

Group Work in Primary Science Classes: Teachers' Knowledge, Attitude, Practice and Challenges

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Group Work in Primary Science Classes: Teachers’ Knowledge, Attitude, Practice and Challenges

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Declaration

I hereby declare that this research report titled ‘**Group Work in Primary Science Classes: Teachers’ Knowledge, Attitude, Practice and Challenges**’ is an original work. This thesis contains no material which has been submitted for the award of any other degree in any university or other institution. All the information presented in the study has been obtained and presented in accordance with the academic rules. I also affirm that as required by the rules and conduct, all the materials which are not original to this work are fully cited and referenced.

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Fahmida Khan
July 2023

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Abstract

Learning in groups is a well-established pedagogical practice for science as it helps to enhance students' achievement and socialization. National curriculum of Bangladesh puts a lot of emphasis on group work for science teaching-learning, however, teachers are still struggling to implement this strategy in class. Hence this study focused on understanding the present situation of using group work at primary level from the teachers' perspective to identify ways for proper implementation of group work in Bangladesh. To meet this purpose, teacher's knowledge, attitude, practice of group work and the challenges faced by them while conducting group work were explored.

A multiple case study framework was adopted here. As the research questions demanded both, qualitative and quantitative data; sequential exploratory mixed method research design was followed. Six primary school science teachers from one district in the rural area and one district in the urban area were selected through maximal variation sampling. A lesson observation schedule and a semi-structured interview were used to gather the qualitative data. Quantitative data was collected through a Likert scale questionnaire. Data for the rural and urban cases were analyzed through thematic and descriptive analysis. Overall findings were then drawn.

Current practice of group work in rural and urban contexts is somewhat similar except for the fact that group work is less practiced in rural areas. This study claims that primary science teachers of Bangladesh have adequate knowledge to plan and conduct group work and their attitude towards this teaching strategy is positive. However, more training and information regarding the group formation, keeping the discussions student-centered and assessment of groups' work is required to improve teachers' practice of group work. Large number of students, time constraint, inattentiveness, workload and lack of infrastructural support are some of the challenges which hinder the implementation of group work.

Findings of this study have implications for the primary teacher educators and teachers to address the challenges. Teacher educators can consider including training on the process of co-construction of knowledge and assessment of group work. Explaining the group work skills to students and using local resources can be practiced by the teachers in order to improve the implementation of group work.

Chapter 1: Introduction to the Study

The context of the current study is introduced in this chapter. The research problem along with the justification is discussed here. Research purpose, research questions and the significance of the study are also specified.

1.1 Introduction

Working in a group or team enables students to share their experiences while performing a task or solving a problem. According to Goodrum (2004), students learn more effectively when they work cooperatively than when they work individually or competitively. Teamwork is so important that the Organization for Economic Cooperation and Development (OECD) regarded learning to cooperate as one of the major competencies that any person in the twenty-first century should possess (Martinez-Farnandez et al., 2011).

Cooperative learning or group work gained popularity in the early 1980s after the meta-analysis of 122 studies conducted by Johnson et al., 1981. This study based on a sample of North American Schools found cooperation and cooperation with intergroup competition to be superior to interpersonal competition and individualistic efforts. This result was applicable to all subject areas and all age groups (Gillies, 2016). Students demonstrate better achievement, socialization, motivation and self-development while working with peers than working individually. Adamseged (2015) defines cooperative learning as ‘an active and inclusive instructional strategy in which a group of heterogeneous students (due to achievement level, sex, age, and special need) work together in a structured form with each member taking an active role to maximize their own and one another’s learning.’

There is plenty of evidence that cooperative learning as a pedagogical practice has an immense effect on student learning and socialization in science programs (Slavin, 2014). However, research of King, 2002 (as cited in Gillies, 2016) indicates, students rarely provide quality explanations or engage in high-level discourse unless they are taught to do so.

Teachers play a vital role in the success of students’ cooperation and their achievement. Gillies and Ashman 1996 & 1998 (as cited in Gillies & Boyle, 2009)

found, ‘When students worked in groups where they were trained to cooperate, the students demonstrated more on-task behavior, gave more detailed explanations and assistance to each other, and obtained higher learning outcomes than their untrained peers’.

Despite being an effective teaching strategy, research by Frykedal & Chiriac (2012) found that a number of teachers in some developed countries are reluctant to use group work as a pedagogical tool in the classroom. Therefore, it is important to explore Bangladeshi teachers’ knowledge, attitude and practice of group work in science classes in order to understand the nature and challenges of using group work at primary level.

1.2 Personal Perspective

As a student of science, I only worked in groups during laboratory work in school. Those practical works were mainly ‘recipe style’. We simply followed the instructions given by the teacher to obtain the desired and predetermined result. No scope of inquiry was present. Though it was one of the highly reputed schools of Bangladesh, teachers mainly used lectures to impart knowledge. Students’ involvement was hardly present in any lesson.

During my course of study in the university, I had taken part in many group work activities in different courses. However, in most of the cases, teachers assigned us into groups, gave the task and we had to present our work on a date fixed by the teacher. Most of the time, we worked without the teachers’ intervention or feedback, all the members achieved the same points regardless of their contribution to the group’s work. There were issues with group formation as well. The laboratory works also followed the ‘recipe style’.

Next, as an intern in a leading Non-government Organization (NGO), I conducted research on science teachers’ and students’ views about implementing the 5E Model in schools of Bangladesh. Though the responses from the teachers and students were positive, some challenges were mentioned by the teachers due to which they prefer using the teacher-centered methods over the student-centered ones.

When I started my career as a teacher in a reputed English medium school, I used group work in my lessons. However, I was instructed to use this strategy at the end of

the chapter. The purpose was just to ensure students' achievement of social skills. My style of teaching was also the same old lecture method with occasional use of teaching aids. I never got an opportunity to introduce a new topic with group work.

Being a student of Education Science, I have read about the significance of different teaching strategies including the group work. Unfortunately, I neither got to see the implementation of these methods in my student life nor did I get an opportunity to implement these student-centered methods as a professional. All these experiences have driven me to conduct this research on the teachers of Bangladesh to understand the current practice of group work in science classes of Bangladesh and help improve the condition by identifying the challenges.

1.3 Problem Statement with Justification

Group work has been promoted in many countries as a key component of elementary science. In line with the global trend, it is mentioned as a major strategy for teaching-learning at primary level in Bangladesh. It is stated in the primary education part of the National Education Policy (2010) that, “In order to develop creative thinking and skills, the opportunity of working individually or in group should be given to the students.” Scope of learning in groups is also included in the new science textbooks. For instance, one activity mentioned in the chapter six of science textbook of class three (Asgar et al., 2012) can be mentioned here, “Tear a small piece of paper into smaller pieces and with the help of an exercise book fan over the pieces of paper. Are the pieces of paper moving away? Who is moving them? Discuss among yourselves and tell the teacher what you have understood.”

Although students play the major role of learning in the group work, we cannot expect the groups to function properly without proper guidance. Besides structuring the groups in a way to facilitate cooperation among students, teachers also have a role in promoting interactions among the students. However, previous research of Mony (2017) and Tuli et al., (2021) indicates that the primary school teachers of Bangladesh lack in pedagogical knowledge to manage the group work in science classes. They face challenges especially in forming groups, ensuring equal participation of students and assessing students' achievement. Although group work is emphasized as an important teaching strategy in the National Education Policy of Bangladesh, these studies suggest that teachers are struggling to implement group work properly.

1.4 Gap in Research

The National Curriculum Framework (2021), considers social-constructivism approach as a psychological foundation which encourages creating a learning environment where learners can find creative solutions to problems through interactions. Social constructivism-based learner-centered teaching-learning and assessment processes are also given preferences in this new curriculum. This framework includes group work as an essential strategy for teaching-learning and assessment as well. This study will provide an insight on the Bangladeshi primary school teachers' preparedness of using group work in science classes.

To ensure that the teachers can efficiently practice this strategy in classrooms, Bangladesh has been providing training to the teachers on learner-centered teaching methods. A model for teacher's role in facilitating group work (Rahman, 2018) has been included in different teachers' training programs to improve teacher's practice of group work in classroom. However, no research has been conducted so far on teachers' practice of group work focusing on this model.

Previous research on learning in group work in the Bangladeshi context was done on exploring students' perceptions on learning in small groups in higher education (Rahman et al., 2010). Several recent researches focused on the nature of group work practice at tertiary level (Hasnat, 2016) and the factors influencing the practice of group work in secondary schools (Jahan, 2019). To the best of my knowledge, no research has been conducted on the teachers' knowledge, attitude and practice of group work at primary level in Bangladesh.

As the teachers' role is vital in implementing group work successfully, it is important to explore their knowledge and views about this pedagogical practice. This research will fill the gap in the existing literature by providing detailed information regarding the primary school teachers' knowledge, attitude and practice of group work and the challenges they face.

1.5 Purpose of the Study

The purpose of this study is to explore the primary school teachers' knowledge, attitude and practice of group work and to find out the challenges they face. Possible

way out will be identified for the better implementation of this strategy in science classes of Bangladesh.

1.6 Research Questions

This study aims to find out answers to the following research questions.

1. What is primary science teachers' knowledge about facilitating group work?
2. What sort of attitude is presented by the primary school teachers towards using group work in science classes?
3. How is group work being practiced by the teachers in primary science classrooms?
4. What are the challenges faced by teachers' while applying the group work in the classroom?
5. How to overcome the challenges of applying group work in the classroom?

1.7 Audience of the Study

Findings of this study will help teacher educators to know about the existing knowledge and attitude of the teachers' about using group work and the challenges of practicing group work in primary science classes and hence they will be able to take roles to reduce the problems.

From the results of this research, the teachers of primary schools will benefit as well. This study will provide them with ideas to resolve the challenges they face in their classrooms while applying group work.

1.8 Thesis Outline

This thesis consists of six chapters in total. Contents of these chapters are mentioned briefly below.

Chapter One introduces the study by discussing the context of the research problem and purpose of the study. Justification of the study is presented through identifying the gaps in existing literature and personal perspectives. This chapter also provides an outline of the structure of each chapter.

Chapter Two reviews the related literature to help build up an understanding about the aims of teaching science, the new techniques of teaching science and the current practice of teaching science in developing countries. Process of designing and implementing group work and the benefits and challenges of using this strategy will be established in light of the existing literature.

Chapter Three provides a detailed idea of the research design and the strategy of inquiry. Sample and sampling techniques, construction of the instruments and data collection procedure for this study will be discussed here. The process of analyzing the qualitative and quantitative data will be mentioned.

Chapter Four presents an elaborate analysis of the collected data. This chapter explains science teachers' knowledge, attitude and practice of group work in classrooms, challenges faced by them and the possible way outs in both urban and rural contexts of Bangladesh.

Chapter Five includes the discussion of the major findings for each of the research questions of this research. These findings are compared with the previous research findings to find similarity and differences in results. Significance of these findings in better implementation of group work are also presented here.

Chapter Six contains the implications of this study for the different stakeholders of primary education in Bangladesh. A brief overview about the major findings is added. This chapter ends with a concluding remark from the author.

Chapter 2: Literature Review

This chapter focuses on building an understanding of the existing literature related to learning science in small groups at primary level. The aims of teaching science in primary schools and the constructivist way of learning are discussed here. Designing and implementing group work for the primary students as well the challenges that might arise has also been explored in light of the existing literature.

2.1 Teaching Science at Primary Level

‘Understanding science helps children to appreciate the world around them by teaching them to make observations, collect information and to use logical thinking to draw conclusions in order to solve daily life challenges. Hence, science education has a major role to play in the development of informed citizens in this advanced technological era’ (Watters & Ginns, 2000, as cited in Garraway-Lashley, 2019).

At primary school age, children develop an understanding of their own and the world. This is the crucial period for building a strong foundation of fundamental science concepts in order to prepare them for the advanced learning of science. Quality of learning vastly depends on the quality of teaching (Garraway-Lashley, 2019).

The aim of teaching science now is to prepare scientifically literate citizens for the future. The teacher's role in this endeavor has shifted dramatically. They are no longer the knowledge provider or explainer rather they are considered as facilitators. According to Hubber and Tytler (2004), five main roles of a modern science teacher are-

1. Stimulator of curiosity
2. Challenger of ideas
3. Resource person
4. Senior co-investigator
5. Discussant

2.2 A Theoretical Underpinning for Group Work

This section will describe different aspects of the group work theory based on the existing literature. This will act as the base of the current study.

2.2.1 Group Work

Group work is one of the teaching strategies which have been devised to implement the social constructivist principles of learning in the classroom. It has been described by different scholars differently over time. Johnson and Johnson (1990) explain group work as small groups of students working together to enhance their own and their team members' learning. Salend (1994 as cited in Adamseged, 2015) describes cooperative learning 'as an organized strategy, in which students work for a common academic goal rather than competing or working separately from their peers'. Rahman (2021) states that, 'Group work is a strategy that includes working in groups to enhance critical, decision-making, collaborative, and communication skills to increase productivity in education.'

The literature makes it clear that group work is not just a few students sitting together and sharing their ideas. It needs to be conducted in an outcome focused way. Group work involves shared decision making of students which is guided by the teacher to ensure all students have achieved the learning outcomes. During the process, students also learn social skills of helping each other, working together and communicating their ideas.

2.2.2 Approaches in Group Work

Group work engages students in sharing their ideas with other students to perform a given task. The study of Davidson and Major (2014) indicates that 'students working in small groups outperform their counterparts in a number of key areas. These include knowledge development, thinking skills, social skills, and course satisfaction.'

Group learning can take place either in a 'Structured' way or in an 'Informal' way. Two approaches are observed in 'Structured' group work: cooperative approach and collaborative approach (Linn & Burbules, 1993 as cited in Rahman et al., 2010). According to Linn and Burbules, 'Cooperative learning involves dividing a task into parts and having each group member complete one of the parts whereas in collaborative learning two or more students jointly work out a single way out to a problem'.

Cooperative Approach

According to Goodrum (2004), “Cooperative learning is an approach that encourages students to work together to help them learn better.” It involves a focus on co-laboring of team members to accomplish a learning task, together.

Cohen defines cooperative learning as students working together in a group small enough that everyone can participate on a collective task that has been clearly assigned. Moreover, students are expected to carry out their task without direct and immediate supervision of the teacher. (Cohen, 1994, p. 3, as cited in Davidson & Major, 2014). In a cooperative setting, each student is responsible for their own learning as well as the learning of the whole group.

According to Salvin (2010), the achievement of outcomes depends heavily on two key factors- the presence of group goals (the learners are working towards a goal or to gain a reward or recognition) and individual accountability (the success of the group depends on the individual learning of each member). To ensure accountability of each member, roles for each member are often specified. especially, for the younger students who do not have much experience of group learning. Goodrum (2004) suggests the roles can be: Manager, Speaker, Director and Reports Coordinator.

Most of the research on cooperative learning in school have shown positive results in academic achievement; development of higher-order thinking skills, self-esteem and self-confidence as learners; friendship across racial and ethical boundaries; social acceptance of students labeled as handicapped or disabled; development of interpersonal skills; and the ability to accept the perspective of another person (Davidson & Major, 2014).

Collaborative Approach

Petrescu et al. (2017) describes collaborative learning as a strategy in which small groups work together to attain a common goal. Davidson and Major (2014) argue that in collaborative learning students not only work with each other but they also work together with the teacher to construct knowledge. This shifts the nature of control of the classroom.

Students control their learning process; the teacher is only a facilitator and a guide of the students. The students work together towards achieving common goals and master the skills of decision making. (Petrescu et al., 2017).

Petrescu et al. (2017) have found that the application of collaborative approach increases students' participation, achievement of knowledge and skills and motivation towards science.

Similarities and Differences between Cooperative and Collaborative Approaches

The above discussion makes it clear that in both the cooperative and collaborative approaches students work in teams to accomplish the given task. Both the approaches aim for the achievement of learning outcomes at individual level through group interaction.

However, Davidson and Major (2014) identified some differences in the nature of these two approaches such as

- Collaborative learning does not assign different roles to the members whereas some cooperative strategies do.
- Cooperative learning groups often work on the structures formed by the teacher. On the other hand, groups are mostly self-managed in a collaborative approach.

2.2.3 Social-constructivism

The traditional way of teaching of science regarded that the students came to the classroom with empty minds and it was the teacher's responsibility to dispense knowledge to them (Goodrum, 2004). However, researchers have always argued that all students possess some ideas about the surroundings based on his or her real-life experience. Constructivist theory of learning suggests an interplay between students' existing knowledge and the knowledge and experiences they are exposed to in the classroom (Hubber & Tytler, 2004).

Social constructivism is a learning theory developed by Lev Vygotsky in 1968. Though it might seem that the constructivist approach puts all responsibility of learning on the students only, however, the social constructivist approach encourages a classroom environment where teacher and students 'co-construct' knowledge

(Tytler, 2004). According to Vygotsky, “Social constructivism is a variety of cognitive constructivism that emphasize the collaborative nature of learning under the guidance of a facilitator or in collaboration with other students” (Akpan et al., 2020).

Table: 2.1 Basic themes and principles of Vygotsky’s social constructivism (Adapted from Palit, 2018).

Social Interaction	Child’s cultural development takes place in two phases- first on social level (through interaction with people) and later individually (inside the child’s mind). Cognitive process starts with social interaction as knowledge is co-constructed through shared activities.
Zone of Proximal Development (ZPD)	The idea of Zone of Proximal Development (ZPD) was introduced by Vygotsky in his social-constructivist theory. This is defined as an area of learning where the learner cannot reach alone or unaided but he/she can be successful to reach that point through guidance and collaboration with teachers and more advanced peers.
Assisted Learning and Scaffolding	A task that is within the child’s ZPD but he/ she cannot reach it alone, can be achieved through assistance and guidance. Teacher’s role here is to provide support and gradually decrease it as the child masters the task. When a task is mastered by a learner it assimilates into his/her Zone of Actual Development (ZAD) and the ZPD around it also expands.
Language Development	Vygotsky puts emphasis on language development as language is the primary mean of interaction through which knowledge is shared among individuals. Shared activities give the learners room to develop communication skills, rational thinking and evaluating diverse opinion.

According to Tytler (2004), social constructivism involves the engagement of students in a process of shared meaning making, guided by the teacher. Teachers' role here is more complex than it was in the traditional teaching strategy as the teacher has to operate with the whole classroom, guiding their discussion, tending to their needs, tracking their behavior as well as to ensure learning of each student individually.

2.2.4 Key Elements of Group Learning

Johnson et al. (2013) describes five key elements for learning in groups-

1. **Positive interdependence-** it is the key to group learning. Students must believe that their success depends on the success of all team members. They have to complete their individual parts and also work as a team (Smith, 1996).
2. **Face-to-face promotive interaction-** students are to share their knowledge and ideas with each other. Interaction between the students on the explanation of topics is the foundation of knowledge construction here (Adamseged, 2015).
3. **Individual and group accountability-** To ensure that each member's learning is strengthened, individual accountability to do their share of the work needs to be ensured. It is also important for the groups to know which member needs more support to complete the task. Teachers will assess each individual separately and share the feedback with individuals as well as with the groups. (Smith, 1996).
4. **Development of teamwork skills-** Students must be taught the group learning skills such as- leadership, decision-making, trust-building, communication, and conflict-management skills. This will help them to perform their role in the groups effectively (Goodrum, 2004).
5. **Group processing-** It is important for the groups to make decisions on how well they are achieving their goals. Groups need to describe what member actions are helpful and unhelpful, and to make decisions about what to continue or change (Johnson, Johnson & Smith, 2013).

2.3 Significance of Group Work

There are many studies which support the idea that collaborative strategies have a positive effect on students' achievement in almost any discipline (Rahman, 2021). Working in groups enables students to learn contents better as well as develop social skills. Some benefits of learning in groups mentioned by Goodrum (2004) are as follows:

- **More effective learning-** Students learn better when they work in groups than when they work individually. Students' attitude towards school work has also improved.
- **Improved self-confidence-** Students can solve problems more successfully by working in groups. This increases their self-confidence.
- **Better class management-** Through group work students learn how to manage the equipment by themselves and control their behavior as well.
- **Teaching students how to work cooperatively-** Group work is needed to develop effective team learning skills like- group management, teamwork and cooperating with group members.

2.4 Designing Group Work

Group work is a designed event. If designed properly, it can provide students an opportunity to work in a social setting to enhance their learning as well as help them acquire social skills.

2.4.1 Five Lenses of Assessing the Group Work Design

Windschitl, Thompson & Braaten (2007) have set five lenses for assessing design of group work.

1. Nature of the tasks assigned

Group tasks can be of two types- short term (work for one or two classes) or long term (work for weeks). Tasks should be planned in a manner so that there is scope to exchange ideas, discuss and debate over the ideas and make decisions. Tasks that involve 'exchange of answers' only (solving worksheets), should be avoided as they do not foster critical thinking and social skills of working in a team.

2. Assigning students to groups

After deciding the task, groups should be formed. Students of mixed ability should be included in a team so that the more accomplished students benefit by explaining their ideas to others and the kids who usually struggle can get access to the thinking of more advanced students. Number of members in a group should also be considered. In large groups it becomes difficult to use the instruments and discuss among the team members.

3. Fostering student ownership

To ensure each student's participation in group work, teachers may assign different roles to the students. Teachers may select different students in a group to perform the roles of recorder, presenter, materials manager, organizer, artist and friendly critic.

4. Interpersonal considerations

Interaction between the students from the same group as well as from the other groups should be ensured to conduct productive group work. Students should be encouraged to express their own ideas, comment on other students' ideas and to ask questions regarding the task.

5. Assessment and accountability

Students' involvement in group work should be assessed by the teacher frequently to ensure effective learning. Involvement in a task not only means to handle the materials, it also includes involvement in open discussions.

The goal of a teacher in group work is to scaffold student's thinking and social actions so that they can eventually do this on their own, without the teacher's intervention. Proper planning of group tasks is necessary to achieve this.

2.5 Model of Teacher's Role in Facilitating Group Work

A model of teacher's role in facilitating group work was developed by Dr. S. M. Hafizur Rahman, Professor of Institute of Education and Research (IER), University of Dhaka in order to provide a guideline for the science teachers on the implementation of the group work. Mony (2017), a student of M.Ed at IER conducted a research on validation of this model in Primary Schools of Bangladesh and found

positive results. Later on, this model was included in the Teachers' Training Program (Rahman, 2018). This model identifies teacher's roles during group work which makes it easier for the teachers to plan and conduct lessons using this strategy. These roles of teacher mentioned in the model were the basis of the data collection instruments and data analysis for this study. The following table represents the roles of teacher identified in the model of teacher's role in facilitating group work. A brief description of these roles in light of existing literature is also presented afterwards.

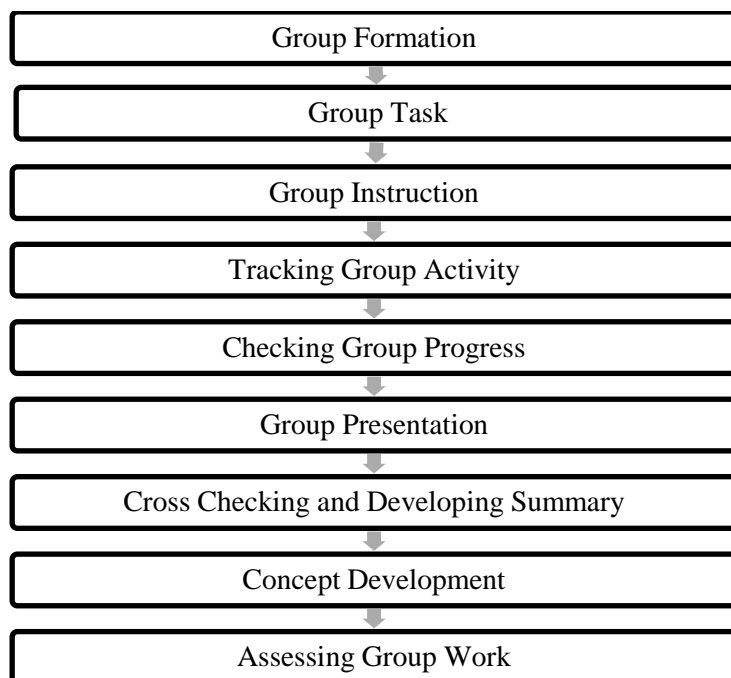


Figure 2. 1 Model of teacher's role in facilitating group work

Group Formation

Table 2.2 Types of Grouping

Type of grouping	Feature
Heterogeneous	Mixed-ability, sex, race teams
Homogeneous	Teams with a shared trait (ability, interest, language)
Random	Randomly formed teams
Student-selected	Students select own teams

According to Beatrice (1987), 'Cooperative groups require students with diverse ability and characteristics to work together and learn from one another to accomplish assigned learning goals or tasks.' Success of the group work to some extent relies on the formation of the groups. Kagan and Kagan (2009 as cited in Adamseged, 2015) mention four types of grouping- Heterogeneous, Homogeneous, Random and Student-selected groups. All four types of groups have their own advantages and disadvantages. Kagan & Kagan (2007) suggest using all four types of grouping throughout the academic year instead of using the same group to give students the experience of working with different kinds of people.

Group Task

While selecting the task for group work the teacher has to consider what sort of learning outcomes, he/she wants the students to achieve. Tasks should be set in such a way that it helps students to learn the specific content of the subject as well as to master some social skills (Smith, 1996).

According to the constructivist teaching approach knowledge should be built upon students' prior knowledge, for this, real-life oriented tasks should be more suitable. Most of the time teachers of Bangladesh prefer using group tasks where the students have to read the topics from the book and then answer the questions as teams and afterwards, they are asked to present their answer verbally. This type of comprehension based tasks is a very commonly used strategy for group work (Smith, 1996). Though there is nothing wrong with this strategy, giving the same type of task time and again can decrease students' interest in group work. In order to make group learning more interesting Goodrum (2004) suggests using different types of tasks such as Envoy, Gallery Work and Jigsaw (see Table- 2.2).

Table 2.3 Teaching Strategies for Learning in Groups (Adapted from Goodrum, 2004)

Teaching Strategy for Learning in Groups	How it works	Benefits
1. Envoy	<ul style="list-style-type: none"> ● Students are formed into groups and one member is selected as the ‘Envoy’ ● After the group discussion the envoy visits another group and reports his/her groups’ work to that group. He also listens to that group’s report. ● The envoy returns to his original group, which has been visited by another group’s envoy. They exchange new ideas. 	<ul style="list-style-type: none"> ● Helps students to learn from each other ● Improves skills like listening and speaking as well as synthesizing and summarizing
2. Gallery Work	<ul style="list-style-type: none"> ● Students are divided into groups and asked to prepare a material (make a list or drawing or a model etc.). ● Students’ work is then placed around the class and students are given time to view the display. 	<ul style="list-style-type: none"> ● Gives students the opportunity to see their peer’s work and get new ideas. They can also assess other students’ work.
3. Jigsaw	<ul style="list-style-type: none"> ● Students are divided into ‘home’ groups first where each student gets a different topic to research. ● The home groups split up and they form ‘expert’ groups where all members research on the same topic and prepare a report. ● Students return to their home groups and each of them report on their specific topic as an expert. 	<ul style="list-style-type: none"> ● Allows students to cover a broad amount of concept in a shorter period of time

Group Instruction

Students need to understand how to work together. Only then can they benefit socially and academically from the small-group experience (Gillies & Boyle, 2009).

Teachers will give specific instructions for the group task to all groups. Besides explaining the task, the teacher will also mention the group norms to be maintained. Gillies and Boyle (2009) suggest that teachers should train the students on interpersonal skills and prepare them for their small-group experience before assigning the task. This will help them to achieve the learning outcomes.

Tracking Group Activity

Teachers need to foster interdependence, face to face interaction and individual accountability among students (Johnson & Johnson 1990). This will make them believe that they are linked with others in such a way that one cannot succeed unless the other members of the group succeed (and vice versa) (Smith, 1996). Teachers need to monitor students' work to ensure that all members are taking part in the group activity and helping each other.

Checking Group Progress

As suggested by Tan (2015), teachers need to monitor students' work otherwise they might engage more in socializing than in the task. It is important to make sure that the groups are working in the right manner and they are able to achieve the learning outcomes. Smith (1996) suggests that, 'When needed, the professor should intervene to assist students in completing the task accurately and in working together effectively.'

Group Presentation

Kempa and Ayob's (2000) study concluded that verbal interaction between pupils engaged in group work provided an effective way of learning from others. It extends student's achievement and 'learning from others' in group work. Actually, inactive group members benefit from presentation of group work activities.

Cross checking & Summarizing

Through cross checking individual group's information is exchanged with other groups. According to Yayo (2013), The exchange of the groups' ideas brings about higher quality decision making and greater insights into the concept being considered. It enriches individual group's contributions. Weak students get benefits from cross checking as they get to learn different perspectives on the topic (Kempa & Ayob, 2000).

Concept Development

Teacher will summarize the group learning activities and provide feedback to students. This is where the co-construction of knowledge between teacher and students takes place. As already mentioned, students come to the class with pre-existing knowledge about different concepts. These ideas can be right or wrong. Even after exchange of ideas with their peers some misconceptions may still remain. Here,

the teacher plays the role of a ‘discussant’ by gathering the key ideas and helping students to identify the key concepts which have been discussed and agreed (Hubber & Tytler, 2004).

Assessing Group Work

Feedback on students' performance is very important for students' learning (Gillies & Boyle, 2007). According to Smith (1996), ‘In cooperative learning individual students' learning is typically evaluated by written exams, quizzes, and papers. To assess students' participation, the teacher provides time and a structure for members of each learning group to process how effectively they have been working together.’ However, this can really be time consuming and challenging. Hence Forsell et al. (2021) suggests, ‘...teachers need better management strategies for high-quality group work assessment that takes validity, fairness, and reliability into consideration.’

2.6 Teachers' Attitude towards Group Work

As discussed earlier, Bangladesh is trying to upgrade the science teaching-learning strategies to cope up with the global trends. However, successful implementation of these changes vastly depends on the attitude of the major stakeholders of education in the country like the teachers and students. According to Adamseged (2015), people's actions are often guided by their beliefs and attitudes. Similarly, if the teachers think group work is useful for them then they will be motivated to implement it.

Tao (2015); Adamseged (2015) and Rahman (2021) have found teachers highly positive and motivated towards using the group work in their classrooms. They recognized the significance of applying this strategy on the achievement of their students.

However, studies of Jahan (2019); Tuli et al., (2022) and Gillies and Boyle (2009) have found unwillingness of applying the group work among the participants of their respective research. They have marked lack of time, extensive preparation on teachers' end, managing the groups among the reasons behind teachers' reluctance towards this strategy. Forsell et al. (2021) have mentioned that the lack of strategy for assessment of students' work reduces the reliability of assessment which is a big challenge for implementing this strategy in class.

Kohn (1992) asserts that teachers find the shift in the nature of authority in the classroom challenging which is why they are often unwilling to use group work. Another reason behind teachers' reluctance in using this strategy is the lack of pedagogical knowledge of teachers Jahan, 2019 and Tuli et al.,2021. Since they do not understand the strategy of managing groups and co-construction of knowledge, they cannot bring out the optimum outcome from the students. As a result, they feel less motivated in applying this strategy.

2.7 Challenges in Implementation

Though the group work is an excellent way of teaching science some researchers have found teachers reluctant to use this strategy. The reason behind this could be the challenges teachers have faced while applying this strategy.

Large number of students, seating arrangements, lack of resources, maintaining discipline (Tuli et al., 2021), lack of time, workload (Rahman 2011), planning, student preparation and assessment (Gillies & Boyle, 2009) are some of the barriers in applying group work mentioned by the science teachers.

Large Number of Students

Research suggests that groups should ideally be formed with 4-6 members (Tan, 2015). However, this principle cannot be maintained in Asian and African countries like Bangladesh (Rahman, 2021, Tuli et al., 2021), China (Tan 2015), Ethiopia (Admseged, 2010, Yayo, 2013) etc. where the number of students in each class is very high.

It becomes difficult for the teachers to monitor so many students at a time. 'Large groups decrease each member's opportunity to participate and often result in some members not actively contributing to the group. In situations where there is a shorter amount of time available to complete a group task, such as in class collaborative learning exercise, it is suggested that smaller groups are more appropriate' (Rahman, 2021).

Lack of Time

The average time per lesson at primary schools of Bangladesh is 40-45 minutes. According to Chiriac and Frykedal (2021), ‘Group work is time-consuming and requires more time than just the period of time allotted in the school schedule.’ Conducting the group work properly within the allotted time becomes difficult, especially, when it comes to the assessment of students. Lack of time limits teachers’ opportunities to collect evidence about students’ learning and hampers the reliability of the assessment process (Forsell et al. 2021).

Workload

Teachers are often burdened with workload (Talukder et al., 2021, 2021; Tuli et al., 2021 and Dorji & Wangchuk, 2022). There are situations where the teachers have to teach more than two or three subjects in a day to students of more than two grades. Sometimes there is a lack of employees so the teachers have to perform both academic and administrative duties (Dorji & Wangchuk, 2022).

Proper implementation of group work requires a lot of preparation and planning on the teacher’s end (Gillies & Boyle, 2009). As the teachers are already under a huge workload, they are often demotivated to apply this strategy.

Maintaining Discipline

Students often get more engaged in socializing with their team members than completing the task. Sometimes few members are inattentive and only one or two members have to complete the task (Tan, 2015; Rahman, 2021).

Implementation of group work can be challenging if the students are inattentive and not taking part in the group task. Because group work is not simply sitting in a group and listening to people talk; giving and receiving help from each other and sharing of ideas and materials among all group members are equally important (Adamseged, 2015).

Student Preparation

In group work, learners play a major role in learning. They need to learn how to learn first. Students need to understand how they are to work together. Only then can they benefit socially and academically from the small-group experience (Gillies & Boyle, 2009).

Researchers put emphasis on training the students on group skills like positive interdependence, individual accountability (Adamseged 2015), communication and conflict management (Adamseged 2015) to make the groups more task focused and attain higher learning outcomes (Gillies & Boyle, 2009). However, this requires a lot of time and preparation on the teacher's end which is why it is often neglected.

Seating arrangements

Successful implementation of group work requires face to face interaction among the group members. Through face to face interaction individuals encourage and facilitate each other's efforts to achieve, complete tasks, and produce certain outcomes in order to reach the group's goals (Yayo, 2013). However, the study of Adamseged (2015) and Chiriac and Frykedal (2011) found that the seating arrangements of the students were not suitable for the implementation of group work. As students are often sitting in large groups as well as the long benches used in many classrooms make it difficult for the students to hear what other members are trying to say.

Assessment

Previous research of Talukder et al., (2021) have found lack of information in the training program of Bangladesh about the assessment process associated with different teaching strategies. According to Forsell et al. (2021) '...teachers need better management strategies for high-quality group work assessment that takes validity, fairness, and reliability into consideration.'

2.8 Conceptual Framework of the Study

The conceptual framework of the study is represented in the Figure 2.2. This framework was developed based on the review of literature related to the topic. This provides an overview of the research planning.

The major focus areas of the five research questions of this study are knowledge about facilitating group work, attitude of teachers towards group work, practice of group work, challenges in facilitating group work and the way out for better implementation of group work in primary science classes. To address the first three research questions, teacher's knowledge, attitude and practice will be analyzed based on the model for teacher's role in facilitating group work (Rahman, 2018). Through lesson observation and interview of the teachers, challenges faced by the teachers in facilitating group work will be identified. The way out for ensuring better implementation of group work will be explored.

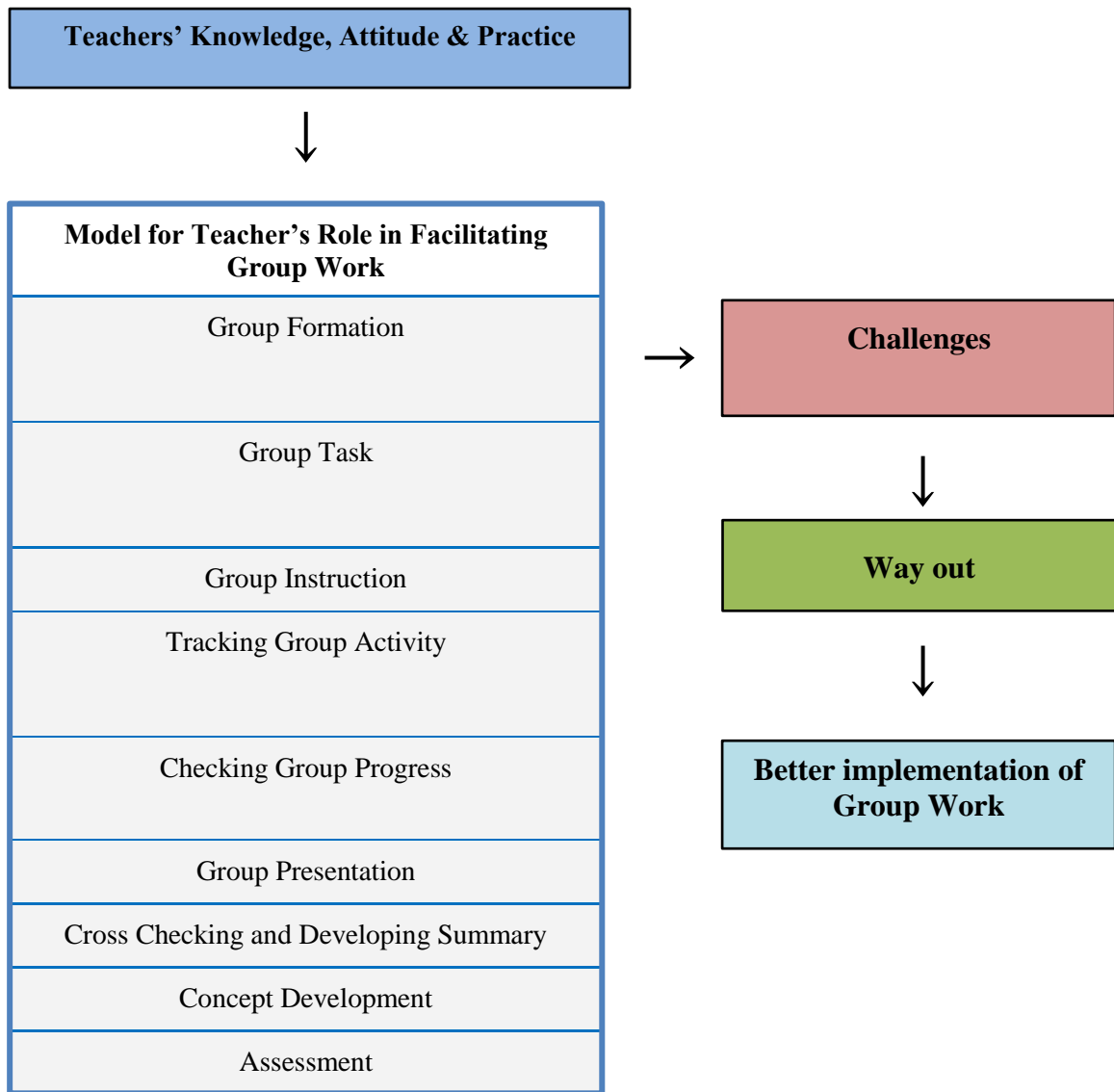


Figure 2. 2 Conceptual Framework of the Study

Chapter 3: Methodology

This research intends to find out the teachers' perceptions and practice of group work in teaching science in primary schools. The methodology followed to conduct this research is discussed elaborately in this chapter. This chapter will include a detailed explanation of the research design, sample and sampling strategies, instruments used for data collection and the process of data analysis adopted for this study.

3.1 Strategy of Inquiry

A multiple case study framework was selected for this research. According to Creswell (2008), in a case study, a researcher intends to explore in depth about a program, event or person over a certain period of time. A collective or multiple case study involves studying more than one case in one research. It is more suitable than a single case study as it enables the researcher to generalize the results (Johnson & Christensen, 2014).

In this study research question one, three, four and five requires detailed understanding of teachers' knowledge about group work, their current practice, challenges of applying group work in classrooms and ways to overcome the challenges respectively. According to Creswell (2012) one characteristic of qualitative research is to develop a detailed understanding of a central phenomenon. However, the second research question aims to describe teachers' attitude towards group work. According to Creswell (2012), a quantitative approach is more suitable to describe attitude and trends (establishing the overall tendency of responses from individuals and to note how this tendency varies among people). Therefore, data for the second research question was collected and analyzed using a quantitative method. As qualitative data and quantitative data both are required for this study, mixed method research design was followed for all the cases in this study. 'A mixed method research is a procedure for collecting, analyzing and mixing both qualitative and quantitative methods in a single study to provide better understanding to a research problem than either one of the methods by itself.' (Creswell, 2012).

To be more precise, this study followed the sequential exploratory mixed method research design for the case study. In this design qualitative and quantitative data are

collected in two phases and then two types of data are connected to explore the central phenomena and trends stated in the research questions (Creswell, 2008). In this study, twelve lessons of six teachers were observed in the first phase followed by a semi-structured interview. Later on, a questionnaire was administered. Lessons were observed first, then interview was conducted and questionnaire was given to the participants at the end to ensure that teacher's practice and knowledge do not get influenced by the items set in the questionnaire. The weight or priority is given to the qualitative approach here which also goes in line with the sequential exploratory model (Creswell, 2008).

Table 3.1: Strategy of inquiry for each research question

Research Question	Required Data Type	Research Approach
1. What is the teachers' knowledge about facilitating group work?	Qualitative	Qualitative
2. What sort of attitude is presented by the primary school teachers towards using group work in science classes?	Quantitative	Quantitative
3. How is group work being practiced by the teachers in primary science classrooms?	Qualitative	Qualitative
4. What challenges are faced by teachers' while applying group work in the classroom?	Qualitative	Qualitative
5. How to overcome the challenges of applying group work in the classroom?	Qualitative	Qualitative

3.2 Data Source

Data for this research was collected from six teachers who teach science at Government Primary Schools. Among them three teachers were selected from Dhaka district and the other three were selected from Jamalpur district. Data was collected from these participants through lesson observation, questionnaire and semi-structured interview. Data source for each research question is presented in Table 3.2 in the next page.

Table 3.2 Data sources for the study

Research Question	Data Source
1. What is teachers' knowledge about group work?	Teacher
2. What sort of attitude is presented by the primary school teachers towards using group work in science classes?	Teacher
3. How is group work being practiced by the teachers in primary science classrooms?	Lesson Observation
4. What challenges are faced by teachers' while applying the group work in the classroom?	Teacher and Lesson Observation
5. How to overcome the challenges of applying group work in the classroom?	Teacher

3.3 Research Design

The participants of this study were six primary school science teachers who were selected from rural and urban areas through maximal variation sampling. Permission was sought from the Head Teachers of the respective schools.

In the first phase of the data collection, two lessons of each teacher were observed (where the teachers used group work) and the observation checklist was used for recording the data. A semi structured interview was conducted with each teacher afterwards. For the quantitative data collection, the teachers were asked to fill up a questionnaire.

All data was transcribed to be used for analysis. Qualitative data was analyzed thematically and descriptive analysis quantitative data was done by finding out the mean score of the responses. Data for each teacher or case was analyzed individually first according to the research questions. Next, cross case analysis among the rural teachers and urban teachers were done respectively. Then cross analysis between the findings of rural teachers and urban teachers was done to draw the overall findings of the study.

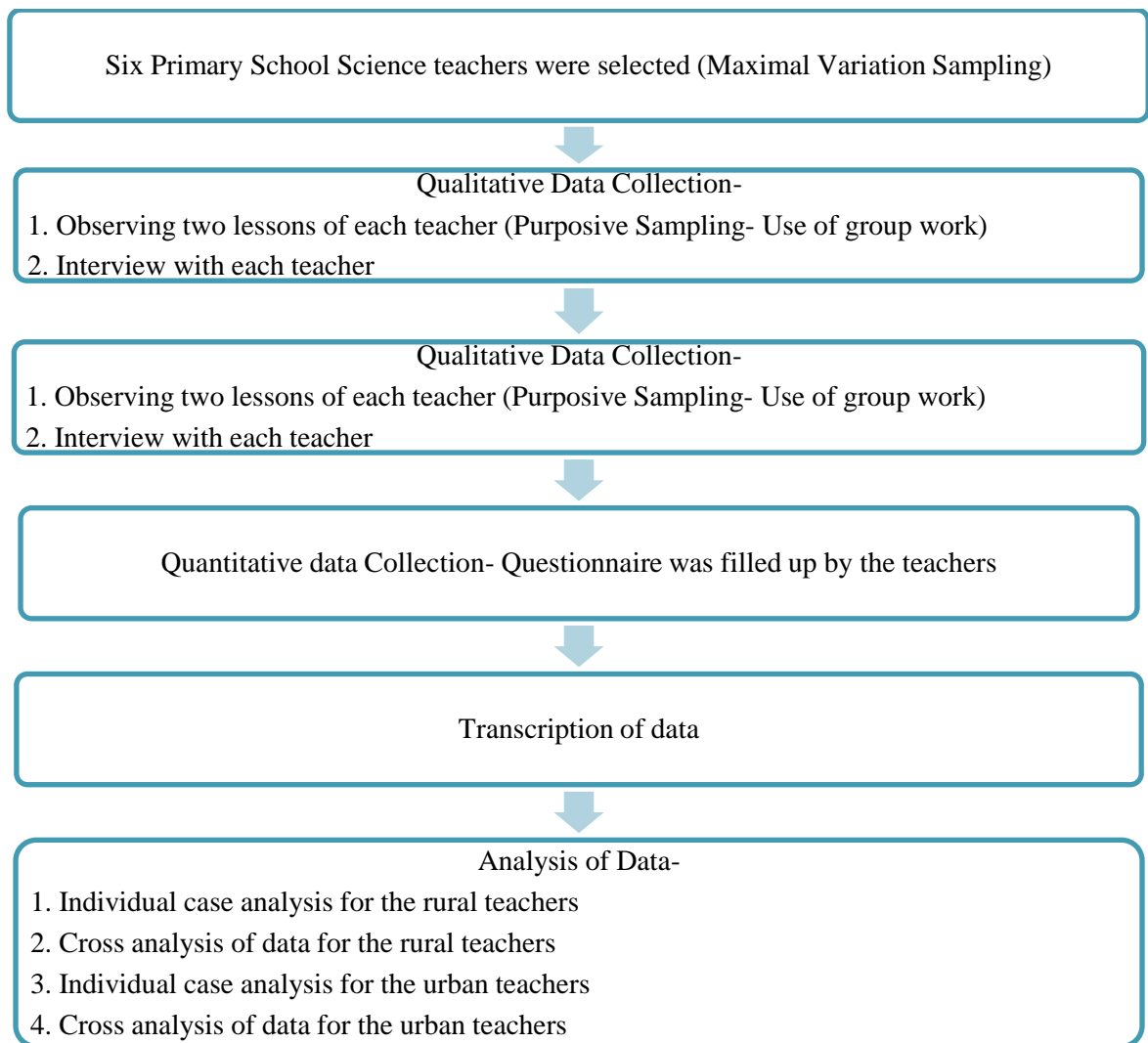


Figure 3.1 Research design

3.4 Sample Size & Sampling Technique

Maximal variation and purposive sampling were followed in this study. These sampling methods were needed to explore views of primary school science teachers of Bangladesh to identify differences in their knowledge, attitude and their practices of group work.

Data was collected from six teachers who teach science in six government primary schools. Three government primary schools from one district in the urban area and three schools from one district in the rural area were chosen. This study required views from teachers with different characteristics such as gender, education, training etc). According to Johnson and Christensen (2004), researchers sample cases or individuals that differ on some characteristics or traits (e.g, gender, experience etc) in maximal variation sampling.

Table 3.3 Sample Size and Sampling

Data Source	Sample Size	Sampling Technique
Teacher	3 Teachers from Urban area + 3 Teachers from Rural area Total 6 teachers	Maximal Variation Sampling
Lesson Observation	2 lessons from each teacher Total 12 lessons	Purposive Sampling

Data was collected from one teacher who teaches science in each of these schools. Two lessons of each teacher were observed. Purposive sampling technique was used here. ‘In purposive sampling, the researcher specifies the characteristics of the population of interest and locates individuals with those characteristics’ (Johnson & Christensen 2004). Two lessons of each teacher in which the teachers used the group work were observed purposefully to understand the teachers’ practice of the strategy in the classroom.

3.5 Research Instruments

Questionnaire, semi-structured interview schedule and a classroom observation schedule were prepared to collect data for the five research questions of this study.

Table 3.4 Research Instruments

Data Source	Research Instrument
Teacher	<ul style="list-style-type: none"> ● Questionnaire ● Semi-structured Interview Schedule
Lesson Observation	<ul style="list-style-type: none"> ● Lesson Observation Schedule

3.5.1 Semi-structured Interview Schedule of Teacher

To collect the necessary data for the first, fourth and fifth research questions, a semi structured interview (Appendix 1) was conducted with the participant teachers. Items for the interview were prepared based on the roles of designing group work. The reason behind using a semi-structured interview is that it consists of open-ended questions and provides in-depth information about a participant’s thoughts, beliefs, knowledge and reasoning, about a topic (Johnson & Christensen 2014).

The interview questions were set in two sections. In the first section, questions (both closed and open ended) were set for exploring the teacher's knowledge about group

work. These questions were based on the role of teacher mentioned in the ‘Model for the Teacher’s role to Facilitate Group Work’, (Rahman, 2018).

Second section consisted of a table to explore the teacher's views about the challenges of using group work in science classes and the ways to overcome them. This table was also prepared based on the role of teacher mentioned in the ‘Model for the Teachers to Facilitate Group Work’, (Rahman, 2018). It also includes some common challenges faced by teachers which were prominent in the reviewed literature (time management, promoting social skills, infrastructure and class management). There is also an option for teachers to mention if they face any other challenges.

3.5.2 Questionnaire for the Teachers

Data for the second research question was collected by using a questionnaire (Appendix 2). The questionnaire was prepared for identifying the teachers’ attitude towards group work. Likert Scale was used in this part, A Likert scale is a unidimensional scale that researchers use to collect respondents' attitudes and opinions. It may be designed to measure how much a person agrees with a statement and assigns a data point to it (Johnson & Christensen, 2014).

Most of the items on this questionnaire were based on the roles of the teachers in facilitating group work as mentioned in the Model for Teacher’s Role in Facilitating Group Work (Rahman, 2018). However, a few statements were added to identify teachers’ attitude towards the importance of group work to foster social skills and the applicability of this strategy in science classes of Bangladesh. Table 3.5 indicates which item of the questionnaire focuses on which major area.

A five-point Likert scale has been designed for determining the answer. Here, the scale was: 1= strongly disagree, 2= disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. Reverse counting was done for the negatively phrased questions.

Table 3.5 Arrangement of the items from the questionnaire

Major Aspect	Statement No.
Group Task	1
Group Formation	2 & 3
Giving Instruction	4 & 5
Tracking group activity and accountability	6 & 7
Checking progress of the group work	8
Presentation of group work	9 & 10
Cross checking and developing summary	11
Using summary for concept development	12
Assessment	13 & 14, 15
Achievement of social skills and learning outcome	16, 17 & 18
Applicability in Bangladesh	19, 20 & 21

3.5.3 Lesson Observation Schedule

‘In research, observation is defined as the watching of behavioral patterns of people in certain situations to obtain information about the phenomenon of interest. Observation is an important way of collecting information about people because people do not always do what they say they do.’ (Johnson & Christensen, 2014)

Here, to understand the current practice (phenomena of interest) of using group work in primary science classes, two lessons of each teacher were observed. For this, a classroom observation checklist (Appendix 3) was prepared based on the roles of group work framework.

3.6 Instrumentation Matrix

Table 3.6 gives the idea of instrumentation strategy of this study. It describes which instrument was used to collect data for which research question.

Table 3.6 Instrumentation Matrix

Research Question	Interview	Questionnaire	Observation
1. What is teachers' knowledge about facilitating group work?	*		
2. What sort of attitude is presented by the primary school teachers towards using group work in science classes?		*	
3. How is group work being practiced by the teachers in primary science classrooms?			*
4. What challenges are faced by teachers' while applying the group work in the classroom?	*		
5. How to overcome the challenges of applying group work in the classroom?	*		

3.7 Data Analysis

To analyze the research questions, a variety of data analysis techniques were used. As mentioned in the earlier section, qualitative and quantitative data will be analyzed for the three rural teachers according to the five research questions. Then findings for the rural teachers will be derived from cross case analysis. Data for the urban teachers will be analyzed similarly. Findings from the urban and rural teachers will be compared to determine the overall findings of this study. Table 3.7 gives an idea about the data analysis process for this study.

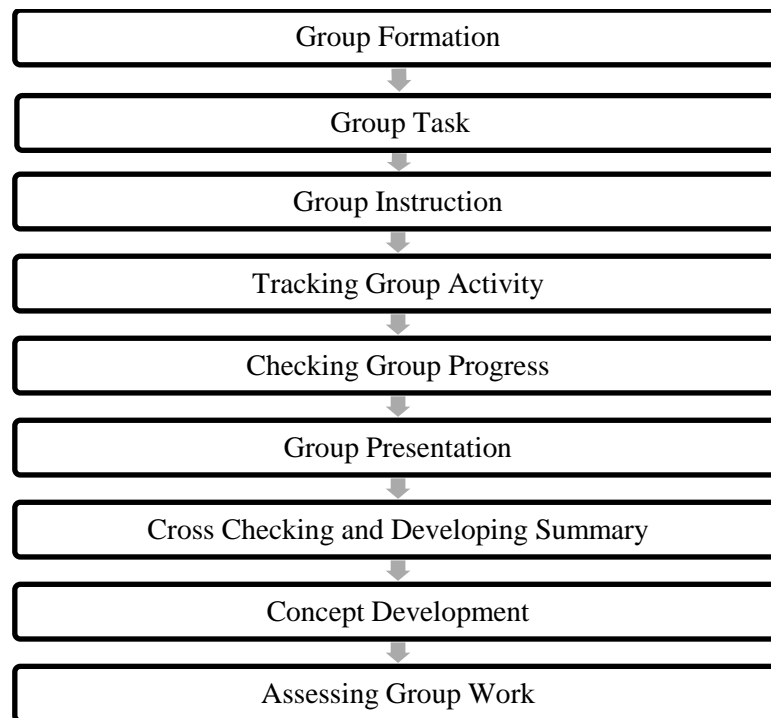
Table 3. 7 Strategy of Data Analysis

Focus area of the Research Question	Instrument	Analysis Methods
RQ 1- Teachers' Knowledge	Semi-structured Interview	Thematic Analysis- The role of teacher mentioned in the 'Model for the Teacher's role to Facilitate Group Work', (Rahman, 2018) considered as the themes
RQ 2- Teachers' attitude	Questionnaire	Descriptive Analysis- Identifying the mean score of responses for each participant along with the analysis of data from teacher's comments regarding his/her responses
RQ 3- Teachers' practice	Lesson Observation	Thematic Analysis- The role of teacher mentioned in the 'Model for the Teacher's role to Facilitate Group Work', (Rahman, 2018) considered as the themes
RQ 4- Challenges	Semi-structured Interview	Thematic Analysis- Identifying themes from the interview transcription
RQ 5- Way out	Semi-structured Interview	Thematic Analysis- Identifying themes from the interview transcription

3.7.1 Analysis of Qualitative data

Thematic analysis approach was used to analyze the qualitative data. According to Clarke and Braun (2014), ‘thematic analysis is used for identifying and analyzing patterns of meaning or theme in qualitative data.’ Qualitative data for the research question one, three, four and five were gathered through lesson observation and semi-structured interview. As mentioned before, data for all cases were analyzed individually.

For each of the cases, interview data for the first research questions were analyzed thematically to identify the teacher's knowledge about group work. Here, the data was analyzed under the predetermined themes. The role of teacher mentioned in the ‘Model for the Teacher’s role to Facilitate Group Work’, (Rahman, 2018) were selected as the themes. Data from lesson observation to explore teacher’s practice of group work in class was also analyzed under similar themes.



Qualitative data was collected for the fourth and fifth research questions from the semi-structured interview. Thematic analysis was followed here as well. However, this time the themes were not predetermined rather the themes were identified from the transcribed data regarding challenges of applying group work and the possible way out.

3.7.2 Analysis of Quantitative data

Descriptive Analysis

To collect the quantitative data regarding teachers' attitude towards group work, a questionnaire was used. The questionnaire consisted of a five-point Likert Scale. The quantitative data to answer the second research question for each teacher was analyzed and interpreted by determining the mean score for each participant's responses and the reasons mentioned by the teachers for those responses (Descriptive analysis). 'Attitude was then determined based on the argument that a mean score of 3 in Likert scale represents neutral attitude, mean score of less than 3 represents negative attitude and greater than 3 represents a positive attitude. The range of interpreting the Likert scale mean score was given as follows: 1.0-2.4 (Negative attitude), 2.5-3.4 (Neutral attitude), and 3.5-5.0 (Positive attitude)' (Wanjohi & Syokau' 2021).

According to Johnson and Christensen (2014), 'In descriptive analysis the researcher attempts to convey the essential characteristics of the data by arranging the data into a more interpretable form and by calculating numerical indexes, such as averages, percentile ranks, and measures of spread. The researcher can summarize the variables in a data set one at a time. He or she can also examine how the variables are interrelated.'

In order to describe the relationship between urban and rural teachers' attitude and practice of group work, qualitative data for the practice of group work by rural and urban teachers was quantified. Numeric value was added to the qualitative data as such: skipped role of facilitating group work= 1, faced problem in role of facilitating group work=2 and practiced well= 3. Mean score for each teacher was calculated.

Correlation coefficient for the urban teachers and the rural teachers were calculated separately to determine how the attitude of teachers towards group work influence their practice of group work in class. 'A correlation coefficient is a numerical index that provides information about the strength and direction of the relationship between two variables. It provides information about how two variables are associated' (Johnson & Christensen, 2014). Interpretation of the correlation coefficient number is described in the table below (Adapted from Johnson and Christensen, 2014) –

Table 3.8: Interpretation of correlation coefficient

Numerical value of correlation coefficient	Interpretation
Less than 0	Negative correlation between the variables
Greater than 0	Positive correlation between the variables
Equal to 0	No correlation exists between the variables
Equal to +1	Perfect or strong positive correlation between the variables
Equal to -1	Perfect or strong negative correlation between the variables

3.8 Validity and Reliability of the Questionnaire

Validity

Validity of the questionnaire which contains various statements about group work method was determined first through pilot testing. According to Creswell (2008), ‘Pilot testing is important to establish the content validity of an instrument and to improve questions, format or scales.’ The questionnaire was first given to two participants. After completing the questionnaire, a thorough discussion was conducted with them to find out the problems they had faced (i.e. understanding any statement or any particular word, length of the questionnaire etc). Their responses were carefully analyzed to identify if the questionnaire serves the purpose of the study or not. Based on the results of pilot testing, statement number 4, 5 and 7 were rephrased in a simpler form to make it easily comprehensible to the participants.

Reliability

Reliability of the questionnaire was ensured by identifying the Cronbach’s Alpha Coefficient. Cronbach’s Alpha Coefficient is used for determining the reliability of a study. For research purposes, the value of alpha coefficient must be greater of equal to 0.7 (Johnson & Christensen, 2014). Cronbach’s Alpha Coefficient value for this study is 0.76. Therefore, it can be concluded that the questionnaire used for this study and the results derived from the data using this questionnaire is reliable.

Table 3.9: Cronbach's Alpha Co-efficient for the study

Statement	R1	R2	R3	U1	U2	U3	Cronbach's Alpha Co-efficient
1	4	5	4	4	5	5	0.76
2	3	3	5	5	5	4	
3	5	5	5	5	5	5	
4	4	4	5	5	5	5	
5	3	2	5	5	5	4	
6	4	5	5	4	3	4	
7	4	4	5	5	5	5	
8	1	2	5	4	4	5	
9	4	4	5	5	5	5	
10	4	3	5	5	4	5	
11	4	4	5	5	4	2	
12	5	4	5	5	5	5	
13	3	2	3	4	3	4	
14	2	1	3	5	3	2	
15	4	4	4	1	5	4	
16	5	4	3	5	5	5	
17	5	4	5	5	5	5	
18	4	5	5	5	5	5	
19	2	3	3	1	5	2	
20	4	3	5	4	3	4	
21	4	4	4	3	4	3	

3.9 Data Trustworthiness

To ensure validity of the research is to determine whether the findings are accurate or not from the viewpoint of the researcher and participants. (Creswell, 2008).

For this study data was collected from two sources- primary school teachers and lesson observation. Most of the items included in the instruments (semi-structured interview, questionnaire and lesson observation) were set based on the role of teacher mentioned in the 'Model for the Teachers to Facilitate Group Work', (Rahman, 2018). Data collected from different sources were analyzed based on the role of teacher mentioned in the 'Model for the Teachers to Facilitate Group Work', (Rahman, 2018) to explain the research questions.

3.10 Ethical Consideration

Permission was sought from the Head Teacher of the respective schools. The nature and purpose of the research was explained. Then one teacher from each school who

teaches science was requested to conduct two lessons using the group work and take part in the interview and fill up the questionnaire. It was made sure that the school environment was not hampered due to data collection of this research.

To ensure the confidentiality of the participants, researchers need to use pseudo names or numbers in the roles of data analysis and reporting (Creswell, 2012). Here, the privacy of the participant teachers was ensured by not disclosing their names or the schools' names in this thesis. For analyzing the data, pseudonyms were used for the participants (R1, R2 & R3 for the rural teachers and U1, U2 & U3 for the urban teachers).

Chapter 4: Results

This chapter presents the major findings of the research based on the analysis of the collected data. This study aims to find out the answers to five research questions which are meant to explore teachers' knowledge, attitude, practice of group work, the challenges they face and possible way outs to meet those challenges. For this, data collected from the lesson observation and teachers' interview was analyzed thematically under six cases. Cross case analysis was made afterwards. To ensure confidentiality, pseudo names (R1, R2, R3 for rural teachers and U1, U2 and U3 for urban teachers) are used for the six participant teachers of this study.

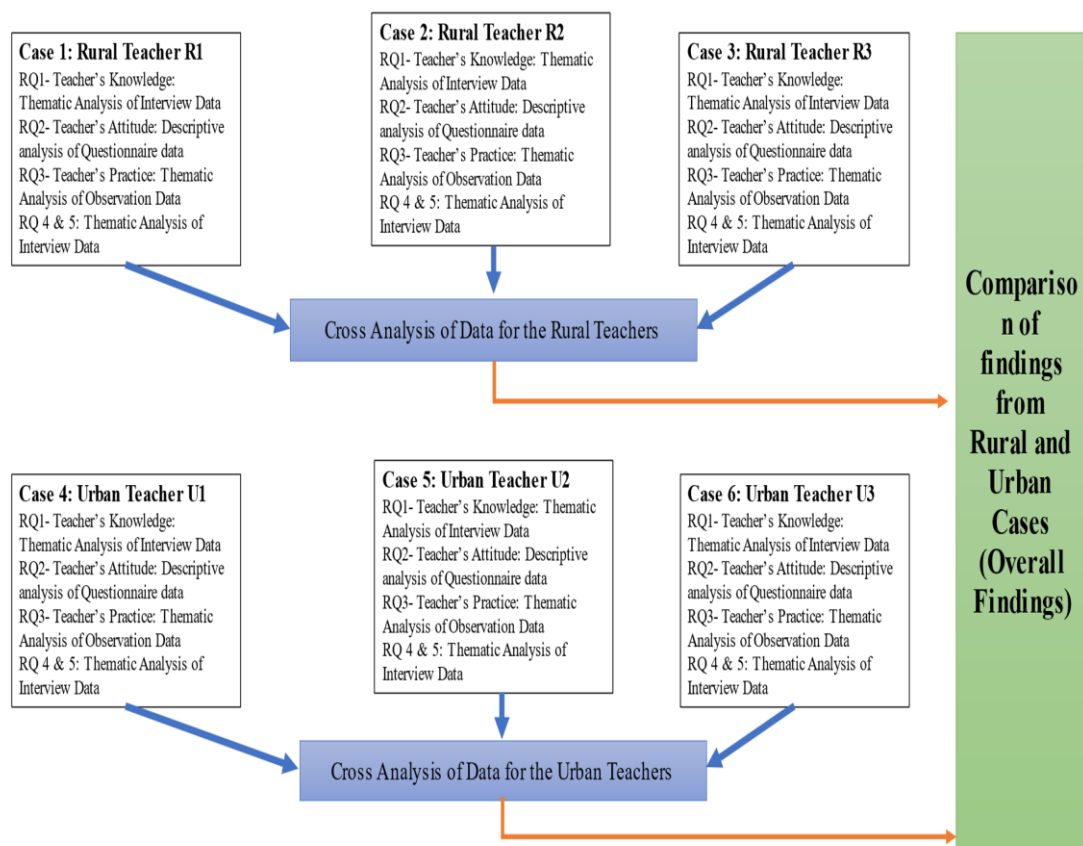


Figure 4. 1 Overview of the chapter

Figure 4.1 describes the process of data presentation in this chapter. The procedure of data analysis of the study will follow this sequence-

- Individual case study of data received from the lesson observation, interview and questionnaire of the rural teachers
- Cross analysis of data for the rural teachers is presented according to the five

research questions

- Individual case study of data received from the lesson observation, interview and questionnaire of the urban teachers
- Cross analysis of data for the urban teachers is presented according to the five research questions
- Cross analysis of findings for the rural and urban teachers (Overall findings)

4.1 Background of the Participants

Participant Teachers' Profile

The profile of the participant teachers of the study is presented in the following table. Participants' pseudo names, their gender and information about their professional qualification are included here.

Table 4.1: Teachers' Demographic information

Participant	Gender		Teachers' Training		Higher Education	
	Male	Female	Received	Not Received	Science related subject	Other Subject
R1	√		√		√	
R2	√			√	√	
R3	√		√		√	
U1	√			√	√	
U2		√	√		√	
U3		√	√		√	

The table 4.1 reveals that majority of the participants of this study (4 out of 6) were male and majority of the teachers (4 out of 6) had received teachers' training. However, two participants didn't get a chance to receive any training as they had joined recently. All of them received different level of higher education in science related subjects.

List of the Lessons Observed

For this study, two lessons of each participant teacher in which the teachers used group work were observed purposefully to understand the teachers' practice of the strategy in the classroom. The following table shows the titles of the observed lessons and how group work strategy was implemented in the lessons.

Table 4.2 : List of the Lessons Observed

Participant	Lesson Title	Use of group work
R1	Lesson 1- Technology in our life	Students were divided into 4 groups and all the groups were asked to write down the uses, merits and demerits of technology in our life
	Lesson 2- Different types of pollution	Students were divided into 6 groups and were asked to write down the reasons for different types of pollution and their harmful effects
R2	Lesson 1- Habitats of animals	5 groups of students were asked to write down the name of one kind of habitat and mention names of plants and animals that live there
	Lesson 2- Elements of food	Students were divided into 6 groups and each group was asked to write characteristics of one element of food
R3	Lesson 1- Types of soil	Students were divided into 5 groups and different groups were asked to write characteristics any one type of soil
	Lesson 2- Natural and manmade environment	Students were divided into 5 groups and asked to list down the things they had seen on their way to school and find out which of them are natural and which are manmade
U1	Lesson 1- Source and use of natural resources	4 groups were formed and asked to write down the source and use of different resources
	Lesson 2- Preservation of natural resources	4 group listed down the ways to preserve natural resources.
U2	Lesson 1- Technology in agriculture	Students were divided into 5 groups and different groups were asked to write about the importance of different types of technology used in agriculture
	Lesson 2- Technology in agriculture	5 groups were formed and were asked to write down the harmful effects of using technology in agriculture
U3	Lesson1- Harmful effects of artificial food colouring and flavourings	Students were divided into 6 groups and all the groups were asked to write about the harmful effects of artificial food colouring and flavourings
	Lesson 2- Junk foods and their harmful effects	Students were divided into 6 groups and all the groups were asked to write about the junk foods and harmful effects of eating them

4.2 Rural Teachers’ Knowledge, Attitude, Practice, Challenges and Way outs

This section discusses the knowledge, attitude, practice of group work and challenges and way outs mentioned by R1, R2 and R3 respectively.

4.2.1 Analysis of Data for Rural Teacher R1: Case 1

R1’s Knowledge about Group work

An analysis of the data from the semi-structured interview is presented under the predetermined themes (the role of teacher mentioned in the ‘Model for the Teachers

to Facilitate Group Work’, (Rahman, 2018)). Interview data of R1 regarding his knowledge about group work is presented in Table 4.3 in the next page.

Group Formation

In the interview R1 said, *‘Students’ learning ability should be considered here. Number of group members can vary based on the total number of students.’* However, it was observed in his lessons that he formed the teams according to their seating arrangement. From this data we can conclude that R1 has adequate knowledge about the process of forming groups.

Group Task

‘Real-life oriented topics help to strengthen the learning of the students. So, I choose topics which are real-life oriented which the students can relate to easily and where the students get enough scope for discussion’, said R1 in the interview. This shows that R1 has the knowledge about choosing the group task.

Table 4.3 R1’s Knowledge about Group work

Role of Teacher	Interview	Comment
Group Formation	Gives importance on considering other factors while forming groups	Adequate knowledge Problem in implementation
Group Task	Chooses discussion-based and real-life oriented tasks	Adequate knowledge
Giving instruction	Clear instruction is the key to the success of group work	Adequate knowledge
Tracking group activity and accountability	R1 finds it important to keep track of the groups’ work	Adequate knowledge Problem in implementation
Checking progress of the group work	It is important for achieving the target of their group task	Adequate knowledge
Presentation of group work	Presentation develops public speaking skills and confidence in students	Adequate knowledge
Cross checking and developing summary	Cross-checking helps to fill up the gaps in students’ learning	Adequate knowledge
Using summary for concept development	Teacher’s intervention gives them a clear idea of the topic	Adequate knowledge
Assessing group work	Assess students based on their participation in group task and understanding of the topic	Adequate knowledge Problem in implementation

Giving instruction

R1 finds it very important to explain the task to the students before they start their work. In the interview he mentioned, *‘If the instruction is not clear students will not be able to complete the task. But sometimes individual instruction for the groups can*

be skipped to save time' So we can say that R1 has adequate knowledge about this process.

Tracking group activity

R1 mentioned in the interview that he mostly follows the collaborative approach for group work rather than cooperative approach where all students work together to complete one task. He tried to ensure that every member of the groups was participating. R1 has the proper knowledge.

Checking progress of the group work

'Some students were confused; they raised their hands and I helped them. Monitoring is important to make sure that groups are working according to the instruction and achieving the learning outcome' said R1 in the interview. Therefore, it can be said that R1's knowledge about this part is adequate.

Presentation of group work

All the groups should get an opportunity to present their work to the class. This gives them the chance to share their ideas with others. R1 believes, *'Presentation helps to develop communication skills among students and eradicates their fear of public speaking. Even the slow and shy students become active and learn better from their peers.'* R1 has adequate knowledge about this part.

Cross checking and developing summary

Students are to be given the opportunity to give their opinion on other groups' findings. In the interview R1 said, *'Cross checking helps in improving critical thinking skills and it also helps to fill up the gaps in their learning.'* R1 has complete knowledge about this part.

Using summary for concept development

R1 has adequate knowledge about this role. He thinks that it is important to find out the gap in students' learning and add new points after cross-checking. In the interview R1 said, *'Teacher's intervention is required to fill up the gaps in students' learning and give them a clear idea of the topic.'*

Assessing group work

It is evident from the interview that R1 has adequate knowledge about how to assess students while using group work. He gives importance on overall assessment as well as ongoing assessment during the group work. He said, *'It is important to assess all students' participation and learning as all of them do not take part in the task equally.'*

R1's Attitude towards Group work

Table 4.4: R1's attitude towards Group work

Major Aspect	Statement	Response Teacher-R1
Group task	1. Real-life oriented tasks which have more than one correct answer and require extensive discussion should be chosen	4
Group formation	2. Groups should have 4-6 members	3
	3. While forming groups learning ability and personality of the students should be considered	5
Giving instruction	4. Clear instruction by the teacher is important for the groups to perform the task properly	4
	5. Individual instruction for all groups can be skipped as it is time consuming	3
Tracking group activity and accountability	6. Assigning the role of the members ensures participation of all members	4
	7. Setting up the group norms like listening, respecting opinion of others and resolving conflicts helps the groups to function properly	4
Checking progress of the group work	8. Teacher does not need to monitor the progress of group work frequently	1
Presentation of group work	9. Through presentation of their work students become more confident about their learning	4
	10. Presentation is an excellent way to ensure participation of rather inactive members	4
Cross checking and developing summary	11. Cross checking of findings from different groups fills up the gap in each group's idea	4
Using summary for concept development	12. At the end of the lesson it is essential for the teacher to identify the gap in students' learning and provide feedback to develop the concept	5
Assessing group work	13. Using group work learning outcome is easily achieved by all the students	3
	14. All members in a group should get equal marks	2
	15. All members should be assessed based on their individual understanding and participation	4
Achievement of social skills and learning outcome	16. Group work is an effective strategy for teaching science	5
	17. Group work develops scientific values like inquisitiveness, open-mindedness and thinking rationally	5
	18. Working in groups helps students to communicate their ideas with others more clearly	4
Applicability in Bangladesh	19. Considering the number of students group work can be easily applicable in teaching primary science in our schools	2
	20. Achieving expected outcome within existing lesson time is difficult	4
	21. I prefer using Group work for teaching science over the traditional lecture based strategy	4
Mean		3.90

The table 4.4 represents that R1 shows a positive attitude towards using group work in science classes at primary level. The mean value of his total responses is 3.904. He believes that group work is an effective strategy for teaching science and prefers it over the traditional strategies. He agrees that working in groups enhances students' social skills. However, due to the large number of students and short duration of class time he thinks that this strategy is not easily applicable in Bangladesh. As he cannot assess all students' learning due to time constraint, he cannot measure the achievement of the learning outcome.

R1's Practice of Group work in Class

Data from the lesson observation to find out how well he is practicing group work in class is presented in the Table 4.5. Analysis of the data is presented under the predetermined themes (the roles of group work framework).

Table 4. 5: R1's practice of Group work

Roles of Teacher	Observation	Practiced by Teacher- R1	Numeric Data	
			Lesson 1	Lesson 2
Group Formation	Formed groups according to seating arrangement	Faced problem in both the lessons	2	3
Group Task	Discussion based topics were chosen and written on the board	Practiced in both the lessons	3	3
Giving instruction	Gave clear instruction	Practiced in both the lessons	3	3
Tracking group activity	Few students were inactive in the first lesson. In the second lesson all students were active.	Faced problem in the first lesson	2	3
Checking progress of the group work	R1 went to all groups and provided feedback	Practiced in both the lessons	3	3
Presentation of group work	Fixed time given for the presentation of all groups	Practiced in both the lessons	3	3
Cross checking and developing summary	Students discussed on other groups' findings	Practiced in both the lessons	3	3
Using summary for concept development	R1 added new points with the summary	Practiced in both the lessons	3	3
Assessing group work	Gave feedback continuously and asked oral questions at the end.	Practiced in both the lessons	3	3
			Mean	2.83

Group Formation

As mentioned in the previous role, R1 has proper knowledge about the process of group formation. However, it was observed that R1 did not consider students' personality, learning ability or gender while forming the groups in either one of his lessons. R1 faced challenges in following this role.

Group Task

Topics that R1 chose and wrote on the board were- 1. Uses, merits and demerits of technology in our life and 2. Reasons for different types of pollution and their harmful effects. Students could easily relate to these topics and discuss them in groups. In the first lesson he chose one topic for all groups but in the second lesson he gave different topics to different groups. We can say that R1 practiced this step well.

Giving instruction

It was observed that R1 gave general instructions for the whole class. He then went to the groups individually to check if there was any confusion or not. He also specified the time for the tasks (discussion and presentation) which helped the students to plan their work and complete within the given time. It is evident that R1 practiced this part properly.

Tracking group activity

Observation data shows that R1 was asking questions and trying to make sure everyone is participating and the groups are working in the right direction but in the first lesson few students were inattentive. However, class management was better in the second lesson. Congested seating arrangement of the classroom was the reason for this as it was difficult to reach the students. This data shows that R1 faced some problems here.

Checking progress of the group work

Throughout the time of group discussion R1 was asking questions and in this way, he tried to keep track of the students' progress. Some students were observed raising their hands and the teacher tried to solve their problems. Checking progress of the group work role was practiced properly.

Presentation of group work

All the groups were given 2-3 minutes time to present their work. Students presented their work orally to the rest of the class. Everyone was attentive during the presentation.

Cross checking and developing summary

Students were given the opportunity to discuss other groups' findings. Discussion among the groups helped to fill up the gaps in their learning. This was conducted very skillfully in a student-centered manner by the teacher.

Using summary for concept development

Even after the cross-checking some students were still confused about a few points so R1 helped them to understand by using real-life examples. R1 also found out the missing points from students' discussion and presented them on a poster. This part was followed correctly by R1.

Assessing group work

It was observed that he gave feedback to students while they were working and also at the end, he asked oral questions to a few students in order to assess students' learning. In the lessons observed R1 managed to assess students' learning.

Challenges faced by Teacher R1 and Possible Way outs

Interview data regarding the challenges R1 faced during group work and the possible way outs suggested by him are thematically analyzed here.

1. Large number of students

In the interview, R1 mentioned the large number of students as a big challenge for the implementation of group work in Bangladesh. The formation of heterogeneous groups becomes very difficult when there are at least 8-10 students in a group. It takes a lot of time to change the seats of so many kids in the classroom according to their gender and learning ability. He also mentioned, *'It is not possible to check the progress of so many students and give feedback to everyone individually.'* So, a large number of students also hampered the checking progress role.

Way out- As a way out R1 suggests that no classroom should have more than 25 students. Then it would be easier for the teachers to give equal attention to all the students.

2. Students are not familiar with Group work

R1 mentioned in the interview that he does not use group work in his classes very often as it needs a lot of time and planning. So, his students are not quite familiar with the process. Specifically, he mentioned that he needs to repeat the instructions twice or more to make it clear to his students.

Way out- R1 thinks the more they practice group work in the class, the more confident and comfortable the students will be to work in groups.

Table 4. 6: Challenges faced by Teacher R1 and Possible Way outs

Area	Challenge	Possible Way out
Group Formation	Large number of students	Decrease the number of students
Group Task	X	X
Providing instruction	Have to repeat the instruction as students are not familiar with Group work	Practice this strategy more often
Tracking group activities	Seating arrangement (bench system) and inattentiveness	Using tables and teaching aids
Checking progress and giving feedback	Large number of students	Decrease the number of students
Presentation of group work	X	X
Cross checking and developing summary	X	X
Using summary for concept development	X	X
Assessing group work	X	X
Class management	X	X
Time management	X	X
Promoting social skills	X	X
Infrastructure	Seating arrangement	Needs to be modernized
Others	X	X

3. Seating arrangement

Long benches that are used in the classroom makes it difficult for the teacher to move around the class to monitor students' progress. Changing a student's group becomes difficult as well.

Way out- Changing the seating arrangement and classroom decorum is suggested by R1 to solve this issue. He said, *'If we can use tables instead of long benches it will be easier for the teacher to monitor the students' work.'*

4. Inattentiveness

R1 mentioned in the interview that during the group work in the first lesson a few students did not pay attention. Therefore, their learning remained incomplete. It was observed in the first lesson that some students were creating chaos in the class during group work.

Way out- As a way out R1 suggested using posters and other materials. Use of teaching aids will increase students' interest and they will be more attentive.

Major findings for Case 1- Rural Teacher- R1

From the analysis, major findings for Rural Teacher R1 have been summarized in the Table 4.7. This table gives the idea about his knowledge, attitude and practice of group work along with the challenges he faced in class. His suggestions for the improvement are also included.

Table 4. 7: Major findings for rural teacher R1

Major findings for Case 1- Rural Teacher- R1		
Knowledge	Attitude	Practice
Adequate Knowledge	Positive	Faced problems in Formation of group and Tracking group activities.
Challenges- <ol style="list-style-type: none">1. Large number of students2. Students unfamiliar with this strategy3. Seating arrangement4. Inattentiveness		
Way outs- <ol style="list-style-type: none">1. Decrease the number of students2. Using group work more often3. Using tables4. Using interesting resources		

4.2.2 Analysis of Data for Rural Teacher R2: Case 2

R2's Knowledge about Group work

Data collected from the semi-structured interview of R2 regarding his knowledge about group work is presented in the table below. An analysis of the data under the predetermined themes (Roles of group work framework) is also presented.

Table 4. 8: R2's Knowledge about Group work

Role of Teacher	Interview	Comment
Group Formation	Students' learning ability should be considered	Adequate knowledge
Group Task	Chooses discussion-based tasks	Adequate knowledge
Giving instruction	Groups cannot work properly if the instruction is not clear but individual instruction is not necessary	Inadequate knowledge
Tracking group activity and accountability	Specifying the role of students will make them more responsible	Adequate knowledge
Checking progress of the group work	It is important for keeping the students focused	Adequate knowledge
Presentation of group work	Presentation removes their anxiety of public speaking	Adequate knowledge
Cross checking and developing summary	Cross-checking helps students to be open-minded and learn from others	Adequate knowledge
Using summary for concept development	Teacher must summarize the discussion to fill out the gaps in learning	Adequate knowledge
Assessing group work	Students should be assessed individually based on their participation and learning	Adequate knowledge

Group Formation

'Groups need to have a combination of quick learners and slow learners', said R2 in the interview. He believes that everyone's learning ability and personality are different. It is important to have different types of students in each group. This data shows that R2 has adequate knowledge about the process of forming groups.

Group Task

While planning the group work R2 chooses discussion-based topics. He said, '*I prefer to select topics where students get a lot of scope for discussion. This strengthens their learning.*' He also added that if the topics are related to the real-life then they will learn more easily and learning will last longer. This indicates that R2 has adequate knowledge about group task.

Giving instruction

R2 said, '*Groups cannot work properly without clear instruction.*' Therefore, he accepts that giving specific instruction to the students is required. However, he also mentioned, '*I gave clear instructions for all the students. I do not think I need to repeat them to all the groups individually. It will be a waste of time*' Individual instruction for all groups is required to make sure that students have no confusion

about their task. From this data we can conclude that R2's knowledge about giving instruction is inadequate.

Tracking group activity and accountability

According to the interview data, R2 has adequate knowledge about tracking group activity and accountability. He said, *'If we assign some tasks to every member of a group, they will take the work more seriously. This way we can ensure everyone's participation.'*

Checking progress of the group work

It is important to check the progress of the group work to make sure that they are working in the right direction. R2 also believes that. He said, *'Monitoring is important to assess students' contribution to the team's work. Providing feedback helps them to be more focused.'* This data indicates that R2 has adequate knowledge.

Presentation of group work

'Presentation helps to remove the students' anxiety of public speaking and builds confidence in them. It also develops their communication skills. Listening to their peer's presentations, other students' can learn quickly.' He also believes that during the presentation a teacher's role should be that of a listener. He can make corrections or add points later. It is very clear that R2 has adequate knowledge about how to conduct the presentation role.

Cross checking and developing summary

In the interview, R2 mentioned, *'Cross-checking gives students the opportunity to exchange their ideas among themselves. They can learn new things from the other students. Discussion on other groups' work makes them open-minded and tolerant. They also develop critical thinking skills.'* This data explains that R2 is well aware of the importance of cross-checking.

Using summary for concept development

'Students might have gaps in their learning and miss out on some important ideas related to the topic. It is the teacher's responsibility to find out the gap and provide the missing information.' This statement by R2 indicates that he has adequate knowledge about concept development roles.

Assessing group work

R2 emphasized on assessing the students individually. He believes that it will be unfair to assess all the members of a team equally. He said, *'All members in a team do not contribute to the team's work equally and also the level of understanding of the topic differs from student to student. So, it is better to assess students individually.'*

R2 clearly knows about the process of assessing students' group work.

R2's Attitude towards Group work

Data from the interview regarding R2's attitude towards group work is presented and analyzed here. The Table 4.9 points out that R2 possesses a positive attitude towards using group work in science classes. The mean value of all his responses is 3.762. According to him, group work can be an effective strategy for teaching science. He believes that group work helps students to learn joyfully and also enhances their social and science process skills. However, he is undecided on the applicability of the group work in Bangladesh at primary level. Number of students and the short duration of class time makes it difficult to ensure that all the students have achieved the learning outcome.

Table 4. 9: R2's attitude towards Group work

Major Aspect	Statement	Response Teacher-R2
Group task	1. Real-life oriented tasks which have more than one correct answer and require extensive discussion should be chosen	5
Group formation	2. Groups should have 4-6 members	3
	3. While forming groups learning ability and personality of the students should be considered	5
Giving instruction	4. Clear instruction by the teacher is important for the groups to perform the task properly	4
	5. Individual instruction for all groups can be skipped as it is time consuming	2
Tracking group activity and accountability	6. Assigning the role of the members ensures participation of all members	5
	7. Setting up the group norms like listening, respecting opinion of others and resolving conflicts helps the groups to function properly	4
Checking progress of the group work	8. Teacher does not need to monitor the progress of group work frequently	2
Presentation of group work	9. Through presentation of their work students become more confident about their learning	4
	10. Presentation is an excellent way to ensure participation of rather inactive members	3
Cross checking and developing summary	11. Cross checking of findings from different groups fills up the gap in each group's idea	4
Using summary for concept development	12. At the end of the lesson it is essential for the teacher to identify the gap in students' learning and provide feedback to develop the concept	4
Assessing group work	13. Using group work learning outcome is easily achieved by all the students	2
	14. All members in a group should get equal marks	1
	15. All members should be assessed based on their individual understanding and participation	4
Achievement of social skills and learning outcome	16. Group work is an effective strategy for teaching science	4
	17. Group work develops scientific values like inquisitiveness, open-mindedness and thinking rationally	4
	18. Working in groups helps students to communicate their ideas with others more clearly	5
Applicability in Bangladesh	19. Considering the number of students group work can be easily applicable in teaching primary science in our schools	3
	20. Achieving expected outcome within existing lesson time is difficult	3
	21. I prefer using group work for teaching science over the traditional lecture based strategy	4
Mean		3.76

R2's Practice of Group work in Class

The following section represents analysis of classroom observation data to identify R2's practice of group work in class.

Table 4. 10: R2's Practice of group work

Roles of Teacher	Observation	Practiced by Teacher- R2	Numeric Data	
			Lesson 1	Lesson 2
Group Formation	In the first lesson considered gender but in the second lesson formed groups according to seating arrangement	Faced problems in both the classes	2	2
Group Task	Discussion based topics were chosen	Practiced in both the lessons	3	3
Giving instruction	Gave clear instruction for all groups but skipped individual instruction	Faced problem in both the lessons	2	2
Tracking group activity	Faced problems with class management in the first lesson. In the second lesson all students were active.	Faced problems in the first lesson	2	3
Checking progress of the group work	R2 asked questions to all groups and provided feedback	Practiced in both lessons	3	3
Presentation of group work	Fixed time given for the presentation of all groups	Practiced in both lessons	3	3
Cross checking and developing summary	Skipped this role in both the classes	Did not practice in any lesson	1	1
Using summary for concept development	R2 added new points and summarized the topic in a teacher-centered manner in both the lessons.	Faced problems in both the lessons	2	2
Assessing group work	Gave feedback continuously and asked oral questions at the end.	Practiced in both lessons	2	2
			Mean	2.39

Group Formation

The lesson observation data shows that R2 faced problems in group formation in both of the lessons. In the first lesson he ensured that all the groups had a combination of boys and girls. So, he considered students' gender while forming groups. However, in the second lesson he asked students to form groups according to their seating arrangement. He did not consider students' learning ability or personality in any of the lessons.

Group Task

In both the lessons R2 gave different topics to different groups. Different groups were asked to 'Write down the name of one kind of habitat of the animals and mention the names of plants and animals that live there' in the first lesson. In the second class he divided the class into six groups and asked each team to 'Write the name of one type of nutrient and mention its sources.' Both the topics were familiar to the students so they could use their prior knowledge to complete the task. This data suggest that R2 has Practiced this role properly in both lessons.

Giving instruction

R2 explained the task to the students very clearly. He also specified the time for completing the task. However, he did not go to the groups individually to find out whether they understood the instruction clearly or not. So, we can say that they gave general instruction but skipped the specific instruction part in both the lessons.

Tracking group activity and accountability

Students were following a collaborative approach. However, some of the students seem to be confused about the task. They did not know what to do. In the first lesson team leaders were seen to be dominating the discussions whereas few members in the groups were completely inactive. Teacher was trying to involve all students by asking questions. He faced class management problems in the first lessons. Things improved in the second lesson. Students seem to be more confident and active this time. After the first lesson they were now clearer about the process.

Checking progress of the group work

It was observed that R2 was moving around the class while the students were discussing the topic. He was asking questions to students and also answering their

questions. He gave feedback on groups' work from time to time. R2 followed this role appropriately.

Presentation of group work

All the group presented their work and three minutes time was given to each group in both the lessons. Though all students were attentive during the presentation in the second lesson, most of them were inattentive in the first lesson. Therefore, we can say that this role was better implemented by R2 in the second lesson.

Cross checking and developing summary

This role was completely skipped by R2 in both the lessons. Students were not given any opportunity to give their opinion on other groups' findings.

Using summary for concept development

After the presentation of all groups, R2 summarized the students' findings and discussed the points they had missed. He used examples from real- life to make them easier to understand. R2 followed the lecture strategy here whereas according to the group work framework it was supposed to be a student-centered discussion. So, we can say that R2 faced problems to implement this role in both his lessons.

Assessing group work

R2 gave feedback to the students while they were discussing in groups. He monitored their participation in group tasks. For assessing their understanding of the topic, he asked oral questions to a few students. As students worked in a more organized way in the second lesson, the learning outcome was achieved better in the second lesson. Assessment role was followed by R2 in both the lessons.

Challenges faced by Teacher R2 and Possible Way outs

R2's opinion about the challenges he faced in conducting group work and the possible ways to solve these challenges are discussed below.

1. Large number of students

'As I have a large number of students in my class it will be really time consuming if I try to sort out the groups according to the students' learning ability and personality,' said R2 in the interview. He also finds it difficult to manage so many students at a time. Especially, during the group discussion it is hard for the teachers to make sure that everyone is participating.

Way out: R2 suggests that the number of students should be limited in order to help the teacher implement group work properly in the class.

Table 4. 11: Challenges faced by R2 and the possible Way outs

Area	Challenge	Possible Way out
Group Formation	Large number of students	Decrease the number of students
Group Task	X	X
Providing instruction	Needs to repeat instruction as the students are not attentive	Starting the lesson with a story to increase motivation
Tracking group activities	Some students do not participate	Specifying the roles
Checking progress and giving feedback	Students are not familiar with this strategy	Using group work often
Presentation of group work	X	X
Cross checking and developing summary	Students are not familiar with this strategy	Using group work often
Using summary for concept development	X	X
Assessment	Lack of time	Giving homework and assessing in the next class
Class management	Number of students	Decrease the number of students
Time management	Can't assess all students	Increase the duration of class
Promoting social skills	X	X
Infrastructure	X	X
Others	X	X

2. Students unfamiliar with this strategy

R2 mentioned that he does not use group work very often. So, his students are not familiar with the process. It was mentioned earlier that the observation data found that

students were confused about the process during the first lesson. R2 said, *'As the students are not used to working in groups, they have a lot of confusion. I need to explain to them again and again.'* He also said that he skipped the cross-checking role in both of his lessons as he thought students will not be able to cope up and there will be more confusion in the class.

Way out: By using group work more often these problems can be solved. R2 said, *'The more they participate in group work the more confident the students will be.'*

3. Time management

In the interview R2 said, *'Group work helps students to learn better but sometimes it takes a long time to complete the lesson using this strategy. It becomes really difficult to assess all students due to the shortage of time.'* R2 faces problems with time management while using Group work.

Way out: To solve this issue R2 suggests increasing the time duration of science classes. For the assessment of students, he suggests giving homework.

4. Inattentiveness

R2 finds the students inattentiveness in class as a challenge for applying group work. In the interview he said, *'Sometimes when I am giving the instruction students are not listening. So, I have to repeat the instructions again and again which kills time. I have also found some students inattentive during group task. They do not take part in discussions.'* For this reason, it becomes very difficult to keep the students on track and achieve the target.

Way out: In order to make the lesson interesting and increase students' attention R2 suggests starting the lesson with a story related to the topic. This will work as a motivation for the students. He thinks that specifying the role of each member in the group task will make them more responsible and ensure their participation in the class.

Major findings for Rural Teacher- R2

The following table summarizes the major findings for Case 2 (R2) from the analysis of data made above. From this table, we can get an idea about his knowledge, attitude and practice of group work as well as the challenges he faced in the application of group work. His suggestions regarding the way out of the problems are also presented.

Table 4. 12: Major findings for Rural Teacher R2

Major findings for Case 2 (Rural Teacher- R2)		
Knowledge	Attitude	Practice
<p>Inadequate knowledge about Giving instruction Adequate Knowledge about rest of the roles</p>	<p>Moderately Positive</p>	<p>Implementation of group work was better in the second lesson Faced problems in Formation of group, Giving instruction, Tracking group activities and Concept Development. Skipped Cross-checking.</p>
<p>Challenges-</p> <ol style="list-style-type: none"> 1. Large number of students 2. Students unfamiliar with this strategy 3. Time management 4. Inattentiveness 		
<p>Way outs-</p> <ol style="list-style-type: none"> 1. Decrease the number of students 2. Using group work more often 3. Increase class duration 4. Using stories and specifying the role 		

4.2.3 Analysis of Data for Rural Teacher R3: Case 3

R3's Knowledge about Group work

Interview data for R3's knowledge about Group work is analyzed in the following section.

Group Formation

In the interview, R3 mentioned, *'A group of 4-6 members is ideal to monitor and provide feedback. If there is a combination of weak and strong learners in a group, there will be a balance. Children learn from their peers more quickly.'* This data indicates that R3 has appropriate knowledge about the group formation role.

Table 4. 13: R3's knowledge about Group work

Role of Teacher	Interview	Comment
Group Formation	Gives importance on forming groups based on students' learning ability and personality	Adequate knowledge
Group Task	Discussion-based, real-life oriented topics help students to learn better	Adequate knowledge
Giving instruction	Groups cannot achieve their goal without clear instruction	Adequate knowledge
Tracking group activity and accountability	Important for ensuring equal participation and communication by the group members	Adequate knowledge
Checking progress of the group work	It is important for achieving the target of their group task	Adequate knowledge
Presentation of group work	Presentation develops public speaking skills and confidence in students, especially, the low achievers are benefitted	Adequate knowledge
Cross checking and developing summary	Students can identify their mistakes and learn from others	Adequate knowledge
Using summary for concept development	Students get a complete idea of the topic	Adequate knowledge
Assessing group work	Assess students based on their participation in group task and understanding of the topic	Adequate knowledge

Group Task

R3 believes that discussion- based topics should be selected for group work. He said, *'The opportunity of discussion brings out their prior knowledge and by sharing their ideas they can clear out the misconceptions they had.'* He also emphasizes on choosing topics which the students are familiar with.

Giving instruction

Giving instruction is an important role in group work. According to R3, *'Without the clear instruction groups cannot achieve the goal set for their task. Some students feel shy and remain quiet even if they are confused about the task. Teachers need to go to all the groups to find out if they have understood the task or not. Otherwise, they will not be able to learn about the topic.'* This data shows R3 has adequate knowledge about this role.

Tracking group activity and accountability

'Teacher needs to constantly monitor the groups while they are engaged in discussion. Sometimes, I have noticed one student is dominating in the discussion and others are quietly listening to him/her. I have to make sure that all students are getting equal opportunity to communicate their ideas.' This statement from R3's interview reflects his knowledge about the importance of tracking group activity and accountability.

Checking progress of the group work

R3 tried to make sure that the students are working properly in groups by walking around the class and asking questions to them. R3 said, *'I went to all the groups, listened to their discussion. I realized they had some misconceptions. I gave them the correct information.'* R3 has adequate knowledge about this role.

Presentation of group work

'I usually fix time for each group's presentation and stand there as a listener only. I think presentation is an excellent way to make the low achievers and shy students active and confident. When they present their work with their peers and listen to their findings; they learn better than just listening to the teacher's lecture,' said R3 in the interview. This data indicates that R3 knows how to conduct the presentation role appropriately.

Cross checking and developing summary

R3 finds cross checking between different groups' work an excellent way to improve open-mindedness and rational thinking skills in students. He said, *'I give students an opportunity to give their opinions about other groups' findings. This way students can understand their own mistakes and learn from other groups.'*

Using summary for concept development

'I try to find out the gaps in students' knowledge and give them the missing information by showing a poster usually. This gives them a clear idea of the topic.'

This data shows that R3 has adequate knowledge about this role.

Assessing group work

R3 believes that all students should be assessed individually for their participation in the task and also for their understanding of the topic. He said, *'All students do not contribute to group work equally. It will be unfair to give the same marks to all the members.'* However, he also pointed out that due to the shortage of time he cannot assess all students.

R3's Attitude towards Group work

Table 4.14 represents data from the questionnaire regarding the attitude presented by R3 towards group work. The data from the table indicates that R3 has a positive attitude towards the use of group work. He believes that by working in groups students can achieve skills like open-mindedness, communication, rational thinking and decision making. This strategy not only helps them to learn a topic but also helps in their socialization. R1 said, group work is an excellent way to make the low achievers learn faster as they get an opportunity to work with the high achievers. However, he thinks that group work can be more effective for teaching science at primary level if there is a combination of group discussion and lecture strategy. Students sometimes have misconceptions which can be cleared by the teacher through the lecture strategy. He also said that a large number of students, time constraint and huge workload on the teachers make it difficult to use this strategy in our schools.

Table 4. 14: R3's attitude towards Group work

Major Aspect	Statement	Response Teacher-R3
Group task	1. Real-life oriented tasks which have more than one correct answer and require extensive discussion should be chosen	4
Group formation	2. Groups should have 4-6 members	5
	3. While forming groups learning ability and personality of the students should be considered	5
Giving instruction	4. Clear instruction by the teacher is important for the groups to perform the task properly	5
	5. Individual instruction for all groups can be skipped as it is time consuming	5
Tracking group activity and accountability	6. Assigning the role of the members ensures participation of all members	5
	7. Setting up the group norms like listening, respecting opinion of others and resolving conflicts helps the groups to function properly	5
Checking progress of the group work	8. Teacher does not need to monitor the progress of group work frequently	5
Presentation of group work	9. Through presentation of their work students become more confident about their learning	5
	10. Presentation is an excellent way to ensure participation of rather inactive members	5
Cross checking and developing summary	11. Cross checking of findings from different groups fills up the gap in each group's idea	5
Using summary for concept development	12. At the end of the lesson it is essential for the teacher to identify the gap in students' learning and provide feedback to develop the concept	5
Assessing group work	13. Using group work learning outcome is easily achieved by all the students	3
	14. All members in a group should get equal marks	3
	15. All members should be assessed based on their individual understanding and participation	4
Achievement of social skills and learning outcome	16. Group work is an effective strategy for teaching science	3
	17. Group work develops scientific values like inquisitiveness, open-mindedness and thinking rationally	5
	18. Working in groups helps students to communicate their ideas with others more clearly	5
Applicability in Bangladesh	19. Considering the number of students group work can be easily applicable in teaching primary science in our schools	3
	20. Achieving expected outcome within existing lesson time is difficult	5
	21. I prefer using group work for teaching science over the traditional lecture based strategy	4
Mean		4.75

R3's Practice of Group work in Class

Data from lesson observation is analyzed below to identify how well R3 is practicing group work in science classes.

Group Formation

It was observed that R3 considered students' learning abilities and gender while forming the groups in both the lessons. In the first lesson he made sure that the ratio of high achievers and low achievers was 2:3 in each group. Groups were formed appropriately in both the classes.

Group Task

Topics chosen by R3 were real- life oriented and students could easily discuss with teammates using their prior knowledge. Topics were- *1. Write down the characteristics of one type of soil and mention one plant which grows in that soil and 2. List down the things you have seen today on your way to school and find out which of them are natural and which are manmade.* Topics were wisely chosen by the teacher.

Giving instruction

R3 explained the group task clearly to the students. He wrote the instructions on the board and fixed time (seven minutes) for the task. Individual instruction was also given. Teacher went to all groups and tried to solve their problems. Teacher followed this role appropriately.

Tracking group activity and accountability

Teacher walked around the classroom and ensured participation of all the members of the group. Students were working actively.

Checking progress of the group work

Teacher was constantly monitoring the progress of the group work. He listened to their discussions and provided feedback when needed. This way he ensured that the groups were working in the right direction. All students finished their work within the given time (7 minutes).

Table 4.15: R3's practice of group work in class

Roles of Teacher	Observation	Practiced by Teacher- R3	Numeric Data	
			Lesson 1	Lesson 2
Group Formation	The learning ability and gender of the students were considered while forming groups.	Practiced well in both the lessons	3	3
Group Task	Discussion based topics were chosen and written on the board	Practiced well in both the lessons	3	3
Giving instruction	Gave clear instruction	Practiced well in both the lessons	3	3
Tracking group activity	Active participation of all students was observed	Practiced well in both the lessons	3	3
Checking progress of the group work	Teacher provided feedback from time to time	Practiced well in both the lessons	3	3
Presentation of group work	All the groups presented their work in both the lessons. Some were inattentive in the second lesson.	Faced problem in the second lesson	3	2
Cross checking and developing summary	Students discussed on other groups' findings	Practiced well in both the lessons	3	3
Using summary for concept development	Spontaneous discussion between the teacher and students in the first class. In the second lesson it was teacher-centered	Faced problem in the second lesson	3	2
Assessment	Gave feedback continuously and asked oral questions at the end.	Practiced in both the lessons	3	3
			Mean	2.89

Presentation of group work

It was observed in both the lessons that all the groups presented their work in front of the class. Teacher wrote down all the important points from each group's findings. However, in the second class a few students were inattentive.

Cross checking and developing summary

After the presentation, in both the lessons students were given the opportunity to discuss the findings of other groups. Misconceptions of the students were cleared. Cross-checking was done skillfully.

Using summary for concept development

An interactive discussion between teacher and students was observed in the first lesson where the teacher discussed the missing points and gave a clear idea of the topic. On the other hand, in the second lesson, the teacher summarized the findings in a teacher-centered way and this discussion did not add any new points. Therefore, it can be said that this role was followed by the teacher skillfully in the first lesson but he faced problems in the second lesson.

Assessing group work

In both the lessons R3 assessed students by monitoring their participation during the group work and presentation. At the end of the lesson, he asked oral questions to a few students. Many students raised their hands which indicates that the learning outcome was achieved in both the lessons.

Challenges faced by Teacher R3 and Possible Way outs

The following section discusses the challenges and possible way outs mentioned by R3 in the interview.

1. Large number of students

R3 considers the large number of students as a hindrance for forming heterogeneous groups. He also found it difficult to monitor so many students; progress at the same time. He also mentioned that as there are many members in a group sometimes conflicts arise during discussion and the teacher needs to counsel them. This becomes very difficult to resolve those conflicts and manage the other students at the same time.

Way out- To solve this issue R3 believes that the number of students should be decreased. He said, *'The number of students in a class should not be more than 25. Then it will be easier for me to ensure all students' learning.'*

2. Time management

Lack of time has been a hindrance for R3. He mentioned, *'Sometimes I have to skip the cross checking role because the class time is too short. So, I have to do the summarization by myself.'* He also said that due to the shortage of time individual assessment of all the students cannot be done.

Way out- *'Duration of science class needs to be increased in order to follow the group work strategy appropriately,'* mentioned R3 in the interview. For ensuring the assessment of all students' learning he suggested giving homework.

Table 4. 16: Challenges faced by R3 and the possible Way outs

Area	Challenge	Possible Way out
Group Formation	Large number of students	Decrease the number of students
Group Task	X	X
Providing instruction	Needs to repeat instruction as the school is located beside a market	Microphone
Tracking group activities	Seating arrangement (Bench System)	Using tables
Checking progress and giving feedback	Large number of students	Decrease the number of students
Presentation of group work	Inattentiveness	Using poster to make it attractive
Cross checking and developing summary	Lack of time	Increase duration of lesson
Using summary for concept development	Lack of time	Increase duration of lesson
Assessment	Lack of time	Giving Homework and assessing in the next class
Class management	X	X
Time management	Can't assess all students	Changing the teaching technique
Promoting social skills	Conflict arises sometimes	Decrease the number of students, counselling
Infrastructure	Seating arrangement, Lack of resources	Needs to be modernized
Others	Taking too many classes	Reduce workload

3. Seating arrangement

R3 finds the seating arrangement in our classrooms as a challenge for applying group work. The long benches used in the classroom makes it difficult for the teacher to move around the class and monitor the students' while they are engaged in group work.

Way out- R3 said, *'If we could use tables instead of those long benches it would have been easier for the teacher to reach the students and also the students could discuss with all the members easily.'* This was his suggestion for solving the issue.

4. Inattentiveness

It was observed that during the presentation of group work some students were found inattentive. They were not listening properly.

Way out- To solve this issue R3 suggested in the interview, *'If I could give posters to the groups for presenting their works, other students would find it very interesting.'* He believes that the use of posters or other resources would make the students more attentive in the class.

5. Lack of resources

As mentioned earlier, R3 thinks that use of teaching aids will be helpful for the joyful learning of the students. However, he also mentions that there is a lack of resources in the school. They cannot provide enough resources for so many students.

Way out- Since the use of resources can make students learn better and keeps them attentive R3 thinks that school should ensure the sufficient supply of resources.

6. Location of the school

In the interview R3 mentioned, *'I have to repeat the instruction again and again as the school is located beside a market. It is very noisy most of the time and the students cannot hear me clearly.'* Students cannot work properly if they are not clear about the instructions.

Way outs- R3 believes that using a microphone will solve this issue.

7. Workload

It takes a long time to plan for a lesson using group work. *'I have to teach three subjects in three different grades. So, it is extremely difficult for me to plan and arrange materials for the activities for so many lessons in a week.'*

Way out- R3 thinks that reducing the workload of teachers will help them to plan more activity-based and student-centered lessons.

Major findings for Case 3 (Rural Teacher- R3)

The summary of the analysis regarding the knowledge, attitude and practice of the teacher in Case 3 (R3) is presented in the Table 4.17. It also contains the challenges and possible way outs mentioned by the teacher.

Table 4.17: Major findings for Case 3 (Rural Teacher R3)

Major findings for Case 3 (Rural Teacher- R3)		
Knowledge	Attitude	Practice
Adequate Knowledge	Positive	Implementation of group work was better in the first lesson. Faced problems in the presentation and Concept development.
Challenges- <ol style="list-style-type: none"> 1. Large number of students 2. Time management 3. Seating arrangement 4. Inattentiveness 5. Lack of resources 6. Location of the school 7. Workload 		
Way outs- <ol style="list-style-type: none"> 1. Decrease the number of students 2. Increase class duration 3. Using tables 4. Using interesting resources 5. Provide resources 6. Using microphone 7. Reducing the number of classes 		

4.2.4 Major findings for the Rural Teachers

Major findings for the rural teachers' knowledge, attitude and practice of group work in science classes as well as the challenges they faced along with the possible way outs are listed below.

Rural Teachers' Knowledge about Group work

- Majority of the rural teachers have adequate knowledge about all the roles of the teacher mentioned in the Model for Teacher's Role in Facilitating group Work. They have the knowledge to plan and conduct a science lesson using group work.

- One teacher thinks providing general instruction about the task is enough. There is no need for instructing the groups individually. This shows the lacking in his knowledge about giving instruction.

Rural Teachers' attitude towards Group work

- All the rural teachers have a positive attitude towards group work. They all think group work is an effective strategy for teaching science.
- All the rural teachers believed that group work is more student-centered and it improves students' communication and rational thinking skills.
- **Relation between Rural Teachers' Attitude and Practice**

Participant	Attitude	Practice	Correlation coefficient	Interpretation
R1	3.9	2.83	0.69	Positive relation between rural teachers' attitude and practice of group work
R2	3.76	2.39		
R3	4.75	2.89		

Figure 4.2: Relation between Rural Teachers' Attitude and Practice

The table above represents correlation between rural teachers' attitude towards group work and their practice of this strategy in classroom. As the correlation coefficient is greater than 0, rural teachers' attitude towards group work has a positive impact on their implementation of the strategy. Which means rural teachers with more positive attitude towards group work faced less problems in practicing the strategy in classroom.

They all find the large number of students, teachers' workload and duration of class time as the main challenges for applying group work in Bangladesh.

Rural Teachers' Practice of Group Work in Science classes

- Most of the roles of group work were practiced well by the majority of the rural teachers.
- Most of the rural teachers faced problems in- Group Formation, Tracking Group Work, Cross-checking and Concept Development.

Major Challenges faced by the Rural Teachers

- All the rural teachers mentioned that they have a large number of students in the class. It creates difficulties in forming groups and tracking group activity.
- Rural teachers think that the class time of science classes needs to be increased in order to apply group work effectively.
- Majority of the rural teachers mentioned that their students are not familiar with this strategy. This is the reason it becomes difficult to explain their task to them.
- Lack of infrastructural facilities and materials was also mentioned by the rural teachers, like- the use of long benches and insufficient supply of resources.
- One teacher mentioned that he is burdened with too much work pressure.

Possible Way outs suggested by the Rural teachers

- Decreasing the number of students can be a way out.
- Increasing the class time will ensure proper implementation of all roles.
- Using group work more often.
- Changing infrastructural facilities and ensuring the supply of resources.
- Reducing the workload on the teachers will help them to plan more effective lessons.

4.3 Urban Teachers' Knowledge, Attitude, Practice, Challenges and Way outs

The knowledge, attitude, practice of group work and challenges and way outs mentioned by the urban teachers (U1, U2 and U3 or Case 4, Case 5 and Case 6 respectively) are discussed here in this section respectively.

4.3.1 Analysis of Data for Urban Teacher U1: Case 4

U1's Knowledge about Group work

The data from interview regarding U1's knowledge about Group work is discussed in the section below.

Group Formation

'Have a combination of students with different learning abilities and personalities makes an excellent learning environment for all students. The weak learners can easily learn from the high achievers,' mentioned U1 in the interview. This data reflects his knowledge about group formation.

Group Task

U1 said in the interview that real-life oriented topics should be selected for group tasks because students can use their prior knowledge for discussion. This indicates that he has clear knowledge about selecting a group task.

Giving instruction

'Giving a clear instruction is essential for doing the group work properly. Without instruction, how will they know what to do?' said U1 in the interview. He also added, *'I usually mention the topic, write down the instructions on the board and also specify the time for the task.'* This data shows that U1 has adequate knowledge about this role.

Table 4.18: U1's knowledge about Group work

Role of Teacher	Interview	Comment
Group Formation	Students' learning ability and personality should be considered by the teacher during group formation	Adequate knowledge
Group Task	Topics which are familiar to the students should be selected	Adequate knowledge
Giving instruction	Without clear instructions students will not know what to do	Adequate knowledge
Tracking group activity and accountability	It is important to ensure that everyone is participating	Adequate knowledge
Checking progress of the group work	Teacher should give feedback after presentation	Inadequate knowledge
Presentation of group work	Presentation makes students confident	Adequate knowledge
Cross checking and developing summary	Cross-checking helps to fill up the gaps in students' learning	Adequate knowledge
Using summary for concept development	Teacher must discuss the groups' findings and add new information	Adequate knowledge
Assessing group work	Assessment should be based on the outcome of their group's work and understanding of the topic	Adequate knowledge

Tracking group activity and accountability

'Teacher needs to monitor the groups while they are discussing to make sure that no one is dominating the discussion and every student gets an equal opportunity to participate.' This statement from U1's interview shows his knowledge about this role.

Checking progress of the group work

In the interview U1 mentioned, *'I think I should not interfere during their discussion and let the students work independently. I usually give my feedback after the presentation.'* Teachers are supposed to guide the students at every role of group work. Constant feedback from the teachers ensures that students are working in the right direction. Therefore, we can say that U1's knowledge about this role is inadequate.

Presentation of group work

'Presentation makes students more confident and improves their communication skills. I often choose the shy students to do the presentation to increase their participation in class.' This data from the interview indicates that U1 has adequate knowledge about this role.

Cross checking and developing summary

'I think the opportunity to discuss other groups' findings makes students more rational and also helps them to identify the gaps in their learning,' said U1 in the interview. This shows that he knows about this role accurately.

Using summary for concept development

U1 has adequate knowledge about the concept development role. In the interview he mentioned, *'After the groups' discussion it is important for the teacher to identify the misconceptions, confusions or gaps in students' learning and provide necessary information. This way students can have a complete idea of the topic.'*

Assessing group work

'As the students were working as a team, I would prefer to assess them based on their whole team's performance.' said U1. He also agrees that students' understanding of the topic should be assessed individually. He has adequate knowledge about the assessment role.

U1's Attitude towards Group work

Table 4.19: U1's attitude towards Group work

Major Aspect	Statement	Response Teacher-U1
Group task	1. Real-life oriented tasks which have more than one correct answer and require extensive discussion should be chosen	4
Group formation	2. Groups should have 4-6 members	5
	3. While forming groups learning ability and personality of the students should be considered	5
Giving instruction	4. Clear instruction by the teacher is important for the groups to perform the task properly	5
	5. Individual instruction for all groups can be skipped as it is time consuming	5
Tracking group activity and accountability	6. Assigning the role of the members ensures participation of all members	4
	7. Setting up the group norms like listening, respecting opinion of others and resolving conflicts helps the groups to function properly	5
Checking progress of the group work	8. Teacher does not need to monitor the progress of group work frequently	4
Presentation of group work	9. Through presentation of their work students become more confident about their learning	5
	10. Presentation is an excellent way to ensure participation of rather inactive members	5
Cross checking and developing summary	11. Cross checking of findings from different groups fills up the gap in each group's idea	5
Using summary for concept development	12. At the end of the lesson it is essential for the teacher to identify the gap in students' learning and provide feedback to develop the concept	5
Assessing group work	13. Using group work learning outcome is easily achieved by all the students	4
	14. All members in a group should get equal marks	5
	15. All members should be assessed based on their individual understanding and participation	1
Achievement of social skills and learning outcome	16. Group work is an effective strategy for teaching science	5
	17. Group work develops scientific values like inquisitiveness, open-mindedness and thinking rationally	5
	18. Working in groups helps students to communicate their ideas with others more clearly	5
Applicability in Bangladesh	19. Considering the number of students group work can be easily applicable in teaching primary science in our schools	1
	20. Achieving expected outcome within existing lesson time is difficult	4
	21. I prefer using Group work for teaching science over the traditional lecture based strategy	3
Mean		4.24

U1's attitude towards group work based on the responses on the questionnaire is analyzed in this section. The Table 4.19 indicates that U1 exhibits a positive attitude towards using group work. According to him, group work is an effective teaching strategy for teaching science at primary level. Working in groups not only helps students to learn better in a joyful manner but also develops some important social skills in them like communication, leadership, tolerance, rational thinking etc. He thinks that the teachers do not need to provide feedback at every role, rather they should let the students work independently. However, considering the large number of students that we have in our classrooms, he does not feel that group work can be widely used by our teachers.

U1's Practice of Group work in Class

Lesson observation data regarding U1's practice of group work is analyzed using predetermined themes, the roles of teacher described in The Model of Teacher's Role in Facilitating Group Work (Rahman, 2018).

Group Formation

So far in this chapter we have seen teachers face difficulties in combining students from different abilities in a group. U1 has come up with a unique idea to overcome this challenge. He had already sorted out students based on their gender and learning ability and determined the groups. So, whenever he conducts group work students simply get up and sit with their team members.

Group Task

It was observed that U1 chose the topics from the textbook in both the lessons. Group tasks chosen by U1 were- 1. Write down the source and use of different resources and 2. List down the ways to preserve natural resources. Students already had some ideas about these topics. So, it was easier for them to complete the group tasks. This step was followed well in both the lessons.

Giving instruction

Teacher explained the task orally, then wrote the instruction on the board and also fixed the time for group discussion (10 minutes). He also went to the groups individually and tried to find out if they had any confusion or not. This role of teacher was also practiced in both the lessons.

Table 4.20: U1's practice of Group work in class

Roles of Teacher	Observation	Practiced by Teacher- U1	Numeric Data	
			Lesson 1	Lesson 2
Group Formation	Formed groups according to learning ability of the students	Practiced in both lessons	3	3
Group Task	Discussion based topics were chosen and written on the board	Practiced in both lessons	3	3
Giving instruction	Gave clear instruction	Practiced in both lessons	3	3
Tracking group activity	All students were active and taking part in the discussion.	Practiced in both lessons	3	3
Checking progress of the group work	Feedback was not given	Skipped in both lessons		
Presentation of group work	Fixed time given for the presentation of all groups	Practiced in both lessons	3	3
Cross checking and developing summary	Students did not get opportunity to discuss other groups' findings	Skipped in both lessons	1	1
Using summary for concept development	U1 summarized the groups' findings and added some new information	Practiced in both lessons	3	3
Assessing group work	Asked oral questions at the end.	Practiced in both lessons	3	3
			Mean	2.33

Tracking group activity and accountability

U1 was observed walking around the classroom and monitoring the students. He made sure that all of them were equally participating in the discussion. He followed this process in both his lessons.

Checking progress of the group work

According to classroom observation data U1 did not provide any feedback to the students while they were discussing in groups. He went to these groups, made sure everyone was working but he did not try to clear their misconceptions about the topic. However, constant feedback from the teacher helps students to make progress towards their goal. U1 skipped checking progress of the students in both the lessons.

Presentation of group work

All the groups presented their work in front of the class. Each team was given 2 minutes to present their work. U1 picked one member from each team to do the presentation. This step was followed in the same manner in both the lessons.

Cross checking and developing summary

U1 completely skipped cross checking in both lessons.

Using summary for concept development

After the presentation, U1 summarized the findings of different groups. Students were not given the opportunity to share their opinion. U1 gave his feedback to all the groups and pointed out their mistakes. He then shared some new information about the topic which the students had missed. This way students' learning was completed in both the lessons in a teacher-centered manner.

Assessing group work

In both the lessons, U1 asked oral questions to a few students. Many students raised their hands to answer the questions which gave an idea that the learning outcome was achieved. He followed the assessment role in both lessons.

Challenges faced by Teacher U1 and Possible Way outs

The following section contains the analysis of interview data regarding the challenges U1 faced in class and the possible way outs mentioned by him.

1. Number of students

In the interview, U1 mentioned that due to a large number of students, he cannot manage time to assess all students' learning at the end of the lesson.

Way out- U1 suggests to decrease the number of students in order to make it easier for the teacher to conduct this strategy properly.

2. Time management

U1 mentioned that it is impossible to assess so many students within the short lesson time. He also skips cross-checking due to time constraints. If he gives the opportunity to the students to discuss other groups' findings then it will exceed the class time.

Way out- Increasing the lesson time of science classes can solve this problem.

3. Lack of resources

U1 said, *'Use of teaching materials and posters would have made my lessons more interesting.'* However, it is difficult for him to arrange teaching aids for all the students.

Way out- Schools should ensure the availability of resources.

4. Location of the school

As the school is located beside a very busy road in Dhaka city there is too much noise from the traffic. It was observed that students were unable to hear the teacher sometimes. In the interview, U1 also mentioned, *'I have to repeat my instructions because of the traffic noise.'*

Way out- U1 suggests that the use of a microphone could solve this issue.

Table 4.21: Challenges faced by U1 and the possible Way out

Area	Challenge	Possible Way out
Group Formation	X	X
Group Task	X	X
Providing instruction	Needs to repeat instruction as the school is located beside the main road	Microphone
Tracking group activities	Seating arrangement (bench system)	Using tables
Checking progress and giving feedback	X	X
Presentation of group work	X	X
Cross checking and developing summary	Lack of time	Increase duration of lesson
Using summary for concept development	X	X
Assessing group work	Lack of time and large number of students	Increase time and decrease the number of students
Class management	X	X
Time management	Can't assess all students	Decrease the number of students
Promoting social skills	X	X
Infrastructure	Lack of resources	Provide resources
Others	Taking too many classes	Reduce workload

5. Workload

'I have to take too many classes every week. So, planning and arranging materials for so many lessons become very difficult for me,' said U1 in the interview. He thinks that

too much work pressure on the primary school teachers is a hindrance to apply group work or any student-centered, activity-based teaching strategies.

Way out- Number of classes per week should be decreased in order to give the teachers enough time to plan activity-based lessons.

Major findings for Urban Teacher- U1

A summary of the findings regarding Case 4's (Urban Teacher U1) knowledge, attitude and practice of group work along with the challenges he faced is presented in the following table. It also contains the suggestions mentioned by him to solve the challenges.

Table 4.22: Major findings for Case 4- Urban Teacher U1

Major findings for Urban Teacher- U1		
Knowledge	Attitude	Practice
Inadequate knowledge about Checking progress role	Positive	Skipped Checking progress and Cross-checking.
Challenges- <ol style="list-style-type: none"> 1. Large number of students 2. Seating arrangement 3. Lack of resources 4. Workload 		
Way outs- <ol style="list-style-type: none"> 1. Decrease the number of students 2. Using tables 3. Ensuring availability of resources 4. Reducing the number of classes 		

4.3.2 Analysis of Data for Urban Teacher U2: Case 5

U2's Knowledge about Group work

The following section represents analysis on U2's knowledge about group work based on the interview data under the predetermined themes, roles of teacher mentioned in the Model of Teacher's Role in Facilitating Group Work.

Group Formation

'Groups should include strong and weak learners both. This way weak learners can learn from the strong learners and the strong learners' learning is also strengthened,' said U2 in the interview. This represents her knowledge about group formation.

Table 4. 23: U2's knowledge about group work

Role of Teacher	Interview	Comment
Group Formation	Groups should be formed with students of different learning ability and personality.	Adequate knowledge
Group Task	Discussion-based and real-life oriented tasks should be chosen	Adequate knowledge
Giving instruction	Groups can not work properly if the instruction is not clear	Adequate knowledge
Tracking group activity and accountability	It is important to keep track of students' work to ensure that they are following the instruction correctly	Adequate knowledge
Checking progress of the group work	Providing feedback helps to remove the misconceptions	Adequate knowledge
Presentation of group work	Low achievers and the shy students become more active	Adequate knowledge
Cross checking and developing summary	Cross-checking helps them to learn from other groups	Adequate knowledge
Using summary for concept development	Finds it important for the teacher to give idea about the topic	Adequate knowledge
Assessing group work	Assess students based on their participation in group task and understanding of the topic	Adequate knowledge

Group Task

U2 has adequate knowledge about selecting a group task. She said, *'I choose discussion based topics and also keep in mind that the topics are real-life oriented. If children do not have any prior knowledge, then all members will not participate in discussion. Only one or two students will be dominating the discussion.'*

Giving instruction

'Without clear instructions students will not be able to conduct the group task,' said U2 in the interview. She also gives importance on giving individual instruction to the groups. She said, *'Though individual instruction is time consuming; it is important to clear out any confusions the groups might have.'* This data implies that she has adequate knowledge.

Tracking group activity and accountability

In the interview U2 mentioned, *'It is important to keep track of students' work to ensure that every member of the group is taking part in the discussion. Teacher also needs to monitor that all students are showing respect to others and there is no conflict.'* This data reflects her knowledge about keeping track of group activity and accountability.

Checking progress of the group work

'The whole time I was walking around the classroom, listening to their discussions and correcting them when they made mistakes,' said U2 in the interview. This indicates that she has adequate knowledge about checking progress of the group work.

Presentation of group work

'Presentation is very important. It makes the shy and inactive students more confident and interested in learning. One group can learn from the other group.' This statement from U2's interview indicates that she has adequate knowledge about the presentation of group work.

Cross checking and developing summary

'Students can rectify their mistakes by comparing their findings with other groups' findings,' said U2 in the interview. This data shows that she has adequate knowledge about cross checking and summarizing.

Using summary for concept development

'Teacher should also summarize the information given by him/her and the findings of the groups to establish the concept on the topic.' This data reflects that she has adequate knowledge about this step.

Assessing group work

In the interview U2 mentioned, *'Since the students were supposed to work as a team it is important to assess their participation and also their individual learning on the topic.'* This data reflects her knowledge about the assessment process of group work.

U2's Attitude towards Group work

U2's attitude towards group work is analyzed in the following section based on the data from the questionnaire.

Table 4.24: U2's attitude towards Group work

Major Aspect	Statement	Response Teacher-U2
Group task	1. Real-life oriented tasks which have more than one correct answer and require extensive discussion should be chosen	5
Group formation	2. Groups should have 4-6 members	5
	3. While forming groups learning ability and personality of the students should be considered	5
Giving instruction	4. Clear instruction by the teacher is important for the groups to perform the task properly	5
	5. Individual instruction for all groups can be skipped as it is time consuming	5
Tracking group activity and accountability	6. Assigning the role of the members ensures participation of all members	3
	7. Setting up the group norms like listening, respecting opinion of others and resolving conflicts helps the groups to function properly	5
Checking progress of the group work	8. Teacher does not need to monitor the progress of group work frequently	4
Presentation of group work	9. Through presentation of their work students become more confident about their learning	5
	10. Presentation is an excellent way to ensure participation of rather inactive members	4
Cross checking and developing summary	11. Cross checking of findings from different groups fills up the gap in each group's idea	4
Using summary for concept development	12. At the end of the lesson it is essential for the teacher to identify the gap in students' learning and provide feedback to develop the concept	5
Assessing group work	13. Using group work learning outcome is easily achieved by all the students	3
	14. All members in a group should get equal marks	3
	15. All members should be assessed based on their individual understanding and participation	5
Achievement of social skills and learning outcome	16. Group work is an effective strategy for teaching science	5
	17. Group work develops scientific values like inquisitiveness, open-mindedness and thinking rationally	5
	18. Working in groups helps students to communicate their ideas with others more clearly	5
Applicability in Bangladesh	19. Considering the number of students group work can be easily applicable in teaching primary science in our schools	5
	20. Achieving expected outcome within existing lesson time is difficult	3
	21. I prefer using Group work for teaching science over the traditional lecture based strategy	4
Mean		4.43

Data from the questionnaire suggests that participant teacher, U2, exhibits a positive attitude towards using group work in science classes of Bangladesh. She believes that,

by working in groups, students can understand easily. If there is a combination of strong and weak learners in a group it will ensure learning of all students. She thinks that group work develops social skills in students. They become more open-minded, friendly, rational and they learn how to make informed decisions. However, as she has a huge class of 45 students, it becomes difficult to monitor the students and give feedback. She also pointed out that due to the short duration of the class time they cannot always achieve the learning outcome.

U2's Practice of Group work in Class

An analysis of lesson observation data regarding the practice of Group work by U2 is presented below.

Table 4.25: U2's practice of Group work

Role of Teacher	Observation	Practiced by Teacher- U2	Numeric Data	
			Lesson 1	Lesson 2
Group Formation	Formed groups according to seating arrangement	Faced problems in both the lessons	2	2
Group Task	Discussion based topics were chosen and written on the board	Practiced in both the lessons	3	3
Giving instruction	Gave clear instruction	Practiced in both the lessons	3	3
Tracking group activity	Students were active in both the lessons	Practiced in both the lessons	3	3
Checking progress of the group work	Went to all groups and provided feedback	Practiced in both the lessons	3	3
Presentation of group work	All groups presented their work in both the lessons	Practiced in both the lessons	3	3
Cross checking and developing summary	Students were not given any time to discuss other groups' findings	Skipped in both the lessons	1	1
Using summary for concept development	Summarized students' findings and showed a poster but there was no new information	Faced problem in both the lessons	2	2
Assessing group work	Gave feedback continuously and asked oral questions at the end.	Practiced in both the lessons	3	3
			Mean	2.44

Group Formation

It was observed in both the lessons of U2 that she formed the groups based on the seating arrangement. Learning ability and personality of the students were not taken into consideration. She faced problems in forming heterogeneous groups in both the lessons.

Group Task

Topics selected by U2 for the group work in her two lessons were- *1. Write about the benefits of using mechanical, chemical and bio-technology in agriculture and 2. Write down the harmful effects of using technology in agriculture.* These topics were discussion-based; no use of materials was observed. If students had any confusion, the teacher explained to them.

Giving instruction

U2 gave clear instructions about the group task, specified the time and wrote the instruction on the board. She was also seen walking around the classroom and explaining the task again to a few groups. She followed this part appropriately in both the lessons.

Tracking group activity and accountability

Collaborative approach was followed in both the lessons. All members of a group were taking part in the discussion and one member was writing the points in classwork copy. The teacher ensured everyone's participation by monitoring their work constantly.

Checking progress of the group work

U2 was seen checking the progress of each group's work. In both the lessons, she was listening to their discussion and giving feedback. For example, in the first lesson one group was writing the example of chemical technology only. U2 reminded them to write the benefits also.

Presentation of group work

All the groups got the opportunity to present their work in both the lessons. However, U2 faced a different kind of problem during the presentation. *As her classroom was located beside a very busy road in Dhaka it was difficult to hear what the students were saying. So U2 herself had to repeat the points in a loud voice during each presentation.*

Cross checking and developing summary

Cross-checking of students' work was not observed in any of the lessons. U2 discussed the findings of groups' work, not the other groups. So, summarization of the findings was done in a teacher-centered manner. Cross checking of groups' work was completely skipped by the teacher.

Using summary for concept development

In both the lessons the teacher put up posters on the board. Important facts about the topic were written on the posters. The points were read out and discussed by the teacher. All the points were already mentioned by the students in the presentation, no new information was added by the teacher. Teacher, U2, faced problems here.

Assessing group work

In both her lessons, U2 assessed students' participation throughout the activity and at the end she tried to assess their learning about the topic. She asked some oral questions to the students. Most of the students raised their hands to answer. The teacher picked a few. Students could answer the questions correctly. However, to assess all students she gave homework after both the lessons.

Challenges faced by Teacher U2 and Possible Way outs

Challenges faced by R2 and the possible way outs mentioned by him are presented in the following table. Data from the interview is analyzed here.

1. Large number of students

U2 finds a large number of students as a challenge in forming groups and checking progress of groups' work. She said, *'Since I have 45 students in my class it is time consuming to select members of each group according to their learning ability and personality.'* She added, *'It is also very difficult to manage so many students while they are discussing in groups.'*

Way out- To solve this issue, U2 suggested to decrease the number of students.

2. Time management

In the interview, U2 mentioned, *'Often I cannot give students the opportunity to discuss other groups' findings due to the shortage of time.'* She also mentioned that due to the short duration of class she cannot assess all students' learning.

Way out- U2 suggests increasing the duration of class time will solve this issue. To assess all students' learning she suggests giving homework.

Table 4.26: Challenges faced by U2 and possible Way outs

Area	Challenge	Possible Way out
Group Formation	Large number of students and seating arrangement	Decrease the number of students Using tables
Group Task	X	X
Providing instruction	Needs to repeat instruction as the school is located beside the main road	Microphone
Tracking group activities	Seating arrangement (Bench System)	Using tables
Checking progress and giving feedback	Large number of students	Decrease the number of students
Presentation of group work	X	X
Cross checking and developing summary	Lack of time	Increase duration of lesson
Using summary for concept development	X	X
Assessment	Lack of time	Giving Homework and assessing in the next class
Class management	X	X
Time management	Have to skip the assessment role sometimes.	Giving Homework
Promoting social skills	Conflict arises sometimes	Counseling
Infrastructure	Seating arrangement	Use of tables
Others	Taking too many classes	Reduce workload

3. Seating arrangement

'In my classroom students sit on long benches. The classroom is so congested that it becomes difficult for me to walk around the class and keep track of all students' performance,' said U2. This type of seating arrangement also makes it difficult to change students' seats and form heterogeneous groups.

Way out- In U2's opinion, it will be easier to conduct group work if we can put tables instead of long benches.

4. Location of the school

U2 mentioned in the interview, *'As my school is located just beside the main road it is very noisy. There is always huge traffic on the road. That is why I have to repeat my instructions sometimes. Especially, during the presentation the student's voice is not audible to the children sitting at the back. As a result, they become inattentive.'* This is a big challenge for her to implement group work in her class.

Way out- U2 suggests use of a microphone to solve this issue. Also, she thinks the concerned authority should consider the surrounding location and environment before establishing a school.

5. Workload

U2 thinks that planning for taking class using group work and arranging materials for it is time consuming. *'I have to teach different subjects to different grades of students every day. Checking their classwork, homework and examination scripts take a long time also. So, it is really difficult to prepare materials and conduct group work every day,'* said U2 in the interview.

Way out- Reducing the workload of the teacher by decreasing the number of classes they take every day will be beneficial.

Major findings for Case 5- Urban Teacher- U2

The following table represents major findings from the analysis of data for Case 5. U2's knowledge, attitude and practice of group work along with the challenges he faced and the possible way outs are mentioned here.

Table 4.27: Major findings for Case 5- Urban Teacher U2

Major findings for Case 544- Urban Teacher- U2		
Knowledge	Attitude	Practice
Adequate knowledge about all the roles	Positive	Faced problems in Formation of group and Concept development. Skipped Cross-checking.
Challenges- <ol style="list-style-type: none"> 1. Large number of students 2. Time management 3. Seating arrangement 4. Location of the school 5. Workload 		
Way outs- <ol style="list-style-type: none"> 1. Decrease the number of students 2. Increase class duration 3. Using tables 4. Using microphone and considering the surrounding environment before building the school 5. Reducing the number of classes 		

4.3.3 Analysis of Data for Urban Teacher U3- Case 6

U3's Knowledge about Group work

The following section contains analysis of interview data regarding U3's knowledge about the group work strategy.

Group Formation

'It is important to have both fast learners and slow learners in a group. This way the weak or shy students can easily learn from their peers,' said U3 in the interview. This data shows that she has adequate knowledge about the group formation process.

Group Task

In the interview, U3 mentioned, *'Teachers need to make sure that students have some idea about the topics so that they can discuss it with their group members. Real-life oriented topics are best for group work.'* This data reflects her knowledge about group work.

Table 4.28: U3's knowledge about Group work

Role	Interview	Comment
Group Formation	Gives importance on considering students' learning abilities and personality	Adequate knowledge
Group Task	Chooses discussion-based and real-life oriented tasks	Adequate knowledge
Giving instruction	Clear instruction is a must to achieve the target of the group task	Adequate knowledge
Tracking group activity and accountability	It is important to monitor students' participation and communication within the group	Adequate knowledge
Checking progress of the group work	It is important for removing the confusions and misconceptions	Adequate knowledge
Presentation of group work	Presentation is an excellent way to make the inactive students more active	Adequate knowledge
Cross checking and developing summary	Cross-checking helps to fill up the gaps in students' learning	Adequate knowledge
Using summary for concept development	Teacher's intervention gives them a clear idea of the topic	Adequate knowledge
Assessing group work	Assess students based on their participation in group task and understanding of the topic	Adequate knowledge

Giving instruction

U3 said, *'Teachers must provide clear and detailed instruction for the group work. Or else, there will be a lot of confusion.'* She also thinks that individual instruction for each group is also required for further clarification. This indicates that she has adequate knowledge.

Tracking group activity and accountability

'It is important to make sure that all the members are working together, there is no conflict between the students and everyone is participating in the task. Sometimes, we see that one or two students are doing all the work and others are just sitting idly.' This statement from the interview indicates that U3 gives importance on tracking group activity and accountability.

Checking progress of the group work

U3 has an adequate knowledge about this step and she emphasizes on the monitoring of students' work. She said, *'Teachers have to listen to the students' discussion and provide feedback. He/she needs to correct their mistakes.'*

Presentation of group work

'I often choose comparatively shy and inactive students for the presentation because I think presentation is an excellent way for making them active. It also grows interest for learning in them,' said U3 in the interview. This data shows that she has adequate knowledge about how to conduct the presentation step.

Cross checking and developing summary

U3 mentioned in the interview, *'Cross checking helps students to identify their mistakes and learn from others. This discussion helps to fill up the gap in their knowledge.'* This statement reveals her knowledge about her role in facilitating group work.

Using summary for concept development

'It is important for the teachers to share their ideas on the topic. This will fill up the gaps in students' knowledge and make their learning complete,' said U3 in the interview. She has adequate knowledge about summarizing.

Assessing group work

In the interview, U3 mentioned, *'I observe the students throughout the lesson time and assess their participation in the activity. In the end I can ask questions to very few students because it'll be impossible to finish the lesson within time if I ask questions to all. Therefore, I give them homework which I can assess in the next class and identify students' level of understanding.'* This data represents her knowledge about the assessment of students in group work.

U3's Attitude towards Group work

Based on U3's responses from the questionnaire, the table in the next page reflects that U3 holds a positive attitude towards group work. She finds group work an effective strategy for teaching science. When students work with their peers, it instils some social skills as well as scientific values in students. They become more open-minded, rational and confident. Group work enhances students' learning. However, according to her, a large number of students makes it difficult to apply group work in our schools. Ensuring the achievement of learning outcomes by so many students within the existing lesson time becomes difficult sometimes.

Table 4.29: U3's attitude towards group work

Major Aspect	Statement	Response Teacher-U3
Group task	1. Real-life oriented tasks which have more than one correct answer and require extensive discussion should be chosen	5
Group formation	2. Groups should have 4-6 members	4
	3. While forming groups learning ability and personality of the students should be considered	5
Giving instruction	4. Clear instruction by the teacher is important for the groups to perform the task properly	5
	5. Individual instruction for all groups can be skipped as it is time consuming	4
Tracking group activity and accountability	6. Assigning the role of the members ensures participation of all members	4
	7. Setting up the group norms like listening, respecting opinion of others and resolving conflicts helps the groups to function properly	5
Checking progress of the group work	8. Teacher does not need to monitor the progress of group work frequently	5
Presentation of group work	9. Through presentation of their work students become more confident about their learning	5
	10. Presentation is an excellent way to ensure participation of rather inactive members	5
Cross checking and developing summary	11. Cross checking of findings from different groups fills up the gap in each group's idea	2
Using summary for concept development	12. At the end of the lesson it is essential for the teacher to identify the gap in students' learning and provide feedback to develop the concept	5
Assessing group work	13. Using group work learning outcome is easily achieved by all the students	4
	14. All members in a group should get equal marks	2
	15. All members should be assessed based on their individual understanding and participation	4
Achievement of social skills and learning outcome	16. Group work is an effective strategy for teaching science	5
	17. Group work develops scientific values like inquisitiveness, open-mindedness and thinking rationally	5
	18. Working in groups helps students to communicate their ideas with others more clearly	5
Applicability in Bangladesh	19. Considering the number of students group work can be easily applicable in teaching primary science in our schools	2
	20. Achieving expected outcome within existing lesson time is difficult	4
	21. I prefer using group work for teaching science over the traditional lecture based strategy	3
Mean		4.02

U3's Practice of Group work in Class

Lesson observation data is analyzed in the following section to identify how well group work is practiced by U3 in class.

Table 4.30: U3's practice of group work

Role of Teacher	Observation	Practiced by Teacher- U3	Numeric Data	
			Lesson 1	Lesson 2
Group Formation	Formed groups according to seating arrangement	Not Practiced in any lesson	1	1
Group Task	Discussion based topics were chosen and written on the board	Practiced in both lessons	3	3
Giving instruction	Gave general instruction. Missed individual instruction role in the second lesson.	Practiced in the second lesson	1	3
Tracking group activity	Ensured everyone's participation by calling out the names and asking questions	Practiced in both the lessons	3	3
Checking progress of the group work	Asked questions and provided feedback	Practiced in both the lessons	3	3
Presentation of group work	All the groups presented their work	Practiced in both the lessons	3	3
Cross checking and developing summary	Students shared their opinion on other groups' findings	Practiced in both the lessons	3	3
Using summary for concept development	U3 discussed the topic and added new points with the summary	Practiced in both the lessons	3	3
Assessing group work	Asked questions orally and gave Homework in both the lessons	Practiced in both the lessons	3	3
			Mean	2.73

Group Formation

It was observed that the teacher asked students to make groups according to the seating arrangements. She did not consider the learning ability, personality or gender of the students. She faced problems with formation of groups in both the lessons.

Group Task

The topics chosen by U3 were- *1. Harmful effects of artificial and chemical food colors and 2. Effects of having junk foods.* Both the topics were familiar to the students and they had a spontaneous discussion on these topics. U3 chose perfect topics for the group work in both the lessons.

Giving instruction

U3 explained the task to the students very clearly and she even wrote the instructions on the board in both the lessons. However, in the first lesson the benches were placed so close together that she could not reach all the groups and provide individual instruction to them. However, before starting the second lesson she took help from the students and arranged the benches so this time she could provide instruction individually as well.

Tracking group activity and accountability

As mentioned earlier, seating arrangement was a challenge for her to reach the students in the first lesson. However, she did manage to make sure that everyone was participating in the discussion by calling out the names of inattentive members and reminding them about the task. All students were observed actively participating in the second lesson also.

Checking progress of the group work

In the second lesson she went to the students, listened to their discussion and provided feedback. Though it was difficult for her to move around the class in the first lesson, she was asking questions to the students and providing feedback. Students also raised their hands and asked questions. This way U3 manages to check the progress of group work in her lessons.

Presentation of group work

Each group was given 2 minutes time for presentation and all the groups presented their work. Other groups were listening to the presentations attentively.

Cross checking and developing summary

Students gave their opinion on other groups' findings. There was a very interactive discussion between teacher and students in both the lessons. This helped students to learn from each other's work.

Using summary for concept development

After the cross-checking of students' ideas, U3 discussed the topic and added new information which the students could not come up with. This way students' concept of the topic was developed.

Assessing group work

It was observed in both the lessons that U3 asked questions orally at the end of the lessons to assess as many students as she can within the remaining class time. However, she was observing students' participation from the beginning of the task. As it was not possible to assess all students' learning at the end, she gave homework in both the classes so that she can assess them in the next day.

Challenges faced by Teacher U3 and Possible Way outs

Interview data regarding the challenges U3 faced and the possible way outs to these challenges are discussed in this section.

1. Large number of students

In the interview U3 said, *'I could not form groups combining students of different learning abilities or gender because I had a large number of students and also it is difficult for the students to change their seats as the classrooms are congested. So it becomes time consuming.'* It is also not possible to assess so many students individually in the same lesson. So, she gives homework and assesses them on the next day.

Way out- According to U3, if the number of students can be decreased then it will be easier for her to form heterogeneous groups.

2. Seating arrangement

It was difficult for U3 to move around the class to provide individual instruction to the groups in lesson one as the benches were placed really close to each other. U3 mentioned

in the interview, *'It is important to reach all the groups to ensure their participation and to resolve their confusions. Therefore, before starting the second lesson, I took help from the students and arranged the benches so that I could walk around the class easily.'*

Way out- U3 thinks that this problem can be solved by replacing the long benches with tables.

3. Workload

U3 said, *'I teach English in class 3, Mathematics in classes 4 & 5, science in classes 4 & 5. So, this becomes really hard for me to plan so many activity based lessons for so many different topics every week!'* Workload on the teachers is a major challenge for applying group work in Bangladesh.

Way out- In order to make it easier for the teachers to plan the group work and other activity based lessons, U3 has suggested to reduce their workload. It can be done either by reducing the number of classes teachers have to conduct every week or by reducing the number of subjects they teach.

Table 4.31: Challenges faced by U3 and the possible Way outs

Area	Challenge	Possible Way out
Group Formation	Large number of students and Seating arrangement	Decrease the number of students and Using tables
Group Task	X	X
Providing instruction	Seating arrangement (Bench System)	Using tables
Tracking group activities	X	X
Checking progress and giving feedback	Large number of students	Decrease the number of students
Presentation of group work	X	X
Cross checking and developing summary	X	X
Using summary for concept development	X	X
Assessing group work	Large number of students	Giving Homework and assessing in the next class
Class management	X	X
Time management	X	X
Promoting social skills	X	X
Infrastructure	Seating arrangement, Lack of resources	Needs to be modernized
Others	Teaching too many subjects	Reduce workload

Major findings for Case 6- Urban Teacher- U3

This section represents a summary of the analyzed data for the case 6- Urban teacher U3. U3's knowledge, attitude and practice of group work in class as well as the challenges she faced are included here. The following table also contains her suggestions for solving the problems of applying group work in science classes.

Table 4.32: Major findings for Case 6 (Urban Teacher- U3)

Major findings for Case 6- Urban Teacher- U3		
Knowledge	Attitude	Practice
Adequate Knowledge	Positive	Faced problems in Group formation and giving instruction.
Challenges- <ol style="list-style-type: none"> 1. Large number of students 2. Seating arrangement 3. Workload 		
Way outs- <ol style="list-style-type: none"> 1. Decrease the number of students 2. Using tables 3. Reducing the number of classes or subjects taken by the teacher 		

4.3.4 Major findings for the Urban Teachers

Major findings regarding urban teachers' knowledge, attitude and practice of group work as well as the challenges they face and the possible way outs are listed below.

Urban Teachers' Knowledge about Group work

- Majority of the urban teachers have adequate knowledge about all the roles of teacher in facilitating group work. Like the rural teachers they also have the knowledge to plan and conduct a science lesson using this strategy.
- One of the teachers believes that after giving the instruction, the teacher should let the students work independently. The teacher should not provide feedback before the presentation is done. This shows his lack of knowledge about checking progress of group work.

Urban Teachers' attitude towards Group work

- All the urban teachers have a positive attitude towards group work. They all find group work as an effective strategy for teaching science at primary level.
- All the urban teachers believed that group work is more student-centered and it improves many social and science process skills such as communication, tolerance, respecting others, rational thinking and making informed decisions.
- **Relation between Urban Teachers' Attitude and Practice**

Participant	Attitude	Practice	Correlation coefficient	Interpretation
U1	4.24	2.33		Negative relation between rural teachers' attitude and practice of group work
U2	4.43	2.44	-0.73	
U3	4.02	2.73		

Figure 4.3: Relation between Urban Teachers' Attitude and Practice

The correlation between urban teachers' attitude towards group work and their practice of the strategy in classroom is negative as the correlation coefficient is less than 0. This implies that these two variables work in opposite directions. Teachers with less positive attitude towards the method have shown better practice. This finding can be an area of interest for further research.

- They all find the large number of students, teachers' workload and duration of class time as the main challenges for applying group work in Bangladesh.

Urban Teachers' Practice of Group Work in Science classes

- Most of the roles of group work were practiced well by the majority of the urban teachers.
- Most of the urban teachers faced problems in- Group Formation, Cross-checking and Concept Development.

Major Challenges faced by the Urban Teachers

- The urban teachers mentioned that they have a large number of students in the class. It creates difficulties in forming groups, giving instruction and tracking group activity.
- Urban teachers think that the class time of science classes needs to be increased in order to apply group work effectively.

- Majority of the urban teachers mentioned the location of the school near the busy and noisy road as a challenge for applying any activity-based teaching strategy.
- Lack of infrastructural facilities and materials was also mentioned by all the urban teachers. The use of long benches and insufficient supply of resources was mentioned as a major limitation
- All the urban teachers said that there is too much workload on them.

Possible Way outs suggested by the Urban teachers

- Decreasing the number of students can help teachers to better manage the groups.
- Increasing the class time will ensure proper implementation of all roles.
- Using a microphone and considering the surrounding environment before building the school can help with the noise problem.
- Changing infrastructural facilities and ensuring the supply of resources.
- Reducing the number of classes or subjects taken by the teacher will help them to plan more interactive lessons.

4.4 Overall Findings of the Study

Cross analysis of data Table 5.33 (see next page) represents the overall findings of the study at a glance. For each research question findings from the rural cases and the findings from the urban cases are compared here. The fourth column of the table consists the overall findings for the study based on the comparison among rural and urban cases.

Table 4.33: Overall Findings of the Study

Focus of Research Question	Findings for Rural Teachers	Findings for Urban Teachers	Overall Findings
1. Knowledge	<ol style="list-style-type: none"> Most teachers have adequate knowledge about facilitating group work Inadequate knowledge about Giving Instruction 	<ol style="list-style-type: none"> Most teachers have adequate knowledge about facilitating group work Inadequate knowledge about Checking Progress 	<ol style="list-style-type: none"> Most of the primary science teachers have adequate knowledge about planning and conducting group work Inadequate knowledge about few parts
2. Attitude	<ol style="list-style-type: none"> Moderately positive Group work is effective for teaching science Cannot be applied widely in Bangladesh There is a positive relation between teacher's attitude and practice 	<ol style="list-style-type: none"> Highly positive Group work is effective for teaching science Cannot be applied widely in Bangladesh There is a negative relation between teacher's attitude and practice 	<ol style="list-style-type: none"> Teachers have shown positive attitude towards group work Group work is an effective way to enhance learning and skills
3. Practice	<ol style="list-style-type: none"> Most of the roles mentioned in the model (Rahman, 2018) were practiced well by the majority of the teachers. Faced problems in- <ul style="list-style-type: none"> ● Group Formation ● Tracking Group Work ● Cross-checking ● Concept Development ● Assessment 	<ol style="list-style-type: none"> Most of the roles mentioned in the model (Rahman, 2018) were practiced well by the majority of the teachers. Faced problems in- <ul style="list-style-type: none"> ● Group Formation ● Cross-checking ● Concept Development ● Assessment 	<ol style="list-style-type: none"> Teachers face difficulties in forming heterogeneous groups Teachers need more training on keeping the discussion student-centered Group work is practiced less in the rural areas Problem in Class Management No specific strategy for Assessment
4. Challenges	<ol style="list-style-type: none"> Large number of students Time management Seating arrangement Inattentiveness Lack of resources Location of the school Workload 	<ol style="list-style-type: none"> Large number of students Seating arrangement Time management Lack of resources Workload Location of the school 	<ol style="list-style-type: none"> Time Constraint Class Size Inattentiveness Workload of the teachers Infrastructural Support Lack of Resources Location of the School
5. Way out	<ol style="list-style-type: none"> Decrease the number of students Increase class duration Using tables Using interesting resources Provide resources Using microphone Reducing the number of classes 	<ol style="list-style-type: none"> Decrease the number of students Using tables Increase class duration Ensuring availability of resources Reducing the number of classes or subjects taken by the teacher Using microphone and considering the surrounding environment before building the school 	<ol style="list-style-type: none"> Keeping limited number of students Increasing class duration Making resources available Reducing the workload of the teacher Changing the seating arrangements Using microphones and considering the surrounding environment before constructing the school

Chapter 5: Discussion

Major findings of the study are discussed in this chapter. The findings are compared to the findings of previous research works conducted on the similar topic. The purpose of this study is to explore teachers' knowledge, attitude and practice of group work and to identify the challenges teachers face and to find possible way outs to ensure better implementation of group work in primary science classes of Bangladesh. In the previous section, major findings for this study were identified. This section discusses how these findings are affecting or will affect the implementation of group work.

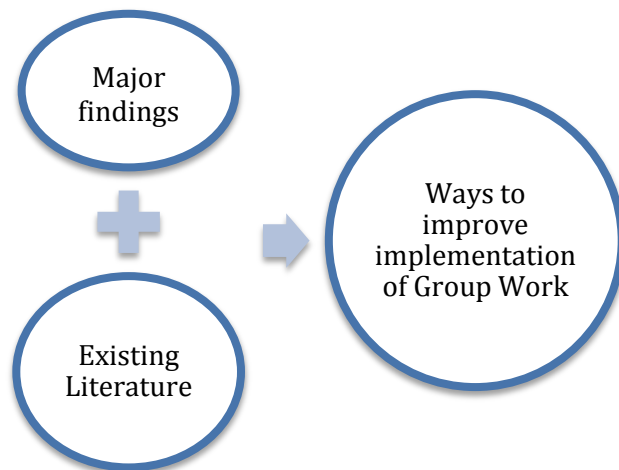


Figure 5. 1 Plan for the discussion chapter

5.1 Teachers' Knowledge about Group Work

The first research question of this study was 'What is teachers' knowledge about facilitating group work?' From the analysis of collected data the following themes have emerged.

Teachers have adequate knowledge about planning and conducting group work

As evident from the interview data, primary school science teachers of Bangladesh have adequate knowledge about facilitating group work. Most of the teachers in both rural and urban areas know how to plan and conduct the lessons using group work. This result goes in line with the findings of Samuel (2020) where he found that Nigerian teachers have a good knowledge of group work.

Various researches (OECD, 2017; Khalid et. al 2021) have found a positive connection between teacher's knowledge of teaching strategies and students' achievement. Pedagogical knowledge enables teachers to make 'informed pedagogical decisions' (OECD, 2017) which involves lesson designing, making on the spot decisions about students' learning etc. As the teachers of Bangladesh have an adequate knowledge about group work it is expected that they will be able to implement it in their classrooms effectively which will enhance their students' achievements.

Inadequate knowledge about few roles

Though most of the participants of this study have adequate knowledge about conducting group work, however, some of the teachers in both urban and rural areas have misconceptions about a few roles (Karmina, 2021). In the interview, one teacher mentioned that he thinks that giving general instruction to the whole class is enough for the students to understand the task and he does not require to go to the groups individually and explain again. Another teacher did not find it important for the teacher to check on students' progress or give any feedback while they are working in groups. This data clearly shows a lack of teachers' knowledge regarding those roles. Both the findings are consistent to the findings of Tan (2015).

Tan (2015) claims that without the clear instruction and constant guidance from the teachers, groups cannot function effectively and attain the desired cognitive and social skills. Lack of teachers' knowledge about the importance of providing feedback and giving individual instructions might result in students' failure to acquire the intended knowledge and social skills. Karmina (2021) found that teachers' lack of understanding about group work resulted in their difficulty to implement this strategy. For the better implementation of group work the Bangladeshi teachers must be made aware of the importance of teachers' role during cooperative learning.

5.2 Teachers' Attitude towards group work

The second research question of this study was 'What sort of attitude is presented by the primary school teachers towards using group work in science classes?' Data from the questionnaire regarding Bangladeshi science teachers' attitude towards group work can be discussed under the following themes.

Teachers have shown positive attitude towards group work

All the teachers have shown a positive attitude towards group work. All of them consider this as an effective strategy for teaching science. This result is consistent with the findings of Adamseged (2015) where the primary school teachers of Addis Ababa had shown a positive attitude towards learning in small groups. Adamseged (2015) also argues that the impact of implementing different strategies in the classroom relies mostly on the attitude of the major stakeholders (Teachers and Students). Therefore, teachers with a positive attitude towards group work will be able to implement the strategy successfully in their lessons when the other challenges are met.

Another finding of this study shows that the rural teachers with more positive attitude towards group work implemented it in their classrooms better. However, a negative relation was found between urban teachers' attitude and practice which is very unusual.

Group work is an effective way to enhance learning and skills

Participants of this research agreed that group work is more student-centered and it improves social and science process skills in students, such as critical thinking,

communicating, being respectful and making informed decisions. Research findings of Johnson & Johnson (1999, as cited in Rahman et al., 2010) also suggests the same.

Adamseged (2010) stated that the attitude of a person can shape how that person thinks, feels, understands and behaves. As the teachers think that cooperative learning has a significant impact on students' achievement, this attitude will help them to facilitate students' learning through the use of group work, when necessary, knowledge and skills to operate group work is provided to them.

5.3 Practice of Group Work in Science Classes

This research intended to find out the answer to the question- How is group work being practiced by the teachers in primary science classrooms? The data from teachers' interviews and lesson observation reveal the following findings.

Teachers face difficulties in forming heterogeneous groups

In both rural and urban schools, the participant teachers found it difficult to form heterogeneous groups by considering individual student's learning ability and personality as there are more than fifty students in the class. They opted for forming the groups according to the students' seating arrangement. Tan (2015), reported similar findings in his study. In heterogeneous groups students of different abilities work together and both benefit from it as peer assistance comes naturally (Adamseged, 2015).

This study reveals that the teachers in Bangladesh do not have a proper strategy of grouping students which supports the findings of Rahman (2021). The teachers in the interview accepted that forming groups based on seating arrangements is not an ideal technique which shows that they have the knowledge about forming groups. However, due to time constraints they cannot form heterogeneous groups.

Teachers need more information about the group formation process as it is vital for the successful implementation of group work. Most of the participants mentioned that it is time consuming to form heterogeneous groups. One of the participant teachers had set the groups previously and whenever he practices group work in class, students can easily form the groups in no time. This can be a good idea. However, working with the same group members might limit their opportunity to meet more of their

peers and hamper the development of their social skills. Therefore, Kagan and Kagan (2007) suggest that all four types of grouping strategies (random, heterogeneous, homogeneous and student-selected) can be used throughout the school year. The idea of predetermined grouping and using different types of group formation can resolve the issue of group formation in large classes.

Teachers need more training on keeping the discussion student-centered

Most of the students discussed with their group members spontaneously. Teachers monitored their work and provided feedback. However, it was evident that the cross-checking and summarizing roles were mostly lecture based whereas it was supposed to be a student-centered discussion among the teacher and students. When it comes to the concept development role teachers fail to keep the discussion student-centered. This finding is in line with the findings of Tan (2015) where the practice of 75% of the participant teachers' (China) teaching modes were mainly as traditional teaching even though they were applying group work. Gillies and Boyle, (2009) also found, 'Grouping practices were aimed at maintaining control and on-task attention and maximizing individual and teacher directed learning.'

In both urban and rural areas, the teachers have the knowledge about group work however they do not understand the essence of cooperative learning. It is a complex process where teachers have to provide students with the opportunity to communicate and reflect on their ideas (Sternberg & Grigorenko, 2004) as well as scaffold and mediate students' learning (Gillies, 2004; Webb, 2009).

Teachers lack in the skills of scaffolding students' learning. As a result, co-construction of knowledge through the discussion between teacher and students which is the main theme of group work was absent in most of the classes. Training teachers with the required skills of facilitating the discussions is required (Lopata et al., 2003; Gillies, 2008 and Karmina et al. 2021).

Group work is practiced less in the rural areas

It is mentioned by most of the rural teachers that their students are not used to this strategy of learning as the use of group work is not very common in the rural schools. Therefore, students find it difficult to maintain group norms and complete the task. Tan (2015) mentioned, 'Influenced by the traditional idea, students pay more attention

to the competition between them. They don't realize the benefits that cooperative learning brings to them, so they don't learn cooperative learning skills actively.'

Teachers suggest that by practicing group work more in the classrooms students will have a clear idea of how groups should function and reap the benefits of this teaching strategy. Smith (1996) mentioned, 'Doing something cooperative regularly helps build a habit of cooperation.'

This research found that students in rural areas face difficulty in understanding the group learning process as they are not familiar with this kind of learning. As a result, rural teachers find it difficult to conduct group work in class. However, Gillies and Boyle (2009) suggest that teachers should train the students on interpersonal skills and prepare them for their small-group experience before assigning the task. This will help students to understand their role and it will be easier on the teacher's end to conduct the class as well.

Problem in Class Management

In this study, the participant teachers faced problems in class management during the group work. Some students were inattentive, some were busy in irrelevant discussions with their friends. This is consistent with the findings of Gillies and Boyle (2009) and Tan (2015). In their research, the participants claimed, '... there is usually more socializing than working and it becomes difficult to make the students listen to the teacher.'

Students need to understand how they are to work together. Only then can they benefit socially and academically from the small-group experience (Gillies & Boyle, 2009). This needs to be pointed out that none of the participant teachers explained the group working skills to the students before starting the group task. Researchers put emphasis on training the students on group skills like positive interdependence, individual accountability (Johnson & Johnson, 1990, as cited in Adamseged, 2015), communication and conflict management (Adamseged, 2015) to make the groups more task focused and attain higher learning outcomes (Gillies and Boyle, 2009).

None of the participants in this study acknowledged the need of explaining the group learning skills to their students before starting the task which leads to mismanagement in the classroom. The Bangladeshi teachers need to be made aware of the impact of

explaining the group norms and emphasizing the social skills they want their students to achieve in order to ensure achievement of the group outcome.

No specific strategy for Assessment

As evident from the observation and interview data, primary school teachers of Bangladesh do not have a structured manner of assessing students' achievements through group work. Most of the teachers assessed students' achievement of social skills by observing their participation during the intra group and inter group discussions. For the achievement of content knowledge, they relied on asking oral question-answers to a few students only. No use of specific or structured format of assessment was observed which can be used further to evaluate students' progress. Time constraint and a lack of idea regarding assessment strategies are the reasons behind this (Talukder et al., 2021).

Previous research of Talukder et al. (2021) found lack of information in the training program of Bangladesh about the assessment process associated with different teaching strategies. According to Forsell et al. (2021) '...teachers need better management strategies for high-quality group work assessment that takes validity, fairness, and reliability into consideration.'

Therefore, it can be concluded that more information and training about the assessment process is required for the Bangladeshi teachers or else the implementation of group work will not be fruitful for the students' progress.

5.4 Challenges and Way outs

To explore the challenges faced by the teachers and the possible way outs to them, were the central phenomena of the fourth and fifth research questions of this study respectively. The following challenges and their way outs have been found from the teachers' interviews.

Time Constraint

According to Chiriac and Frykedal (2011), 'Group work is time-consuming and requires more time than just the period of time allotted in the school schedule.' This finding is consistent with the findings of this study. Here, the participants have mentioned that the class time is not sufficient for applying group work as it involves

so many phases- group task, monitoring, presentation, summarizing and assessment.

A few teachers have mentioned that they had to skip the assessment and summarizing due to the lack of time which goes in line with the findings of Forsell, Frykedal and Chiriac (2021). Lack of time limits teachers' opportunities to collect evidence about students' learning and hampers the reliability of the assessment process. As the teachers are always in a hurry to complete the lesson within allotted time, they might not be able to follow all the roles. Therefore, construction of knowledge and attainment of social skills by the students might remain incomplete.

As per the participant teachers' suggestion, lesson time for science classes need to be increased if we want to implement group work successfully. Whereas some researches support this idea (Lavy 2012, Jensen 2013 as cited in Dorji & Wangchuk, 2022), some studies also oppose this (Mayer & Van Klaveren, 2013 as cited in Dorji & Wangchuk, 2022). Whether the class time should be increased or not is still debatable and the policy makers should take it into consideration. However, another way out for the time constraint can be allowing particular space for group work during the staff meetings for curriculum planning (Baines et al., 2015). Which means, specific time can be allotted for group work in the school timetable and all the subjects can use this time by rotation. This idea worked successfully in the participant schools in England (Baines et al., 2015). Our school authorities can also think about keeping a specific time for using group work in the weekly time table. In this way the time constraint issue can be resolved.

Class Size

In most of the observed lessons, the number of students was nearly fifty. Due to the seating arrangements teachers had formed five to six groups and each group consisted around ten to twelve students. Whereas, according to Tan (2015), cooperative learning groups should ideally have four to six students.

In the interview teachers mentioned that it is very difficult to ensure all students' participation in such large groups. They also cannot form smaller groups because then it will not be possible for them to monitor so many groups within the short class time. 'Large groups decrease each member's opportunity to participate and often results in some members not actively contributing to the group's work. In situations where there

is a shorter amount of time available to complete a group task, such as an in-class collaborative learning exercise, it is suggested that smaller groups are more appropriate' (Rahman, 2021). For ensuring the participation of each member of the groups, to make group formation easier the number of students in every class should be balanced.

Inattentiveness

A few teachers have mentioned that students are sometimes inattentive during group work. The same was observed in a few of the lessons as well. This finding goes in line with the study of Tan (2015). If the students are inattentive and not taking part in the group task with other members it can be challenging to implement group work. Because group work is not simply sitting in a group and listening to people talk; giving and receiving help from each other and sharing of ideas and materials among all group members are equally important (Johnson & Johnson, 1990 as cited in Adamseged, 2015). If the teachers are unable to grab all students' attention, then the achievement of the knowledge and skills at individual level cannot be ensured.

Providing feedback from time to time, random oral questioning (Adamseged, 2015) to ensure individual accountability can increase the level of students' involvement. In this study, all the participant teachers have mentioned following these strategies to ensure participation of all students.

Another suggestion that came from the teachers is the use of materials during the group tasks to make it more interesting. Tan (2015) emphasized on making the tasks more interesting as it will motivate the students to get involved in the learning process. It was observed that all the tasks were conducted in the same manner- *discussion in group*>*presentation of group work*>*summary*. There was no variation in the tasks. Teachers need to explore different strategies of conducting group work like envoy, gallery walk etc. (Goodrum, 2004) other than discussion and writing points. These variations might grow interest in the students and they'll take part in activities spontaneously.

Workload of the teachers

Most of the primary teachers in Bangladesh claim that they are burdened with a huge workload (Talukder et al., 2021). They have to take so many classes per week and

have to teach more than two subjects to students from different grades. Group work requires careful preparation like- finding suitable tasks and arranging for the resources (Gillies & Boyle, 2009). All these require a good amount of time. As it becomes really difficult for the teachers to prepare for so many lessons, the implementation of group work might not be successful.

The teachers insisted on reducing their workload. To ensure that Dorji & Wangchuk (2022) suggests that the governments should reconsider the teacher-student ratio and the number of staff in each school and make sure that teachers do not have to teach more than two subjects.

In 2020, the teacher student ratio in Bangladesh at primary level was 1:28 (Salahuddin, 2021). However, in the government primary schools where this research was conducted, the teacher student ratio was nearly 1:50. This shows that the teacher student ratio varies from school to school. In some schools there are more teachers compared to the number of students whereas it is the opposite scenario in some other schools. In order to ensure that teachers are not burdened with work and can plan student-centered lessons properly, the ratio of teacher and students needs to be balanced.

Infrastructural Support

The study of Adamseged (2015) and Chiriac and Frykedal (2011) found that the seating arrangements of the students were not suitable for the implementation of group work which is in line with the findings of this research. Most of the participant teachers mentioned the traditional benches used in Bangladeshi classrooms as a problem for implementing the group work. Long benches create hindrance in students' face to face interaction. The congested seating arrangement makes it difficult for the teachers to move around the classroom and monitor the students. Constant monitoring of the teachers is vital to ensure accurate completion of the task and effective team interaction (Smith, 1996). Based on the previous research it can be concluded that the current seating arrangement in the schools of Bangladesh is not suitable to acquire cognitive and social skills through group work.

The teachers therefore suggested the use of tables instead of benches to mitigate this problem. This suggestion echoed in the study of Brooks (2012) where it was

mentioned that roundtable seating arrangements lead to the practice of more active learning activities by the teachers and students. Thus, resulting in improved learning outcomes. As activity-based lessons are being encouraged in our curriculum and textbooks, our authorities need to realize the need of changing the classroom decorum accordingly.

Lack of Resources

Interview data reveals that there is a lack of resources which are needed for the successful implementation of group work in science classes. Required resources like books, space and equipment should be readily available for the student-centered activities (Rahman, 2012; Beatrice, 1987). Lack of resources might encourage the use of traditional strategy of lecture based teaching among the Bangladeshi teachers.

Participant teachers urge that the schools need to provide them with the necessary resources. However, being a developing country with a poor economy this can be challenging. Rahman (2012) suggests that providing the teachers with ideas of using local resources for teaching science instead of the sophisticated equipment can reduce this problem. Research suggests that the use of local teaching aids results in a better understanding of science concepts (Driver & Oldham, 1986 as cited in Rahman, 2012).

Location of the School

Some of the schools included in this study were located in noisy and crowded places like beside the main roads or beside a market. Previous research (Shaaban & Abouzaid, 2021) has found that, 'Noise can affect the educational processes, both teaching, and learning. According to Tiesler et al., 2013, 'Students who were subject to chronic road noise during class hours reported significant academic performance and achievement impairments. It is evident from both the interview data and observation data that it was difficult for the students and teachers to hear each other. The success of the group works involves interactive and extensive discussion, explanation and sharing of experiences among the students and teachers (Adamseged, 2015). Due to the noise pollution around the schools managing and conducting group works will be difficult.

Teachers have suggested using microphones so that students can hear them clearly.

However, this will add to the noise pollution only which will be harmful for the students' health (Shaaban & Abouzaid, 2021). To improve the conditions around these schools and make it favorable to apply group work, way outs such as sound walls and proper insulation of windows are suggested by Shaaban and Abouzaid, 2021.

5.5 Understanding the Research Problem and Possible Way outs

The Figure 5.2 above tries to connect the findings of this study to the research problem to find a way out. This study intended to understand the present situation of using group work at primary level from the teachers' perspective; their knowledge and attitude towards this strategy and their classroom practices to identify ways to implement group work fruitfully in primary science classes of Bangladesh. Figure 5.1 gives a brief idea about how the findings of this study can reduce teacher's struggle and ensure better implementation of group work in Bangladesh.

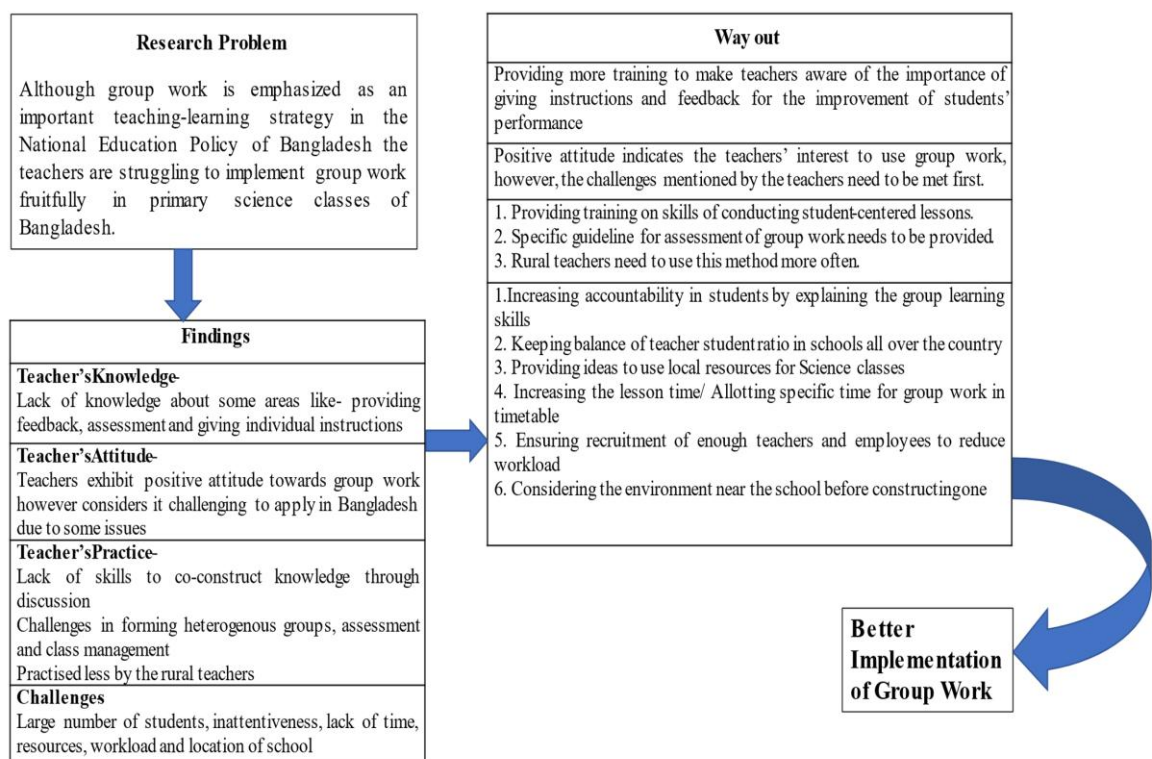


Figure 5. 2 Overview of the findings

Chapter 6: Implications and Conclusion

This chapter will summarize the answers to the five research questions set for the study. Implications of the study for the policy and for practice in classrooms to ensure better implementation of group work in primary science education of Bangladesh and recommendations for further research are presented in this chapter. Concluding remarks from the researcher is also included.

6.1 Implications

The findings of this study can be beneficial to different stakeholders of primary science education in Bangladesh. Implications of the study are mentioned below.

Implications for the Practice

This study gives the teachers an idea about the challenges which may arise while applying group work in class and also provides them with the possible way outs to them. The primary school science teachers of Bangladesh can utilize these findings and improve their practice of group work in the classroom.

- Major findings of this research suggest that teachers are not forming the groups properly due to time constraint. They can use the predetermined grouping idea which is mentioned in this study.
- Another suggestion is that, the teachers need to explore different strategies to make the task more interesting.
- This study also emphasizes that rather than relying on the school for providing resources the teachers need to be proactive in finding local resources to be used in their lessons.

Implications for Policy

Findings of the study also have some implications for the policy makers. They can take these suggestions into consideration for the improvement of the conditions.

- Several findings indicated the need for training the teachers regarding the implementation process of group work. Teachers' training programs in Bangladesh need to provide teachers with the proper guidelines on group formation, teachers' role and assessment strategies associated with group work.

- Lack of resources and time, workload and noise pollution around the schools were mentioned by the teachers as challenges for applying group work in class. The school authorities must take necessary roles to resolve these issues.

6.2 Limitation of the study

This study has some limitations. It was a small scale academic study hence it was conducted on a very limited sample.

The researcher had access to collect data from the government primary schools of two districts of Bangladesh only. Private schools were unwilling to take part in the study. As it was difficult to select schools it was not possible to ensure participation of equal numbers of male and female teachers. Moreover, due to time constraints, only two lessons of each participant were observed which is not sufficient for understanding their teaching practice properly.

However, in order to have a better understanding of the Bangladeshi teachers' perspectives on group work, further research can be conducted with a larger and more diverse sample.

6.3 Implication for further research

Based on the findings of this research, further research on the following topics is recommended-

1. One of the findings of this research indicates that the use of group work is not very common in the rural areas. Further research is suggested to explore this concept.
2. This research was mainly conducted before the COVID-19 pandemic. Future research can focus on the current practice of group work in post-COVID situations.
3. Teachers' perspectives about group work were focused in this research. New research can be done to explore students' perspective on the strategy.
4. Focus of this research was on the government primary schools. Research can be conducted on the use of group work in non-government primary schools.
5. After COVID- 19, virtual classes have become more common in our country, the opportunity and feasibility of using group works in various online platforms can be explored.

6. Negative relation between urban teachers' attitude towards group work and their practice can be an interesting topic for future researchers.

6.4 Answer to the research questions

The following answers for the five research questions were drawn from the analysis and discussion of data.

6.4.1 Answer to Research Question 1: What is teachers' knowledge about facilitating group work?

- Teachers have adequate knowledge about most of the roles they have to play during group work. It is expected that they will be able to plan for a lesson using group work properly.
- Teacher's lack in knowledge regarding giving individual instruction, providing feedback and assessment process of group work. More information regarding these process needs to be shared with the teachers.

6.4.2 Answer to Research Question 2: What sort of attitude is presented by the primary school teachers towards using group work in science classes?

- Teachers have exhibited a positive attitude towards group work. It is expected that teachers will apply this strategy in their classes.
- They believe this strategy is useful for enhancing students' knowledge and social skills. Challenges like large class size, time constraint and workload of teachers are the challenges which might demotivate them from using this strategy in class.

6.4.3 Answer to Research Question 3: How is group work being Practiced by the teachers in primary science classrooms?

- Group work is practiced less in the rural areas. As a result, the students in rural areas face difficulty in understanding the process of working in groups and learning the concepts.
- Sometimes it becomes difficult to complete the lesson within the given time. Teachers often cannot practice cross checking of groups' findings and assess students properly due to time constraints.

- Teachers do not follow any specific strategy for assessment of students' knowledge and skills.
- Teachers lack in the skills to conduct student-centered discussions. Co-construction of knowledge is often absent in the classes.
- Teachers struggle in forming heterogenous groups.

6.4.4 Answer to Research Question 4: What challenges are faced by teachers while applying the Group work in the classroom?

- Due to lack of time lessons cannot be completed sometimes.
- A large number of students in classroom makes it difficult to form groups considering students' ability, gender and personality traits. Monitoring students' work also becomes difficult in a large class.
- Seating arrangements are not favorable to foster face to face discussion among students.
- Students are often inattentive and not interested in the task. They do not take part in group task actively. Maintaining discipline is a challenge for some teachers.
- Planning and conducting lessons using group work is time consuming. As the teachers have to take too many classes in different grades it becomes difficult for them to use group work frequently.
- Location of the school has been found as challenge for some schools. Noise outside was so loud that students could not listen to the instructions the teachers gave. As a result, they had to repeat the instructions several times which was time consuming.

6.4.5 Answer to Research Question 5: How to overcome the challenges of applying group work in the classroom?

- Training on skills of conducting student-centered lessons is required for the teachers to understand the essence of group work. Training should also be provided to make teachers aware of the importance of giving instructions and providing feedback for the improvement of students' performance.

- Positive attitude towards group work indicates the teachers' interest to use group work, however, the challenges mentioned by the teachers need to be met first.
- Specific guideline for assessment of group work needs to be provided.
- Rural teachers need to use this strategy more often.
- Increasing accountability in students by explaining the group learning skills will ensure discipline in the class as well as students' participation.
- Balance of teacher student ratio in schools all over the country needs to be ensured.
- We have to accept the fact that as a developing country our resources are limited. To resolve this issue teachers, need be encouraged to use local resources for science classes.
- Increasing the lesson time can be a way out for the time constraint. However, allotting a specific time for group work in the timetable can also be considered.
- Recruitment of sufficient number of teachers and employees based on the number of students to reduce workload on the teachers should be ensured.
- Considering the conditions surrounding the school before constructing one is a must to ensure proper teaching-learning environment.

6.5 Concluding Remarks

This study provides an insight into the knowledge and attitude of the primary school science teachers of Bangladesh. It gives us a glimpse of the current practice of this strategy in our science classrooms. Although the teachers have adequate knowledge about this strategy of teaching and they consider it as an effective way of teaching science as well as making the children socially responsible, they do not find it easily applicable in Bangladeshi schools. Lack of resources, large number of students, short lesson time and workload of the teachers do hamper the practice of the group work by the teachers. Teachers' misconception about the process of implementation of this strategy is another hindrance for the successful implementation of this process. Besides all these challenges, the teachers of Bangladesh are still positive about using this strategy as they believe this strategy not only makes them learn the topic better but also makes them confident and more social.

While conducting this study, my personal insight about group work has changed a lot. While collecting evidence for this research, I have understood that group work can be beneficial for concept development as well. Letting the students take the responsibility of their learning and elaborating their concept by sharing their prior knowledge with each other not only makes learning enjoyable but also increases their mastery of the topic. I think these new perceptions will help me to implement the group work more effectively in my classroom and help my students excel academically and socially.

In order to make our students ready for the challenges of the twenty-first century we need to bring about a change in our traditional teaching-learning strategies. Group work is an excellent way of providing academic knowledge as well as social skills to the students. It is really assuring to see that despite having so many challenges, the teachers of Bangladesh are still trying to practice this strategy in their classroom. However, proper planning, identifying the teacher's and students' role and appropriate assessment of students' achievement are all crucial to achieve the complete benefit of applying this strategy.

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Appendices

Appendix 1: Semi-structured Interview for the teachers (Part A)

1. Which type of approach do you prefer for group work?
 - a. Collaborative Approach: Two or more students jointly work out a single way out to a problem
 - b. Cooperative Approach: Divide the task into small parts and each member completes one of the parts
2. How did you apply the approach in your classes?
3. Which type of task do you prefer to select for the groups?
 - a. Solving a worksheet (set of questions)
 - b. Conducting and explaining an experiment
 - c. Topics that require elaborate discussion among groups members
4. Mention the topics that you chose for your lessons and explain why you had chosen them.
5. What are the factors that should be considered while forming the groups?
6. How did you form the groups in your lessons?
7. How do you provide specific instructions for all groups before starting the task?
8. Is it necessary to provide instructions individually for each group? What is the importance?
9. How did your students maintain group norms in group activities?
10. How did you ensure that the groups are working as per expectation?
11. What is your opinion about the importance of presenting the group work?
12. Did all of your students get the opportunity to present their work?
13. What was your role during their presentation?
14. Is it important for the students to cross check their ideas with that of the other groups? Why?
15. Was there any scope for cross checking the ideas in your lessons? Give examples.
16. What was the process of summarizing the ideas and developing the concept? How did you assist?
17. How did you assess the achievement of desired learning outcomes?
18. Which of these following statements do you agree with and why?

- a. I gave equal points to all the members in one group
- b. B. I assess each student based on their individual understanding and participation in the task

19. Is there any difference between the traditional class and the group work activity? Please explain.

20. What type of science process skill did the students achieve by working in groups?

21. What type of attitude and scientific values did the students achieve by working in groups?

Appendix 1: Semi-structured Interview for the teachers (Part B)

Area	Challenge	Possible Way out
Group Formation		
Group Task		
Providing instruction		
Tracking group activities		
Checking progress and giving feedback		
Presentation of group work		
Cross checking and developing summary		
Using summary for concept development		
Assessing group work		
Class management		
Time management		
Promoting social skills		
Infrastructure		
Others		

Appendix 2: Questionnaire for the teachers

Major Aspect	Statement	SD	D	N	A	SA	Reason
Group task	1. Real-life oriented tasks which have more than one correct answer and require extensive discussion should be chosen						
Group formation	2. Groups should have 4-6 members						
	3. While forming groups learning ability and personality of the students should be considered						
Giving instruction	4. Clear instruction by the teacher is important for the groups to perform the task properly						
	5. Individual instruction for all groups can be skipped as it is time consuming						
Tracking group activity and accountability	6. Assigning the role of the members ensures participation of all members						
	7. Setting up the group norms like listening, respecting opinion of others and resolving conflicts helps the groups to function properly						
Checking progress of the group work	8. Teacher does not need to monitor the progress of group work frequently						
Presentation of group work	9. Through presentation of their work students become more confident about their learning						
	10. Presentation is an excellent way to ensure participation of rather inactive members						
Cross checking and developing summary	11. Cross checking of findings from different groups fills up the gap in each group's idea						
Using summary for concept development	12. At the end of the lesson it is essential for the teacher to identify the gap in students' learning and provide feedback to develop the concept						
Assessing group work	13. Using group work learning outcome is easily achieved by all the students						
	14. All members in a group should get equal marks						
	15. All members should be assessed based on their individual understanding and participation						
Achievement of social skills and learning outcome	16. Group work is an effective strategy for teaching science						
	17. Group work develops scientific values like inquisitiveness, open-mindedness and thinking rationally						
	18. Working in groups helps students to communicate their ideas with others more clearly						

Applicability in Bangladesh	19. Considering the number of students group work can be easily applicable in teaching primary science in our schools						
	20. Achieving expected outcome within existing lesson time is difficult						
	21. I prefer using Group work for teaching science over the traditional lecture based strategy						

Appendix 3: Lesson Observation Schedule

Roles of Teacher	Major Aspect	Activity	Comment
Group Formation	Forming groups of 4-6 members considering their learning abilities, gender and personality traits		
Group Task	Mention the task chosen for the groups		
Giving instruction	Specific instruction for all groups		
	Individual instruction for all groups to ensure clarity		
Tracking group activity	Specifying the role of each member		
	Ensuring involvement of all the members		
Checking progress of the group work	Providing feedback to help the groups achieve the expected outcome		
Presentation of group work	All groups present their work in front of the class.		
Cross checking and developing summary	Discussion among students on ideas presented by other groups to draw a summary		
Using summary for concept development	Using the summary from the group findings teacher fill up the gaps to develop the concept		
Assessing group work	Teacher assesses the achievement of desired learning outcome		