TEACHER'S PERCEPTION AND PRACTICE ON COLLABORATIVE LEARNING

A

THESIS

BY

BHIM BAHADUR DANGI

IN THE PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER'S IN MATHEMATICS EDUCATION

SUBMITTED

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LETTER OF CERTIFICATE

This is to certify that Mr. BhimBahadurDangia student of academic year 2070/071 with campus Roll Numbear 746, Thesis Number 1378, Exam Roll Number 280377 (2073) and TU registration number 9-2-29-2068-2008 has completed this thesis for the period prescribed by the rules and regulations of Tribhuvan University, Nepal. This thesis entitled '**Teacher's Perception and Practice on Collaborative Learning'** has been prepared based on the results of his investigation. I, hereby recommend and forward that his thesis be submitted for the evaluation as the partial requirements to award the degree of Master of Education.

Date: 24 Jan, 2021

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LETTER OF APPROVAL

This thesis entitled "**Teacher's Perception and Practice on Collaborative Learning**" submitted by Mr. BhimBahadurDangi in partial fulfillment of the requirements for the Master's Degree in Education has been approved.

Viva Voce Committee Signature

Prof. Dr. Bed Raj Acharya……..

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Date: 11 Feb, 2021

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RECOMMENDATION FOR ACCEPTANCE

This is to certify that Mr. BhimBahadurDangi has completed his M. Ed. thesis entitled "**Teacher's Perception and Practice on Collaborative Learning** " under my supervision during the period prescribed the rules and regulations of Tribhuvan University, Kirtipur, Kathmandu, Nepal. I recommended and forward his thesis to the Department of Mathematics Education to organize final viva-voce.

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(Ms. SaralaLuitel)

Supervisor

Date: 11 Feb, 2021

Declaration

This dissertation contains no material which has been accepted for the award of other degree in any institutions. To the best of my knowledge and belief, this thesis contains no material previously published by any authors except due acknowledgement has been made.

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BhimBahadurDangi

Date: 11 Feb, 2021

Defence Date: 11 Feb, 2021

Dedication

To my parents

Acknowledgements

There are a lot of scholars without whom, I would not be able to form this research work. First and foremost, I would like to express my deep gratitude to my thesis supervisor Ms. SaralaLuitel, for her valuable time and suggestions throughout my research duration. Her professional guidance was valuable in every step of the study.

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As the final note of appreciation, I would like to thanks to my parents for their supportsup to now.

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BhimBahadurDangi

Abstract

Title of this research was Teacher's Perception and Practice on Collaborative Learning. The primary purpose of this research was to explore teacher perception and practices on collaborative learning in mathematics. To accomplish this objective, the researcher usedthe explanatory sequential design with purposive sampling techniques. The sample of study contained 94 school level teachers of mathematics from Nuwakot District of Nepal. The researcher surveyed a questionnaire that contained 34 items and then 8 teachers were asked to answer the semi-structured interview questions. The researcher analysed the questionnaire data using frequency by performing SPSS 21.0 setting 0.05 level of significance. Whereas, the interview data were analysed based on thematic approach. The results of this research showed that the teachers have perceive collaborative learning in mathematics, positively, however, the level of its practice was very weak. Moreover, teachers of mathematics were confident to get benefit from the collaborative learning due to increased responsibility of students in mathematics learning. Problems solving was most common strategy in mathematics teaching and learning whereas, Fishbowl debate and Double Entry Journal were least common. There were a lot of factors that made hindrance in implementation of the collaborative learning strategy in mathematics instruction such as lack of enough teaching materials and organizational support, and learning atmosphere.

Contents

Chapter I

Introduction

Background of the Study

In mathematics teaching, teachers' understanding of teaching methods, styles, and strategies are considered utter important to accomplish the national goals and standards of the national mathematics curricula. Effectiveteachers are seen to be more successful to implement the appropriate strategy in the different contents of the mathematics (Stanford University, 2018) because of their precise understanding of the teaching methods used in mathematics classroom including student-centred approach. There are a number of student-centredapproaches whichare used in mathematics classroom. Among such methods, the collaborative learning process is one.

Collaborative Learning (CL) is an educational approach to teaching and learning that involves groups of students working together to solve a problem, complete a task, or create a product. It is one of the dominant methods of teaching and learning mathematics. An effective use of collaborative learning is not so easy because it demands a range of skills and strategy such as Group Investigation, face to face interactions. Persuasive evidence that proponents of CL that the active exchange of ideas within small groups not only increases interest among the participants but also promotes critical thinking. The shared learning gives students an opportunity to engage in discussion, take responsibility for their own learning and thus become critical thinkers (Totten, Sills, Digby, and Russ,1991; as cited inGokhale, 1995). The advancement in technology and changes in the organizational infrastructure put an increased emphasis on teamwork within the workforce workers need to be able to think creatively, solve problems and make decisions as a team.

It is recognised that teachers should have positive perceptions towards the teaching methods which are used in mathematics classroom because perception influences the teacher choice of strategies (Ehindero&Ajibade, 2000) that provides learners with an ample opportunity to learn mathematics on their own pace. Due to the advancement of technology in mathematics instruction, it has become relatively easy to implement CL for teaching mathematics in the classroom.

However, in the context of Nepal, mathematics teachers generally, follow a traditional approach such as lecture method and transmission approach (Panthi and Belbase, 2017) to teach mathematics in their classroom. Freire (2003) described this approach as a banking method in which a student's mind is a bank and teacher as the processor of knowledge. Johnson and Johnson (1997) specified that, in the traditional way of teaching, students often are passive recipients of knowledge rather than being active participants due to teachers' inclination to talk at students and how students interact with one another is a relatively neglected aspect of instruction. This method is not suitable for mathematics learning because it may be unfair to some students just to continue lecturing and not giving them the opportunity for reflecting on what they learned (Panthi and Belbase, 2017). Moreover, this pedagogy encourages to develop cognitive skills rather than higher order thinking and diverse application.

The worldwide trend of the use of students centred learning in mathematics and the framework of NCTM (2000) stated: “Teachers’ actions are what encourage students to think questions, solve problems, and discuss their ideas, strategies, and solutions (p.18).” These activities encourage the collaborative learning in mathematics to develop higher order thinking skills of mathematics.

Abiding such worldwide trend and the framework, Basic and Secondary Mathematics Curricula (2005; 2008; 2012) of Nepal has encouraged the mathematics

teachers to be a facilitator in the mathematics classroom. Moreover, mathematics curriculum also emphasises collaborative learning strategies in the classroom such as pair work and sharing, group work, individual work, project work. In this point of view, many educators, mathematics educators, and educational plans and provision succinctly encouraged collaborative learning in mathematics.

Despite the mathematics curriculum that suggests collaborative learning strategies, the teachers are adopting a traditional chalk-and-talk approach in Nepalese schools (Nakawa, 2013). This trend may be lack of the use of technology in the mathematics classroom because the use of technology has not widely used yet in the mathematics classroom of Nepal (Bist, 2017). In case of mathematics learning, Nepali students still well in cognitive skills but weaker in the application and higher ability skills and the situation urges that more concentration on improving the pedagogical process be needed at basic and secondary level mathematics to improve students' achievement in mathematics (Education Review Office, 2016). Research has demonstrated that CL can promote academic and social educational outcomes (Johnson, Johnson, & Smith, 2007), over the last decades. However, research also shows that the implementation of CL is not always adequate in daily classroom practice. Therefore, this study has attempted how mathematics teacher perceived collaborative learning in mathematics and what were the significant factors that influence the implementation of CL in the classroom.

Statement of the Problem

Collaborative learning in mathematics refers toan educational approach that is based on the idea that learning is a naturally social performance in which learners talk and work among them. It encourages students' participation in each phase of mathematics instruction and, however, the teachers' preferred methods for teaching

contents of mathematics guide learning activities of students in the classroom (Bidabadi, Isfahani, Rouhollahi,&Khalili, 2016). Teachers have been encouraged through training and professional seminars to provide an ample opportunity to the students in the learning process (NCF, 2007) through collaborative learning methods.

However, the mathematics curriculum provisioned, and teacher training advocated collaborative learning for decades, the students have still lacked the understanding the application of mathematics, and so weaker in its application in real problem-solving. It seems the real practices of collaborative learning for mathematics may have some constraints that affect the successful implementation of collaborative learning in the mathematics classroom.

Despite the dissemination of collaborative learning process for mathematics through training and a range of national and regional seminars, there are some constraints to be identified which hampered the proper implementation of CLstrategies in Nepalese schools. Therefore, there was necessary to conduct a study to explore the teacher perceptions of CL in mathematics. Moreover, this study wasintended to seek an answer to the following research questions:

- What is the teacher's perceptions of collaborative learning in mathematics learning?
- Do basic and secondary teachers identify collaborative learning as an important and beneficial teaching strategy?
- What are the influencing factors of the use of collaborative learning in the mathematics classroom?

Objectives of the Study

Objectives of the study refers to what the researcher would like to achieve through this research. Objectives are stated exactly which outcome measures are

going to be used within their statements.They are important because they not only help the researcher to develop the protocol but also play significant role in chosing the design. The primary purpose of this research was to explore the teacher perceptionsof collaborative learning in mathematics. This objective is stated in the following specific form:

- To identify the teachers' perceptions towards the collaborative learning.
- To identify what collaborative learning methods are more prevalent in basic and secondary level.
- To find out the factors that influence the collaborative learning methods in mathematics.

Rationale of the Study

The significance of the study refers to how allied sectors, personnel, and researcher could take benefit from the results of the study. The significance of the study must reflect on the extent of the contribution made by the study to improve our understanding, or to change a concept in a particular field of research.In this way, this study can be advantageous to the mathematics teachers, researchers and other readers in the following way:

mathematics teachers. This study may provide to the mathematics teachers to learn different affecting factors of the implementation of collaborative learning in mathematics.

mathematics educators.This study maybe beneficial to the mathematics educators to encourage the collaborative learning process in mathematics from the planning level.

Mathematics researchers. This study has made some hidden aspects of CL as the recommendation for further researcher which is acue to conduct new research in the field of mathematics.

Finally, this study would be valuable to the curriculum developers, students and independent learners of mathematics.

Delimitation of the Study

Delimitation refers to the specific research area in which the researcher completes the study. It specified the boundary of the research setting and research arena. The delimitations of the study were as follows:

- This study was completed in Nuwakot district selecting 94 basic and secondary level teachers of mathematics.
- This study adopteda survey with the small sample with purposive sampling techniques.
- This study only focused on mathematics teachers' perception towards collaborative learning.
- The sample and population of the study wasbasic and secondary level teachers of mathematics.
- Perception scale and interview were used as data collection tools.
- Data were collected through email generating google mail form and responds were accepted until one and half months. The researcher also collected data through direct way using questionnaire and semi-structured interview.
- Data Collection process was completed within one and half months.

Definition of Key Words

Government schools.The schools which receive regular grants from the government and does not have individual ownership in the organization.

Collaborative Learning. Collaborative learning is an educational approach to teaching and learning that involves groups of students working together to solve a problem, complete a task, or create a product.

Teacher's Perceptions.Perceptions are the teacher's understanding of the collaborative learning in mathematics and how they perceived collaborative learning in the mathematics classroom.

Chapter II

Review of Related Literature

A literature review is the summary of journal articles, books and, other documents, which expresses about the past and current state of information on the topic which is going to be studied (Creswell, 2014). It supports the researcher to identify the gap in the literature and makes the research more significant.In addition, it helps to conduct the new research in a manner by providing the general outline of the study and avoid the unnecessary duplication. This chapter includesthe empirical review of the literature, the theoreticalframework and conceptual framework.

Review of Empirical Literature

Lee, Janssen and Wubbels (2018) conducted a qualitative study entitled "*Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration"* to find out the obstacles of successful implementation of the collaborative learning process. The researchers collected data from both students and teachers of discipline including mathematics in Vietnam. They used interview only the data collection tools. The finding of the study showed the main obstacles were lack of collaborative skills, free riding, competence status and friendship.

Yadav (2017) did an experimental research on "*Effect of collaborative on mathematics"* to examine the effectiveness of collaborative learning process in mathematics in the context of Nepal. The researcher used non-equivalent experimental design among 53 students (experimental group contained 30 and control group contained 23 students). Achievement test was used to examine the effectiveness of CL. The finding of the study showed that CL is the best strategy in mathematics than traditional methods.

Garbin and Colleagues (2015) carried out the study entitled "*Teachers Perception on Collaborative Learning Processes: Experiencing Continuing Teacher Education in Brazil"*to examine the experience of a distance-training course for 250 Brazilians mathematics teachers. The researchers used questionnaires to obtain data and the results were analysed through content and frequency response. The results showed that participants considered essential to solving problems together and indicated the importance of interactive spaces where educational professionals share experiences. They mentioned that student teachers were able to reflect on their own practice and learn new ways of teaching. Due to a workload of exhaustive work and as a result of a school culture characterized by individualism, often teachers do not have time to discuss the practice.

Dekker (2008) carried out the study entitled on "*Collaborative learning for mathematical level raising, what does it take?"* to explore the influence of the different roles, students take in pairs, on the performing of the key and regulating activities in mathematics learning. The finding of this study was a smooth collaboration can lead to shared knowledge building, but at the same time level raising is at risk, as during smooth collaboration there is less need for explaining and justifying, which are key activities for level raising.

A study carried out by Summers (2006) entitled on "*Effect of Collaborative Learning in Math on six graders' individual goal orientations from a social constructivists"* to examine the collaborative learning as a process that may influence the individuals' social and achievement goals. The researcher used survey design of research. The finding of this study indicated that students in groups that are collaboratively valued the academic goal of group work were likely to adopt

individual motivational strategies associated with performance avoidance goals over time.

In one study of collaborative learning, pairs of children from two U.S. public schools worked together (Matusov, Bell, &Rogoff, 2001). One member of each pair was from a traditional school that provided only occasional opportunities for children to work together as they learned. The other member of the pair was from a school that emphasized collaboration throughout the school day. The children with the collaborative schooling background more often built on the partner's ideas in a collaborative way than the children with traditional schooling experience. The traditional school children predominately used a "quizzing" form of guidance based on asking known-answer questions and withholding information to test the partner's understanding. Collaborative learning often works best in classrooms with well-specified learning goals. Increasing efforts are being made to connect collaborative learning and technology in the classroom. For example, one program, Computer-Supported Collaborative Learning (CSCL), attempts to increase peer interaction and joint construction of knowledge through technology (Prinsen& others, 2009).

Previous studies identified common problems perceived by either teachers or students, obstacles of implementation of collaborative learning in mathematics and the effectiveness of CL in mathematics, but how does teacher perceive CL was lacking. Therefore, teachers' perception towards collaborative learning in mathematics may have been overlooked. To address this problem, the aim of the present study was to explore the teacher perceptions of collaborative learning. In addition to this, the affecting factors and implementation of CL could be measured through teacher perceptions. CL literature also showed that many problems faced by teachers and students have been investigated in different levels of education (e.g.

primary, secondary, higher education), from diverse subject areas (e.g. economics, social studies, mathematics), and across varied national contexts (e.g. Europe, America, Australia, Asia). In addition to the previous work, this research work was carried out among the mathematics teachers in Nepal, where CL has promoted through policy and practice (NCF, 2007).

Theoretical Framework

This study was based on constructivism approach to concept learning of mathematics. Constructivism is a learning theory that emphasis on the mathematical knowledge is constructed actively rather than received. There are two types of constructivism: cognitive constructivism and social constructivism. Cohen, Manion and Morrison (2013) stated that both constructivismsshares some common characteristics such as the view that the knowledge is constructed through reflective abstraction, through learners' cognitive structures and processing, through active and participative learning, and through therecognition that learning is not fixed and inert, but is continually developing.

Piaget to Vygotsky, the conceptual shift is from the individual to collaboration, socialinteraction, and sociocultural activity (Daniels, 2011). In Piaget's cognitive-constructivist approach, students construct knowledge by transforming, organizing, and reorganizing previous knowledge and information. Vygotsky's social constructivist approach emphasizes that students construct knowledge through social interactions with others. The content of this knowledge is influenced by the culture in which the student lives, which includes language, beliefs, and skills (Holzman, 2009).

Piaget emphasized that teachers should provide support for students to explore and develop understanding (Santrock, 2011). Vygotsky emphasized that teachers should create many opportunities for students to learn by constructing knowledge

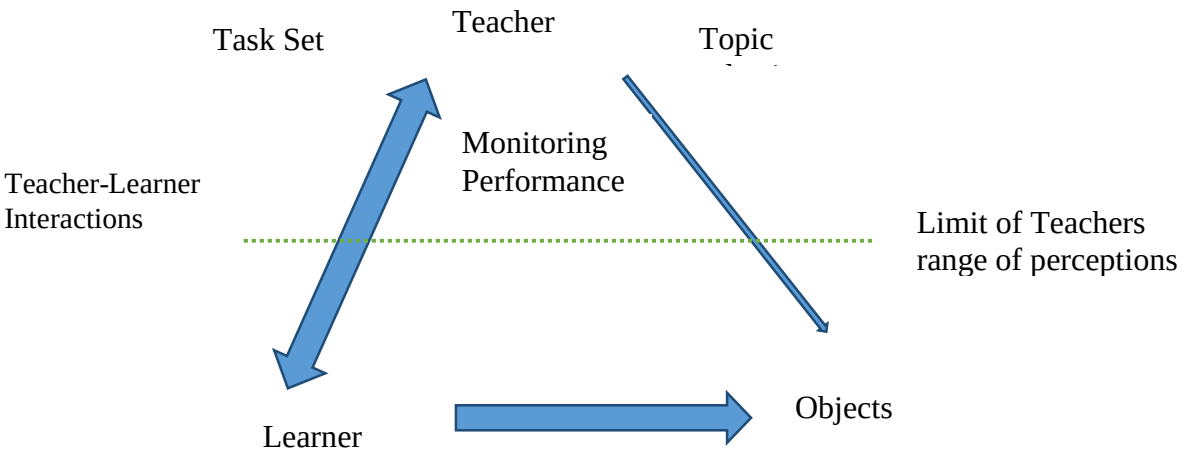
along with the teacher and with peers (Gauvain&Parke, 2010). In both models of constructivism, teachers play as facilitators and enablers rather than directors of student's learning.

Santrock (2011) has underscored that there are no clear-cut distinctions between social constructivist and other constructivist approaches, however, for example, when teachers serve as guides for students in discovering knowledge, there are social dimensions to the construction. It means that processing the information and social interaction are inter-related. The social constructivist approach that emphasizes the social contexts of learning and the idea that knowledge is mutually built and constructed (Santrock, 2011). It seems that collaborative learning is based on social constructivism.

Conceptual Framework

A conceptual framework refers to the connection of research variable and the theory of the study. It is researcher's understanding about the theoretical framework by which the researcher narrows the theory in order to imply in his own research purpose. It is the map of the study on which research variables connect with each other in the possible diagrammatic form.

This study was based on the social constructivism learning theory. In processes of constructivist learning, the teacher sometimes excluded. It is the learner who creates his or her understanding of the objects of learning. The construction of meaning takes place in the learner's mind, beyond the teacher's range of perception. The researcher has developed the following conceptual framework for this study:



Source: Living Democracy, 2015

There are mainly three dimensions in this framework such as Learner, Teacher and Objects. The teacher looks out the outcome that the students produce and behave. It means the teacher sees the performance, not the competence. Furthermore, it is the students, not the teacher, who ultimately decide what they find interesting and worth learning, and what they remember for life, or forget.Furthermore, the teacher\s range of perception directly related to the interaction, either directly or indirectly. It tends that more positive interaction in the classroom implies positive perceptions of teachers towards the learning atmosphere. This frame of learning is clearly demonstrated in the above conceptual framework and the researcher has intended to collect data based on this frame of learning.

Chapter III

Methods and Procedures

This chapter conveys the Research Design, Population and sample, Data collection tools, Determination of Reliability and Validity of Data Collection Tools, Data Collection Procedures and Data Analysis and Interpretation. Apart from this Data section, this chapter includes the ethical consideration throughout the research process in the last.

Design of the Study

The researcher used mixed methods which is both qualitative and quantitative. Since the first phase of data collection starts with quantitative form, the researcher adopted explanatory sequential design. The explanatory sequential design begins with quantitative data collection and analysis followed by qualitative data collection and analysis (Creswell, 2014). For the purpose of this study, the research adopted the explanatory sequential design because it examines the current understanding of the population about the particular issues, and in which the researcher uses the qualitative data to refine the results from the quantitative data. It means that this types of mixed design of the study provides the better understanding about the research problem (Creswell, 2014).It is the understanding of the population by which their practice influence significantly. Thus, in this study, the researcher used the explanatory sequential design to explore the teachers' perception towards the use of collaborative learning in mathematics.

Population and Sample of the Study

The population of the study was the basic and secondary school teachers of mathematics those had been teaching mathematics at a basicand secondary level in NuwakotDistrict.The sample was comprised 94 basic and secondary school teachers

of mathematics in Nuwakot District. This sample of the study was selected using the purposive sampling method.Thereason for choosing purposive sampling was to focus on particular characteristics of a population that were of interest, which would best enable the researcher to answer his research questions. Then the researcher selected8 teachers from 94 basic and secondary level teachers of mathematics for the purpose of conducting an interview with them.

Data Collection Tools

Development of tools is very important in order to collect the required data. To collect primary data from the subjects of the study, the researcher used different data collection instruments to collect both quantitative and qualitative data. In fact, the researcher employed a questionnaire, interview and document analysis for the study to collect primary and secondary data. In this study, the researcher used following data collection tools to collect data:

Questionnaire. To collect the relevant data, the researcher used the questionnaire to find out the teachers' perception toward the implementation of CL in the mathematics classroom. The questionnaire was based on Likert scale. For this study, the researcher adopted the questionnaire developed by Borger (2013) which was modified with the help of the supervisor. The questionnaire consisted34 items as the combined form of five and three point Likert's scale, after ensuring the validity and reliability.The retained questionnaire was divided into three sections, namely General Knowledge and implementation of Collaborative Learning in Mathematics Classroom, Practice of Collaborative Learning and Influencing factors of Collaborative Learning in Mathematics Classroom. The distribution of items across each section of questionnaire is presented in the following table I:

Section	GKCLM	PCL	IFCLM
Number of Items	10	12	12

Where,

GKCLM= General Knowledge and implementation of Collaborative Learning in Mathematics Classroom

PCL = Practice of Collaborative Learning

IFCLM = Influencing factors of Collaborative Learning in Mathematics Classroom

Semi-*Structured* Interview. To identify the factors affecting the successful implementation of collaborative learning, the researcher developed the semi-structured interview with the help of a supervisor. There were sevenopen-ended questions in the interview. The interview was completed by8 teachers of mathematics. In this regards, the interview was focused on exploring the constraints of implementation of collaborative learning in mathematics learning. Moreover, the interview questions wereconnected to each section of the questionnaire to get in-depth information from the participants.

Reliability and Validity of Tools

Reliability refers to the consistency of a measure and validity is the extent to which the scores from a measure represent the variable they are intended to. In this study the researcher used different methods to ensure reliability and validity of the data collection instruments.

Questionnaire. To calculate the reliability of the questionnaire, the researcher conducteda pilot study among 20 mathematics teachers that represented the population of the study but not included in the sample of the study. The questionnaire contained 40 items. Then the researcher calculatedthereliability coefficient, Cronbach's Alpha, performing SPSS 21.0 setting 0.05 level of significance. The reliability coefficient Cronbach’s Alpha of the questionnaire was 0.90 which was

excellent with reference to the interpretation criteria provided by George and Mallery (2003, 231). It means that there was greater internal consistency of the items in the scale. As for the validity of the questionnaire, expert judgement was used. The retained 34 items for this study.

Semi-StructuredInterview. The researcher developed the 12 open ended questions with the help of the supervisor for the purpose of pilot test. Then the reliability and validity of the interview wasensured by the expert judgement. The researcher adopted only seven questions in this study, after ensuring the reliability and validity.

Data Collection Procedures

After guaranteeing the reliability and validity of the data collection instruments, the researcher proceededthe data collection by granting the permission from the principal and mathematics teachers of the sampled schools. In the initial phase of data collection, the researcher accumulated the numbers of mathematics teachers engaged in practising mathematics at a basicand secondary level in the Nuwakot District. Then the researcher usedpurposive sampling procedures to select a sample for the study.

The researcher then made a contact with the teachers and requested for conducting the study by clarifying the purpose of the study. After that, the researcher usedashort briefing to the individual participants about how to use questionnaire and distributed the questionnaire to sampled teachers by visiting different schools and teachers. The researcher also collected the data through google mail of which the researcher generated the same questionnaire in the electronic form. The questionnaire was sent to the participants and they needed to provide valid email address before

reply to the responds. Their responds were recorded in googlespreadsheet and google analytics. The email responds were accepted up to one and half months.

After collecting the questionnaire from all participants, the researcher selected8 teachers from the sample of teachersbased onpurposive sampling to conduct the interview. Then, the researcher conducted the semi-structured interview with these 8 participants. The interview was recorded on the electronic device (recorder). The data collection process took one and half months.

Data Analysis and Interpretation Procedures

After completion of the data collection, the researcher organisedthe data using a computer database. The data obtained from the questionnaire wascoded in terms of SPSS 21.0 for calculation frequency and percentage. In fact, the researcher will use SPSS 21.0 setting 0.05 level of significance to calculate the descriptive statistics. The analysis and interpretation of the questionnaire data was based on the frequency and mean of each item assigned by the participants. More specifically, the researcher adopted the google analysis in the data that were collected through google mail. Then both data were combined using SPSS 21.0. The researcher interpreted the percentage of the majority and the mean of each item using the interpretation criteria provided by Hull and Wie (1986) (as cited in Arthur, 2010). The researcher added the interview data to enrich the analysis and interpretation of the results of the questionnaire.

As for the analysis of interview data, the researcher followedthe steps proposed by Bardin (1977), which anticipates 3 steps to be followed for the content analysis on data from a qualitative approach: a) Preparation of information and b) categorization or classification of units in categories c) Description and Interpretation(as cited in Garbin&Colleagues, 2015).Finally, the interview data

wastriangulated with the conceptual framework and questionnaire, according to their suitability.

Ethical Considerations

Throughout this study, the researcher considered some of the ethical issues which ensure the standardisation of the data collection process and conformity of the reporting of the study findings. The following ethical issues was considered in this study:

- The researcher requested permission from the schools before planning or conducting the study.
- The researcher made consent to participants for conducting the study.
- The researcher did not enforce the teachers to complete a questionnaire or participate in the research activity.
- The researcher informed the participants to record the interview. The researcher neither fabricate the data nor do falsify in the reporting.
- The researcher used appropriate language that will reasonably understandable to the participants.

Chapter IV

Analysis and Interpretation of Data

This chapter presents and discusses the results of the research. After acquiring the data from research venue using the questionnaire and then interview with the participants, the researcher started to analyse the data. The analysis of the data completed in two comparative phases: in first phase, the researcher analysed the questionnaire data, and to supplement and enrich the information that was drawn using questionnaire, the result of the interview was described in the second phase. Indeed, the researcher analysed and interpreted the result of questionnaire and interview together.

Analysis interpretation of questionnaire and interview data

There were 34 items in this questionnaire across the three sections. The semi-structured interview consisted seven open-ended questions. The interview questions were asked to understand the information related to eachpart of thequestionnaire that questionnaire overlooked in its statements. The researcher analysed and interpreted the questionnaire and interview data together.

Teachers' perceptions of Collaborative Learning in Mathematics Classroom. There were ten items in this section of the questionnaire. Moreover, this section of the questionnaire consisted the statements related to the assumptions about collaborative learningand familiarity of collaborative learning in mathematics. Then, the sample group of the teachers of mathematics were asked to respond to these statements. The researcher calculated the percentage of eachitem assigned by the respondents for the purpose of the data analysis. Moreover, the researcher assumed that Strongly Agree (SA) and Agree (A) as the Agree, Neutral (N), and Strongly Disagree (SD) and Disagree (D) as Disagree. Also, the researcher added the analysis

of related interview data with the interpretation of this section of the questionnaire. The percentage of each item is presented in the table II:

Table II: General Knowledge and implementation of Collaborative Learning in Mathematics Classroom

SN	Statements	SA %	A %	N %	D %	SD %
1	I'm familiar with the term "Collaborative learning	85.7 (81)	14.3 (13)			
2	Collaborative learning is an effective teaching strategy.	64.3 (61)	28.6 (27)	7.1 (6)		
3	My students benefit from collaborative learning	7.1 (6)	71.4 (67)	21.4 (21)		
4	Student achievement improves with the use of collaborative learning	7.1 (6)	85.7 (82)		7.1 (6)	
5	Student motivation improves with the use of collaborative learning	7.1 (6)	64.3 (60)	21.4 (22)	7.1 (6)	
6	Collaborative learning is important to prepare students for success in the future	28 (29)	42.9 (39)	14.3 (13)	14.3 (13)	
7	Technology makes collaborative learning easier.	78.8 (75)	14.3 (13)	7.1 (6)		
8	Students need to respect and appreciate each other's viewpoints for it to work.		35.7 (34)	42.9 (39)	14.3 (13)	7.1 (6)
9	It increases in student retention, self-esteem, and responsibility.	28.6 (27)	57.1 (55)	7.1 (6)	7.1 (6)	
10	Collaborative learning enhances students'	50	50			

SN	Statements	SA %	A %	N %	D %	SD %
	level of understanding and involves them in problem solving.	(47)	(47)			
Total Average (in percentage)		35.68	46.43	12.13	4.99	0.58

The above table shows that majority of the mathematics teachers have positive perception towards the general positive aspects of collaborative learning in mathematics classroom. Moreover, all of the mathematics teachers are familiar with collaborative learning and its use in mathematics teaching and learning. Likewise, teachers of mathematics conform the use of collaborative learning in enhances thestudents' level of understanding and involves them in problem solving. In addition, about 92.9 % of teachers of mathematics agreed that the use of technology makes collaborative learning easier and collaborative learningas an effective teaching strategy in mathematics teaching and learning. Similar percentage of mathematics teachers agreed that, the successful implementation of collaborative learning in mathematics improves the students' achievement in mathematics.

On the other hand, well over half (64.3 %) of the teachers either do not decide or disagree about the students might respect to ideas of their peers in the mathematics classroom, especially while using collaborative discussion. Apart from that, one in seven mathematics teachers did not consent that the implementation of collaborative learning leads success in the future. Nearly 85 % of teachers agreed that it increases the students' responsibility in the learning and their retention in their learning.

In the interview, the researcher asked respondents: *What do you understand about the collaborative learning in mathematics?* The respondents explained that: *Collaborative learning is a student-centred pedagogy in which students are*

encouraged to be active in learning process and teacher's role is to help students, if they need. It provides learning by doing opportunities to the students. As a result, students' creativity and the independent learning can be realized. whichare a fundamental principle of practical mathematics instruction. It is a form of active learning.

It seems clear that, teachers of mathematics were familiar with collaborative learning approach and its implementation in mathematics instruction. They define collaborative learning as active and students centred teaching techniques in mathematics. Apart from that, majority of the teachers were participated in the students centred pedagogy, for example, collaborative learning in mathematics.

The researcher again asked that: I*n your view, what is the successful implementation of Collaborative Learning in mathematics*? The respondents replied that:*The successful implementation of collaborative learning in mathematics indicates the higher achievement of students in mathematics. For example, if the students average score was fifty before the implementation of the collaborative learning and after the implementation of collaborative learning the average achievement would become more than fifty. Then it is described as successful in mathematics classroom.*

From questionnaire and the interview data, it is clear that the use of collaborative learning was common in mathematics teaching and learning in various forms. They thought that implementation of collaborative learning provides bottomless opportunities to the students in order to secure high score in the final examination.

Practice of Collaborative Learning

The researcher used this section of the questionnaire which contained 12 possible approaches of collaborative learning for a single question: How often do you use these Collaborative Learning strategies in the classroom?Then the sample group of the mathematics teachers reacted to this question in terms of various approaches listed there. The answer to this question was notedregarding Always, Frequently, Not sure, Rarely, and Not at all. The researcher calculated the percentage of eachitem assigned by the respondents. Moreover, the interview data are analysed together with the questionnaire data. The percentage of each itemare presented in the following Table III:

Table III: Practice of Collaborative Learning

SN	How often do you use these Collaborative Learning strategies in the classroom?	Always %	Frequently %	Not sure %	Rarely %	Not at all %
1	Jigsaw technique	6 (6)	38 (36)	25 (24)	12 (12)	6 (6)
2	Stump your partner		18 (17)	20 (19)	6 (6)	55 (52)
3	Problem-solving Learning	94 (89)	5 (5)			
4	Think-pair-share/ Write-pair-share	55 (52)	24 (23)	8 (8)	6 (6)	5 (5)
5	Catch-up	5 (5)	3 (3)	13 (13)	21 (20)	56 (53)
6	Fishbowl debate		15	19		64

SN	How often do you use these Collaborative Learning strategies in the classroom?	Always %	Frequently %	Not sure %	Rarely %	Not at all %
			(15)	(18)		(61)
7	Group problem solving	28 (27)	71 (67)			
8	Team-based learning	11 (11)	20 (19)	40 (38)	13 (13)	13 (13)
9	Double Entry Journal	9 (9)	15 (15)			70 (74)
10	Group Writing Assignments	2 (2)	12 (12)	5 (5)	51	24
11	Group Grid	1 (1)	11 (11)	13 (13)	18 (17)	55 (52)
12	I prefer the class to have more group activities rather than individual study.	27 (26)	44 (42)	20 (19)	7 (7)	
Average total (in percentage)		19.66	21.0	13.91	11.41	29.41

As presented in the table above, different form of collaborative learning take place in the mathematics teaching and learning. More importantly, problem solving and problem based learning are more common strategies in mathematics teaching. Whereas, Fishbowl debate and Double Entry Journal are least common in mathematics teaching and learning.

In detail, most of the teachers, about 95 %, in the school practice problem solving approach. Likewise, 80.3 % teachers of mathematics use a think-pair-share approach in mathematics learning. Apart from this, jigsaw and team based learning are frequently seen in the classroom. On the other hand, the double entry journal is never used in mathematics classroom. However, teachers are willingness to incorporate different kinds of collaborative learning approach in mathematics teaching and learning.

As the interview question, the researcher asked the respondents that: *what are elements that you often take into consideration as designing collaborative tasks? Can you describe a collaborative task as an example?* The respondents reacted that: *problem solving approach is best example. In this approach first, the problem is selected based on students' past performance and knowledge, then students are divided into different small work groups, then each group is assigned different tasks. Teacher supports students and encourage to work on group and get final solution.*

The researcher again asked that:*what do you do to ensure the contribution of each group member to accomplish a group task*?The respondents reacted that:*after the dividing the tasks, teacher watches the students' activities on the tasks and records their achievement in proper way, so as it is useful in decision making process.*

From interview and questionnaire result of this section, it reflects that teachers were using different approaches of collaborative learning to teach mathematics in the classroom. They believed that problem solving was used everywhere in mathematics. The problem-based learning and discussion in mathematics were commonly used in the mathematics classes, frequently.

Influencing Factors of the Implementation of Collaborative Learning in the Classroom

This section of the questionnaire consisted12 possible factors related to curriculum design, working time in the classroom, dissemination of collaborative learning, use of training in the actual situation, the boundary of the activities in the mathematics classroom. To find out the possible constraints of successful implementation of the collaborative learning in mathematics instruction, the researcher asked the participants to react these statements. The responsestoward these items were recordedregardingthree-pointLikert's scale: Not serious, Serious, and Most Serious. Forthe purpose of analysis, the researcher calculated the percentage of eachitem assigned by the respondents. Also, the researcher added the analysis of related interview data with the interpretation of this section of the questionnaire. The frequency and percentage of each itemare presented in the following Table IV:

Table IV: Influencing factors of Collaborative Learning in Mathematics Classroom

SN	Statements	Most Serious %	Serious %	Not Serious %
1	Lack of enough teaching aids for active learning.	82 (78)	17 (16)	
2	Recognize and Communicate Common Vulnerabilities		86 (81)	13 (13)
3	Group diversity is essential to forming effective collaborations and difficulty to address it.	13 (13)	26 (25)	59 (56)
4	Maintain an Environment of Trust.	11 (11)	51 (48)	37 (35)

5	Use Good Problem-Solving Tools.	31 (30)	58 (55)	9 (9)
6	Arrangement of the seating and size of the classroom/ Space limitations.		23 (22)	76 (72)
7	Ways of assessment for learning.	22 (21)	42 (40)	35 (33)
8	Replace Belief with Knowledge.	39 (37)	39 (37)	10 (10)
9	Lack of organizational support	44 (42)	20 (19)	35 (33)
10	Differences in organizational culture	30 (29)	14 (14)	54 (51)
11	Knowledge and resource limitations	82 (78)	8 (8)	8 (8)
12	Lack of time for collaboration	94 (89)	5 (5)	
Average Total (in percentage)		36.66	32.25	27.33

The above table shows the hindering factors that influence the implementation of collaborative learning in mathematics learning. It is clear that lack of enough time for students centred activities in mathematics classroom is considered as most serious problems. Unlikely, seating arrangement and addressing the diversity in the mathematics classroom are not serious problems.

In detail, almost all, about 95% of them, teachers responded that shortage of time for collaboration is serious problem to implement collaborative learning successfully in mathematics. Majority of the teachers indicated that the paradigm shift

is also challengeable. However, space limitation and trustiness toward the group activities are not so serious problems.

As the interview question, the researcher asked the respondents that: *what do you think about skills needed for students to work successfully in a group?* The respondents reacted that: *the students need to how to work on groups and some basic calculation skills and some previous experiences. These experiences would be fruitful if students had. Other skills are work honestly in the group within the time frame.*

Again the respondents asked that:*What do you do to help students improve these skills? What were difficulties you experienced as promoting these skills?*The respondents reacted that: *some students are encouraged to learn with their peers and some skills are taught in the classroom before the collaborative leaning approach started.*

The researcher asked that: *What were difficulties you experienced as preparing collaborative tasks?*The respondents reacted that*: there are a lot of difficulties in the implementation of collaborative learning in mathematics learning. However, some have definite solution and other do not have. The most difficulty is the time frame of mathematics instruction in which collaborative learning is approached. Secondly, the pressure of the school team is also considered as the challengeable. Some difficulties such as lack of time to use technology in mathematics is remained next day to be completed, but not always.*

From the questionnaire and interview results, different factors affected the implementation of collaborative in the mathematics classroom. One of the most influencing factors was the time allocated to math learning in the classroom. Apart from this, teaching materials and external support of the classroom was considerably impact on the use of collaborative leaning in mathematics instruction.

Like any other educational issue in the teaching-learning process, it is also possible to think that collaborative learning may have shortcomings or constraints during its implementation in the real classroom conditions. Of these constraints, the researcher has selected 12 of the most severe possible factors affecting the implementation of collaborative learning. These factors are selected by their frequencies in the responses of the instructors. Shortage of time is among these factors. Concerning this problem, the respondents agreed that the timetable was the significant problem negatively affecting the implementation of active learning. Supporting this fact, Farant (2000) explains the effect of time by stressing that shortage of time limits instructors and students from implementing student centred learning in the classroom. In this study, the instructors' tendency towards traditional lecture method is blamed as an obstacle to the implementation of active learning by instructors.

Chapter V

Summary, Findings, Conclusions and Recommendations

This chapter conveys the summary and findings of the study, conclusion and implication of the study based on the analysis and interpretation of data in previous Chapter IV. Then finally the recommendation for future research areas are presented.

Summary and Findings

This is an explanatory sequential mixed method design that has been completed within two subsequent phase. The primary purpose of the study was to explore the mathematics teachers' perceptions towards collaborative learning in the mathematics classroom at school level. Also, the study has identified factors that affected the implementation of collaborative learning in the math classroom, apart from this, the research has identified how often they used various approaches of collaborative learning in mathematics lessons. The researcher selected a group of 94 teachers of mathematics based on purposive sampling techniques. The researcher completed the data collection in two phase. In first phase, the researcher surveyed the questionnaire over 94 mathematics teachers. The questionnaire was the form of three sections having 34 items in the total.For simplicity, the researcher developed the questionnaire to collect data through google mail, however, only 50% of the questionnaire data were collected through google mail, Then, in the second phase, the researcher selected 8 teachers from 94 teachers of mathematics based on random sampling to take the interview. Finally, a semi-structured interview was conducted with 8 mathematics teachers. The interview questions were related to each part of the questionnaire. The semi-structured interview consistedseven open-ended questions. After collecting the data, the researchers analysed the data obtained from questionnaire using descriptive statistics performing SPSS 21.0 setting 0.05 level of

significance. Finally, the researcher made a connection with the results of data based on the relationship to each other, using triangulation. The researcher interpreted the questionnaire results based on the majority of the percentage. Based on the analysis of the study following were the main findings of the study:

- Teachers of mathematics have perceived the use of collaborative learning in mathematics positively as an effective teaching strategy.
- About 92.9 % of teachers of mathematics agreed that the use of technology made collaborative learning easier and collaborative learning as an effective teaching strategy in mathematics teaching and learning.
- Approximately, 95 % of mathematics teachers in the school practiced problem solving approach, whereas 80.3 % teachers of mathematics used a think-pair-share approach in mathematics learning.
- 95% teachers of mathematics responded that shortage of time for collaboration was serious problem to implement collaborative learning successfully in mathematics
- Mathematics teachers were confident to get benefit from collaborative learning.
- Technology makes collaborative learning more meaningful in mathematics learning.
- The successful implementation of collaborative learning provided the higher achievement in mathematics.
- Collaborative learning increased student’s responsibility towards their learning.
- Collaborative learning enhanced students’ level of understanding and problem solving skills.

- Teachers of mathematics were confident to have the skills necessary to use different types of collaborative learning approach for mathematics instruction.
- Problem solving and problem based learning were common in mathematics learning, whereas, journal review was not used in mathematics learning.
- There were different factors that made hindrance in implementation of collaborative learning. However, lack of enough teaching materials, lack of organizational supports were more serious. Apart from these, recognize and Communicate Common Vulnerabilities, group diversity is essential to forming effective collaborations and difficulty to address it, maintain an Environment of Trust, arrangement of the seating and size of the classroom/ space limitations and replace belief with knowledge were serious problems.

Conclusion

Collaborative learning in mathematics instruction has become common in promoting quality learning. The collaborative learning activities to be carried out by the teachers and hence performed by students. Moreover, collaborative learning encourages the students to participate in learning activities in the classroom and outside of the class. Thus, it promotes the independent learning that makes students work with their own knowledge and experiences. The successful implementation of collaborative learning approaches in mathematics classroom shares the responsibility of learning among students and teachers that encourage students to take ownership over the learning process. It demands the full range of tasks to be designed to the students to engage them time to time in the learning activities.

Learning activities in such students centred learning initiated classroom may control the unnecessary behaviours of the students due to their active participation in the classroom. The activities might be related to creativity, independent learning,

visual thinking, application of mathematics to real-world problems, and searching the meaning of knowledge.

There is much hindrance to the implementation of collaborative learning in mathematics lessons in Nepal. One of the most prominent factors is the lack of enough time for mathematics learning in the classroom. The flexibility of the time for mathematics learning and the development of curriculum in terms learner centred learning may be a panacea for it. The limited space and lack of modern technology in the classroom also seen the major problem for initiating the collaborative learning in the mathematics classroom. The diversity in the mathematics classroom hinders in classroom activities, and as a consequence, the teacher and students do not complete their task in time.

Thus, it is asserted that the teachers have positive perception toward the collaborative learning in mathematics classroom. However, their real practices of students centred learning in Nepal is not so fruitful due to the various planning and implementing parts of national curriculum of mathematics. The collaborative learning for mathematics generates the quality education and students' success in the mathematics. Thus, it is necessary to encourage collaborative learning in mathematics from elementary level to higher level in Nepal to improve the national achievement of students in Mathematics.

The Implications of the Research for Educational Purpose

The results of this study may lead valuable insight into the improving the national achievement of the students in mathematics and giving the worth in applying the collaborative learning for mathematics in the classroom. The result of this study has a wide range of application from curriculum designer to the actual implementersof

mathematics. Based on the findings and conclusion of the study, the following are the significant implication:

- The national curriculum of mathematics must be based on the assumption and principles of collaborative learning. This is because it demands flexibility in contents and time for activities.
- The teachers should be encouraged to use collaborative learning for mathematics through on job training package and other disseminated seminars.
- The technology might be used in mathematics widely. Because the technology makes easy to implement active learning in mathematics.
- The teacher and student ratio should be reduced regarding the education act, and equipment that is used in class should be portable.
- The performance based assessment system should be used in mathematics classroom so that each students' performance can be recorded effectively and used in the final decision of the final form of evaluation.
- The use of collaborative learning in mathematics teaching and learning can shift the traditional way of teaching and learning mathematics so that mathematics teachers both pre-service and in-service should be informed about the much more about how to use and design collaborative tasks for the complex contents of mathematics. Moreover, pre-service teachers of mathematics should be habituated to practice collaborative learning before they pursue actual practice in the mathematics instruction

Recommendations for Future Research

This study has focused on the teachers' perception collaborative learning in mathematics classroom based on mixed method design including small sample size from school mathematics teachers in Nuwakot District. The other researcher may

carry out the study based on the considerable sample and the other context or settings to encourage student centred learning in the mathematics classroom. Based on the experience of this study, the researcher has made the following recommendations for the further study:

- It is recommended that further study may be carried out to find out students' perception and attitudes toward the students centred learning in the mathematics classroom.
- It is recommended to evaluate the prescribed methods and activities of mathematics learning by the principles of collaborative learning.
- The further research should try to examine the causal impact of the use of collaborative learning on the students' different level of mathematical thinking, and reasoning. So, future study may be carried out to examine how use of collaborative learning supports to teach the hard to teach aspects of mathematics such as theorem proving and problem solving.
- It is recommended to explore the way through which students are assessed in collaborative learning approach.
- It is recommended that further study may conduct on evaluating mathematics teachers' professional development regarding the implementation of students centred learning in the mathematics classroom.
- Although this study was conducted among the teachers of mathematics to assess their perceptions towards the use of collaborative learning in mathematics. An additional research is needed to explore the students' perceptions and attitudes towards the use of collaborative learning in mathematics teaching and learning.

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Appendix A

Survey Questionnaire

Dear Participants,

My name is BhimBahadurDangi and I am a graduate student at University Campus, TU, Kirtipur. I am enrolled in the Mathematics Education program and am beginning the research for my Master's Thesis. I'm currently working on teaching profession as well as the study—looking at Teachers' perceptions and practice of Collaborative Learning Approach in mathematics classroom. You are invited to participate in this research project about your perceptions toward collaborative learning approach. Your participation will involve completing a questionnaire.

Note: SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

Section I: General Knowledge and implementation of Collaborative Learning in Mathematics Classroom						
	Statements	SA	A	N	D	SD
1	I'm familiar with the term "Collaborative learning					
2	Collaborative learning is an effective teaching strategy.					
3	My students benefit from collaborative learning					
4	Student achievement improves with the use of collaborative learning					
5	Student motivation improves					

	with the use of collaborative learning					
6	Student motivation improves with the use of collaborative learning					
7	Collaborative learning is important to prepare students for success in the future					
8	Technology makes collaborative learning easier					
9	Students need to respect and appreciate each other's viewpoints for it to work.					
10	It increases in student retention, self-esteem, and responsibility.					
11	Collaborative learning enhances students' level of understanding and involves them in problem solving					
Section II: Practice of Collaborative Learning						
	How often do you use these Collaborative Learning strategies in the classroom? Please Read the ***NOTE***, given at the last page	Always	Frequently	Not sure	Rarely	Not at all

1	Jigsaw technique					
2	Stump your partner					
3	Problem-solving Learning					
4	Think-pair-share/ Write-pair-share					
5	Catch-up					
6	Fishbowl debate					
7	Group problem solving					
8	Team-based learning					
9	Double Entry Journal					
10	Group Writing Assignments					
11	Group Grid					
12	I prefer the class to have more group activities rather than individual study.					

Section III: Influencing factors of Collaborative Learning in Mathematics Classroom

SN	Factors	Not serious	Serious	Most Serious		
1	Lack of enough teaching aids for active learning.					
2	Recognize and Communicate Common Vulnerabilities					
3	Group diversity is essential to					

	forming effective collaborations and difficulty to address it.					
4	Maintain an Environment of Trust.					
5	Use Good Problem-Solving Tools.					
6	Arrangement of the seating and size of the classroom.					
7	Ways of assessment for learning.					
8	Replace Belief with Knowledge.					
9	Lack of organizational support					
10	Differences in organizational culture					
	Knowledge and resource limitations					
11	Space limitations					
12	Lack of time for collaboration					

Appendix B

Semi-structured Interview Questions

1. What do you understand about the collaborative learning in mathematics?
2. In your view, what is the successful implementation of Collaborative Learning in mathematics?
3. What are elements that you often take into consideration as designing collaborative tasks? Can you describe a collaborative task as an example?
4. What do you do to ensure the contribution of each group member to accomplish a group task?
5. What do you think about skills needed for students to work successfully in a group?
6. What do you do to help students improve these skills? What were difficulties you experienced as promoting these skills?
7. What were difficulties you experienced as preparing collaborative tasks