



Factors Affecting Students Difficulties in Learning Geometry: A Qualitative Study

Dev Chandra Manandhar*, PhD

Lecturer

Bagmati University, Nepal

manandhar0000@gmail.com

<https://orcid.org/0000-0001-9289-589X>

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Abstract

Background: Geometry plays a substantial role in developing students' logical reasoning, spatial conception, and problem-solving skills. Many secondary-level students in Nepal have faced pressing problems in learning geometry. It has been found to result in low achievement and negative attitudes of those students toward the issue.

Purpose: This study aims to explore the underlying factors that contribute to students' difficulties in learning geometry and to identify effective strategies to enhance teaching geometry in the Nepalese context.

Methods: To attain the objectives, I employed an exploratory research design which involved 10 semi-structured interviews and classroom observations of 24 students and 6 teachers from six public secondary schools in Makawanpur District, Nepal in 2025. Thematic analysis was used to interpret the data and identify key patterns of challenges and influences on geometry learning.

Key findings: Students face cognitive challenges in understanding geometry concepts, affective barriers such as anxiety and low confidence hinder their learning, and instructional as well as contextual limitations negatively impact their academic performance.

Implications: This study underscores the need for learner-centered, technology-supported teaching with continuous teacher training and equitable resources to create supportive classrooms that build students' confidence and interest in geometry.

Keywords: geometry learning, qualitative study, teaching practices, visualization, student difficulties



Introduction

Geometry, as a fundamental branch of mathematics, plays a major part in developing students' spatial reasoning, problem-solving skills and logical thinking (Hock et al., 2015). This is important because it plays a fundamental role in the mathematics curriculum worldwide (Panthi & Belbase, 2017; Ural, 2016). The challenges that learners face in the learning of geometry do not only lie in the academic domain but are a result of a complex combination of cognitive, pedagogical, affective, and environmental factors (Ashkenazi & Hagar, 2023). Overcoming the challenges that learners face in the learning of geometry requires a genuine understanding of the learners' context, learning resources, different teaching methods, and socio-cultural effects (Kshetree et al., 2021).

Thus, in many educational systems, such as in Nepal, geometry is introduced in the early stages of schooling and is developed in the secondary levels (Tabassum et al., 2024). However, the research literature indicates that a number of students face difficulties with different concepts such as geometric constructions, spatial visualization, and abstract perceptive (Panthi & Belbase, 2017). These situations lead to low achievement and mathematics anxiety (Ashkenazi & Hagar, 2023). On the contrary, quantitative studies have been conducted to find the performance gaps in geometry; however, little attention has been given to the experiences of the students and the teachers, especially in the context of diverse classrooms (Kshetree et al., 2021).

That's why this qualitative study seeks to fill that gap by exploring the various factors that contribute to students' difficulties in learning geometry through the different perspectives of those which is directly involved in the teaching learning process of students and teachers (Marange & Tatira, 2023). By using open-ended responses, thematic analysis and interviews, this research tries to exposes the underlying reasons for these challenges and the upcoming strategies employed to address those issues (Joshi & Rawal, 2021).

This study is guided by the Van Hiele model of geometric thought (Ma et al., 2015), Bandura's concept of self-efficacy (Poluektova et al., 2023) , and constructivist learning theory (Mishra, 2023). Moreover, these frameworks help to interpret how these students develop geometric understanding as well as teaching practices and affective factors influence teaching learning outcomes (Panthi & Belbase, 2017).

Objectives of the Study

1. To identify the major conceptual and procedural difficulties students encounter in learning geometry.
2. To investigate the impact of teaching methods, the preparedness of the teacher, and the availability of teaching resources on the students' understanding of geometry.
3. To analyze the cognitive and affective aspects of the learners in the process of learning geometry.
4. To investigate the difficulties that the teacher may encounter in teaching geometry and the strategies that the teacher may employ in teaching geometry.



5. To suggest strategies for improving the effectiveness of geometry teaching and learning.

Research Questions

1. What conceptual and procedural difficulties do students encounter while learning geometry?
2. How do the methods employed in teaching, the teacher's preparedness, and the resources at their disposal affect the student's grasp of geometry?
3. How do the cognitive and affective aspects, such as the student's interest, beliefs, and motivation, influence the learning of geometry?
4. What are the problems that the teacher encounters when presenting geometry to the student, and what steps are employed to assist the student in solving the problems associated with learning geometry?
5. What steps can be taken to make the learning and teaching of geometry more effective?

Significance of the Study

By exploring conceptual misunderstandings, the role of geometric language, curriculum design, instructional practices and student attitudes, this study provides valuable insights into how teachers can better support different learners. The findings will support to the growing body of research in mathematics education by identifying key problems and proposing contextually proper pedagogical improvements. Overcoming these challenges is vigorous to unite students' geometric comprehending and growing overall mathematical attainment.

Literature Review

This review of literature synthesizes existing findings to identify factors affecting students' learning of geometry, providing a foundation for the present qualitative study.

Conceptual Difficulties in Learning Geometry

Geometry is a typical branch of mathematics needing high levels of spatial reasoning and concept. Students often face theoretical hurdles when transitioning from existing arithmetic reasoning to abstract geometric thinking. Duval (1998) asserts that understanding geometry demands synchronization of multiple cognitive processes: visualization, linguistic interpretation skills and reasoning that are not easily integrated by many learners. Unlike in arithmetic, where procedures are linear, in geometry, there is reasoning from various perspectives and the ability to alternate from pictorial, symbolic, and abstract representations (Oner, 2016).

A study from Jones (2002) showed that learners generally misunderstand concepts such as congruent and similar figures, mainly depending on memorization rather than abstract thinking. Fujita and Jones (2007) also acknowledged that there are many misunderstandings, such as those relating to parallel lines, angles, and transformations.

The Role of Language and Symbolism in Geometry Learning

Geometry has a unique vocabulary and symbolic system that can be a cognitive barrier for learners. Pimm (1987) argued that the problem for learners is not conceptual but rather that of



vocabulary: bisect, adjacent, transversal, and hypotenuse are all common terms that create difficulties for them. Sfard (2008) has described the “dual nature” of the symbolic system used in describing geometry in that concepts are both processes and objects for learners. Students who are unable to correctly interpret symbols on a diagram can make mistakes in understanding the diagram (Poch et al., 2015).

Instructional Methods and Teacher Preparedness

Instructional methods and teacher preparedness play a significant role in the study of geometry for students. The study of geometry requires a person to be involved in abstract thinking and visualization skills. Abstract thinking and visualization skills can be best imparted through a dynamic teaching method (Healy et al., 2001). The traditional teaching method that is more prevalent in developing countries focuses on memorization of concepts, definitions, theorems, and formulas (Hafeez, 2021; Adhikari et al., 2024).

Inquiry methods and constructivist methods have been found to be more beneficial for teaching geometry, using manipulatives and GeoGebra software for visualization skills (Ghimire, 2025; Laborde, 2002).

Teacher Professional Development and Beliefs

Professional development is vital in ensuring teachers are adequately prepared to support students in a student-centered geometry instruction approach. This is because Van Hiele’s (1986) theory provides a framework of understanding students’ geometric knowledge, from visualization to deduction, to guide teachers in scaffolding their students’ learning. Teachers’ beliefs, such as procedural and exploratory, influence their teaching practices, with procedural teaching leading to memorization and exploratory teaching leading to reasoning and creativity (Adhikari et al., 2024).

Curriculum Design and Resource Availability

The sequencing of the curriculum and the availability of resources are also major factors that influence the learning of geometry. The introduction of abstract concepts before their proper understanding may hinder the growth of concepts (Mullis et al., 2016). The lack of resources, such as textbooks, may hinder the learning of geometry, as it is best learned through hands-on and visual experiences (Manandhar & Koirala, 2019; Manandhar & Koirala, 2021). Instruction that is linked to the cognitive stages of learning, as outlined by Van Hiele, and real-life experiences is effective.

Student Attitudes and Motivation

An affective aspect such as anxiety, low self-confidence, and negative attitude plays an important role in the learning of geometry. Geometry learning for students who view it as an abstract or disjointed subject may also manifest avoidance behaviors. Positive learning environments, collaborative learning, and real-world applications are also important in enhancing motivation and resilience in learning.

Summary and Theoretical Framework

The article is based on several well-established educational theories. The cognitive dimension, which encompasses students’ understanding, reasoning, and conceptual clarity in geometry, is supported by Piaget’s Cognitive Development Theory (1936), which emphasizes that learners



construct knowledge according to their developmental readiness. The instructional dimension, reflecting teaching methods, learning materials, and classroom practices, is underpinned by Vygotsky's Sociocultural Theory (1978), particularly the Zone of Proximal Development, which explains how guided support from teachers and peers enhances learning, and Gagné's Conditions of Learning (1965), which emphasizes that specific instructional strategies are necessary to achieve different learning outcomes. The affective dimension, relating to students' attitudes, motivation, self-confidence, and anxiety, draws support from Bandura's Social Learning Theory (1977), which underscores the role of self-efficacy and observational learning. Finally, the external dimension, including environmental and contextual factors such as peer influence, parental support, and school resources, is informed by Bronfenbrenner's Ecological Systems Theory (1979), which situates learning within interacting social systems, and Tinto's Theory of Student Departure (1975), which highlights the importance of institutional and social support for academic integration and success. Together, these theories provide a comprehensive rationale for the framework, demonstrating that the challenges students face in learning geometry emerge from the complex interplay of cognitive, instructional, affective, and external factors.

Conceptual Linkages of This Study

The conceptual diagram presented below illustrates the key interrelated factors that contribute to the difficulties students encounter in learning geometry, as identified through the qualitative research findings of this study. It highlights four major dimensions: cognitive (Piaget, 1936), instructional (Vygotsky, 1978), affective (Bandura, 1977), and external (Bronfenbrenner, 1979) which interact in complex ways to influence students' learning experiences. The cognitive dimension encompasses students' understanding, reasoning abilities, and conceptual clarity in geometry, while the instructional dimension relates to the teaching methods, learning materials, and classroom practices employed by teachers (Gagné, 1965). The affective dimension involves students' attitudes (Atkinson, 1964), motivation, self-confidence, and anxiety toward learning geometry, and the external dimension includes environmental and contextual factors such as peer influence, parental support, social support (Tinto, 1975), and school resources. All these dimensions contribute to the specific learning challenges faced by students, which in turn give rise to broader academic difficulties and problem areas in their overall mastery of geometry.

Figure 1
Conceptual Linkages

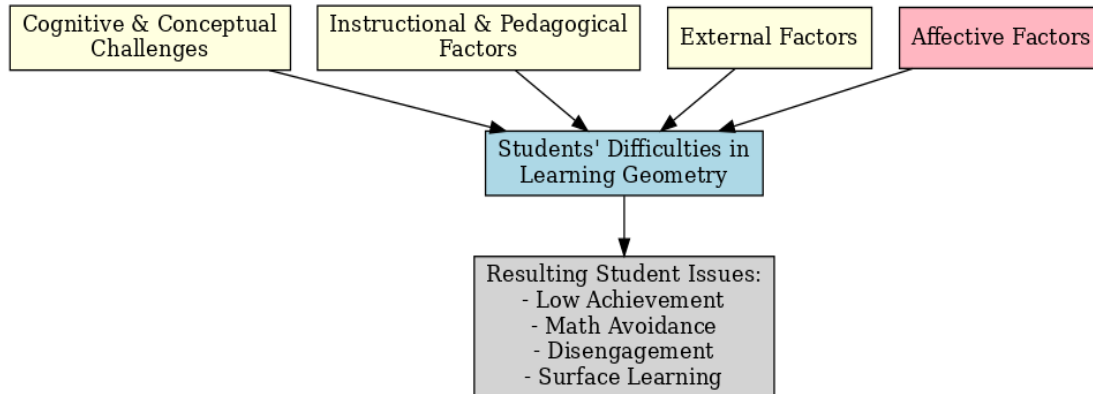
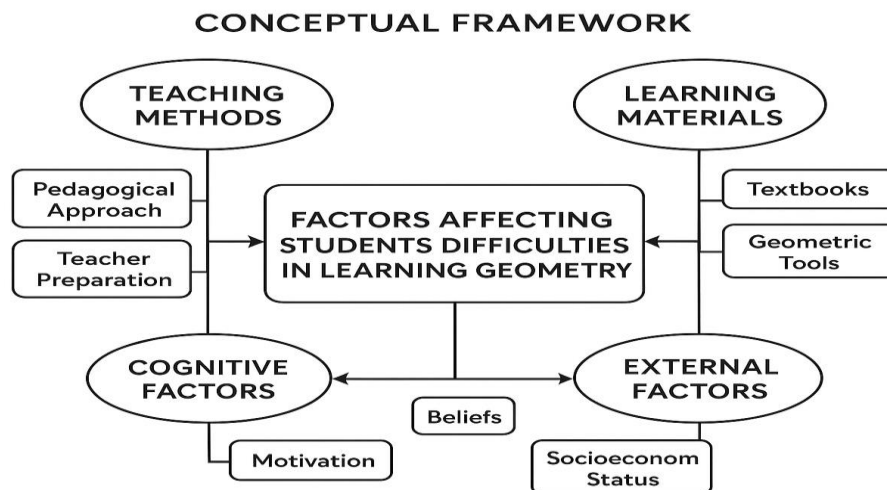


Figure 2
Conceptual Framework Showing the Interrelated Factors Affecting Students' Difficulties in Learning Geometry



Methodology

Research Design

This study employed an exploratory research design within an interpretivist paradigm to explore the contextual factors influencing students' difficulties in learning geometry (Creswell & Poth, 2017). The approach enabled a deep understanding of students' lived experiences, classroom interactions and teacher perspectives.

Population and Sample

The population comprised Grade 9 and 10 students from public secondary schools in Makwanpur district, Nepal where geometry is part of the curriculum. Consequently, purposive sampling was employed to select 24 students, comprising both urban and rural, and six mathematics teachers. Purposive sampling was appropriate in this study because it allowed the researcher to deliberately select participants who were most relevant to the research objectives.



By choosing Grade 9 and 10 students and mathematics teachers from both urban and rural schools, the study ensured a diverse representation of experiences related to learning and teaching geometry in terms of geography, gender, and socio-economic background.

Research Instruments

The instruments for collecting the data included various qualitative methods such as:

1. Semi-structured interviews with the students as well as teachers.
2. Using classroom observation checklists.
3. Document analysis.

These instruments were created on the basis of previous studies and validated by education experts (Merriam & Tisdell, 2016). The instruments were translated into the Nepali language to ensure that the participants understood the questions (Lincoln & Guba, 1985).

Reliability and Validity of the Instrument

To ensure reliability, consistency was maintained in the interview procedures, observations, and transcription of data from all participants. Triangulation was also used to analyze the data obtained from students, teachers, and observations.

To ensure validity, member checking was used to establish the accuracy of the study, and expert consultation was used to establish the validity of the research instruments used.

Sources of Data

Data was obtained from different sources to ensure credibility and triangulation.

- Primary Sources: Interviews with students and teachers, and observations.
- Secondary sources: Students' geometry assessments, notebooks and teaching plans (Cohen et al., 2007).

This multi-source method facilitated a inclusive understanding of the factors manipulating geometry erudition across diverse school contexts.

Data Collection Procedures

Data collection was conducted over six weeks. Ethical clearance was obtained from the university and district education authorities. The data were collected in 2025. Participants and their guardians provided informed consent. Interviews were conducted in Nepali, audio-recorded with permission, and classroom observations were non-intrusive (Bogdan & Biklen, 2007). All data were transcribed into English for analysis.

Data Analysis Procedures

Data were analyzed using thematic analysis following Braun and Clarke's (2006) six-phase framework: familiarization, coding, generating initial themes, reviewing themes, defining and naming themes and reporting. Both inductive and deductive coding approaches were used. The major themes identified included misconceptions in geometry, ineffective teaching strategies, limited spatial thinking, and socio-cultural factors. In order to establish credibility, member checking, peer debriefing, and reflexivity were used (Lincoln & Guba, 1985).

Ethical Considerations

The study was carried out under strict ethical standards. Ethical approval was obtained from the relevant institution, and the study was purely voluntary. Informed consent was obtained



from the students and guardians, and pseudonyms were used to maintain anonymity. The participants were assured of their right to withdraw at any time without any consequences. The data was stored under strict security and was only accessible to the research team. The interview was handled in a sensitive manner to promote beneficence, non-maleficence, autonomy, and justice (BERA, 2018).

Results and Discussion

Geometry is a fundamental branch of mathematics that develops students' spatial, logical, and problem-solving skills, yet it is often considered one of the most difficult subjects. Students' difficulties arise from cognitive, affective, instructional, and environmental factors, making it essential to explore their perspectives, teaching practices, and context. This qualitative study, conducted in public secondary schools in Nepal, investigates these challenges, focusing particularly on what students find most difficult in geometry and the causes behind them.

Research question 1: Challenging Topics in Geometry

Students and teachers largely agree that several geometry concepts are particularly challenging. Geometric constructions using compass and ruler, especially of triangles, quadrilaterals, and angles, are difficult due to weak spatial and procedural understanding. Logical reasoning and proof, including concepts like congruence and similarity, also pose problems because of students' limited sequential thinking skills. Additionally, visualization of 2D and 3D objects, such as surface area, volume, and spatial transformations, remains a major challenge. Finally, topics like trigonometry and coordinate geometry are difficult as they require the integration of conceptual understanding with procedural application.

Factors Contributing to Geometry Difficulties

Students' difficulties in geometry stem from cognitive, emotional, instructional, pedagogical, and environmental factors, including weak foundational knowledge, low confidence, limited resources, and reliance on traditional methods. Addressing these challenges requires supportive teaching, adequate resources, and positive learning environments.

Research question 2: Teaching Methods and Classroom Resources

This question aimed to investigate how the instructional strategies and teaching materials affect students' knowledge of geometry. In the interview both students and teachers have confirmed the impact of teaching strategies, classroom instructions and availability of teaching materials.

Impact of Teaching Methods

Students and teachers use lectures, group work, discussions, and activities, but students prefer interactive, visual, and hands-on methods. While lectures help, active participation, step-by-step guidance, and collaboration improve understanding, visualization, and retention. Teachers applying scaffolding, collaborative problem-solving, and multiple representations effectively address students' geometry difficulties, aligning with constructivist principles.

Influence of Classroom Resources

Students and teachers emphasized the importance of physical models and teaching aids, such as compasses, protractors, and solid geometry models, which provide hands-on experiences and improve understanding and retention. Students also preferred digital tools like projectors,



animations, and GeoGebra for clearer and more engaging learning. However, teachers faced challenges due to limited infrastructure, training, and access to technology, creating unequal learning experiences across schools.

Interpretation and Implications

The results show that passive lectures are insufficient, and students learn best through varied, concrete, and visual methods, supporting Piaget, Bruner, and Van Hiele. Effective instruction matches learners' levels, and trained, competent teachers enhance engagement and understanding.

Research question 3: Cognitive and Affective Factors in Geometry Learning

In understanding students' experiences in learning geometry, it is important to examine both cognitive and affective aspects, which are interconnected in determining students' learning outcomes. Students' and teachers' data showed the significance of visualization and spatial skills, students' confidence, and anxiety in learning geometry.

Cognitive Factors: Visualization and Spatial Reasoning

Visualization is a key cognitive skill in learning geometry, yet students struggle with it, citing difficulties in constructing shapes and mentally rotating figures, as well as moving from 2D to 3D forms. According to Van Hiele's theory, students at the visualization or analysis stages face barriers in progressing to abstract and deductive reasoning, making limited spatial reasoning a developmental obstacle to understanding geometric concepts.

Affective Factors: Confidence, Fear and Attitude

Emotions significantly impacted students' learning of geometry, with anxiety, fear, and low self-confidence being common; many students felt apprehensive, expressing thoughts like "I am afraid" or "geometry is hard," which led them to avoid challenging problems. While students were confident with simple geometry, most had low self-efficacy for complex tasks, and teachers highlighted that students' beliefs about their abilities and past struggles strongly influenced their engagement and performance.

Interaction of Cognitive and Affective Factors

Cognitive and emotional factors are closely connected: poor visualization can raise anxiety, while low confidence or fear can overload working memory. A supportive classroom that encourages questions and views mistakes as learning opportunities boosts confidence, whereas a punitive environment increases fear.

Theoretical Interpretation

The findings support Bandura's self-efficacy theory and constructivist principles, showing that belief in one's abilities and active learning aid understanding, while anxiety and fear hinder it. Teachers' use of step-by-step guidance, visual aids, manipulatives, and encouragement reduces fear and enhances learning, highlighting the need to address both cognitive and emotional factors.

Research question 4: External Factors Influencing Students' Geometry Learning

Students' learning in geometry is affected not only by what the students are taught in class and by internal factors, but also by external factors such as support from family, access to additional learning, socio-economic factors, and learning resources.



Family Support

Family engagement strongly influenced students' motivation and persistence in learning. Supportive families provided time, space, and encouragement, boosting understanding and confidence, while students from less educationally experienced or disengaged households faced academic isolation and higher anxiety. Teachers observed that children with academically inclined or effort-valuing parents were more resilient and motivated in geometry tasks.

Additional Classes and Tutoring

Supplementary instruction, such as tuition and extra classes, helped students improve understanding, clarify doubts, and gain confidence, but access was unequal, urban and wealthier students benefited more while overreliance on these classes sometimes limited independent learning.

Socio-Economic and Resource-Based Disparities

Access to learning resources outside the classroom also affected the learning of geometry. Some students who had access to the internet, smartphones, or geometry sets could use online tutorials, videos, or apps to learn. On the other hand, some resource-constrained students lacked the opportunity to practice their constructions or assignments due to the lack of equipment. According to the teachers, this affected their self-confidence.

Theoretical Interpretation

This is in line with Bronfenbrenner's Ecological Systems Theory that focuses on the role of various environmental layers in the process of learning, ranging from the family (microsystem) to socio-economic status (ecosystem). Family factors, culture, and socio-economic status are all mediators of learning opportunities and reinforcement mechanisms that may supplement or limit teaching in school.

Voices from the Field

Student Perspective: A rural ninth-grade student shared, "I try to practice from my book but sometimes I don't understand the steps. I don't attend tuition classes as there are none nearby and my family cannot afford private coaching. In class, it goes fast; I feel left behind."

In contrast, an urban student reported, "Geometry was confusing before but now I take extra classes in the evening. The tutor shows us with 3D models. It makes sense now. My parents help me find online videos and bought a compass set. Now I feel confident and help my friends in class too."

Teacher Perspective:

A teacher from a semi-urban school reflected, "I see a big difference between students who get extra help and those who don't. Some children have no one at home to guide them. Those who come familiar with the basics because of home support or tuition learn faster. It's not just ability; background support makes the difference."

Research question 5: Teacher Challenges and Strategies in Geometry Instruction

Teaching geometry is inherently complex, requiring the communication of abstract, spatial, and symbolic knowledge while supporting students' cognitive and visual reasoning. There are a number of challenges that teachers face, and they affect their ability to help students learn, but teachers also have a variety of strategies to help students who are having learning difficulties.



Key Challenges in Teaching Geometry

Challenges: Students struggle with conceptual understanding, visualization, and advanced geometry topics like proofs, congruence, and 3D representations. Limited resources, mixed-ability large classes, math anxiety, negative attitudes, and curriculum pressures further hinder learning.

Support Strategies: Teachers use visual aids, step-by-step scaffolding, group work, positive reinforcement, additional support sessions, and real-life contextualization to help students grasp concepts, build confidence, and engage actively in learning.

Voices of Geometry Teachers

Teacher 1 (Urban School): *“Many students think they won’t understand geometry. I start with simple constructions and paper models. Without projectors or GeoGebra, I feel limited. Extra support at home helps some students and I stay back after class to assist others, it’s exhausting but meaningful.”*

Teacher 2 (Rural School): *“Resources are scarce. The geometry box is shared and digital tools are unavailable. I make students work in pairs and draw step by step. One student was afraid to try; after showing him how to draw a triangle slowly, he gained confidence. Small successes matter.”*

Teacher 3 (Semi-Urban School): *“Time and attention are the biggest challenges. In a class of 50, it’s hard to know who is lost. I ask students to present on the board and talk through mistakes. Geometry is logic, but also confidence, if they feel safe, they usually succeed.”*

Research question 6: Suggestions from Students and Teachers to Enhance Geometry Learning

Due to geometry’s visual and abstract nature, students face cognitive and emotional challenges, and the study identified key themes from students’ and teachers’ perspectives on strategies to make learning easier.

Theme 1: The Integration of Visual and Concrete Learning Aids

Both students and teachers emphasized using concrete and visual aids—such as charts, models, and geometric tools to make abstract concepts like symmetry, surface area, and constructions easier to understand, with students noting that tangible materials help them visualize and grasp concepts better.

Theme 2: Use of Digital Technology and ICT Tools

Both students and teachers recommended using digital tools—like GeoGebra, videos, slides, apps, and 3D modeling to enhance geometry learning, though limited resources, especially in rural schools, pose challenges.

Theme 3: Active and Participatory Teaching Methods

Both teachers and students favored interactive, collaborative, and hands-on methods—such as group work and problem-solving as effective for engagement and understanding, aligning with constructivist learning principles.

Theme 4: Curriculum and Instructional Design Improvements



Participants suggested curriculum improvements, including early introduction of geometry, simplified content, more teaching time, a spiral progression from basic to advanced concepts, and real-life examples, to better meet students' learning needs and enhance understanding.

Theme 5: Emotional and Motivational Support

Emotional and motivational support through encouragement, constructive feedback, and a safe learning environment was seen as crucial for student engagement and success, particularly for those with math anxiety.

Theme 6: Equitable Access to Resources and Support

Equitable access to resources such as extra classes, tuition, visual aids, and geometry kits was seen as essential for supporting students, especially those from rural or disadvantaged backgrounds, to succeed in geometry.

Results

Students faced cognitive challenges in visualizing and thinking spatially, particularly with constructions, congruence, similarity, and 3D shapes, and affective challenges like fear, anxiety, and low self-confidence worsened these difficulties. Instructional factors such as large classes, limited resources, and lack of ICT also posed obstacles, which students addressed using visual aids, step-by-step methods, group work, and real-life applications. External factors, including limited home support and learning materials, further hindered their progress.

Suggestions for Improvement

Students recommended using visual aids, ICT, real-life applications, early geometry introduction, and supportive classrooms to improve learning. Difficulties in geometry stem from cognitive limits in visualization, spatial reasoning, and abstraction, compounded by fear, low confidence, and anxiety. Overcrowded classes, limited resources, and lack of ICT hinder interactive teaching, while inadequate home support worsens outcomes. Coping strategies like group work and practical examples help, but integrated pedagogical reforms are needed to systematically support learning.

Discussion

This study examined factors affecting students' difficulties in learning geometry in selected public secondary schools in Nepal, revealing multidimensional challenges across cognitive, affective, instructional, and socio-environmental domains.

Cognitive and Visualization Challenges: Students struggled with spatial reasoning, visualization, constructions, proofs, and geometric properties due to limited foundational knowledge (Ural, 2016; Panthi & Belbase, 2017), aligning with the VHM's emphasis on concrete experiences for abstract thinking.

Affective Factors: Fear, low confidence, and anxiety hindered learning, while high self-efficacy supported persistence (Ashkenazi & Hagar, 2023; Joshi & Rawal, 2021).

Teaching Methods and Classroom Resources: Active methods like group work, problem-solving, and visual aids improved understanding, and technology such as GeoGebra aided learning, though infrastructure limitations, especially in rural areas, restricted usage (Marange & Tatira, 2023; Joshi & Rawal, 2021; Panthi & Belbase, 2017).



External and Home Factors: Family support, tuition, and socio-economic status influenced performance, with supportive environments enhancing confidence and understanding.

Teachers' Challenges and Strategies: Large classes, mixed abilities, resource shortages, and time constraints were challenges; effective strategies included scaffolding, visual aids, contextual examples, cooperative learning, and emotional support (Joshi & Rawal, 2021).

Students' difficulties in learning geometry in Nepal are multifaceted, involving cognitive, emotional, instructional, and socio-environmental factors. Weak spatial reasoning, low confidence, and anxiety hinder learning, while active strategies like group work, visual aids, and technology help but are limited by large classes, scarce resources, and rural infrastructure. Family support and socioeconomic factors also affect performance, highlighting the need for integrated reforms addressing cognitive, emotional, and contextual challenges.

Conclusions

The study concludes that the problems faced by the students in understanding geometry are due to a complex interplay of cognitive, affective, instructional, and socio-environmental factors. Geometric constructions, proofs, spatial understanding, and trigonometry were found to be the most challenging concepts in geometry. Visualization and basic understanding of concepts are essential in understanding these concepts. Another important factor that has been identified in this study is that fear, lack of confidence, and attitude have been found to be the most important factors affecting the learning of geometry. In this study, it has been found that classroom strategies and resources have played a significant role in improving understanding. Inequity in access to resources has also been identified as a problem in understanding geometry in urban and rural schools. Teachers have also faced challenges in handling large numbers of students, mixed ability, and resource constraints. By using the strategies mentioned in this paper, geometry can be made to look appealing and exciting instead of menacing and boring.

Recommendations

Based on the findings, the following recommendations are completed:

1. Teachers should utilize visual and digital media, such as charts, models, and GeoGebra, to help students grasp the concepts of geometry.
2. Teachers should encourage students to learn by doing, or by participating in group activities and problem-solving exercises.
3. Teachers should make an effort to connect students' learning of geometry with real-life experiences.
4. Teachers should introduce students to geometry early and gradually increase the level of difficulty, reviewing basic concepts to lay a strong foundation.
5. Schools should provide additional resources, such as geometry kits, ICT, and remedial classes, especially for students from disadvantaged areas.

Transparency Statement: The author confirms that this study has been conducted with honesty and in full adherence to ethical guidelines.

Data Availability Statement: Author can provide data.

Conflict of Interest: The author declares there is no conflicts of interest.

Authors' Contributions: The author solely conducted all research activities i.e., concept, data collecting, drafting and final review of manuscript.



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