

Teachers Students Interaction in Mathematics Learning

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Abstracts

In learning mathematics interaction between teachers and students play a significance role. Instruction has a primary role in helping student understand concepts. Interaction becomes effective when subject matter is applied in practical contexts. In this study a qualitative method with a phenomenological approach was used. Data were collected using three types of tools: interviews, observation and documentation. The data were transformed, coded, and categorized in to three type of themes such as the interaction of learning mathematics through technology, the interaction of learning mathematics through collaboration, the interaction of learning mathematics through strategies and then analyzed to the results. The study area consists of BICTE students from Butwal Multiple Campus. In this study purposive sampling was used. Technology transformed the traditional teaching approach into a digital approach. The collaborative approach increased students' engagement and motivation in the learning process. The strategies-based approach enhanced students' skills and strengthened their ability to learn independently through self-directed learning.

Keywords: Interaction, Content, Structure, Collaboration, Technology, Learning, Strategies

Introduction

In classroom interaction during the teaching and learning mathematics, many challenges have to be faced. The challenges researcher has faced included classroom management, teaching materials, digital materials, collaborative learning and teaching strategies. In the classes researcher conducted and found that students learn effectively through discussion and problem-solving activities. However, some teachers consider it appropriate when student remain quite in the classroom. This suggest that interaction is not seen necessary. In the Nepalese context many teachers tend to use the lecturer method. Due to limited interaction students often show lower creativity in mathematics and their academic results are also affected negatively (Panthi & Belbase, 2017). Interaction between the teacher and students is very essential for learning mathematics. Interaction refers to the effort made to understand a particular subject matter. Mathematics is important subject that enhance students' analytical skills and critical thinking abilities. It is essential for development in every sector of Nepal. However, students' academic achievement indicates that mathematics remains one of the most challenges subjects in the Nepalese context. In every sector of society, activity created through teachers' students' interaction play a significant role. Both positive and negative interactions influence students learning and over all development. Vygotsky's theory provides a frame work for understanding how effective teachers' students' interaction can support learning. Furthermore, based on the National Curriculum Framework,

mathematics is taught using a learned center approach which emphasizes active student participation and meaningful learning experiences.

The learning environment plays an important role in interaction in mathematics learning. Students immediately get a sense of what mathematical problems are like. Teachers should be able to explain clearly and easily the question asked by students. The confusion that arises in students should be resolved by the teacher. The home environment affects learning mathematics and the interaction between parent and students are interrelated (Levine & Gunderson, 2011). In learning mathematics home activities can be taken as intervention. Practicing mathematics increases both the quality and volume of education (Espartero & Del Prado, 2024). When the quality of education improves, students develop interest in their studies as well as a sense of enjoyment.

To learn how to respond appropriately to questions based on their requirements can also be used to measure interaction between teachers and students. The question should be such that students can answer them easily. Emphasis should be given to guiding students towards problem solving. Interaction can be enhanced through open ended questions such as how did you learn from this task? Can you solve this problem using another method? Based on these types of questions passive students become active. Students consider how to solve mathematical problems and how to apply mathematical concepts to real life situations in society (Dlsu, 2015). The application of mathematical concepts helps students enhance their knowledge and deepen their understanding of mathematics.

Technology plays an important role in interaction for teaching and learning. To learn modern mathematics various types of tools are needed while teaching mathematics in the classroom. The blackboard should be presented in an attractive way. Students should be encouraged to use online platforms. The creativity of students in learning mathematics through online platforms plays a positive role. Students are always dynamic in the learning process, so according to time and situation new mathematics applications should be used to support learning.

Another important aspect of interaction in the learning process is collaborative learning. When work is done in groups a problem can be solved more quickly and easily. When the teacher guides group work, students share their ideas. They explain concepts according to their own reasoning. Based on students' explanations correct and incorrect ideas can be identified. From the natural patterns of mathematics, students imitate and appreciate its beauty. Intelligence helps facilitate interaction between teachers and students in mathematics. The emotional and social dynamics related to mathematics promote collaborative learning (Ched, 2017). Through collaborative learning mathematical problems can be applied in real life.

In the context of Nepal a review of the existing literature indicated that most studies have employed quantitative research methods and have primarily focused on students' mathematics achievements. However, there is a limited body of research that explores teachers' students' interaction in mathematics learning using a phenomenological

approach. This lack of qualitative studies examines the lived experiences and perceptions of teachers and students represents significant research gaps. Therefore, this study seeks to address this gap by exploring teachers' students interactions in mathematics learning through a phenomenological perspective.

Statement of the problems

Mathematics is considered a very essential subject for students. It is studied both at the school level and in higher education. Compared to other subject students often perceive mathematics is a difficult subject. Students with a weak foundation in mathematics often find learning mathematics challenging. Therefore, to understand mathematics students need to actively engage and interact with teachers at the school level.

In the classroom many students find it difficult to interact with the teacher while learning mathematics. However, they should make an effort to immediately interact with the teacher to understand any concepts they do not grasp. To understand mathematics, it is essential first to understand the question. Students need to clearly identify what the words in the questions are conveying. They must understand what is given, what need to be found and how to proceed such as which method or formula to apply. Otherwise, students cannot move forward.

With the progression of time it has become very important to enhance interaction in mathematics by interacting technology. Mathematics should be learned in digitalized and practical way by interacting with new technological applications. Therefore, well-equipped school infrastructure and mathematics teachers who are proficient in technology are essential in the present context.

Teachers' students play a crucial role in improving the quality of students learning. In the Nepalese context one of the major problems is the continued use of the teacher centered approach to instruction. Another issue is that many teachers focus only on completing the syllabus prescribed by the National Curriculum Framework rather than promoting deep understanding and active learning. Insufficient opportunities for students to practice problem solving and complete mathematical exercises also hinder the development of their mathematical skills. Furthermore, many students do not study consistently from the beginning of the academic session and instead develop the habit of studying intensively only when examinations are approaching. This last-minute preparation negatively affects their understanding, motivation, and overall achievement in mathematics.

Objective of the study

The objective of this study, To explore the interaction of teacher's students in learning mathematics. The research questions were how can teachers and students interact to create good learning? Can students improve their mathematics learning through instructional interaction?

Limitations

The study was conducted among BICTE students enrolled at Butwal Multiple Campus. The participants also included teachers who taught ICT in the BICTE program as well

as in other academic programs. This study employed a qualitative research method using a phenomenological approach. Three data collection instruments were used, document analysis, interviews, and classroom observations. Participants were selected through purposive sampling.

Methods and producers

In this study students from the BICTE departments of Tribhuvan University's constituent campus, Butwal Multiple Campus was selected. Student of the Bachelor of the Information and Communication Technology. Butwal Multiple Campus was selected as the study site because ethical approval for the research was obtain from the Campus. It was assumed that these students could provide insight in how mathematics is connected with technology and the relationship between mathematics and technology. This study was initiated to explore from BICTE students, what kinds of interaction are required when integrating mathematics with technology and digital tools and how interaction in teaching strategies is correct out. This study employed a qualitative method and conducted based on phenomenological approach. The BICTE program under the faculty of education runs from semester 1 to 8. In this program mathematics is taught from semester 1 to 5 with 3 credit hours in each semester. Additionally Numerical Analysis is taught in later semester. The participants included all 27 BICTE students enrolled in the fifth semester of the 2080 batch. Among them 6 students who regularly attended the classroom were selected using purposive sampling. According to the campus records all six participants were female students.

In this study data were collected using Interview, documentation, and observation. This study adopted a qualitative method using a phenomenological approach to explore the learning experiences of campus level BICTE mathematics students. The learning content and learning structure of the mathematics subject are explored in terms of students' experience.

Individual knowledge of particular events, experience or situations as gathered through interviews. The participants were interviewed based on interaction of teacher's students in learning mathematics. Regarding the phenomenon what experience do you have? What is your experiences of typical influence within a particular context and situation? (Creswell & Poth, 2016). The phenomenological method of qualitative research was used (Moustakas, 1994). Each statement was examined for significance based on the participants experiences. The participants important statements were audio recorded after obtaining their informed consent. Non-repetitive and non-overlapping statement were listed. Field notes were prepared during the interview, and classroom observation. The interviews were transcribed and the data securely stored. Themes were developed using the meaning of related and unchanged statements. Finally, the themes were synthesized and described. The research data were advanced based on validity. Validity is important in a phenomenological approach. Validity was determined using the triangular method. The data obtained through the triangular method were cross checked based on research tools that were used.

In this study the credibility of the data was ensured through triangulation using multiple data collections methods, including interviews, classroom observations, and document

analysis. Interviews were conducted with both teachers and students. The finding from the classroom observations were compare with the interview responses to verify consistency. In addition, the lesson plans and the instructional materials collected through document analysis were compare with the classroom observations to further establish the credibility of the finding. Content validity was used to access the components on the interview (Zamanzadeh, & Nikanfar, , 2015). Content validity was established based on the suggestions and feedback provided by BICTE mathematics experts and ICT teachers.

The questions were open ended. The participants responded based on their lived experiences. The experiments were clearly classified based on multiple perspectives, which made it possible to measure the entire content related to their experiences. The report was prepared based on the participants' daily experiences.

The interview were transcribed and analyzed. The interview were reviewed and explained in detail. For data privacy pseudonyms (shadow names) were assigned to the participants and the information was anonymized to prevent identification.

The transcribed data were identified in such a way that only the participants and the researchers were aware of them. During the analysis the data connected through the tools were coded, and interview were transcribed into themes and organized in to patterns. Interaction was investigated based on similar and related themes. There were two disciplines, numerical analysis and learning interaction was examined in terms of subject concepts and subject structure. The subject structure was divided based on points and evidence.

This study employs a qualitative research method using a phenomenological research design. The study explores teachers' students interaction in mathematics learning at the secondary school level. It emphasizes that effective interaction is essential for improving the teaching and learning process in the classroom. The study seeks to understand How teacher can motivate students and enhance their confidence in learning mathematics. Through a phenomenological approach, it explores the lived experience and perceptions of both teachers and students regarding the classroom interactions.

Result and discussion

Based on numerical analysis methods math Ed 446 subject in the BICTE forth semester, the content and structure were reviewed and students were divided into groups. Interview, documentation and observations tools were used. First the researcher prepared an interview schedule. According to schedule, information was provided to forth semester students of the BICTE department at Butwal campus. Based on the schedule the student was interviewed.

A purposive sampling technique was used to selected the participants. Data were collected through interview, document analysis and classroom observations. The interview focused on the experience and perceptions of teachers and students about their interaction during the teaching and learning process. The collected data were analyzed to gain a deeper understanding of the nature and significance of teacher students interaction in mathematics learning.

The researcher recorded the interview in audio format using a mobile phone. Field notes were also prepared, and key points were noted down. In this way the primary data were transcribed and translated into English. After that the data were coded. The codes were categorized and main themes were developed based on these categories. Finally the results were derived through the analysis of these main themes. The themes identified in this study were discussion in relation to the research questions and the relevant literature.

The interaction of learning mathematics through technology.

The interaction of learning mathematics through collaboration.

The interaction of learning mathematics through strategies.

The interaction of learning mathematics through technology

In learning mathematics interaction between teachers and students through technology is highly essential. Participants tend to rely on flexible learning approaches. When technology is used in subject content, it becomes possible to integrate more content and enhance the learning process. By exploring different mechanisms, technology helps to reduce learning difficulties faced by students. Through the use of mobile phones and laptop, students can easily search web browsers to learn mathematics and it becomes convenient on-line classes when needed. Teachers assist students in analyzing their problem-solving skills (Muthuprasad & Aiswarya, 2021). Through interactive approaches aligned with current demands, teachers are also able to understand students emotions.

Participants were using technology in their own ways. Teachers utilized technology by conducting both synchronous and asynchronous classes through different learning platforms. It was observed that technology functioned as a learning medium to improve students' mathematical skills (Lapada & Robledo, 2020). The findings revealed that technology plays a significant role in enhancing teachers' students' interactions. The use of technology made problem solving easier for both teachers and students. Teachers integrated various digital tools into their teaching, including whiteboard, smart boards, Geogebra, Mathematica, Maple. These technologies were used to solve numerical analysis problems, particularly those involving the Trapezoidal rule, Simpsons one third rule, Simpsons three eight rule.

The interaction of learning mathematics through collaboration

Student collaborated with one another and interacted with the teacher. Their activity was focused on collaborative work. According to the deadline set by the teacher, students engaged in interaction and completed their tasks. The mathematics teachers provided flexible time, facilitated interaction and guided students to produce outcomes. Through collaboration, students interacted based on the content and structure on the subject matter. By engaging in discussion and solving mathematical problems, students enhance their knowledge and skills (Chan & Wan, 2019). Through collaboration interaction students meet with each other for a fixed period of time and exchange knowledge. Students regulated their own experiences and emphasized flexible learning. The teacher encouraged students to make maximum use of digital resources.

The students were divided into groups to discuss mathematical problems collaboratively. A digital workspace was used to engage students in group tasks. The teachers provided guidance and facilitated the activities while students completed to assign task. Each group presented its work, and the teacher assessed the students' performance based on their presentation and participation.

The interaction of learning mathematics through strategies

When the teacher observed the class students used instructional materials, engaged in discussion and apply learning strategies. In the observed class, the learning strategy was implemented as a game-based learning strategy. When the teacher uses games in the classroom, student becomes motivated and more interested in their task. During the observation when the teacher designed games students were actively involved. The teachers created many questions for students to solve and provided them based on a time limit. The teacher closely monitored each students' activities. When students made mistake in the tasks assigned by the teachers, it led to interesting interaction between them. Students who used fun learning strategies were able to present educational content more easily. With the teachers' support student become more active and closely connected to the learning process. This approach can consider an indicator of students' academic success (Fatta, & Gorman,, 2009) .In different learning states the role of the teacher varies. The teacher assigned and the students collaboratively worked to find join solution and solve problem. The teachers focus on developing group skills and encouraged shared leadership. Emphasis was given to mathematical communication. The teacher also guided students to compare and explain their solution within peer groups. Through interactive teaching strategies students improved their ability to formulated and transform mathematical problems. They also developed the ability to represent and explain the concepts they had learn through visual representations. Furthermore, concepts to solve problems was enhanced.

Teacher guided the mathematics task

1. *Provided, Explanation: This is my strategy.
I demonstrated my thinking process and explained it clearly.*
2. *Agree with region: because
Explain the regions for your agreement.*
3. *Construct it: I develop the idea.
Presented the constructed idea.*

Conclusion

From this study it can be conclude that flexible learning is an effective form of interaction between teacher and students. Some students perceived it as a positive form of interaction. Furthermore, several students clearly expressed that instruction can be carried out through both content learning and structure learning. It has been concluded that interaction among students can be facilitated when teachers implement activity base learning in the classroom. This study primarily explores the foundational factors required for effective interaction. During the learning process teachers should enter the classroom with proper planning. Interaction between teachers and students becomes stronger when it is based on activities. By adapting learning activities, interaction can

also be enhanced through the use of technologies such as computer, tablets, projectors, i-phone and mathematical apps. Overall students' interaction in learning mathematics was found to be positive. Technology enhanced interaction improved students' ability to exchange mathematical ideas with their classmates. It also enhanced their ability to prepare and submit digital assignment effectively. Through collaborative interaction students developed their critical thinking, mathematical reasoning, and communications skills. Their ability to engage in pair learning also improved. Furthermore, collaborative learning helped build students' sense of responsibility and accountability. Through interactive teaching strategies students enhanced their ability to work effectively in teams. Their overall skills improved particularly in problem solving. In addition, students developed stronger self-directed learning skills become more capable in learning independently.

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