious.

Interviewer: Will you please explain?

Pupil: (smiles) Sir, at these two points the displacement of the body is zero and velocity is zero.$

The reply marked with $ is a reflection of episode E1. Because of the emphasis on the non-essential attributes of the graph, i.e., coordinates of points, the concept of velocity has been internalised by the pupils as displacement/time and not as change in displacement/change in time. This form of internalisation is also reflected in the responses R.7(b).2 where the pupils feel that the larger the displacement, the larger is the velocity and R.7(c).2, where the pupils express that negative displacement means negative velocity, so the turning around at D.

Manifestations of similar conceptualisations generated out of treating coordinates of points as essential attributes are also indicated in the responses to Question 8 as given below.

R.8(a).1: *Speed of A less than that of B (correct use of E1 and E4)

R.8(a).2: Speed of A greater than that of B (misuse of E1 and E4)

R.8(b).1: *No (correct use of E1 and E4)

R.8(b).2: Yes, at 2 seconds (misuse of E1 and E4)

R.8(c).1: *Speed of A less than that of B (correct use of E1 and E4/misuse of E1 and E4)

Responses R.8(a).2 and R.8(b).2 corroborate our earlier conclusions. However, response R.8(c).1 needs some discussion.

Of course, if one applies the correct use of E1 and E4 and calculates the slope of the graph, one arrives at the correct response R.8(c).1. But, peculiarly, wrong use of E1 and E4 also helps to arrive at the right answer, as is transparent from the following interview.

Interviewer: In respect of Q. 8(c) and Figure 6, you have answered that at t = 4 seconds, the speed of B is greater than that of A.

Pupil: Yes, sir.

Interviewer: Why do you feel so?

Pupil: Sir, that is what we have been taught.

Interviewer: What have you been taught?

Pupil: Sir, speed is distance divided by time, particularly, in the case of linear motion.@

Interviewer: So?

Pupil: Sir, you can see from the graph; the distance travelled by B is more than that by A at 4 sec.@@

The response marked with @ and the conclusion marked with @@ drawn from it, indicate our assertion that a wrong use of E1 and E4 has

resulted in the right answer. The situation is similar to 'right answers/ wrong reasons' of Berg and Phillips (1994). It is for this reason that both the correct use of E1 and E4 and misuse of E1 and E4 have been shown as the generative causes in R.8(c).1. Perhaps only due to this, there was no variation in the response to Q.8(c). The non-existence of any other response to Q.8(c) is perhaps the strongest evidence of our presumption that Epi-Cons are one of the possible geneses of manifest ALCONs.

In case of Question 9 (Q.9), the responses were—

R.9(a).1: *B and F (correct use of E1 and E4)

R.9(a).2: O, D and G (misuse of E1 and E4)

R.9(b).1: *C (correct use of E1 and E4)

R.9(b).2: B and F (misuse of E1 and E4)

R.9(c).1: *B and F (correct use of E1 and E4)

R.9(c).2: D (misuse of E1 and E4)

R.9(d).1: *A and E (correct use of E1 and E4)

R.9(d).2: C and D (misuse of E1 and E4). Here, there were various combinations of answers like C and D, only C, only D, etc. We have clubbed them together, as the basis of these was that displacement is decreasing.

In case of Question 10 (Q.10), some of the typical responses obtained are as shown in Figure 12.

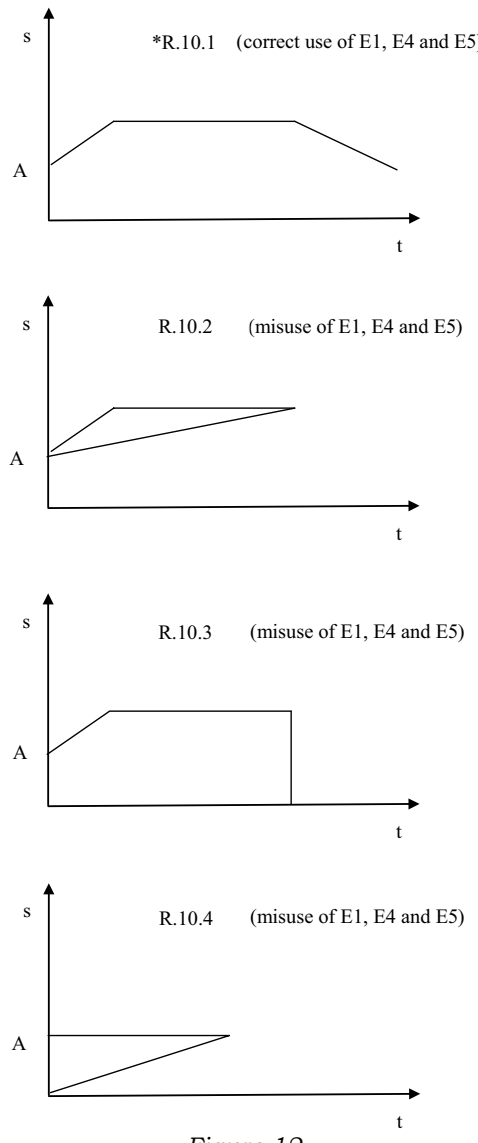

Figure 12

In case of Question 11 (Q.11), some of the typical responses obtained are as shown in Figure 13.

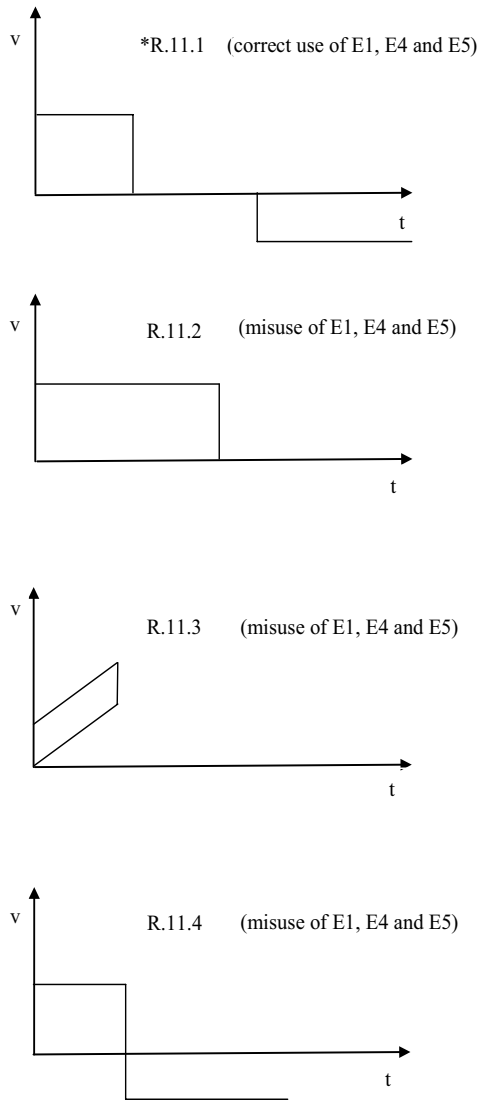

Figure 13

In case of Question 12 (Q.12), some of the typical responses obtained are as shown in Figure 14.

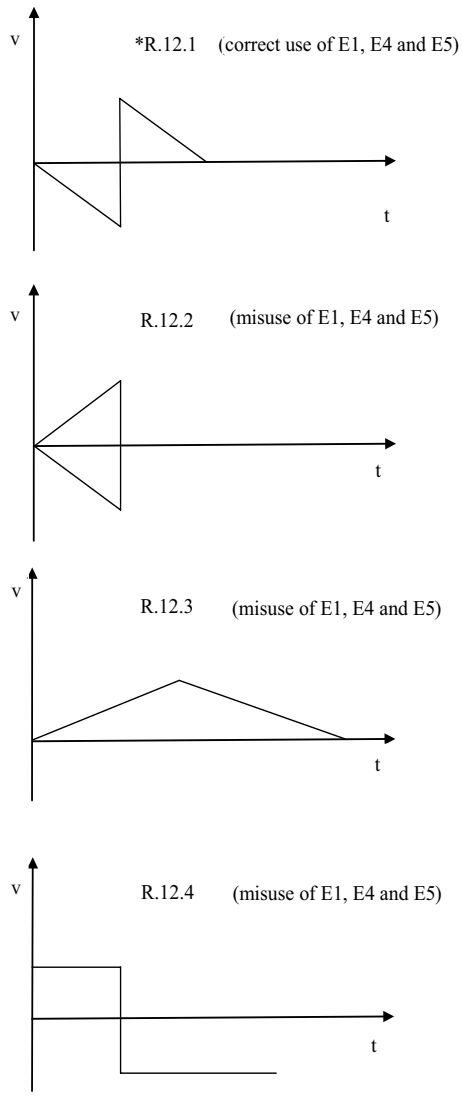

Figure 14

In case of Question 13 (Q.13), the responses were as follows.

R.13(a).1:*Acceleration of A is less than that of B (correct use of E1 and E4)

R.13(a).2:Acceleration of A is more than that of B (misuse of E1 and E4)

R.13(b).1:*NO (correct use of E1 and E4)

R.13(b).2:YES at two seconds (misuse of E1 and E4)

Responses to Q.13 are repetitions of the pattern of responses to Q.8 which has structures similar to those of Q.13, and obviously reconfirms the existence of the type of Epi-Cons and hence, the genesis.

The percentage of each group of subjects preferring any particular response in respect of any specific question is presented in Table 2 in which the correct responses are indicated by asterisk marks.

Table 2
Percentage of Subjects Preferring a Response

Question No.	Responses	Subjects			
		P1	P2	P3	T1
1(a)	*R.1(a).1	2.6	2.9	3.7	33.3
	R.1(a).2	97.4	97.1	96.3	66.7
1(b)	R.1(b).1	51.8	50.9	49.8	44.5
	R.1(b).2	45.6	46.2	46.6	22.2
2(a)	*R.2(a).1	3.1	2.2	4.0	30.5
	R.2(a).2	96.9	97.8	96.0	69.5
2(b)	R.2(b).1	77.6	82.1	70.1	52.7
	R.2(b).2	19.3	15.7	25.9	16.8
3	*R.3.1	34.4	44.1	50.2	88.8
	R.3.2	65.6	55.9	49.8	11.2
4	*R.4.1	26.5	27.7	42.6	72.3
	R.4.2	71.4	68.6	55.9	27.7
	R.4.3	2.1	3.7	1.5	0.0
5	*R.5.1	51.8	52.2	70.1	94.4
	R.5.2	45.6	43.2	25.9	5.6
	R.5.3	2.6	4.6	4.0	0.0
6	*R.6.1	9.5	11.2	26.8	88.8
	R.6.2	2.6	2.9	3.1	0.0
	R.6.3	87.9	85.9	70.1	11.2
7(a)	*R.7(a).1	6.9	9.7	30.3	61.1

	R.7(a).2	93.1	90.3	69.7	38.9
7(b)	*R.7(b).1	16.4	15.7	31.5	66.7
	R.7(b).2	83.6	84.3	68.5	33.3
7(c)	*R.7(c).1	15.4	15.0	44.6	69.5
	R.7(c).2	84.6	85.0	55.4	30.5
8(a)	*R.8(a).1	6.9	9.7	20.3	69.5
	R.8(a).2	93.1	90.3	79.7	30.5
8(b)	*R.8(b).1	8.5	13.5	26.5	77.8
	R.8(b).2	91.5	86.5	73.5	22.2
8(c)	*R.8(c).1	95.2	95.5	98.4	100.0
9(a)	*R.9(a).1	84.6	85.8	86.3	97.2
	R.9(a).2	15.4	14.2	13.7	2.8
9(b)	*R.9(b).1	55.8	56.0	62.7	77.7
	R.9(b).2	44.2	44.0	37.3	22.3
9(c)	*R.9(c).1	22.4	30.6	37.1	66.7
	*R.9(c).2	77.6	69.4	62.9	33.3
9(d)	*R.9(d).1	28.6	23.8	40.2	75.0
	*R.9(d).2	71.4	76.1	59.8	25.0
10	*R.10.1	15.8	18.1	14.4	58.4
	R.10.2	63.5	61.2	55.9	25.0
	R.10.3	10.5	10.4	14.9	11.1
	R.10.4	9.5	8.9	13.0	0.0
11	*R.11.1	23.8	32.4	25.9	50.1
	R.11.2	44.2	42.5	48.3	22.2
	R.11.3	20.0	13.3	13.4	11.1
	R.11.4	10.5	8.9	11.2	11.1
12	*R.12.1	10.9	18.0	14.7	35.8
	R.12.2	12.0	8.9	9.3	11.1
	R.12.3	63.5	61.2	59.8	41.6
	R.12.4	12.6	10.4	13.7	8.8
13(a)	*R.13(a).1	9.5	11.2	19.1	72.2
	R.13(a).2	90.5	88.8	80.9	27.8
13(b)	*R.13(b).1	10.0	10.6	22.8	75.1
	R.13(b).2	90.0	89.4	77.2	24.9

** (asterisk) indicates the correct response*

From the data in Table 2, Figure 15 is drawn depicting the percentage of each group of subjects giving question-wise correct response.

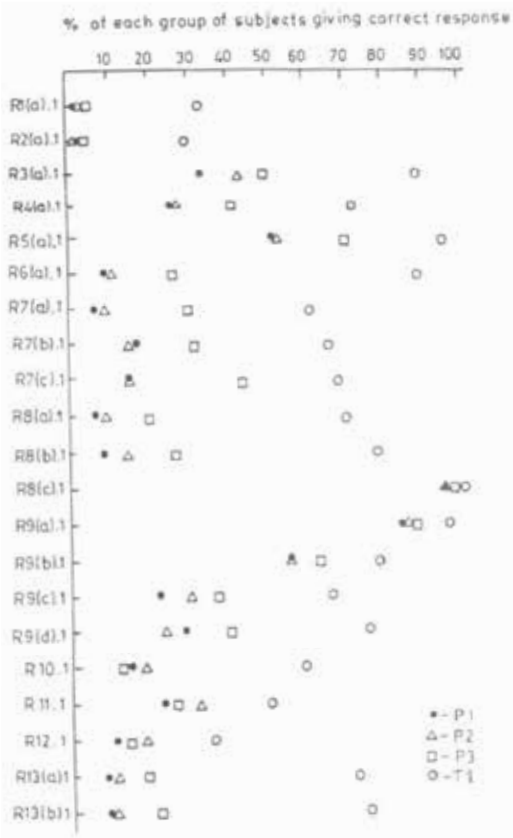

Figure 15

As discussed in the beginning, the data may be analysed from two points of view—(a) effect of Epi-Con on the ability of construct graphs, and (b) effect of Epi-Con on the ability to interpret graphs in kinematics.

Ability to Construct Graphs

There were 5 questions, Q.5, Q.6, Q.10, Q.11, and Q.12 to test this. The relatively high percentage of pupils opting for a straight line with a positive slope with t-axis in response to Q.5 shows a state of confusion between and/or overlapping of conceptualisation of v-t and s-t graphs. This confusion is also corroborated by the high percentage of pupils opting for the response R.6.3. The genesis of this ALCON does not change much with years. It is interesting to note that even higher secondary teachers are susceptible to the effect of this Epi-Con.

The graphs drawn in response to Q.11 and Q.12 show a different phenomenon, that is, they demonstrate that the subjects' thought process is dominated by the ALCON that graphs are the actual paths taken by bodies in motion. This picture has perhaps been generated by the episodes on Simple Harmonic Motion (hereafter SHM) waves, and circular motion. As a result, when the question says that finally the body comes back to the starting point, the pupils immediately picturise that the s-t and v-t graphs must also make a loop and come back to the starting point of the graph. This is manifested in a high percentage of pupils giving responses R.10.2 and R.11.3. Even the PGTs are affected by this Epi-Con.

It is felt necessary to analyse the responses to Q.12 separately. The question, of course, was a bit difficult to graphically conceptualise and answer. However, the responses are also indicative of many effects of the Epi-Cons. The high percentage

of pupils as well as teachers opting for the response R.12.3 indicates a few things. Firstly, the subjects seem to have forgotten that velocity is a vector and positive direction has been specified in the question. Secondly, there seems to be a confusion between speed and velocity, as is indicated by the following discussion with one of the teachers who opted for the response R.12.3.

Interviewer: (showing the graph drawn) You have drawn this graph.

Teacher: Yes, sir.

Interviewer: As you see, the graph has two parts. Let us analyse the first part. Why do you think the graph has to be like this at the beginning?

Teacher: Sir, as the ball falls freely, its velocity increases with a constant acceleration.+

Interviewer: What about the second part?

Teacher: After the rebound the velocity of the ball decreases constantly.+

Interviewer: But as you see, the question has instructed to take the upward direction as positive.

Teacher: Yes, sir, it is negative when the ball is going up after the rebound. But, it was positive when the ball was falling freely.+

Interviewer: If you take the upward direction as positive, then when the ball was falling its velocity was becoming more and more negative.

Teacher: No, sir. How can you say that? The velocity of a freely falling body increases, it does not decrease.+

The responses marked with + clearly show the effect of the Epi-Cons. Even treating (wrongly) the graph as the actual path is evident from the response R.12.2.

Ability to Interpret Graphs

We analyse this from two angles.

Interpretation involving nature of the path and shape of the graph

Two graphs are given in Q.1 and Q.2 and the subjects are asked to describe the type of motion, if their answer is YES to the first part of the question. Again, the answers show an association of these graphs with their episodes on circular motion and S.H.M., particularly in the case of the graph in Q.2, the pupils interpreted the graph as the actual path taken by the body. As a result of this, in both the questions, about 90 per cent opted for the answer YES when the correct answer is NO. Interestingly, about 65 per cent of the PGTs also committed the same mistake.

When we come to the second part of Q.1, since the pupils are exposed to such a graph in circular motion and also SHM, almost equal percentage of pupils opt for each of

the answers. Even the responses of the teachers are not much different, which demonstrates the effect of episodic nature of teaching, both on pupils and teachers. In respect of Q.2(b), since the graph has a zigzag shape, a large percentage of pupils as well as teachers opt for response R.2(b).1.

Association of the shape of graph with the actual path taken by the body is again exemplified in the high percentage of the pupils opting for response R.3.2 and R.4.2. Even about 20 per cent of the teachers have favoured these responses.

Interpretation involving slope of the graph

Under this category, it is worthwhile to compare the responses to Q.7 and Q.9. The teachers and pupils are familiar with the graph in Q.9 and perhaps not familiar with that in Q.7. The effect of this familiarity with an episode is immediately transparent from the percentage of pupils opting for responses R.7(e).1 and R.9(a).1. Whereas in case of Q.7 the percentage of subjects giving correct response is very low, in case of Q.9 it is as high as 90 per cent. On the other hand, high percentage of pupils opting for response R.7(a).2 again shows the effect of the episodes emphasising the non-essential attributes of graph. This effect of the Epi-Con is also evident in respect of the responses to Q.7(b), Q.7(c) and Q.8(b), Q.8(c), Q.8(d), where the pupils have used the coordinates and not the change in coordinates (slopes) to arrive at the conclusions.

The responses to Q.8 and Q.13 are to be analysed simultaneously as the questions are similar in form, structure and content. In these cases again, it is observed that the pupils have wrongly utilised the coordinates of points to draw inferences for which change of coordinates should have been utilised. This is evident from the high percentage of pupils responding that the larger the coordinate at a given time, the larger is the velocity or acceleration of the body at that time. In fact, they have also responded that if two bodies have the same coordinates at the same time, then they have the same velocity or acceleration.

The data also show that the effect of the Epi-Con does not change much with school years and even teachers are affected by the same.

CONCLUSION

In this study, we have been able to demonstrate that Epi-Con is a probable generative cause of alternative conceptions (ALCONs), as manifested by a group of pupils and teachers and further, that these ALCONs are perhaps more due to the episodic nature of learning of concepts by the pupils and teaching by the teachers, rather than due to their wrong comprehension of each of the concepts when considered in isolation. The conceptualisation is seen to have forms without coherence and with boundaries without

intercommunication channels. The very fact that the Epi-Con generates the same ALCONs simultaneously in a group of pupils can help in the design of curative prescriptions for implementation in classrooms.

For curative measures for dealing with graphs in kinematics, the following suggestions may be considered.

1. The essential attributes of graphs be emphasised both through problems demanding comprehension of these attributes and through innovative classroom activities.
2. It should be stressed that graphs do not represent the actual paths of the motion of a body even though sometimes there might be a resemblance.
3. It may be indicated in particular that in the case of projectile motion, the displacement-time graph resembles, by chance, the actual path of the projectile.
4. It may also be stated that the visual shape of a wave has nothing to do with the displacement-time graph of the SHM executed by each particle as the wave propagates.
5. It ought to be emphasised that velocity and speed, displacement and distance have distinctive characteristics such as (a) velocity and displacement can be positive or negative but speed and distance are always positive, (b) displacement can increase and then decrease whereas the distance travelled by a body only increases.
6. Innovative activities involving motion may be tried out in a classroom situation by asking a pupil to walk and noting down his displacement at various moments from a reference point.

In a more general framework, the following may be tried.

1. Identify the isolated episodes which are likely to have interrelations.
2. Map the boundaries of these episodes as outlined in the curriculum and textbooks.
3. Locate the points on the boundaries where channels of communication with other episodes can be opened up.
4. Design activities, problems, experiments and discussions based on the utilisation of these channels.
5. Test the coherence of concepts achieved through this process.

Finally, it has been possible to demonstrate that the Epi-Con affects the pupils and teachers in an almost similar way. It is suggested that the cross-cultural validity of Epi-Con as a generative cause of ALCONs in a group of pupils might be investigated.

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Towards Sustainable Development Goals and Environment Stewardship through Geography Education

KIRAN K. SINGH*

Abstract

Distinctiveness of geography as a discipline is revealed through its focus on the study of the earth surface as a world of human. At the time of organisation of knowledge into two broad realms; humanities, social science and sciences, geography could not separate itself due to its inherent nature of performing a role to bridge the human and earthly relationship. The study of geography is by nature ecological in approach and perspective, and creates a bond between the two by studying both, ways of interaction and intervention. Space, time and scale are the critical elements of the discipline which play an important role in the analysis and pursuit of sustainability. This paper deals with the conceptual framework of sustainable development and how geography education plays a role in creating awareness and developing critical thinking about the different components of sustainability at various scales and in different time frames. The paper also brings attention to the core contents or themes of sustainable development which can be seen in the geography curricula in various universities. Sincere attention to content and themes in the curriculum will help to maintain its orientation in the dynamic world scenario. It also discusses the role of geography in transforming learning into environment stewardship.

INTRODUCTION

There is not a single day in our lives that does not tell us about environmental problems. We hear about the changing weather pattern, dying of fishes on shore, salinity ingression, river pollution, extinction of species, pollution-related diseases

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and so on. Furthermore, the realisation of such problems has mobilised public opinion and had an impact on the government policies and decision making. The words sustainable development are so common that any educated person can define them literarily and sense the meaning of it as promoting a practice which continues to achieve a form of existence which can be maintained indefinitely. According to Whitehorse (2006), the phrase 'sustainable' has become a very fashionable adjective in the light of the concerns over environmental problems, and appears in a wide range of contexts like sustainable environment, sustainable economy and sustainable society.

There are two kinds of intellectual discourses on the degrading condition of the earth and environment. One views it from the grand geological process of evolution and proposes that the natural process is so strong that human contribution is negligible. The other views it from the human perspective and considers anthropogenic activities as the prime cause of environmental degradation. The proposition based on scientific research makes both the discourses worth being paid serious attention to. But, such a discourse is the outcome of the realisation and visibility of widespread environmental problems. The point here is that if there is so much awareness about it, then why is the problem becoming serious? Are we becoming apathetic to these concerns because the development of mankind depends on the natural capital, and degradation of the environment is inevitable in the due process of development?

The problem does not lie only in the development vs. environmental conservation debate but also in the attitude of the human beings. Education, in this context, plays a significant role. Today, the academic discipline is fragmented into several parts (mainly science, social science and humanities) and one discipline which has always focussed on the interdependence of humans with their physical, social-cultural, and human-built environments is geography. The study of geography is, by nature, ecological in approach and perspective, and creates a bond between the human and environment by studying both, ways of interaction and intervention. This discipline has the capacity to generate inventories which are required to take the decisions that may enhance the quality of human life as well as the quality of environment. Such inventory can be generated in different space and time frame. Space, time and scale are the critical elements of the discipline which play an important role in the analysis and pursuit of sustainability.

But, one may raise the question that the realisation of the role of education in solving environmental problems is not a new revelation, so where does the problem lie? Is it with the way we communicate

environmental information to the students and the general public, or because since education does not carry this responsibility in isolation, so it shall not be held accountable for remaining ineffective? There are various strategies to implement sustainable development, like the efficiency strategy, consistency strategy, permanency strategy, sufficiency strategy and education and social commitments (Haubrich, 2007). Thus, one may examine the efforts that education has spearheaded to develop a mechanism to reinforce the standard of environment education and to make it possible to achieve them. In this text, sustainable development has been viewed from environmental and societal perspective because geography takes it as green agenda.

Geography and Sustainable Development

Active social commitments are essential for sustainable development. The social element is necessary to maintain human and ecological integrity. This social element is the product of the society and culture and if ways and means in pursuit of sustainable development are embedded in the cultural and social ideology, then it is a matter of living a life with practices of sustainable development; otherwise it remains a matter of law and policy decision. The society and culture which do not promote ecological and human integrity by practice cannot contribute to ameliorate any of the environmental problems, though they claim to. The discipline of geography in India has the advantage of dealing with a variety of cultures and societies which were, more or less, connected with the conservation of nature. It is a matter of reorienting the curricula to those practices which are missing today.

Sustainable development has three components—the environment, society and the economy. Granados (2010) has metaphorically compared the component of sustainable development with a three lens telescope (Figure 1). Of these three aspects, the environment is the basic life support giving mechanism behind human activity, society is the organisational base of institutional structures and agents, and the economy comprises all goods and services. The environment lens put emphasis on the maintenance of natural resources and keeping the planet healthy, the

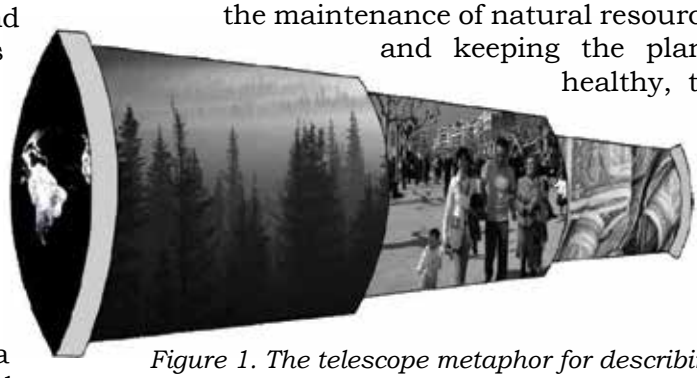

Figure 1. The telescope metaphor for describing and interpreting sustainability
(Source: Granados 2010)

social lens denotes the social justice, and the economic lens proposes the development of an efficient system.

Granados explained that in order to get a clear view of the sustainable world, one needs to look through all the three lenses at the same time as they are interrelated and interdependent. Thus, sustainable development is only viable if these three cruxes exist in equilibrium, just as a telescope only functions well when each lens works in conjunction with the other. In this way, this metaphoric model allows us to see the space from a different scale—global to local, and from dynamic time dimension—short, mid or long term. According to Kolnik (2009), geography has the educational potential in civic education and sustainable development because it offers quality in connecting natural and social knowledge and common values in order to understand global as well as local problems, and encourage students to respond to these responsibly.

Geography Education and Sustainability

In order to develop a sustainable pattern of living, the role of education is significant, as it develops the knowledge, skills and values. Development of knowledge through research enables people to engage themselves with the world in more reasonable ways. Education for sustainability inculcates responsible attitudes towards environmental conservation. By understanding the interdependence of three components of sustainable development, suitable action plan can be suggested through action-oriented research[1]. Education for Sustainable Development first gained widespread attention during the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992. Chapter 36 of Agenda 21 (WCED 1998) described ESD and identified the need to reorient the current national educational system to it. The aim was to empower learners to change their behaviour and adopt sustainable action through participatory learning (UNDP).

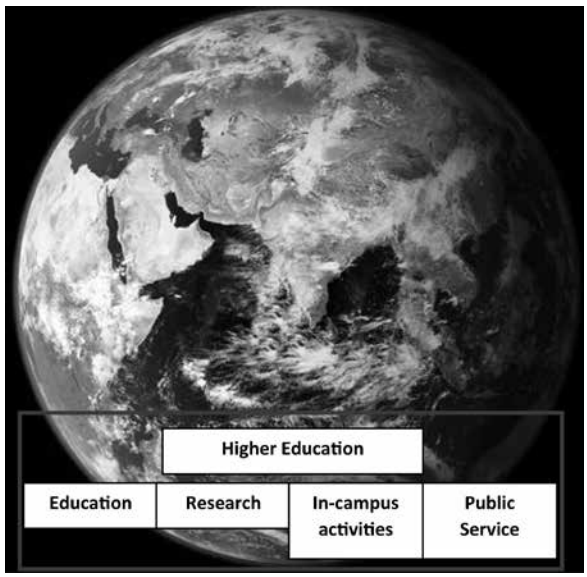

Figure 2. Holistic and systemic approach to sustainable development in higher education

[1]*Source: Australian Curriculum. Sustainability. Retrieved October 2013: from: http://www.australian curriculum.edu.au/CrossCurriculumPriorities/Sustainability*

The International Conference on Education as Driver for Sustainable Development in Ahmedabad from 11 to 13 January 2016[2] discussed that policy instruments and technological solutions are not going to be sufficient, but education is critical in achieving sustainable development. It also acknowledged that the education system has tended to impose a narrow concept of rationality at the expense of emotional understanding, learning acquired through experience and traditional knowledge system.

According to a report by the University of Antwerp & Ghent University, the higher education is generally seen as a major (potential) catalyst towards sustainable development through its traditional missions of education, research and public service. It is not only the education (curriculum/teaching) and campus operation that have impact of sustainable development but research and public service as cross-cutting issues, can also have an impact. The report also highlights the need for holistic and systematic research to sustainable development as shown in Figure 2.

In the case of geography, the International Geographical Union Commission on Geographical Education (IGUCGE) argues that geography curriculum cannot attain uniformity at the global level because it contains objectives and contents that relate to the regional and national needs differing from region to region and from country to country. Therefore, a global geography curriculum would ignore or deny the regional and national needs and differences (Haubrich, Reinfried and Schleicher 2007).

Normally, sustainable development and sustainability are used interchangeably because the ultimate goal of both is to reconcile human activity with the environmental process to the mutual benefit of both. But, sustainability should be regarded as the goal and sustainable development as the means to achieve that goal (Porrit 2007). The social and environmental as well as educational reasons why the geography addresses sustainability is reflected in many literature. Many geography educators like Bardsley (2004) think that teaching and learning for sustainability is the prime concern of geographical education or the raison d'etre of geography teaching. McKeown and Hopkins (2007) consider geography as an integrating discipline that bridges natural, social and economic sciences, and its distinctive dimensions of place, space and scale and its capacity of synthesis are crucial for the analysis and pursuit of sustainable development. Morgan (2000) offered three concrete suggestions regarding the ways geography can contribute to teaching for a sustainable society—in understanding the changing nature of

[2] *Conference was organised by the Centre for Environment Education (CEE) in partnership with UNESCO and UNEP to share experiences in strengthening the role of education in achieving 17 Sustainable Development Goals (SDG) adopted by UN.*

work in different parts of the world at different scales; in understanding the social divisions; and in investigating the complex social factors that create variations in social environments.

McKeown (2002) proposes to reorient curricula towards sustainable development through five aspects—knowledge, topics, skills, perspectives and values. The curricula should be designed in such a way that could develop the ability to communicate effectively, the ability to think critically, the capacity to move from awareness to knowledge to action, the ability to think in time and to forecast, and the capacity to develop an aesthetic response to the environment. 'Perspective' means the perspective of different stakeholders in order to understand different environmental issues. 'Values' are the sense of commitments, the respect and care for the community of life and the ecological integrity, the respect of human rights and the social and economic justice, and of the culture of peace.

According to Kerski (2011), geography is not just a 'nice to have' subject among the already crowded educational curriculum. It underpins the critical thinking skill, citizen skill and technology skill. It is essential for grappling with the essential issues of our time. Through geography, students understand that the earth is changing and then they scientifically and analytically explore the reason why it is changing. In this process, they dig deep and understand the causes and consequences of the change. In geography, they also try to find out the human role in such changes. In this way, geography does not only provide scope for critical thinking and problem based learning but also empowers students to become decision makers. Some of the central concepts in geography are—

- location
- place
- people-environment relationship
- spatial interaction
- region
- temporal change

Geographers ask the following questions—

- What is it?
- Where is it?
- Why is it there?
- How did it happen?
- What impact does it have?
- How should it be managed for the mutual benefit of humanity and the natural environment?

Pursuing the answer to these questions necessitates the investigation of the nature of problem in a location, spatial pattern and temporal change, digging deep into the causes of the problem, its impact on the nature as well as the community and suggest ways for management and future course of action. If an area is facing the problem of water logging, then students or researchers of geography can map the waterlogged areas in different time periods, find out the causes behind the problem, detect the spatial change and direction of change, its impact on

the local community and economic activities. Subsequently, suggestions can also be given to solve the problem. Field work offers a lot of opportunities to understand the real cause of a problem. In many literatures, poverty is linked with the degradation of land, forest and water resources because poor people lack the resources to manage those resources properly. But through field work, interaction with the local community may give different insights. Local poor people might be protectors of resources than exploiters.

Core Elements of Geographical Knowledge and Sustainable Development

Geography and sustainable development are tied together in terms of core knowledge elements, skills and values. The International Charter on Geographical Education focuses on the geographical competencies which are crucial to implement sustainable development goals. Since the discipline offers the prospect to attain knowledge and an understanding of natural systems, and socio-economic systems of the Earth and their interaction with each other, so the goal of knowledge creation for sustainable development is achieved. Figure 3 shows such interaction between these two systems. Such interaction also gives a sense of location, space and time.

Such interaction reveals the entire social and cultural practices and values which affect the natural system. The use and application of geographical skills like cartography, geospatial technologies, field work, analysis of information, action or policy-oriented research are all related to critical thinking and problem solving skills and are a very common skill of sustainable development too (Selected from International Charter on Geographical Education 1992, p. 17).

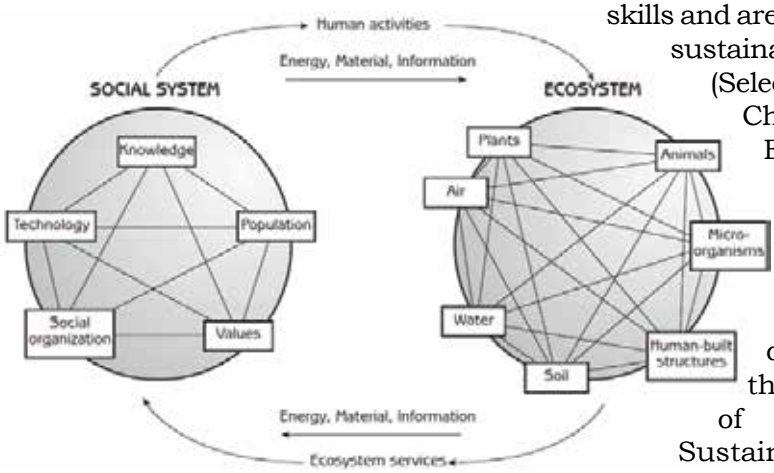

Figure 3. Interaction of the human social system with the ecosystem
Source— Marten, 2008

Many universities across the world have started departments of geography and sustainable development like the Department of Geography and Sustainable Development under the School of Geography and Geosciences, University of St. Andrews, UK; the Department of

Geographical and Sustainability Sciences, University of Iowa; Department of Geography and Environmental Sustainability, University of Oklahoma; School of Geography and Sustainable Communities, University of Wollongong, Australia; Geography, Urban, Environmental and Sustainability Studies, University of Minnesota, Duluth and Department of Geography and Geology, Central University of Punjab. The aim of such departments is to enable students at the forefront of education and research in various fields of Geography and Geology. The syllabi in geography is designed in such a way as to make the students learn and critically think not only about the local and regional human-environmental issues but also sense the nation through the lenses of the physically unifying forces. Table 1 shows the relevance of the core concepts of sustainable development in geography curriculum.

The main question is how this discipline translates knowledge into action and fosters environment stewardship? Reinfried et al. (2007) suggest, through their elucidating example of water shortage and its possible causes, that modern geography education should not only take the analysis of a problem into account. If education shall qualify students for their participation for example, in local agenda activities then, by moving a step ahead, the contemplation of alternative solutions and responses are required to be discussed. The 63 themes from three major components of sustainable development encompass almost everything. The themes are slightly modified from what were suggested by the United Nations, and is based on the major and minor themes from the syllabi of geography in higher education. In the context of sustainable development, geography in India should include the Indian traditional and cultural environment conservation practices. Fleischner (2011), in his edited book *The Way of Natural History*, nicely states, 'That Gautama, the historical Buddha, had his original moment of awakening while seated under a tree is probably not coincidental.' Let us all find our tree and awaken, for the future of our earth is at stake.

The curriculum reflects our sensitivity towards the global and local agenda, but it hardly incorporates or discusses the traditional methods of finding a solution. The Convention on Biological Diversity signed at the 1992 Rio Earth Summit, is dedicated to promoting sustainable development. It interprets biological diversity as more than plants, animals, and ecosystem. It is also about human beings and our food security. It views the ecosystem from a human perspective. But the rich Indian heritage safeguarded in texts and scriptures have always valued the role of ecosystem and considered human being as a part of it. It recognises the importance of each and every living being and

does not recognise their importance because it is important for human beings. This difference in ideology should be appreciated by everyone. The UN Declaration on the Rights of Indigenous People, endorsed by UNHRC in 2006, recognises that respect for indigenous knowledge, culture and traditional practices contributes to environmental management and sustainable development. Traditional knowledge got attention in Biological Diversity Act (2002) of India, and is being utilised in medicine and health but has still not received attention in many disciplines.

Rai (2007) has substantiated several examples of from eco-cultural communities who utilise traditional ecological knowledge in sustainable natural resource management. In such practices, certain religious beliefs and traditional practices help in the conservation of nature and its biodiversity for example, Demazong (the Buddhist eco-cultural landscape in Sikkim Himalaya) and the Apatani eco-cultural landscape in Arunachal Pradesh. Apatanis, one of the major ethnic groups of eastern Himalayas, are known for their systematic land use practices and rich traditional ecological knowledge of natural resource management and conservation[3]. Such knowledge is required to be shared with the students in class so that they can know and value the practices. Geography has the freedom to choose the themes which are in the local, regional and national interest.

Table 1
Relevant Themes for ESD and the Teaching of Geography

ESD Component	S.No.	Themes
Environment	1.	Air Quality/pollution
	2.	Climate change
	3.	Monsoon and ENSO phenomena
	4.	Biodiversity protection
	5.	Threat status of species
	6.	Desertification/land degradation
	7.	Land use change
	8.	Deforestation and forest fire
	9.	Continental and marine water quality
	10.	Waste generation
	11.	Generation of hazardous waste
	12.	Water resources used
	13.	Waste management

[3]*Apatani Cultural Landscape, UNESCO*

	14.	Soil conservation
	15.	Ecological quality of river
	16.	Noise pollution
	17.	Natural/anthropogenic hazards/disaster
	18.	Effect of environmental change on process of landforms
	19.	Weathering and erosion
	20.	Gaia theory
	21.	Environment ethics
Society	22.	Human Environment interaction
	23.	Population growth
	24.	Life expectancy at birth
	25.	Poverty and inequality
	26.	Gender equality
	27.	Cultural diversity and identity
	28.	Access to primary health care facilities
	29.	National investment in health services
	30.	Living conditions and housing
	31.	Security and crime
	32.	Leisure and services
	33.	Mobility and migration
	34.	Social welfare and quality of life
	35.	Literacy
	36.	Investment in education and ICT
	37.	Employment
	38.	Safety at work
	39.	Participation in decision-making
	40.	Corruption
	41.	Role of women in environmental and disaster management
	42.	Behavioural approach and subjectivity
Economy	43.	GDP
	44.	Cooperation, technology transfer and global sustainability
	45.	Research and development
	46.	Sustainable public finance
	47.	Corporate responsibility
	48.	Energy use and consumption

	49.	Renewable energy production
	50.	Transportation and connectivity
	51.	Fisheries
	52.	Sustainable consumption
	53.	Development of rural areas
	54.	Management of biotechnology
	55.	Eco tourism
	56.	Regional disparity
Skill Development	57.	Critical thinking
	58.	Quantitative techniques
	59.	Cartographic techniques
	60.	Spatial/temporal analysis
	61.	Geospatial techniques
	62.	Environment stewardship
	63.	Action oriented project work

Source: Relevant themes of ESD are adopted from Sanchez (2011).

Fostering Environment Stewardship

We use natural resources for the sustenance of our life and it is impossible to survive in the absence of it. What is required is the appreciation of its role in our daily lives and the commitment to modify our behaviour and attitude in order to reduce our footprints on the environment. Our emotional and psychological attachment to our earth and the environment is essential to foster environment stewardship. It is only possible when we make such an attachment from the beginning of one's life by making it a part of the educational curriculum. Human beings still like the intact beauty of nature. The concept of environment stewardship was advocated by Aldo Leopold for land ethics and it is generally considered that ecologists can be among the leaders to define the societal path to planetary stewardship and this is possible if the scientists integrate social aspects in their research (Power and Chapin 2009). This is applicable for geography also.

Outdoor field study is one of the integral components of geography. Outdoor field activities expose the students to the world reality and the wonder of nature and society. They could learn to appreciate the earth's intrinsic beauty, recognise the significance of their own footprint, and, potentially, alter their behaviours to create positive change (Ray 2013). General observation by the individual is not sufficient, but purposeful and well organised field activities can help students to understand the problem.

Robert Aitken, a contributing author of *The Way of Natural History*, claims that close attention to nature is a prerequisite to intimacy with nature. Most of the geographical projects are environment oriented. When students go to the field, they understand the reality in a better way (Fleischner 2011). Several examples can be cited in this context. Watershed management involves the study of hydro-physical characteristics of watershed, changing landuse or cover pattern, human interaction with the environment and its management. During such a study, a student gets the chance to know the relevance of watershed not only for the local community, but also for other catchment areas. It offers an opportunity to learn how rivers, mountains or hills, and human beings are woven in a bond. Such a study may help in influencing the land and water management practices and policies in the watershed. The author of the book *The Way to Natural History* writes that if an individual experiences the nature through slow-paced, sensory-based recreational activities (like nature photography, birdwatching, sketching, and foot travel), they develop a higher degree of introspection and spirituality than those who partake in fast-paced activities, and they will so develop their behaviour that it will not compromise with the sanctity of nature. According to Ray (2013), 'we protect what we love, and if playing outside cultivates a passion for environmental health, then getting people outdoors is essential in responding to global climate change'.

Conclusion

Geography inherently deals with the core concept of sustainability and can provide a strong methodological foundation in addressing various issues. The discipline allows to relate the phenomena in different time frames which are essential to develop an understanding of the nature of any phenomena and its association with others. Students can connect themselves to the nature and can study the dynamics. The spatial dimension of the discipline facilitates an understanding of the phenomena at various scales and assists in finding area specific solutions. Another advantage of this discipline is its nature to incorporate the society as a key factor in shaping the earth's processes which gives realistic insights. Besides the intrinsic nature of geography, its curriculum can aim to empower learners to change their behaviour and adopt sustainable action through participatory learning as the discipline is not confined within the boundary wall of a classroom. Purposeful and well organised field activities can help students to understand the problem. The geography curricula should also include the traditional practices, in order to comprehend environmental perception and conservation methods. The learning acquired through experience and traditional knowledge system can be a catalyst to achieve sustainability.

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Book Review

India: Social Development Report 2016

Disability Rights Perspectives

Author: Ranjita Dawn
Edited by: Kalpana Kannabiran and Asha Hans
Publication date: December 2016
Publisher: Oxford University Press India

The Social Development Report 2016 provides a comprehensive interpretation of disability and is indeed a fresh approach, quite different from the usual works concerning persons with disabilities in general and women with disabilities in specific. It skillfully intersects various concepts—disability, discrimination and development, and highlights how each of these different concepts can traverse across and cast an irrefutable impact on each other. The layout of the Report is clear and concrete. It showcases a vivid collection of papers by proficient writers. It certainly addresses a wide array of issues concerning persons with disabilities, ranging from critically reviewing disability in relation to gender employment, education and access to economic rights. It must be stated that the work does stand out exceptionally well because while addressing various issues in detail and based on the empirical evidences, it also focuses on the achievements of persons/women with disabilities.

The expertise of the Report finds reflection through its ability in highlighting the problems or plights of persons with disabilities and thereby reveals a committed initiative to create awareness concerning them. Its dexterity in emphasising the achievements of

women with disabilities does play a central role in clearly communicating the message across, that the real essence of disability lies not in being treated based on charity or the medical model, but rather strongly advocates the inclusion of persons with disabilities and other social groups into the mainstream society. I believe that this can create concrete awareness not only among the general masses but also among persons with disabilities themselves by making them conscious of their own rights.

The Report, while presenting a commendable spectrum of papers highlighting neglect and abuse based on narratives of women with disabilities, displays not only academic excellence but also a whirlpool of humane emotions. The authors have effectively communicated numerous socially relevant messages through their well-researched papers based on empirical evidences.

The Report provides a fresh set of information, much in deviation from the usual quantitative and qualitative data available from other sources. It provides tangible quantitative and qualitative data based on the diverse demographic locations and boundaries. This variability of data is commendable as it not only facilitates in-depth understanding of the issue of disability among the readers, but at the same time glaringly points out how issues concerning persons or women with disabilities inspite of commonness vary in nature and intensity across geographical boundaries. The proficiency of the Report is also revealed through the presentation of quantitative data, wherein the tables provided are comprehensive, well explained and clearly communicate the intended purpose through the data presented.

I strongly feel that besides addressing singular issues, the report also reflects a strong relationship between the civil, political, economic and social rights of people across various social groups. The vivacity of the writers in addressing various issues finds expression in the nature of their papers. Besides urging the imperative need to undertake concrete educational, social and civic initiatives as a means to implement inclusion and use it as a revolutionary measure to ascertain essential respect for women with disabilities, it also challenges the concept of ability in conceptualising labour. This is well reflected in papers exploring the perceived relation between disability and labour space, thus highlighting the innumerable issues and factors that mediate as persons or women with disabilities negotiate a space in, and recognition for themselves in the labour space.

The social development of any country is affected by a multiplicity of factors, among which the progress of women, persons with disabilities, other marginalised communities and the aged or elderly constitute a significant role. This finds good representation in this report. It is true that some of the topics do not

address the issue of disability as a theme, but they do certainly address numerous challenges that people from other marginalised social groups experience. Through its attempt in addressing various issues concerning numerous other social groups, the Report adequately highlights the innumerable challenges experienced by the elderly, and advocates the necessity for a strong social security system to resolve their varied issues. The report justly explores how vulnerability of the old age makes them susceptible to disease, dependency, being considered a burden, and there hence, lies the element of disability.

Elaborating on numerous degenerations that the marginalised sections of society experience, the Report traces the essential and acute problem of accessibility to housing in urban India. It exposes the status and character of unmet demand for housing in the light of present policy frameworks. Addressing the needs of diverse communities, the Report also presents a critical analysis of the gravity or volume of development of the mining community.

In a period when continual emphasis is being laid on laying the strong foundation of *'Swachh Bharat'*, the Report attempts to provide a concrete picture revealing the multiple layers of shame and oppression imposed by caste, patriarchy and untouchability as professed by the livelihood of manual scavenging. It contests the workability of the current sanitation programmes in the realm of missing of toilets, neglect of waste management, etc.

Section Three of the Report, which includes composite social development indices based on a wide range of indicators, provides comprehensive, valid and comparable statistics traversing across states, social groups as well as urban-rural divide. This can facilitate greater understanding of the numerous issues concerning persons or women with disabilities and other social groups. This can be particularly resourceful for researchers, people from diverse professions, governments, the civil society and organisations of persons with disabilities, to focus on various issues related to the inclusion and development of people with disabilities both as beneficiaries and agents.

Based on an overall analysis, I find that the report fervently urges the necessity to review the concept of inclusion. It argues for the need to go beyond the prerequisite norm of mere adaptation, as argued by the concept of integration towards transforming the system itself, which would instead acknowledge and accept diversity. Most of the papers throughout the report raise strong deliberations on the need to establish a link between the varied needs of the diverse sections of society and address the basic structures of inequity in the society. The Report provides critical insight into several Indian policies and makes a judicious attempt not only to highlight their chief assurances,

but rather traverses ahead to judge and challenge some of their failures in terms of addressing the needs of persons with disabilities, women with disabilities, migrants, status of financial services, etc. It critically questions the feasibility of some of the policies and glaringly points out to the innumerable shortcomings, ranging from regulatory failure to institutional neglect.

I am sure that the Report will be widely referred to by people from diverse professions concerned with issues focussing on disability. The work does not need very many revisions, except a few typological errors and a few suggestions which I think can be incorporated into the Report. I think that the introduction to the Report can be made more compact. The issue of disability can be introduced in a more evaluative manner thus, rationalising the necessity and urgency for the Social Development Report to incorporate it as a subject to be addressed in one of its issues. Moreover, I also believe that although the Report has dealt with the concept of disability across various social groups, yet it is also advisable, if besides the various groups emphasised on it could also address challenges confronting persons experiencing visual impairment, dyslexia, autism and psychiatric problems. It could include research papers or thematic papers concerning specific forms of disabilities since each of its kind has its own sets of achievements and confrontations. On certain occasions, these can vary across territorial boundaries which can be highlighted. It could also focus on providing some pertinent information concerning legal rights and accessibility issues (transportation, sanitation, etc.) of persons or women with disabilities.

It is also a suggestion that the Report could deal with disability as a singular issue in one of its publication, since there are still several issues that can be incorporated in its deliberations. Although Section Two of the Report explores some essays on financial inclusion, housing and Clean India campaign, and there is no denial of the fact that they too portray significant issues that need to be addressed, but it would be good if they can be dealt with in a separate publication issue rather than attempting to incorporate it with the disability studies.

There are a few single authored and edited books available in the market that deal with the subject of disability at large. They focus on the diverse challenges experienced by persons or women with disabilities. However, this Report does comprehensively deal with some of these issues.

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Note

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