

## Exploring teaching learning of primary science outside the classroom in Bangladesh: Rationale, scopes, practice and challenges

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### Abstract

*Primary science textbooks in Bangladesh have been prepared with an inquiry approach and teaching learning outside the classroom has been given a strong emphasis. The purpose of this study is to explore how scopes of teaching science outside classroom are integrated in curriculum and curricular documents and how teachers view and practice this. Qualitative approach was adopted for this study and document analysis, classroom observation and follow up interviews with teachers were employed whereas thematic analysis was followed for data analysis. The study finds that the primary science curriculum, textbook and teachers guide have instructed to engage the students outside the classroom for teaching learning purpose. However, students were given opportunities rarely to learn science outside the classroom though majority of the science teachers expressed positive views regarding this. Existing issues in education system, school practice, societal readiness and location of the school are among the factors that are influencing teaching learning of science outside the classroom. These findings may help curriculum and textbook developer, teacher educators and teachers in taking policy decisions and actions for better science learning through outside classroom science activities.*

**Keywords:** *Primary Science Education, Teaching Learning Outside Classroom, Science outside classroom*

### 1. Introduction

Science educators are trying to make science learning interesting and effective for students and in this regard, various innovations and strategies have been evolved. Žoldošová and Prokop (2006) have found that outside classroom activity has a positive effect on interest and ideas about science education to students. Similar findings on consequences of regular school-based outdoor teaching and learning are found in other research (for example, Rickinson et al., 2004; Thomas, Potter & Allison, 2009; Thorburn & Allison, 2010). There are numerous benefits of teaching and learning activities of science outside the classroom; they:

- Improve academic achievement.
- Provide a bridge to higher order learning.

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- Develop skills and independence in a wide range of environments.
- Make learning more engaging and relevant to young people.
- Develop active citizens and stewards of the environment.
- Nurture creativity.
- Provide opportunities for informal learning through play.
- Stimulate, inspire and improve motivation.
- Develop the ability to deal with uncertainty.
- Provide challenge and the opportunity to take acceptable levels of risk.
- Improve young people's attitudes to learning. (Department for Education and Skills [DfES], 2006, p. 4)

School curriculum in Bangladesh was reformed in 2012 and implemented in 2013. The objective of primary science education is “acquiring knowledge of the science principles and technology, using the knowledge to solve problems and making students scientifically tempered and inquisitive about the surroundings (National Curriculum and Textbook Board [NCTB], 2012, translated by authors)”. Terminal competencies of primary science education emphasizes that students will know about the environment and environmental change and thereby will try to protect the environment (NCTB, 2012). The curriculum also stresses that students will achieve some values; one of the competencies set in the science curriculum expresses it clearly:

Attaining scientific mindset and participating in doing science through knowing the methods of scientific inquiry and acquiring values such as curiosity, open-mindedness, logical analysis, posing question, creativity and imagination (NCTB, 2012. p. 287, translated by authors).

The above-mentioned emphases in the primary science curriculum are consistent with most of the attributes of scientifically literate people suggested by Goodrum (2004). It is clear that the primary curriculum is aimed at developing scientific literacy among students.

Inquiry-based learning is widely promoted to develop scientific literacy (Gormally, Brickman, Hallar & Armstrong, 2009). On the basis of reformed curriculum in Bangladesh, primary science books have been prepared focusing on inquiry-based learning and teaching. Inborn curiosity of primary students and their natural interest about their surroundings make them ideal candidates for the experiential style of learning (Michalopoulou, 2014). These inquisitiveness and encouragement of learning about the natural environments are often closely tied to nature and outdoor settings (Blair, 2009). Teaching Science outside of classroom has the potential of developing scientific literacy through developing required attributes of a scientifically literate person (Sultana & Siddique, 2014).

## 2. Problem Statement

Inclusion of something in the curriculum and textbooks does not guarantee that it will be implemented at schools and achieved by the students. As already mentioned, primary science textbooks are developed with an inquiry based approach in order to implement the aims and objectives of science education stated in National Education policy and National primary curriculum. As primary science books are inquiry based and inquiry based learning is closely tied to outside setting, teaching learning outside the classroom is necessary to promote scientific literacy (Rennie, 2009). Our experience showed that teachers are not willing to conduct science lesson outside the classroom and school had no culture of taking students outside the classroom. There is no study finding available on scopes and challenges of teaching learning primary science in outside classroom settings.

## 3. Purpose and research questions of the study

How teachers view a curriculum innovation is crucial to successful implementation, therefore, now it is important to explore how teachers view teaching science outside the classroom. To explore this, this study sets the following research questions:

1. What are the scopes of teaching learning of primary science outside the classroom?
2. How do primary science teachers view outside classroom science teaching learning activity?
3. What are the challenges of teaching primary science outside the classroom?

## 4. Methodology

The research was designed by following a qualitative method to answer the research questions. Curriculum, textbook and teachers' guide for grade IV were purposively selected as data sources. Four Head Teachers and four science teachers of Class iv from four different schools were chosen conveniently under two clusters, i.e. schools from urban and rural areas. The study was conducted in three phases. In the first phase, primary science curriculum, science textbook and teachers' guide were analyzed to explore the existing scopes of engaging students outside the classroom. In the second phase, science teachers' classes were observed by one of the researcher as a non-participant observer without getting involved in the teaching learning activities as suggested by Creswell (2012). In the third phase, teachers and head teachers were interviewed to gather their views about teaching learning of science outside the classroom and to identify the challenges of teaching science outside the classroom. Collected data from these three phases using multiple methods have brought trustworthiness of this qualitative study. Thematic analysis has been followed for data analysis.

## 5. Results

Scopes of teaching science outside classroom: Scopes are found discretely and sporadically in curriculum, textbook and teachers guide. From analysis of Curriculum, Science Textbook and Teachers Guide, a total of seven topics, shown in table 1 below, were identified to have scopes in engaging students outside the classroom. Among these seven, three

topics have been clearly instructed to engage students outside the classroom. For example, a planned work to take students outside the classroom has been suggested in primary science curriculum for the topic ‘Diversity of Plants and Animals in terms of habitats’. The planned work is instructed as:

“Students will observe the local environment and identify its characteristics and write down on the exercise book. By observing local environment, Students will make a list of plants and animals that are living in the local environment and will discuss about them in the class (NCTB, 2012, p. 313).

Activity on this topic to go outside the classroom is found in both the primary science book and teachers guide. As seen in the snapshots taken from the textbook and Teachers Guide (Figure 1 and 2), the teacher is suggested to instruct the students to go outside the classroom with their exercise book and find out the different kind of plants.

**QUESTION :** Where do plants grow in the environment”

**Activity :** Where plants grow”

**What to Do :**

1. Make a table like the one shown below:

Name of plant	Where do you find it?

2. Go out of the classroom with your exercise books.
3. Find plants around your school and write the name and the place of plant you found in the table.
4. Share your idea with your classmates.

Figure 1: A snapshot from the textbook (Asgar, Haque, Jahanara & Siddique, 2019, p. 13)

[একক কাজ]

৮। নিচের ছকের মতো একটি ছক আঁকুন এবং শিক্ষার্থীদের খাতার ছকটি আঁকতে বলুন।

উদ্ভিদের নাম	কোথায় দেখেছি?

৯। পৃষ্ঠা ১৩ এর কাজটি কীভাবে করবে সে সম্পর্কে শিক্ষার্থীদের স্পষ্ট নির্দেশনা দিন:  
 “তোমার খাতা নিয়ে শ্রেণিকক্ষের বাইরে যাও। তোমার বিদ্যালয়ের চারপাশের বিভিন্ন উদ্ভিদ খুঁজে বের কর এবং এদের নাম ও কোথায় দেখেছ তা ছকে লেখ। [প্রয়োজনে নিকটবর্তী কোনো বাগান/পার্ক/উদ্যানে নিয়ে যান।]

Figure 2: A snapshot from the Teacher Guide (Tapan, Jahanara, Khanam & Khanam, 2016, p. 43)

Although curriculum instructs to engage students in outdoor activities while teaching two topics i.e. ‘Soil Pollution’ and ‘Sources of food’, science book and teachers guide have not given clear instructions in this regard. Primary science curriculum has instructions to take students to the nearby environment to introduce soil pollution and there is also an instruction to remove polythene lying on the ground to incorporate positive attitude into the students to be aware of soil pollution. But no activity or instructions is visible in science textbook and teachers guide in this regard.

On the other hand, science book and teachers guide gives clear instructions to engage students outside the classroom while teaching ‘Growth of Soil Fertility’ and ‘Weather Observation’, but similar instruction is missing in the curriculum. The following table presents a summary of topics where scopes are included regarding taking students outside classroom for science learning.

Table 1: Scopes of teaching learning of primary science outside the classroom of class four

Sl No	Topic	Status in terms of instruction in:	
		Science Curriculum	Textbook and Teachers Guide
1.	Chapter 1: Living things in the Environment Topic: What plants need to make food	Clearly instructed	Clearly instructed
2.	Chapter 2: Plants and Animals Topic: difference between Plants and Animals (Characteristics) & Plants in the Environment	Clearly instructed	Clearly instructed
3.	Chapter 3: Soil Topic: Growth of Soil Fertility	Not clearly instructed	Clearly instructed
4.	Chapter 3: Soil Topic: Soil Pollution	Clearly instructed	Not clearly instructed
5.	Chapter 4: Food Topic: Sources of food	Clearly instructed	Not clearly instructed
6.	Chapter 10: Weather and Climate Topic: Weather Observation	Not clearly instructed	Clearly instructed
7.	Chapter 12: The Universe Topic: The Moon	Clearly instructed	Clearly instructed

### Teachers' views and practice regarding outside classroom science activity

Teachers' practice is found to be inconsistent with their positive attitude. All the participating teachers had shown positive attitude towards outside classroom activity. They all acknowledged the importance of going outside the classroom. For example, Ms Khanom (all names are pseudonyms) said:

Taking students outside the classroom is helpful for them because it creates an opportunity for learning by doing and seeing. Primary Science is all about knowing the environment around them, without going outside they can't know the best.

Similar views are obtained from other participant teachers. They see outside classroom science activities as complementary to classroom activities. They asserted that there was a huge opportunity for students for first hand experiences of places, surroundings and investigating independently outside the classroom, which could not be possible by teaching only inside the classroom. All the teachers acknowledged that students need to be oriented with a topic by lessons from books and lectures in classroom setting and then they could be allowed to explore their surroundings and nature outside the classroom. Ms. Khanom stated:

Elements of environments are polluted everywhere. If teachers teach about these pollutions inside the classroom, students will never be aware of those pollution. Students can be taken to the surrounding environment and they can investigate independently to find out the reason behind pollution. This type of teaching learning process can make students informed about taking decisions and can make students interested in the environment.

Again Ms. Begum expressed:

Students can experiment their hypothesis in the environment and experiment can generate a concept.

It can be seen from the above statements, teachers view outside classroom activity as an integral part of Science teaching learning. They see great benefits of teaching learning of science outside classroom. Teachers said that students could attain some important science process skills and social skills through investigation outside the classroom; here are teachers' opinions. Attainable skills are highlighted in bold.

When I send them outside the classroom for observing different kind of trees and their location, they can classify different kind of trees [Ms. Khatun]

By working on a group outside the classroom, their leadership quality has been improved. [Ms. Khanom]

Participating teachers also said that students could attain positive attitudes and interest towards Science through outside classroom activity. They mentioned Curiosity, students' active and spontaneous participation in class work, as well as awareness of healthy lifestyle. Here is what they said:

Active and spontaneous participation is very common in outside classroom activity with compare to inside classroom activity. [Ms. Khanom]

I have learned from the parents that students are very aware of buying any products from shop as they check the expired date of the products. [Ms. Khatun]

Thus it is evident that the teachers had shown positive view about outside classroom activity to improve students' skills and positive attitudes.

Though all the teachers had shown positive attitude, but their classroom practice did not match with their attitude. It was observed that only one teacher was seen taking students outside. Hence, authors had the opportunity to observe the students' participation in science activities outside classroom. Authors had found students curious, active and spontaneous in their work. The teacher informed that students are not this much active and spontaneous in classroom. Thus it can be said that though teachers show positive attitude towards outside classroom activity, their attitudes are not consistent with their practice.

### **Challenges in implementing outside classroom activity**

As presented above, only one of the participant teachers is found to conduct outside classroom science activity, hence, there must be some challenges or reasons behind this. Five major factors were found across the four cases that influence the implementation of science teaching outside classroom. These are - (a) Teacher's reluctance (b) unfavorable education system (c) school location (d) School practice/culture and (e) societal readiness.

#### ***(a) Teacher's reluctance***

In this study, lessons were observed where there were scopes of engaging students outside the classroom. However, only one participating teacher was found to engage students outside the classroom. It implies that teachers were somehow reluctant to engage students outside the classroom. When teachers were asked, the common response was that the pressure of completing syllabus discouraged them. Ms. Sultana claimed that they had the fear of government's inspection since they are accountable for completing syllabus. When they were reminded that outdoor teaching is part of the instruction in the curriculum they did not have any convincing answer. When head teachers were asked about teachers' reluctance, one participating head teacher Ms. Shahanaz said: "All the teachers are not competent enough to carry out a class outside the classroom" whereas another head teacher Ms. Hasina asserted that she had a doubt whether they know the nature or strategy well.

***(b) Unfavorable education system***

The study finds several issues namely shortage of teachers, very low teacher-students ratio, short duration of class, high workload of teachers etc. that impede teaching learning activities outside the classroom in Bangladesh. Two of the visited schools have shortage of teacher; hence teachers have to conduct up to six classes a day. Ms. Khatun claimed:

We are not mentally or physically ready for taking them outside all the time because of so many classes we have to take in a day.

Teachers and Head Teachers identified short class duration as a barrier. Indicating large number of students, Ms. Sultana noted:

It's hard to control them even inside the classroom. Teaching and learning outside the classroom is a far cry. Even when we take them outside, They start to play themselves, some escapes."

Two participating teachers of the urban area mentioned that teaching learning outside the classroom requires extra expenditure for renting vehicle, providing snacks etc, but sufficient budget is not allocated for this purpose. The only observed class outside classroom was hampered because of limited time. In one school from rural area, only one teacher in the whole school was available for taking class; others were in training or on medical leave and there were no replacement for them. It is evident that there exist issues that impede outside classroom activity.

***(c) School location***

From the observation, it was observed that the rural teachers felt more comfortable than urban teachers in engaging students outside the classroom. It was observed that rural schools have the surroundings where students can be taken to observe and explore things that are required for science lessons.

Two observed schools of urban area have no playground or any open place. No feasible environmental resource was found near the urban school to facilitate meaningful lesson outside the classroom. Justifiably, an urban Head teacher Ms. Nasima threw a question, "Where should we go? I do not see any resources around our school". Urban teachers were concerned about the security of students in taking them to available open spaces or nature, since they need to go far away from the school using busy roads.

***(d) School practice***

From the observation it was seen that primary schools have not culture of engaging students outside the classroom. Head Teacher Ms. Keka identified that absence of culture is a barrier in implementing learning outside the classroom. Similarly Ms. Begum said, "Tradition compels to follow it". No collaboration was seen in any sampled primary schools. Some schools have no staff at all. Schools even viewed learning outside the classroom as 'extra workload'.

***(e) Societal readiness***

One participant teacher had mentioned parents and society as a challenge. Ms. Khanom noted:

Parents of the children and society members are not aware of the importance of going outside the classroom for teaching learning purpose. A large numbers of parents are

not educated, they believe in the traditional way of teaching and learning. Again educated parents have also little knowledge about importance of outside classroom activities. They consider outside teaching learning activity as a waste of time.

## 6. Discussion

This study identifies that scopes to engage students outside the classroom were given discretely in Science curriculum, textbook and teachers guide. There are a good number of topics in which case curriculum, textbook and teachers guide have consistent and clear instruction for engaging students in outside science activities. In Bangladesh, textbooks are in fact the de-facto curricula in schools and exclusively followed by teachers (Siddique, 2007). Therefore, this is a progress for science education in Bangladesh since it gives us a platform teaching and learning of science meaningfully as we know that integrating into the curriculum and curricular materials is prerequisite for successful implementation of outside science activities (Ofsted, 2008; Council for learning outside the classroom, 2020). At the same time, however, there were some inconsistencies found regarding embedding scopes in these three curricular materials. This needs to be addressed in future curriculum.

This study also identifies that primary science teachers has positive views on science teaching and learning outside classroom. Teachers' think that Science teaching learning outside classroom is helpful for students in many ways. According to the teacher participants it helps students acquire scientific concepts through increasing students interest, active and spontaneous participation, real hands on experience and experiments. They also asserted that Science teaching learning outside classroom also helps students to acquire science process skills like observation, classification etc. and social skills like leadership skills. Teachers also find that students develop curiosity and environmental awareness if they are taken to the environment for science learning. Teachers' views on benefits of outside science activities are consistent with the arguments found in the science education literature such as Rickinson et al., 2004; Thomas, Potter & Allison (2009) Thorburn & Allison (2010) and DfES (2006).

Teachers are found to be reluctant to conduct science lessons outside the classroom despite having a positive view. The positive attitude is supposed to influence how teachers planned and implemented outdoor learning (Chawla, 1994); however, this study did not find it in reality. This study found some factors or challenges that discourage teachers to conduct science lessons outside classroom. One of the factors is teachers' lack of confidence and competence about how to use school surrounding as an outdoor classroom. This is supported by the arguments by Rickinson et al. (2004) and Ofsted (2004) that insecurities in subject knowledge, lack of understanding about practice and being less experienced, lead teachers to not opting for challenging activities like science activities outside classroom.

Several existing issues in education system in Bangladesh were identified to impede teaching learning activities outside the classroom. There is a shortage of teachers in primary school; short class duration with large class size is a barrier as well. This is consistent with Broda (2011); indicating short class duration, he found that teachers are fearful of mismanagement outside the classroom. No or limited budget allocation for outside science activities is another issue that is consistent with Ofsted (2008). Pressure of completing syllabus and preparing students for examinations acts as a barrier similar to the challenges seen in implementations of many other innovations. It has been found that issues related to school location are also hindering science teaching and learning outside the classroom. According



to Waite (2011), the school playgrounds are often the first step in taking students outside the classroom. There are no opportunities for urban students to go outside for lack of playground, community resources and natural environments. Urban teachers are concerned about the security of students, as they have to go far away from the school using busy roads. Simmons (2010) has the similar findings; they identified safety of students as an issue. Primary schools have no tradition to take and engage students outside the classroom; society is not ready for it yet. These pose challenges for teachers as Ofsted (2008) has suggested that the success of learning outside the classroom depends on collaboration of school, teachers and community.

## 7. Implications

The findings of this study have implications for curriculum and Textbook development, Teachers' professional development and, teachers' and schools' practice. Since learning science outside the classroom is effective when it is integrated in the curriculum and curricular materials especially in the Science textbook; curriculum developers and authors of textbooks and Teachers' Guide need to make conscious efforts to create structural scopes in the curriculum and textbooks.

Teachers are responsible for implementing curricular intention and contents. Initial teacher education and continuous professional development programs need to incorporate necessary pedagogical knowledge on inquiry-based and outside classroom science activities to make teachers competent in this regard.

School system needs to be made suitable for implementation of innovation like inquiry-based and outside classroom science activities. Fund needs be allocated to schools; however, schools also need to be adaptive to new innovations in terms of making class schedule flexible so that longer class can be arranged if required.

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