CHAPTER I

INTRODUCTION

Rational for the Study

The main challenge faced in the educational sector as a whole is how to enhance the proportion of pupils who achieve the expected learning achievement, especially for different stages of school education. The School Education and Research Unit Royal Education Council, 2012 in Bhutan claimed that the learning achievement of a significant proportion of pupil enrolled in schools does not measure up the expected levels (represented in the minimum required marks) especially in rural and remote areas [1].

The status and quality of the primary education in Bhutan had been assessed through the key determinants of grade repetition and students' academic achievement. Grade repetition appeared a hallmark of the primary education system. It is reflected in the repetition status for 2001-2002 through 2006-2007, mentioned that the repetition rate (on average) stood at 8.5 percent per grade annually. It indicated that the proportion of students who are not mastering the curriculum. This could be due to a low level of overall "learning gain" [2].

The major objective of all educational systems is learners' cognitive development. The degree to which a system actually achieves is an indicator of the quality. Then, an important measure of the latter is represented by test scores which help to assess learners' achievements [2].

A report done by the National Education Assessment [3] revealed the mean test scores was only 23.08 out of 50, in numeracy. In addition, it also stated that the achievement levels of learners in core subjects, particularly mathematics, at the end of primary education were disappointingly low. Such learning levels clearly indicated the poor quality of teaching and learning in classrooms. Furthermore, World Bank's Bhutan Learning Quality Survey [4] also reported that the lowest score was in Mathematics subject and its overall rate learning was categorized low.

The students' mathematics achievement was disappointingly low in Bhutan [3]. Rabgay [16] studied the effect of using cooperative learning method on learning achievement and opinion towards science subject of the seventh grade students at Samtse Lower Secondary School in Bhutan. The results of test score analysis showed that the pretest means of the two groups were not different but the posttest mean of the experimental group (11.27) was significantly higher than that of control group (16.01), which provided the evidence that the cooperative learning was effective in improving the students learning achievement in science and suggested that there was positive change in opinion as a result of inclusion of cooperative learning. But there is no research on effect of cooperative learning on students' mathematics achievement. Therefore the researcher wanted to study the effect of cooperative learning on the students' mathematics achievement. Furthermore, the researcher felt that, when cooperative learning could improve the students' learning achievement in science in Bhutan, then cooperative learning should also improve the students' mathematics achievement as well.

But the several researcher from other countries such as Nigeria, India, Indonesia, Pakistan, and London have studied been conducted on the effect of cooperative learning on the mathematics achievement of the learners. Iqbal [5, 7, 14, 15, 17, 18, 19] had done research on the effect of cooperative learning on the mathematics achievement of the students. They have found that cooperative learning had positive effect on the students' mathematics achievement.

There is considerable evidence indicating that the goals of mathematics instruction will be better achieved when cooperative learning procedure and strategies are implemented. The implementation of cooperative learning will result in the success of the students to be more active cognitively, in problem solving, more confident in their math abilities, less anxious about learning math, more motivated to keep learning math and better able to transfer what they learnt to career situation [5].

Terim [6] stated that cooperative learning was one example of an instructional arrangement that can be used to foster active student learning, which is an important dimension of mathematical learning and is highly endorsed by mathematical educators and researchers. Students can be given a task to discuss a problem to solve, and a goal to accomplish.

Sharma and Kalra [7] supported that the teaching of mathematics was not about dispensing rules, definition and procedure for students to memorize, but engaging students as active participants through discussion and collaboration among students. Learning will be more successful if students are given opportunity to explain or clarify ideas [8].

Mathematics education offers students specific opportunities for cooperative learning with purpose in view to put it differently and to make the general more specific. The content of mathematics allows for a specific model of cooperative learning that can order to accommodate individual differences among students. In a cooperative learning environment student of different abilities become more involved in the task. Students in the cooperative learning setting improve their problem solving skills and develop their mathematical understanding.

In the cooperative learning, the implementation of the exchange of knowledge settings promotes students' active explorations. A close examination of the nature of students' activities increase students' mathematical communications. Students receive verbal explanation is the predominant type of help. Students' attitudes towards the exchange-of knowledge method were positive. All these behavior ultimately leads to higher mathematics achievement [9].

Learning is a social process in which children grow into the intellectual life of those around them. Mathematical ideas and truths, both in use and in meaning, are cooperatively established by the members of a culture. Thus, the cooperative learning classroom is seen as a culture in which students are involved not only in discovery and invention but in a social discourse involving explanation, negotiation, sharing, and evaluation [10].

Ajaja [11] tried to determine how the adoption of cooperative learning as an instructional strategy for teaching Integrated Science influences students' achievement and attitude towards studies in Nigeria. He found how moderating variables like gender and ability affect students' achievement in investigated Science when cooperative learning is used as an instructional strategy. The major findings of the study included a significant higher achievement test scores of students in cooperative learning groups than those in a traditional classroom; a significant higher attitude scores of students in cooperative learning groups than those in traditional classroom; a

significantly higher achievement test scores of all students of varying abilities in cooperative learning group than those in a traditional classroom; a insignificantly difference in achievement test scores between the male and female students in the cooperative learning group, and insignificant interaction effect between gender and ability, gender and method, ability and method and among method, gender and ability on achievement.

Iyer [12] analyzed the effects of cooperative learning in a classroom to see its impact on student learning in Hyderabad. Also, elements of cooperative learning are discussed and its influence on students' achievement. The result of the study indicated cooperative learning promotes a thought provoking and interactive environment for the students. The instructions and activities based on cooperative learning are creative, thought provoking interactive and offer ideas for how the students can live the value in practice and find the answers within themselves. Cooperative learning can be utilized to enhance and promote higher student achievement.

Furthermore, many researchers have found the evidence of the effect of cooperative learning on the students' mathematics achievement. For example [7] conducted the research to study the effect of cooperative learning strategies on students' achievements in mathematics at elementary level in Indonesia.

Findings of the research revealed that the children who studied in collaborated collectively in the cooperative learning strategy obtained a significantly higher achievement in mathematics than the students who exposed through traditional method of teaching. He further stated that it may be concluded that in order to develop mathematics as well as achievement in mathematics, teachers must implement the cooperative learning strategies in the classroom at particularly elementary and secondary level.

Rahim and Al-Shakili [13] conducted research to determine the impact of the cooperative learning strategy on academic achievement and retention of the information and trends of student in Pakistan. From the research concluded that there was no significant statistical difference in achievement and retention between a cooperative learning group and a traditional learning group, but there was a significant statistical difference in the trends towards the teaching method for the benefit of a cooperative learning group.

Moore [14] investigated the impact of cooperative learning calculus experience of non Asian ethnic minority engineering students. Finding of the study indicated the cooperative learning calculus program was successful in improving retention and academic achievement rates for colored freshmen engineering students. Similarly Panitz [15] conducted research on cooperative learning with the hope of encouraging teachers to use cooperative learning. He concluded that a cooperative learning technique, when used extensively in mathematics classes, could generate many advantages for teachers and students.

Iqbal [5] conducted research to examine the effect of cooperative learning on academic achievement of secondary school students in mathematics in London. From this research he concluded that cooperative learning is more effective as a teaching-learning technique for mathematics as compared to traditional teaching.

The students in the cooperative groups outscored the student working in traditional learning situation, but the cooperative groups have no obvious supremacy over students taught by the traditional method in retaining the learnt mathematical materials. The low achievers in the cooperative groups have significant superiority over low achievers learning mathematics by the traditional method. Thus, cooperative learning is a very effective method for teaching mathematics to low achievers.

They have further stated that some of the reasons behind the positive effect of cooperative learning are positive attitude toward mathematics [11]; thought provoking and interactive environment [12] and students willingness to learn [20, 21, 22, 23]. further added there will be the positive effect of cooperative learning on students' mathematics due to following reasons:

1. Addressing the scientific concepts through different activities makes students more interesting, more exciting and more participating.

2. Direct reinforcement was considered during the process of implementing various activities for learning principals, concept and skills.

3. Providing opportunities for dialogues and free debate gave special consideration to the intelligence, abilities and inclination of students at primary stage.

4. Providing an opportunity for the group member to learn from each other.

5. Generating more interest in mathematics and making it more enjoyable.

Johnson, Johnson and Stanne [24] summarized that cooperative learning strategies are widely used because they are based on theory, validated by research, and almost any teacher can find a way to use cooperative learning methods that are consistent with personal philosophies. Therefore amongst various teaching strategies researcher would like to select cooperative learning as an intervention and study its effect on the students' mathematics achievement in Bhutan.

Furthermore education policy in Bhutan is strongly influenced by the theory Gross National Happiness (GNH) [25]. In Gross National Happiness inspired learning, the learner is seen as a whole individual. Instead of focusing on a narrow set of job-specific skills, GNH- inspired learning seeks to include a common set of core skills which include social skills [26].

However, it is generally observed that students at all the levels lack social skills. They are not active in the classroom discussion, asking questions and raising issue, generating new ideas, expressing opinions etc [27]. Therefore the researcher would also like to find out whether the cooperative learning can improve students' social skills or not.

Research questions

1. What is the difference in the students' mathematics achievement in pre-test of experimental and control group?
2. What is the difference in the mathematics achievement of the pre-test and post-test of experimental group?
3. What is the difference in the students' mathematics achievement of control group and experimental group in the post-test?
4. What is the difference in the social skills of the experimental group, before and after cooperative learning?

Research objective

1. To compare the students 'mathematics achievement of pre-test of experimental and control group.
2. To compare the mathematics achievement of pre-test and post-test of the experimental group.

3. To compare the mathematics achievement of post-test of experimental group and control group.

4. To compare the social skills of experimental group, before and after cooperative learning.

Research hypothesis of the study

1. Students' mathematics achievement in pre-test of experimental group and control group is not significantly different.

2. Students' mathematics achievement of the experimental group will be higher in the post-test than that in the pre-test.

3. The students' mathematics achievement in the post test of experimental group will be higher than that of the control group.

4. Students' social skills in the experimental group will be higher after cooperative learning than before cooperative learning.

Significance of the study

1. It is beneficial to the students as it would bring some changes in students' attitude toward mathematics. Students would learn to solve the mathematics problems in a constructive way.

2. It would improve the students' interest in learning mathematics.

3. It would make all the Mathematics teachers of Bhutan aware of the effectiveness of the cooperative learning method in teaching and learning mathematics.

4. It would help mathematics teachers to bring some positive changes in their teaching style for the betterment of the students.

Research instrument

1. Achievement test was administered as pre-test and post-test.

2. Social skills checklist was used to find the effect of cooperative learning on students' social skills by comparing the social skills before and after the cooperative learning.

3. Lesson plans (24 lesson plans) designed by researcher was also administered as cooperative learning instruction.

Scope of the study

1. Location of the study

This study will be carried out in the Mendrelgang Primary school. It is one of the oldest school established in the year 1962. It is located in Tsirang district, which is at the south west of Bhutan. There are 389 students and 17 teachers in the school. The standard ranges from class pre primary to class six. There are twelve sections altogether (PP, I A, II A, II B, III A, III B, IVA, IV B, VA, VB, VI A and VI B). The number of students enrolled in each class room is shown below:

Table 1 Number of students enrolled in each class

SI. No	Class and section	Number of students
1	PP	40
2	I	39
3	II A	29
4	IIB	30
5	III A	27
6	III B	26
7	IV A	39
8	IV B	40
9	VA	36
10	VB	37
11	VI A	23
12	VI B	23

Source: Survey data, 2014

Content

The content chosen for the experiment is a whole unit of the class six mathematic syllabuses. The title of the unit is Fractions. In this unit there are two chapters. The first chapter is about relating fraction and the second chapter is about relating fraction with decimal. The chapter one is divided into six sub- topics and chapter two into three sub-topics as follows: [28]

Chapter 1 Relating Fractions

1. Relating Mixed Numbers to Improper Fractions
2. Comparing and Ordering Fractions
3. EXPLORE: Adding and Subtracting Fractions
4. Adding Fractions
5. Connection: Fractions between Fractions
6. Subtracting Fractions

Chapter 2 Relating Fractions to Decimals

1. Naming Decimals as Fractions
2. Game: Fraction Match
3. Naming Fractions as Decimals

These topics will further divided into 24 lesson plans based on cooperative learning techniques. Reason for selecting fractions as content is as follow:

Although fraction is used in our day to day life, many learners identify fractions as an area of mathematics that they find difficult. It is really difficult for them to explain what does the fraction means. Learners are able to draw or label fraction correctly but cannot put them in order of size, or use them to solve problem. Furthermore it is really difficult for them to add the fraction of different denominator. Therefore the researcher would like to teach fraction through cooperative learning method (experiment teaching fraction through cooperative learning method) to help them learn better [29].

Subject of the study

Six grade students studying in the Mendrelgang Primary School was the subject of this study. There were 46 students, with 23 students in class VI A and another 23 students in class VI B. Class VIA was assigned to experimental group and

VI B was assigned to control group through purposive sampling because the background of the students was same. Both the groups were supposed to contain the students of all the achievement levels (high low and average achievers). Furthermore, to make it more sure that the background of both the groups were same the researcher compared the pre-test of experimental group and control group. Researcher found that there was no significant difference in the mathematics achievement of pre-test of experimental group (M=13.09, SD=2.778) and control group (M=13.22, SD=2.255; t(44)=-.175, p=.862) which clearly indicated that both the groups are of same background.

Variables

1. Independent variable is cooperative learning method.
2. Dependent variables are students' mathematics achievement and social skills.

Definition of the terms

1. Cooperative learning

It is the teaching and learning situation where group of students study the respective content (fraction) in a small group to achieve the shared goal (work assigned), through seven various techniques of cooperative learning method, namely think pair share, team accelerated instruction, jig saw, three minutes review, STAD group investigation and round robin brain storming. These techniques will be mainly focused in the lesson activity (ies). But cooperative learning lesson plans should also contain all other component of lesson plan such as lesson introduction, lesson development, lesson activity (ies), monitoring if the activity (ies), follow up activities and lesson closure. It is carried out as follow:

Lesson introduction: Structure the ideas to focus on introducing the topic by relating the students' prior knowledge to the topic (content to be learned).

Lesson development: Gain attention and gave the activity instruction.

Lesson activity: Students learn the content through various techniques of cooperative learning.

Monitor the activity: Check the activity (ies) is started or not, check the activity (ies) carried out properly or not and assist the needy students.

Follow up activity: Use an appropriate method to help the students consolidate or to clarify the learning.

Lesson closure: Check whether the objective is achieved or not by letting students solve similar problem (s), summarize or review the key point of the lesson.

2. Direct instruction method

Direct instruction method is an instructional approach that is teacher centered. The content is presented by the teacher whereby students just follow what the teacher has presented. Or the teacher solves the mathematics problem/s to impart the concept to the students and students strictly follow the procedure taught by teacher to solve the problem/s. direct instruction lesson plan contains all the components of lesson plan such as lesson introduction, lesson development, lesson activity (ies), monitoring the activity (ies), follow up activities and lesson closure. It is carried out as follow:

Lesson introduction: Structure the ideas to focus on introducing the topic by relating the students' prior knowledge to the topic (content to be learned).

Lesson development: Gain attention and solve some problems, to impart the knowledge (teach) to the students.

Lesson activity (ies): Students will solve the similar problem (solved by teacher) following the procedure (taught by teacher) to solve the problem.

Monitor the activity: Check the activity is started or not, activity is carried out properly or not and assist the needy students.

Follow up activity: Use an appropriate method to help the students consolidate or to clarify the learning.

Lesson closure: Check whether the objective is achieved or not by letting students solve similar problem(s), summarize or review the key point of the lesson.

3. Achievement

It is the mathematics score obtained by the students in the mathematics achievement test, designed by the researcher based on the six levels blooms taxonomy on the content fraction after having taught with cooperative learning method.

4. Social skills

Social skill can be defined as foundation skills, interaction skills, affective skills and cognitive skills. Foundation skills are the basic social interaction skills such as ability to maintain eye contact, keeping appropriate personal space and understanding the gesture and facial expressions. Interaction skills are the skills that are needed to interact with others such as resolving conflicts, taking turns and learning to communicate [30].

Affective skills are the skills that are needed to understand one and others. This includes identifying one's feelings, recognizing the feelings of others, demonstrating the empathy, decoding body language and facial expression and determining whether someone is trustworthy or not [30].

Cognitive skills are the skills that are needed to maintain the more complex social interaction such as social perception, making choice, self monitoring, understanding community norms and determining appropriate behavior for different social situation [30].

Conceptual framework of the study

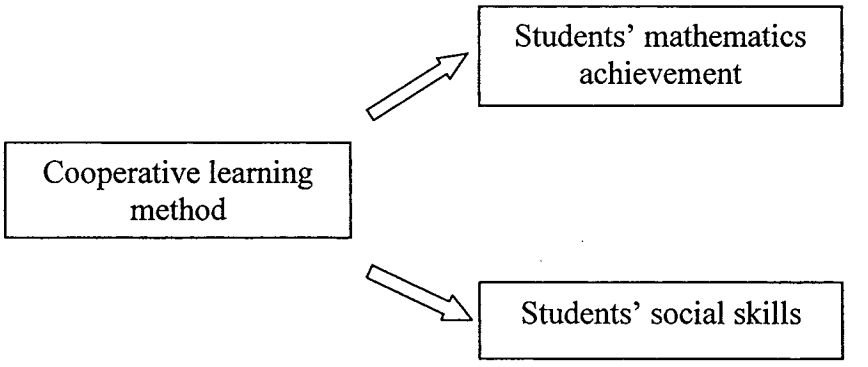

Figure 1 Conceptual framework of the study