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AN INVESTIGATION INTO PROBLEMS IN TEACHING AND LEARNING MATHEMATICS AT PLATEAU STATE UNIVERSITY BOKKOS, NIGERIA

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Abstract: This study investigated the challenges of teaching and learning mathematics at Plateau State University (PLASU), Bokkos, Nigeria. Although the challenges in this area are diverse, the study focused on five key domains: effective teaching and learning styles, mathematical knowledge for teaching, mathematics foundation and transition, attitudes toward mathematics, and a conducive learning environment. Data were collected through questionnaires, interviews, and focus group discussions. Findings revealed significant issues, including students'' negative attitudes toward mathematics, poor foundational knowledge, and inadequate preparation from high school for the demands of university-level mathematics. Additional challenges included the difficulty of adjusting to new teaching practices, the impact of living off-campus, and limited access to relevant resources such as updated reference books, modern mathematics software, and current mathematics journals. The study concluded with recommendations to address these issues. It emphasized the need for both lecturers and students to have access to adequate mathematics resources and emphasized the importance of adopting teaching methods that foster active student participation. Furthermore, the need for infrastructure expansion was stressed, given PLASU's growth into a full-fledged, internationally recognized institution catering to a large student population.

Keywords: Investigation, Problems, Teaching, Learning, Mathematics, Plateau State University Bokkos

1. INTRODUCTION

1.0 Introduction

Mathematics is the foundational language of many disciplines, with applications spanning science, technology, business, health, and humanities. Despite its centrality, many students struggle to grasp mathematical concepts, which impedes their academic performance in mathematics-dependent fields. As a structured intellectual discipline, mathematics fosters both cognitive and ethical development, equipping individuals with critical thinking skills necessary for solving real-world problems and driving innovation.

Ukeje (1990) aptly described mathematics as the "queen of the sciences," highlighting its indispensable role in scientific and technological advancement. This view underscores the need for effective mathematics education to nurture learners' intellectual capacity. At the core of this study is an investigation into the challenges of teaching and learning mathematics at Plateau State University, Bokkos. A solid foundation in mathematics is not only desirable but also essential. Obarakpo (2009) emphasized that mathematics is a vital service subject that offers transferable skills across disciplines such as engineering, medicine, finance, and the social sciences.

A critical element of mathematics education is the quality of the teacher. According to Iji and Uka (2012), even gifted students may underperform if instruction is inadequate or misaligned with their learning needs. The role of teachers in shaping understanding is thus central to educational success. Beyond classrooms, mathematics influences broader societal functioning by encouraging imagination, precision, and logical reasoning. It accommodates diverse abilities, making it essential for personal development and collective progress.

1.2 Theoretical and Conceptual Frameworks

Educational systems worldwide face persistent challenges, especially in mathematics instruction. Inana (2010) identified these as spanning institutional, pedagogical, and learner-specific dimensions, while Power (2014) defined them as critical barriers to success. The teaching and learning of mathematics at PLASU face similar complexities, necessitating an analytical framework to identify and address core issues. This study adopts a conceptual framework grounded in five domains: effective teaching and learning strategies, mathematical knowledge for teaching, foundational and transitional gaps, student attitudes, and conducive learning environments.

1.2.1 Effective Teaching Strategies:

Traditional “absorption models” (Clements & Battista, 1990) promote passive learning, which often fails to meet students’ diverse needs. Brooks and Brooks (1993) advocate for student-centered, constructivist approaches in which learners build understanding through engagement and reflection. Mathews (2000) and Wertsch (1997) support this theory by; emphasizing individualized learning processes. Active learning and peer collaboration foster deeper comprehension, particularly in mathematics, a subject rooted in practice and problem-solving.

1.2.2 Mathematical Knowledge for Teaching:

Ferrini-Mundy, Floden, and McCrory (2001) define Mathematical Knowledge for Teaching (MKT) as discipline-specific knowledge tailored for educational contexts. At PLASU, lecturers are expected to possess at least a Master’s degree. Shulman’s (1986) concept of Pedagogical Content Knowledge (PCK) emphasizes not only understanding mathematical content but also knowing how to effectively communicate it. This includes anticipating misconceptions and tailoring explanations to diverse student needs.

1.2.3 Student Attitude:

Attitudes toward mathematics—defined by Aiken (2000) as emotional, cognitive, and behavioral tendencies—strongly influence achievement. Tapia (2004) noted that negative emotions like anxiety hinder learning. Building confidence and cultivating intrinsic motivation are essential for fostering positive attitudes and long-term engagement.

1.2.4 Foundational Gaps and Transitions:

Holton (1997) and Artigue (1999) highlight the discontinuity between secondary and tertiary mathematics, which can cause confusion among students. Okello (2010) observed that many undergraduates struggle with basic concepts, such as college algebra. Effective transitional support is essential, especially as students adjust to increased independence.

1.2.5 Conducive Learning Environment:

Lieb (1991) emphasized relevance, respectful interaction, and student engagement. According to Schmidt (2005), curriculum coherence, adequate infrastructure, and feedback mechanisms are vital to successful learning environments. Together, these factors shape the academic experiences and outcomes of students.

1.2.6. Summary of the conceptual and theoretical frameworks are summarized.

The domains discussed here can be shown in the conceptual model that follows:

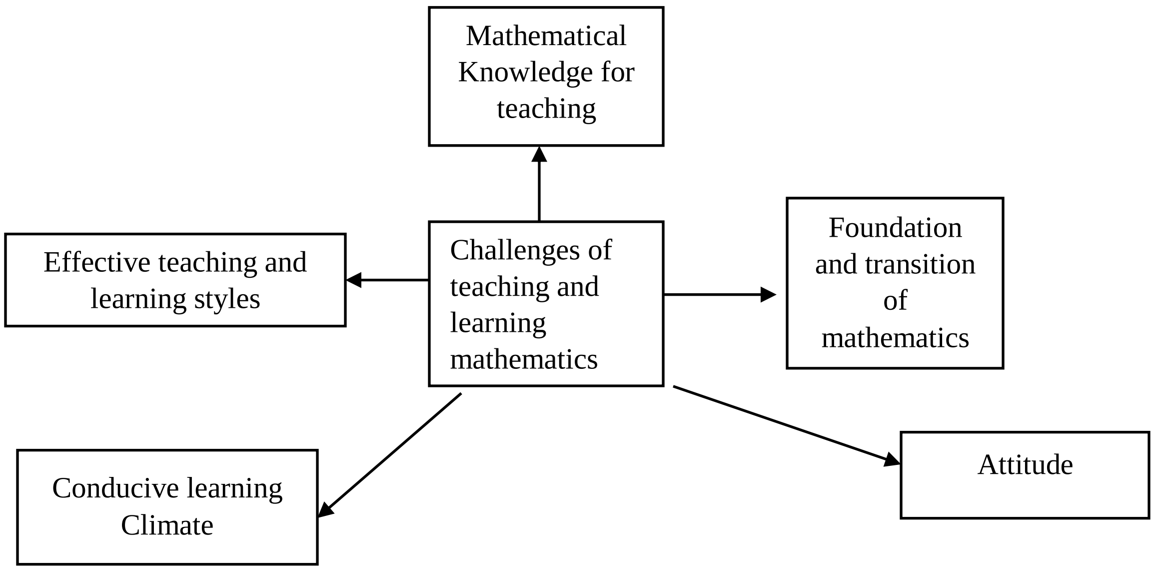

Figure 1.1: Conceptual model of challenges in teaching and learning mathematics

Establishing a conducive learning environment and implementing effective teaching strategies are fundamental for improving mathematics education. These factors are particularly crucial for students who struggle with mathematical concepts or experience difficulty transitioning from secondary- to tertiary-level mathematics. A positive and supportive environment can significantly influence the attitudes and motivation of students. Lecturers play a pivotal role in this process by applying both their subject-matter expertise and Pedagogical Content Knowledge (PCK), enabling them to address misconceptions, simplify complex ideas, and support conceptual understanding (Shulman, 1986). Such instructional approaches help students develop a solid mathematical foundation and more effectively navigate academic transitions.

1.3 Definitions of the Terms

Tertiary Institution: An institution offering education beyond the secondary level, culminating in a certificate, diploma, or degree (Grubb, 1996).

Learning: The active process of discovery and knowledge acquisition (Perry, 1999).

Lecturer: An academic responsible for tertiary institution instruction in a specific subject.

Student: An individual enrolled in either a secondary or tertiary institution; used interchangeably with "learner."

Challenges: Barriers or obstacles that hinder academic progress or achievement.

1.4 Statement of the Problem

Despite the importance of mathematics across disciplines in Nigeria, student performance remains consistently poor (Nkoya, 2009). At Plateau State University Bokkos, no comprehensive study has yet explored the challenges affecting mathematics teaching and learning, prompting this investigation.

1.5 Justification/Significance of the Study

This study is expected to provide significant insights for lecturers, students, and departmental heads at Plateau State University Bokkos, as well as for stakeholders in other tertiary institutions across Nigeria. The findings will illuminate the key challenges in teaching and learning mathematics, thereby informing improvements in pedagogical practices and learning outcomes. University management, academic planning units, and governmental bodies, such as the State and Federal Ministries of Education, will benefit from this research. The findings will be used to design more effective interventions that enhance mathematics education nationwide. Additionally, prospective students will gain valuable information to better prepare for the rigors of studying mathematics and related disciplines. Ultimately, this research contributes to the national and academic discourse on improving mathematics education in Nigeria.

1.6 Study Objectives

a) To assess the current teaching and learning conditions of mathematics at the PLASU.

b) To identify the challenges faced by PLASU mathematics lecturers.

c) To determine the challenges students encounter in learning mathematics.

1.7 Limitations of the Study

The study was limited to PLASU's Department of Mathematics. Despite scheduling difficulties, high participation of lecturers and students ensured robust findings. Confidentiality measures addressed concerns regarding anonymity in questionnaire responses.

2. LITERATURE REVIEW

This section provides a contextual foundation for understanding the teaching and learning of mathematics at Plateau State University Bokkos by drawing on existing literature on educational challenges in general and mathematics education in particular. It first considers broad learning and teaching frameworks before narrowing the focus to specific challenges in mathematics instruction at various educational levels.

Learning has long been a subject of study, with varied theories explaining how individuals acquire knowledge. Post (1988) noted that learning involves diverse interactions, whereas Burns (1995) defined it as a relatively permanent change in behavior shaped by internal and external influences. Learning theories range from passive models to active engagement paradigms, with Post (1998) distinguishing between teacher-centered and student-centered approaches. Inana and Agbedeyi (2010) advocated active learning in mathematics, emphasizing problem-solving and strategic thinking.

Effective teaching blends subject knowledge and pedagogy. Beaton et al. (1996) and Shulman (1986) stressed the need for deep content understanding and instructional skills. Pfund and Duit (2000) warned that gaps in content mastery lead to misconceptions, whereas Ma (1999) and Ball (2005) linked the knowledge of lecturers to student achievement. Koehler and Mishra (2007) further highlighted pedagogical understanding as essential for fostering meaningful learning experiences.

At the primary level, challenges include insufficient foundational knowledge, inadequate resources, untrained teachers, and limited student engagement (Farooq & Shah, 2008). Abe and Adu (2013) emphasized the shortage of qualified mathematics teachers and noted mismatches between teacher specialization and assigned subjects. The scarcity of instructional materials (Abdullahi, 2008; Emizie, 2010; Adewale, 2011), lack of practice, student fear (Mullis et al., 2020; Varsavsky, 2010), and societal attitudes (Okafor &Anaduaka, 2013) exacerbate these problems.

Additional constraints include a rigid or foreign curriculum (Azuka et al., 2013), poor societal perception of mathematics, underfunding, and widespread examination malpractice. These interconnected issues demand a holistic, well-funded, and context-sensitive reform of mathematics education at and beyond Plateau State University.

Recent investigations have shed light on the persistent challenges in mathematics education across various contexts. Denbel (2023) examined the experiences of postgraduate students with online mathematics learning and found that social difficulties, poor internet access, limited resources, and lack of instructor support were major barriers. The study recommended blended learning to address these concerns. Similarly, Ohiri (2024) identified obstacles in Nigerian secondary schools, such as unqualified teachers, overcrowded classrooms, lack of instructional materials, and students' negative attitudes toward mathematics. The study emphasized the need to employ trained teachers and improve infrastructure.

Mukuka et al. (2024) explored the integration of digital tools in teacher education in Zambia, revealing infrastructure deficits, limited access to technology, and inadequate teacher training as major hurdles. The authors advocated systemic reforms, including curriculum updates and professional development. A national report, Key Challenges in Nigeria's Mathematics Education (2024), corroborated these findings, highlighting issues like curriculum irrelevance, language barriers, and insufficient facilities.

The K12 Digest (2020) article highlighted online learning challenges, such as explaining abstract concepts without in-person interaction, tracking assignments, and assessing performance. It called for appropriate digital platforms to support teaching. The NCSM (2021) report addressed the pandemic's impact, advocating adaptive strategies for safe and effective learning.

Mathematics Learning Challenges and Difficulties (ResearchGate, 2023) emphasized structural reforms to ensure equity post-COVID. Meanwhile, Education Week (2025) discussed the controversy surrounding New York City's new curriculum, reflecting tensions between traditional and reform approaches. ASCD (2024) urged a realignment of math education to emphasize critical thinking and real-world relevance.

Finally, Education Week (2025) showcased top teachers fostering student resilience and problem-solving skills. Collectively, these studies highlight that addressing mathematics education challenges requires comprehensive efforts in curriculum design, teacher training, digital inclusion, and attitudinal change.

3. METHODOLOGY AND RESEARCH DESIGN

3.0. Introduction: This section outlines the methods used to explore the teaching and learning challenges in mathematics at the Bokkos Plateau State University. It covers research design, site, population, sampling, data collection tools, and ethical considerations.

3.1. Research Design: A descriptive and contextual research design will be adopted, allowing an in-depth understanding of the challenges of teaching and learning. As Burns and Grove (2001) and Collis and Hussey (2003) explain, descriptive design helps to outline real situations and phenomena. A qualitative approach with quasi-quantitative methods will be used to determine the issues faced. Botes (1995) highlighted the relevance of contextual research in capturing study-specific circumstances.

3.2. Research Site: The study will be conducted at Plateau State University, Bokkos (PLASU), which was established in 2005 and is located 70 km from Jos. It offers diverse undergraduate and postgraduate programs across nine faculties, including natural and applied sciences.

3.3. Target Population: The target population includes all mathematics lecturers and students at PLASU and students taking mathematics-intensive courses, as defined by Polit and Hungler (1999).

3.4. Sample: All mathematics lecturers and students from the department will participate, following Polit and Hunger's (1999) sample definition.

3.5. Sampling Design Purposive sampling will be used to select participants with rich insights into the research questions. Creswell (2003) and Patton (1990) supported this method for gaining a deeper understanding of the subject.

3**.6. Triangulation,** as described by Robson (2002) and Neuman (1994), involves using multiple methods (questionnaires, interviews, and focus groups) to enhance the validity and reliability of the findings.

3.7. Data Collection Methods and Instruments

3.7.1. Questionnaire: Separate questionnaires for lecturers and students will gather data on demographics, instructional methods, and challenges. As noted by Munn and Drever (1996), questionnaires provide efficient, anonymous data collection.

3.7.2. Interviews: Semi-structured interviews will be conducted with lecturers, Heads of Departments, Deans, and library staff to gain comprehensive insights. Creswell (2003) recommends semi-structured formats for depth and flexibility.

3.7.3. Focus Group Discussions: Focus group discussions will be organized for students. Creswell (2003) and Heurich (1997) supported this method for its efficiency and depth in collecting verbal data.

3.8. Data Analysis Techniques: Qualitative data will be analyzed thematically, while quantitative data will be processed using SPSS and Excel for descriptive and inferential statistics.

4. PRESENTATION OF FINDINGS ONTHE TEACHING AND LEARNING OF MATHEMATICS AT PLASU

This section deals with the prevalent situations in the teaching and learning of Mathematics at the Plateau State University, Bokkos (PLASU). This section comprises the qualification of lecturers teaching mathematics, availability of lectures for consultation, the use of the library by students, completion of the syllabus by lecturers, and an overview of how courses are assessed at the Plateau State University, Bokkos.

4.1.1 Qualifications of mathematics lecturers: Table 4.1 presents the qualifications of the lecturers teaching mathematics at the Bokkos Plateau State University.

Highest Qualification	**Number of lecturers**	**Percentage of lecturers**
B.Sc	1	14.3
M.Sc	2	28.6
M.Ed	1	14.3
Ph. D	3	42.9
Total	7	100

The Mathematics Department, PLASU, has a total of eleven (11) lecturers, however, at the time of this study, two (1) lecturers with M.Sc. were on study leave abroad, one (1) lecturer with a Ph.D. Was on sabbatical outside the state and one (1) lecturer with an M.Sc was unavoidably absent. Therefore, a total of seven (7) lecturers took part in the study. Among the lecturers that took part in the study, one (1) had a B.Sc, two (2) have M.Sc, one (1) has M.Ed and three (3) had Ph.D.which translate to approximately 14.3% of the lecturers with B.Sc, 28.6% of lecturers with M.Sc, 14.3% of lecturers with M.Ed, and 42.9% of lecturers with Ph. Ds. Obviously, a higher percentage of lecturers who teach mathematics at the Plateau State University Bokkos are qualified and experienced lecturers.

4.1.2 Perception of lecturers of their teaching loads

The lecturers were asked if their teaching load was within the recommended bracket. Their responses are presented in Table 4.2.

My teaching load is within the recommended bracket	Number of lecturers	Percentage of lecturers
Strongly Disagree	1	14.3
Disagree	3	42.9
Agree	2	28.6
Strongly Agree	1	14.3
Total	7	100

Table 4.2 shows lecturers' perceptions of their teaching loads. Here, 1 (approximately 14.3%) lecturer Strongly Disagreed that his teaching load is within the recommended bracket, 3 (approximately 42.9%) of lecturers disagreed that their teaching loads are within the recommended brackets, 2 (approximately 28.6%) of the lecturers agreed that their teaching loads are within the recommended brackets, and 1 (approximately 14.3%) strongly agreed that their teaching loads are within the recommended brackets. Generally, the results showed that greater number 4 (approximately 57.2%) of the lecturers disagreed that their teaching loads are within the recommended brackets. At the Department of Mathematics, Plateau State University, Bokkos, lecturers take more teaching loads than they recommend. This is because some lecturers have gone on study or sabbatical and their workloads must be shared among the available lecturers. This is why, at the end of every academic year, these excess workloads are computed and paid for.

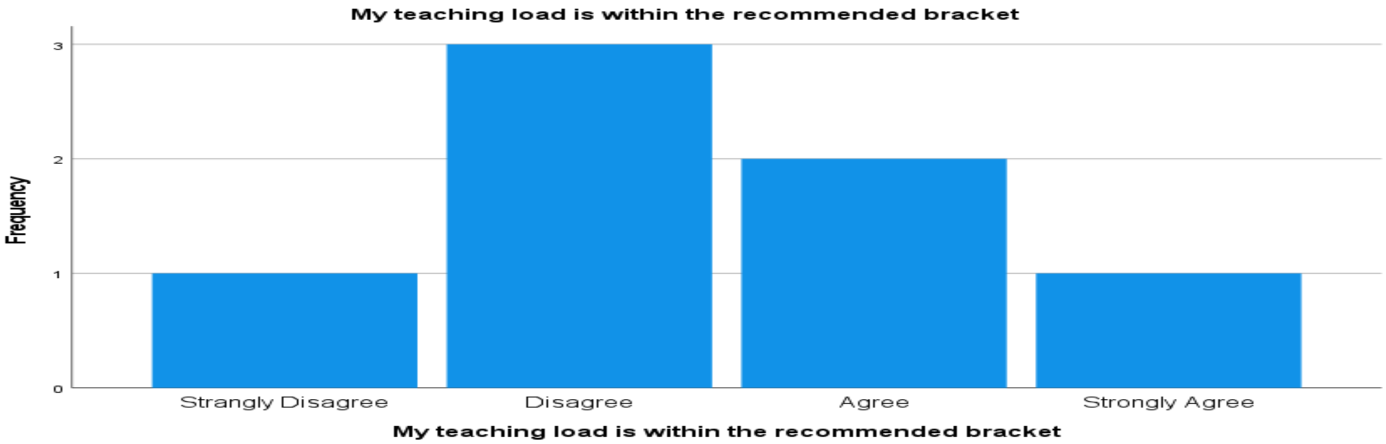

Figure 4.1: Perception of lecturers regarding their teaching loads

Figure 4.1 on lecturers' perception of their teaching loads clearly confirms what was obtained on the table. The figure shows that the majority of lecturers disagree that their teaching loads are within the recommended brackets. Therefore, lecturers end up doing more work than the recommended brackets.

4.1.3 Mathematics tutorial: Students were asked how often tutorials were conducted at the PLASU. Their responses are shown in Table 4.3.

Table 4.3: Students' responses on the frequency of mathematics tutorials

Level of study	Never (%)	Sometimes (%)	Often (%)	Always (%)	Total
100	1(3.1)	12(37.5)	9(28.1)	10(31.3)	32(100)
200	3(23.1)	10(76.9)	0(0)	0(0)	13(100)
300	3(12.5)	15(62.5)	1(4.2)	5(20.8)	24(100)
400	3(7.3)	16(39.0)	9(22.0)	13(31.7)	41(100)

The table presents students' responses on the frequency of mathematics tutorials across 100–400 levels.

Among the 100 level students (n=32), 1 (3.1%) said that tutorials were never conducted, 12 (37.5%) said that tutorials were sometimes conducted, 10 (31.3%) said that tutorials were often conducted, and 10 (31.3%) said that tutorials were always conducted. This shows that tutorials are regularly conducted at this level.

For 200 level students (n=13), 3 (23.1%) reported that tutorials were never conducted, while 10 (76.9%) said they were sometimes conducted, indicating limited but present tutorial support.

Among the 300 level students (n=24), 3 (12.5%) said tutorials were never conducted, 15 (62.5%) said it was sometimes, 1 (4.2%) said it was often, and 5 (20.8%) said it was always.

Of the 400 level students (n=41), 3 (7.3%) said that tutorials were never conducted, 16 (39%) said that tutorials were sometimes conducted, 9 (22%) said that tutorials were often conducted, and 13 (31.7%) said that tutorials were always conducted.

In conclusion, tutorials are conducted across all levels, although the frequency varies, with some levels experiencing more consistent sessions than others.

4.1.4 Completing the syllabus at the end of each academic year: Lecturers were asked if they managed to complete the syllabus at the end of each academic year. Their responses are shown in Figure 4.2.

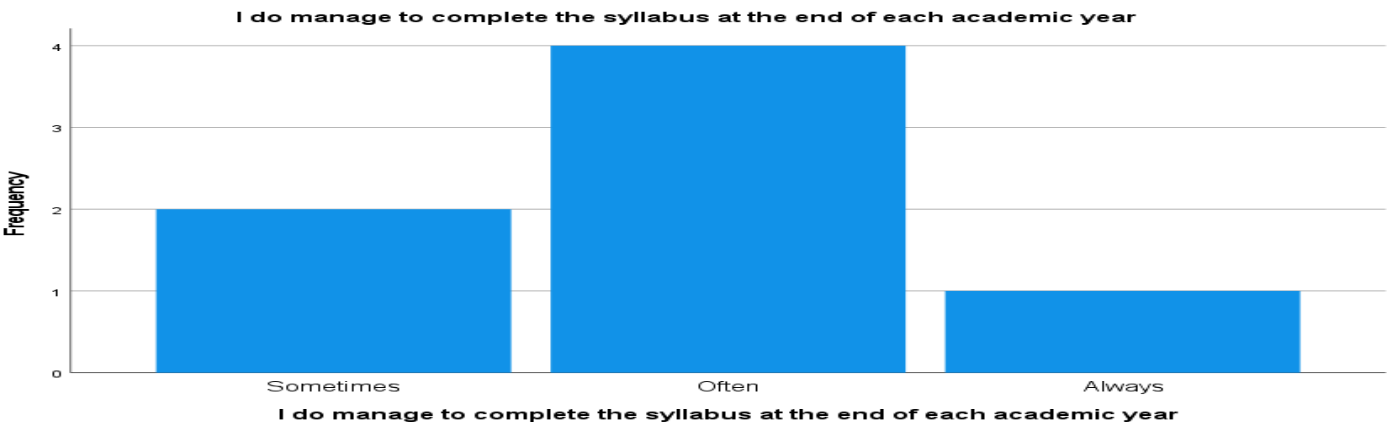

Figure 4.2: Number of lecturers who completed the syllabus

From Figure 4.2, out of the 7 lecturers that took part in the study, 2 sometimes complete the syllabuses at the end of each academic year, 4 of the lecturers always complete their syllabuses at the end of each academic year, and one, who seemed to be an exceptional lecturer, always completed the syllabus. Looking at the results generally, the lecturers teaching mathematics are hardworking, which results in the majority of them completing their syllabuses.

4.1.5 Availability of lecturers for consultations: Lecturers were asked how often they were available for consultations. The first section outlines the responses of the lecturers, and the second section outlines the responses of the students.

i. Lecturers' responses on their availability

During the interview, all the lecturers stated that they were available for consultations with the learners and spent varying amounts of time with them.

The lecturers were asked if they were available for consultations with the students. Table 4.4 shows the responses of the lecturers.

Table 4.4: Availability of consultation by lecturers

Available	**Lecturer**
Yes	6
No	0
Total	6

Table 4.4 shows that the 6 lecturers who answered this question said they are available for consultation with the students.

The lecturers were asked how many times they were available for consultation with the students in a week. Table 4.5 presents the number of times per week that lecturers are available for consultation.

Table 4.5: Number of times for consultation per week

Number of times	Frequency
Once a week	2
Twice a week	1
Thrice a week	1
Four times a week	1

Table 4.5 displays the number of times that lecturers is available for consultation with the students. Among the 5 lecturers that responded to this question, 2 were available for consultations once a week, one was available for consultation twice a week, one was available for consultation thrice a week, and one was available for consultation four times a week. Generally, despite the busy schedule of these lecturers, they always create time for consultations with the students.

The lecturers were asked how long, on average, they spent with each student. Table 4.6 shows the length of time that lecturers spent on consultations with students.

Table 4.6: Time spent with the students

How long	**Lecturer**
1 hour	1
15 minutes	1
25 minutes	1
30 minutes	1
Depends on the nature of the problem	1

Table 4.6 shows that five lecturers responded to this question. On average, one spent 1 hour with each student, another spends 15minutes with the students on average, one spends 25minutes, one spends 30minutes and the last one said it depends on the nature of the problem. Sometimes, lecturers may allocate time to students but may end up spending more or less than the time allocated, depending on the nature of the problem.

The lecturers were asked if they have specific times when they meet the students. Table 4.7 shows the responses of the lecturers.

Table 4.7: Specific Time with Students

Have a specific time	**Lecturer**
Yes	0
No	5
Total	5

From Table 4.7 above 5 lecturers responded whether they have a specific time when they meet the students. All five lecturers stated that they do not have specific time with the students. This is because lecturers give students time when they are less busy. It could be before a lecture, after a lecture, before a meeting, or even after a meeting etc.

ii. Learners' responses on their lecturers' availability for consultations

Learners/students were asked about the availability of their lecturers for consultations. Table 4.8 displays the responses of the Learners.

Table 4.8: Availability of Consultation Lecturers

Level of study		Frequency	Percentage
100 Yes No		14 10	58.3 41.7
200 Yes No		5 7	41.7 58.3
300 Yes No		16 8	66.7 33.3
400 Yes No		23 13	63.9 36.1

Table 4.8 shows the responses of learners when asked if lecturers are available for consultation.

Of the 100 level students/learners who answered this question, 14 (58.3%) said yes, and their lecturers are available for consultation, while 10 (41.7%) said no, lecturers are not available for consultation. Here, a greater percentage of the 100-level students said that their lecturers are available for consultation.

Of the 200 level students who answered this question, 5 (41.7%) said their lecturers are available for consultation contrary to the 7 (58.3%) learners said their lecturers are not available for consultation. A greater percentage of learners do not agree that their lecturers are available for consultation.

Furthermore, among the 300 level students who answered this question, 16(66.7%) learners agreed that their lecturers are available for consultations, and 8 (33, 3%) learners said there lecturers are not available for consultation. A greater percentage of learners agreed that their lecturers are available for consultation.

Among the 400 level students who answered this question, 23 (63.9%) learners said their lecturers are available for consultations, whereas 13 (36.1%) learners who said their lecturers are not available for consultations. The majority of learners agreed that their lecturers are available for consultations.

Generally, the results from the 100, 200, 300, and 400 levels show that majority of the lecturers are available for consultation. These lecturers have very tight schedules but still create time for the learners.

Learners were asked if consultation time is given to them. Table 4.9 presents their responses.

Table 4.9: Consultation Time

Level of study	Response	Frequency	Percentage
100	Yes No	13 0	100 0
200	Yes No	0 1	0 100
300	Yes No	4 7	36.4 63.6
400	Yes No	3 11	21.4 78.6

Table 4.9 presents the responses of the learners who said their lecturers are available for consultations and were further asked if consultation time is given to them.

First, 13 100-level students responded to this question. All the 13 (100%) students agreed that consultation time is given to them.

For the 200-level students, only one learner responded to the question. Here, 1 (100%) learner said that consultation time is not given.

Moving further, 11 300-level students responded to this question, of which, 4(36.4%) learners agreed that consultation time is given to them while 7(63,6%) learner said consultation time is not given to them.

Lastly, 14 400 level students responded to this question, of which 3(21.4%) said that consultation time is given to them contrary to the 11(78.6%) learners said that consultation time is not given to them.

Generally, majority of the learners said consultation time is not given to the lecturers even though they are available for consultations. This means that even though you do not book a consultation time with the lecturers, they still make themselves available for the learners.

4.1.6 Hours of library opening

The main library opens from 09:00 am to 03:00 pm during week days. Students were allowed to borrow books from the main collection for two weeks and from the short loan section for three hours.

4.1.7 Assessment of the coursework

The assessment of coursework consists of continuous assessment (CA), which weighs 40%, and the final examination in each course, which weighs 60%. The CA consisted of tests, assignments, projects, practical work, and any other work assigned in each course. Each semester, the CA consisted of at least two assessments.

Learners were asked if they were allowed to sit for end-of-year semester/session examinations irrespective of the mark they scored in the continuous assessment (CA). Table 4.10 presents the responses of the learners.

Table 4.10: Examinations Allowed Irrespective of CA Score

Level of study	Response	Frequency	Percentage
100	Yes	19	86.4
	No	3	13.6
200	Yes	13	100
	No	0	0
300	Yes	25	100
	No	0	0
400	Yes	32	94.1
	No	2	5.9

The table above shows responses from 100, 200, 300, and 400-level mathematics students when asked if they are allowed to sit for end-of-semester/session examinations regardless of their continuous assessment (CA) scores.

In the 100 level, 19 (86.4%) said they are not, implying a minimum CA score.

All 13 (100%) 200-level respondents confirmed that they are allowed to sit for exams regardless of their CA scores. Similarly, all 25 (100%) 300-level students reported the same.

Among 400 level students, 32 (94.1%) said they are allowed to write exams irrespective of CA scores, while 2 (5.9%) said they are not.

Overall, the responses indicate that most students across all levels in the Department of Mathematics, Plateau State University Bokkos, are allowed to sit for exams regardless of their CA marks. Respondents who responded "no" claimed to have issues such as unpaid fees rather than academic performance. The students said they were allowed to write examinations irrespective of their CA scores, while 3 (13.6%)

4.1.8 Perception of lecturers on the availability of mathematics resources

Lecturers were asked if mathematics resources such as reference books were available in the main library. Their responses on the availability of mathematics reference books are shown in Figure 4.3.

Figure 4.3: Perceptions of the availability of mathematics resources

The figure above displays the responses of the seven lecturers who took part in the survey on the availability of mathematics resources in the library. 2(28.6%) lecturers disagreed that mathematics resources are available in the library, 3(42.8%) agreed that mathematics resources are available in the library and 2(28.6%) strongly agreed that mathematics resources are available in the library. Results clearly showed that majority of the lecturers 5 (71.4%) agreed that mathematics resources are available in the library.

4.1.9 Perception of students on the availability of mathematics resources

The students were asked about the availability of relevant mathematics books in the main library. Their responses are presented in Table 4.11.

Table 4.11: Availability of the Mathematics Resources

Level of study	Strongly Disagree (%)	Disagree (%)	Agree (%)	Strongly Agree (%)	Total
100	0(0)	5(15.6)	19(59.4)	8(25.0)	32(100)
200	0(0)	0(0)	6(46.2)	7(53.8)	13(100)
300	0(0)	2(8.3)	12(50.0)	10(41.7)	24(100)
400	1(2.4)	2(4.9)	26(63.4)	12(29.3)	41(100)

Table 4.11 shows the responses of 100 level, 200 level, 300 level and 400 level students when asked if relevant mathematics books are available in the main library.

First, out of the 32 students who responded to this question from the 100 level, 5(15.6%) disagreed, 19(59.4%) agreed and 8(25.0%) strongly agreed that there are relevant mathematics books in the main library. Here, the majority of learners 27 (84.4%) agreed that there are relevant mathematics books in the main library.
Second, out of the 13 learners from the 200 level who responded to this question, 6 (46.2%) agreed and 7 (53.8%) strongly agreed that there are relevant mathematics books in the main library. All 13 learners in the 200 level agreed that there are relevant mathematics books in the library.
Third, of the 24 300-level learners who responded to this question, 2(8.3%) disagreed, 12(50.0%) agreed and 10(41.7%) strongly agreed that there are relevant mathematics books in the main library. Here, the majority of learners 22 (91.7%) agreed that there are relevant mathematics books in the main library.
Finally, of the 41 learners who responded to this question in the 400 level, 1(2.4%) strongly disagreed. 2(4.7%) disagreed, 26(63.4%) agreed and 12(29.3%) strongly agreed that there are relevant mathematics
Books in the main library. In this study, the majority of learners 38 (92.7%) agreed that there are relevant mathematics books in the main library.

Generally, the results from students at all levels of study showed that the majority of learners agreed that relevant mathematics books were available in the library.

4.1.10: Teaching methods used by lecturers

The lecturers were asked to state the methods of teaching they usually used when teaching mathematics. They were at liberty to write more than one method if they so wished. Table 4.12 presents their responses.

Figure 4.12: Teaching methods used by the lecturers

Teaching Methods	Response	Frequency	Percentage
Discussion	Yes	4	57.1
	No	3	42.9
Direct Discovery	Yes	2	28.6
	No	5	71.4
Guided Discovery	Yes	3	42.9
	No	4	57.1
Free Discovery	Yes	2	28.6
	No	5	71.4
Lecture	Yes	5	71.4
	No	2	28.6
Questions and Answers	Yes	3	42.9
	No	4	57.1
Combination of the Methods	Yes	5	71.4
	No	2	28.6

The table above displays the teaching methods used by lecturers. 4(57.1%) lecturers out of the total of 7 lecturers use the Discussion method, 2(28.6%) out of the 7 lecturers use the Direct Discovery method, 3(42.9%) out of the 7 lecturers use the Guided Discovery, 2(28.6%) out of the 7 lecturers use the free discovery method, 5(71.4%) out of the 7 lecturers use the lecture method of teaching, 3(42.9%) out of the 7 lecturers use the questions and answers method and 5(71.4%) out of the 7 lecturers use a combination of methods. Generally, the lecturers used more than one method to teach the students. This combination of methods helps students understand better.

4.1.10.1 Methods of teaching preferred by lecturers.

Six teaching methods were presented to the lecturers: question and answer, lecture, free discovery, guided discovery, directed discovery, and discussion. The lecturers were asked to indicate the methods they usually use when teaching and, the methods they enjoyed most. The table below shows their responses.

Table 4.13: Teaching Methods Preferred by Lecturers.

Method	Frequency	Percentage
Discussion	1	16.7
Guided Discovery	1	16.7
Lecture	1	16.7
Combination of the Methods	3	50

Table 4.13 shows that 6 lecturers responded to this question of which 1(16.7%) preferred the discussion method of teaching, 1(16.7%) preferred guided discovery, another 1(16.7%) preferred the lecture method and 3(50%) preferred a combination of methods. On a normal condition, it will be difficult to use only one method of teaching to teach the learners, which is why most lecturers, consciously or unconsciously, use a combination of methods.

The following figure displays the teaching methods preferred by lecturers. Six lecturers responded to this question, of which 1 lecturer prefers the discussion method, 1 prefers the guided discovery, 1 prefers the lecture method and 3 prefer a combination of methods. This result is in agreement with the results in Table 4.13, where most lecturers preferred a combination of methods.

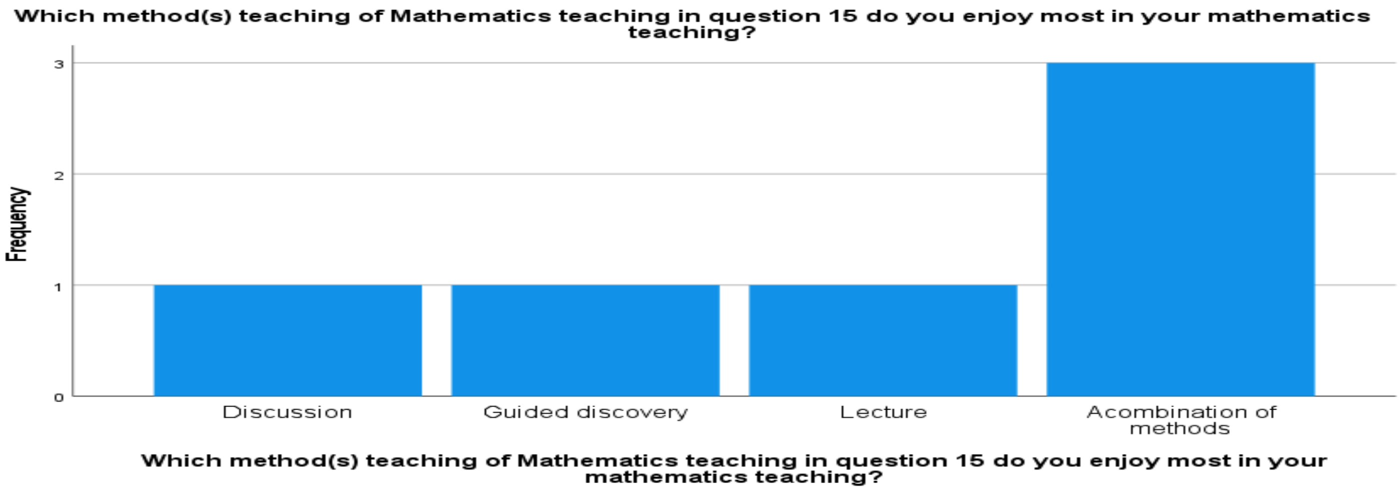

Figure 4.4: Teaching Methods Preferred by Lecturers

4.1.10.2 Methods of teaching least enjoyed by lecturers.

Lecturers were asked which method of teaching mathematics they enjoy the least. Table 4.13 presents their responses.

Table 4.13: Teaching methods Least Enjoyed by Lecturers.

Method	Frequency	Percentage
Discussion	2	28.6
Direct Discovery	1	14.3
Free Discovery	1	14.3
Lecture	2	28.6
Questions and Answers	1	14.3

The table above shows the responses of lecturers when they were asked which teaching methods they least enjoy. 2(approx. 28.6%) lecturers least enjoyed the discussion method, 1(approx. 14.3%) least enjoyed the direct discovery method, another 1(approx. 14.3%) least enjoyed the free discovery method, 2(approx. 28.6%) least enjoyed the lecture method and 1(approx. 14.3%) least enjoyed the questions and answers method.

Figure 4.5 clearly confirms Table 4.13 where 2 lecturers least enjoyed the discussion method, 1 lecturer least enjoyed the direct discovery, 1 lecturer least enjoyed the free discovery, 2 lecturers least enjoyed the lecture method and 1 lecturer lest enjoy the questions and answers method. These results clearly explain why the majority of lecturers use a combination of methods to teach their students.

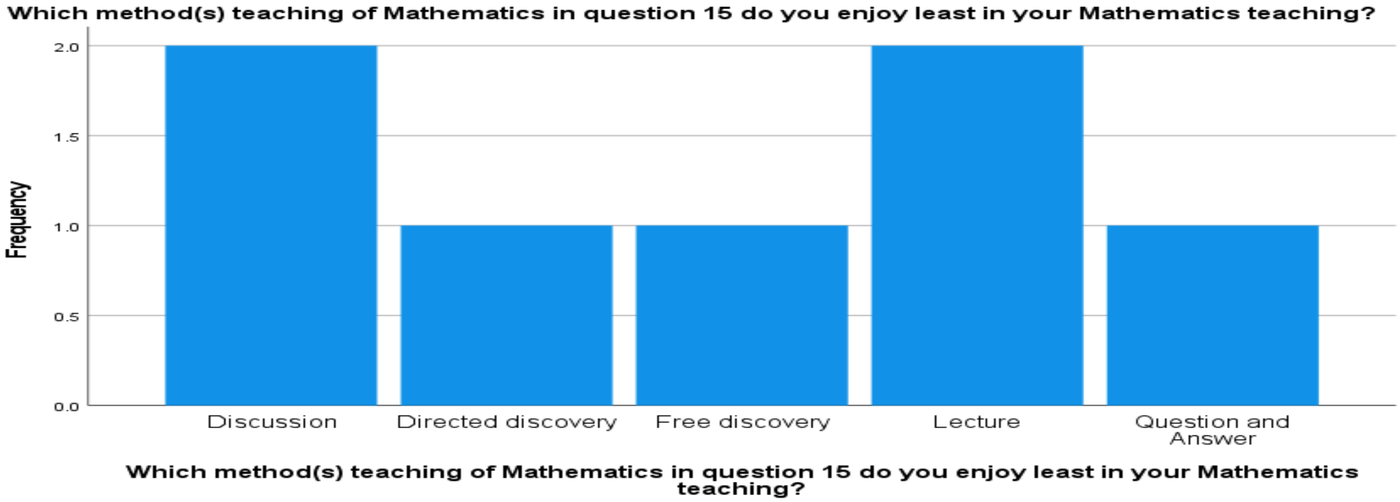

Figure 4.5: Teaching Methods Least Enjoyed by Lecturers

4.1.10.3 Lecturers' activities while teaching.

Some of the activities that lecturers engaged in while teaching were presented to them such as: working out questions on the board, giving instructions, listening to students' explanations, commenting on students' questions, answering questions from students, asking students questions, and explaining facts. The participants were asked to indicate the activities that they usually engaged in. Table 4.14 shows their responses.

Table 4.14: Lecturers' teaching activities

Activities	Response	Frequency	Percentage
Explaining facts (talking)	Yes	3	42.9
	No	4	57.1
Asking questions	Yes	3	42.9
	No	4	57.1
Answering questions from students	Yes	5	71.4
	No	2	28.6
Commenting on the students' questions	Yes	2	28.6
	No	5	71.4
Listening to the students' explanations	Yes	2	28.6
	No	5	71.4
Working out the questions on the board	Yes	5	71.4
	No	2	28.6
Giving instructions	Yes	4	57.1
	No	3	42.9

Table 4.14 above shows activities of lecturers while teaching. 3(2.9%) of lecturers engage in explaining facts while 4(57.1%) do not, 3(42.9%) engage in asking questions while 4(57.1%) do not, 5(71.4%) engage in answering questions from students while 2(28.6) do not, 2(28.6%) engage in commenting on students' questions while 5(71.4%) do not, 2(28.6%) engage in listening to students' explanations while 5(71.4%) do not,

5(71.4%) engage in working out questions on the board while 2(28.6%) do not and finally, 4(57.1%) engage in giving instructions while 3(42.9%) do not. From these, it is obvious that lecturers do not engage in only one activity when teaching. These lecturers combine various activities for effective lecture delivery.

4.1.10.4 Teaching Practices as observed by students

Activities that lecturers perform while teaching mathematics may include the following: writing notes without explaining, working out questions on the board, listening to students‟ explanations, commenting on students‟ questions, giving instructions, answering questions from students, asking students questions, and explaining facts to students. Learners were asked to indicate the activities that their lecturers usually performed while teaching. Their responses are presented in Table 4.15.

Table 4.15: Lecturers' activities while teaching as observed by the learners

Level of Study	Activities	Response	Frequency	Percentage
100	Explaining facts (talking)	Yes No	25 7	78.1 21.9
	Asking questions	Yes No	14 18	43.75 56.25
	Answering questions from students	Yes No	22 10	68.75 31.25
	Giving instructions	Yes No	10 22	31.25 68.75
	Listening to the students' explanations	Yes No	13 19	40.6 59.4
	Commenting on the students' questions	Yes No	16 16	50.0 50.0
	Working out the questions on the board	Yes No	25 7	78.1 21.9
200	Explaining facts (talking)	Yes No	9 4	69.2 30.8
	Asking questions	Yes No	5 8	38.5 61.5
	Answering questions from students	Yes No	8 5	61.5 38.5
	Giving instructions	Yes No	4 9	30.8 69.2
	Listening to the students' explanations	Yes No	4 9	30.8 69.2
	Commenting on the students' questions	Yes No	3 10	23.1 76.9
	Working out the questions on the board	Yes No	12 1	92.3 7.7
300	Explaining facts (talking)	Yes No	23 2	92.0 8.0

	Asking questions	Yes No	18 7	72.0 28.0
	Answering questions from students	Yes No	19 6	76.0 24.0
	Giving instructions	Yes No	13 12	52.0 48.0
	Listening to the students' explanations	Yes No	12 13	48.0 52.0
	Commenting on the students' questions	Yes No	7 18	28.0 72.0
	Working out the questions on the board	Yes No	19 6	76.0 24.0
400	Explaining facts (talking)	Yes No	35 6	85.4 14.6
	Asking questions	Yes No	29 12	70.7 29.3
	Answering questions from students	Yes No	29 12	70.7 29.3
	Giving instructions	Yes No	14 27	34.1 65.9
	Listening to the students' explanations	Yes No	12 29	29.3 70.7
	Commenting on the students' questions	Yes No	13 28	31.7 68.3
	Working out the questions on the board	Yes No	37 4	90.2 9.8

Table 4.15 presents the responses of 100, 200, 300, and 400-level students to the observed teaching activities of mathematics lecturers at Plateau State University, Bokkos.

Among 100 level students, 25 (78.1%) agreed that lecturers explained facts, while 7 (21.9%) disagreed. Only 14 (43.75%) noted that lecturers asked questions, while 18 (56.25%) did not. In addition, 22 (68.75%) agreed that lecturers answered students'' questions, but 10 (31.25%) disagreed. On giving instructions, only 10 (31.25%) agreed, while 22 (68.75%) disagreed. Regarding the students' explanations, 13 (40.6%) agreed, while 19 (59.4%) did not. Equal proportions (50%) agreed and disagreed that lecturers commented on students' questions. Finally, 25 (78.1%) said lecturers worked out problems on the board, while 7 (21.9%) said they did not.

For 200 level students, 9 (69.2%) agreed that lecturers explained facts, 5 (38.5%) said they asked questions, and 8 (61.5%) confirmed that lecturers answered students' questions. However, only 4 (30.8%) felt lecturers gave instructions or listened to student explanations, and 3 (23.1%) said lecturers commented on students' questions. A majority of, 12 (92.3%) lecturers observed working out problems on the board.

Among 300 level students, 23 (92%) observed explanation of facts, 18 (72%) reported questioning, and 19 (76%) said that lecturers answered questions. Instruction-giving and listening were noted by 13 (52%) and 12 (48%), respectively. Only 7 (28%) students commented on their questions, and 19 (76%) saw lecturers work out problems on the board.

Finally, the 400-level responses showed that 35 (85.4%) agreed that lecturers explained facts and, 29 (70.7%) said they asked and answered questions. Instruction-giving was reported by 14 (34.1%) students,, while only 12 (29.3%) saw lecturers listening to students, and 13 (31.7%) observed commenting. Notably, 37 (90.2%) lecturers reported working out problems on the board.

Overall, students across all levels observed that mathematics lecturers actively engaged in explaining, answering questions, and solving problems on the board, while activities like listening, giving instructions, and commenting received lower acknowledgment.

4.1.11 Activities of students while learning mathematics

Students may engage in the following activities while learning mathematics: listening to fellow students' explanations, copying notes, asking fellow students questions, asking the lecturer questions, answering fellow students' questions, answering the lecturer's questions, and listening to the lecturer's explanations. Students were asked to indicate the activities that they usually engaged in while learning mathematics. Their responses are presented in Table 4.16.

Table 4.16: Activities of students while learning

Level of Study	Activities	Response	Frequency	Percentage
100	Listening to the lecturers' explanations	Yes No	30 2	93.75 6.25
	Answering the lecturer's questions	Yes No	18 14	56.25 43.75
	Answering fellow students' questions	Yes No	6 26	18.75 81.25
	Asking the lecturers questions	Yes No	24 8	75.0 25.0
	Asking questions of fellow students	Yes No	9 23	28.1 71.9
	Copying note	Yes No	17 15	53.1 46.9
	Listening to fellow students' explanations	Yes No	3 29	9.4 90.6
200	Listening to the lecturers' explanations	Yes No	13 0	100 0
	Answering the lecturer's questions	Yes No	8 5	61.5 38.5
	Answering fellow students' questions	Yes No	4 9	30.8 69.2
	Asking the lecturers questions	Yes No	7 6	53.8 46.2
	Asking questions of fellow students	Yes No	3 10	23.1 76.9

	Copying note	Yes No	3 10	23.1 76.9
	Listening to fellow students' explanations	Yes No	13 0	100 0
300	Listening to the lecturers' explanations	Yes No	25 0	100 0
	Answering the lecturer's questions	Yes No	14 11	56.0 44.0
	Answering fellow students' questions	Yes No	4 21	16 84
	Asking the lecturers questions	Yes No	18 7	72 28
	Asking questions of fellow students	Yes No	7 18	28 72
	Copying note	Yes No	18 7	72 28
	Listening to fellow students' explanations	Yes No	25 0	100 0
400	Listening to the lecturers' explanations	Yes No	36 2	94.7 5.3
	Answering the lecturer's questions	Yes No	17 22	43.6 56.4
	Answering fellow students' questions	Yes No	8 31	20.5 79.5
	Asking the lecturers questions	Yes No	25 14	64.1 35.9
	Asking questions of fellow students	Yes No	11 28	28.2 71.8
	Copying note	Yes No	28 11	71.8 28.2
	Listening to fellow students' explanations	Yes No	3 36	7.7 92.3

The table above presents responses of 100 level, 200 level 300 level and 400 level students who responded to the questions on their activities as they learn Mathematics.

Firstly, for the 100 level students, 30(93.75%) of the learners agreed they listen to lecturers' explanations while 2(6.25%) do not, 18(56.25%) said that they answer questions from lecturers while 14(43.75%) do not, 6(18.75%) agreed that they answer fellow students questions while 26(81.25%) do not, 24(75%) agreed that they ask lecturers question while 8(25%) do not, 9(28.1%) of learners agreed that they ask fellow students questions while 23(71.9%) do not, 17(53.1%) agreed that they copy notes while 15(46.9%) do not, and 3(9.4%) of learners agreed that they listen to fellow students' explanations while 29(90.6%) do not.

Secondly, looking at the 200 level students' responses, 13(100%) all agreed they listen to lecturers' explanations, 8(61.5%) said that they answer questions from lecturers while 5(38.5%) do not, 4(30.8%) agreed that they answer fellow students questions while 9(69.2%) do not, 7(53.8%) agreed that they ask lecturers question while 6(46.2%) do not, 3(23.1%) of learners agreed that they ask fellow students questions while 10(76.9%) do not, 3(23.1%) agreed that they copy notes while 10(76.9%) do not, and 3(9.4%) of learners agreed that they listen to fellow students' explanations while 10(76.1%) do not..

Thirdly, looking at the responses from the 300 level students, 25(100%) all agreed they listen to lecturers' explanations, 14(56%) said that they answer questions from lecturers while 11(44%) do not, 4(16%) agreed that they answer fellow students questions while 21(84%) do not, 18(72%) agreed that they ask lecturers question while 7(28%) do not, 7(28%) of learners agreed that they ask fellow students questions while 18(72%) do not, 18(72%) agreed that they copy notes while 7(28%) do not, and all 25(100%) learners agreed that they listen to fellow students' explanations.

Fourthly, responses of the 400 level learners indicate that, 36(94.7%) of the learners agreed they listen to lecturers' explanations while 2(5.3%) do not, 17(43.6%) said that they answer questions from lecturers while 22(56.4%) do not, 8(20.5%) agreed that they answer fellow students questions while 31(79.5%) do not, 25(64.1%) agreed that they ask lecturers question while 14(35.9%) do not, 11(28.2%) of learners agreed that they ask fellow students questions while 28(71.8%) do not, 28(71.8%) agreed that they copy notes while 11(28.2%) do not, and 3(7.7%) of learners agreed that they listen to fellow students' explanations while 36(92.3%) do not.

Based on these results, learners engage in several activities to increase their understanding of mathematics learning.

4.1.12 Budgetary Allocation to the School

Information concerning the funds allocated to different faculties in the university was not established, but the Department of Mathematics and the Faculty of Natural Sciences indicated that the budgetary allocation to it was not enough to purchase reference books for the departmental library and other resources required by the department. According to the Dean of the Faculty, the faculty could not obtain the latest materials and resources for teaching due to the meager allocation, the problem of overcrowded lecture rooms and poor conveniences.

4.2 Challenges faced by PLASU Mathematics Lecturers when Teaching

This section presents an outline of the challenges faced by lecturers when teaching mathematics at PLASU. The number of mathematics lecturers that took part in the study was 7 (N=7). The section begins by looking at the lecturers' perceptions of the students' mathematics study patterns and the availability of mathematics resources. Then, it examines the lecturers' perception of the students' attitude, foundation in mathematics, and preparedness to study university mathematics.

4.2.1 Practices of Students in Mathematics

The lecturers were asked if they thought that students did not practice solving mathematics problems on their own during their study time. Figure 4.6 shows their responses.

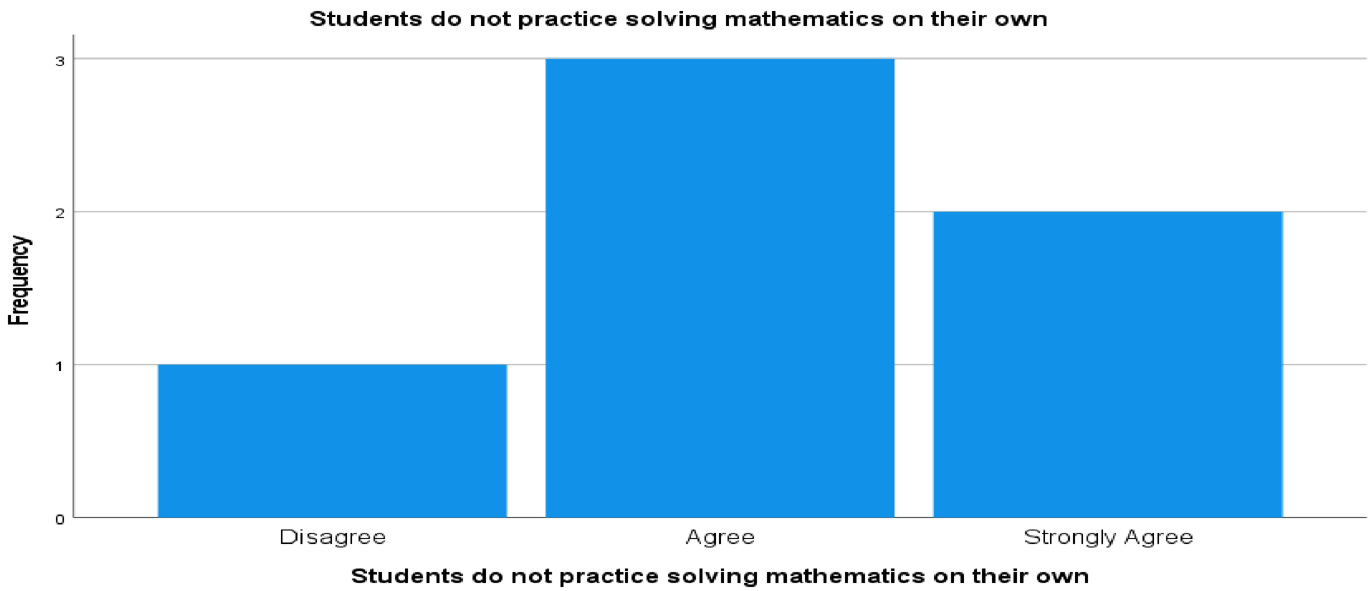

Figure 4.6: Students do not solve problems on their own

From the figure above, out of the 6 lecturers that responded to this question, 1 disagreed which means he/she believes that students practice solving mathematics questions on their own, 3 greed that students do not practice solving mathematics on their own and 2 strongly agreed that students do not practice solving mathematics on their own. The majority of lecturers believe that students do not practice solving mathematics on their own.

4.2.2 Attitude of students toward mathematics

The lecturers were asked about their perception of their students' attitude toward mathematics. Their perceptions of the statement "Students have a positive attitude toward mathematics" are shown in Figure 4.7.

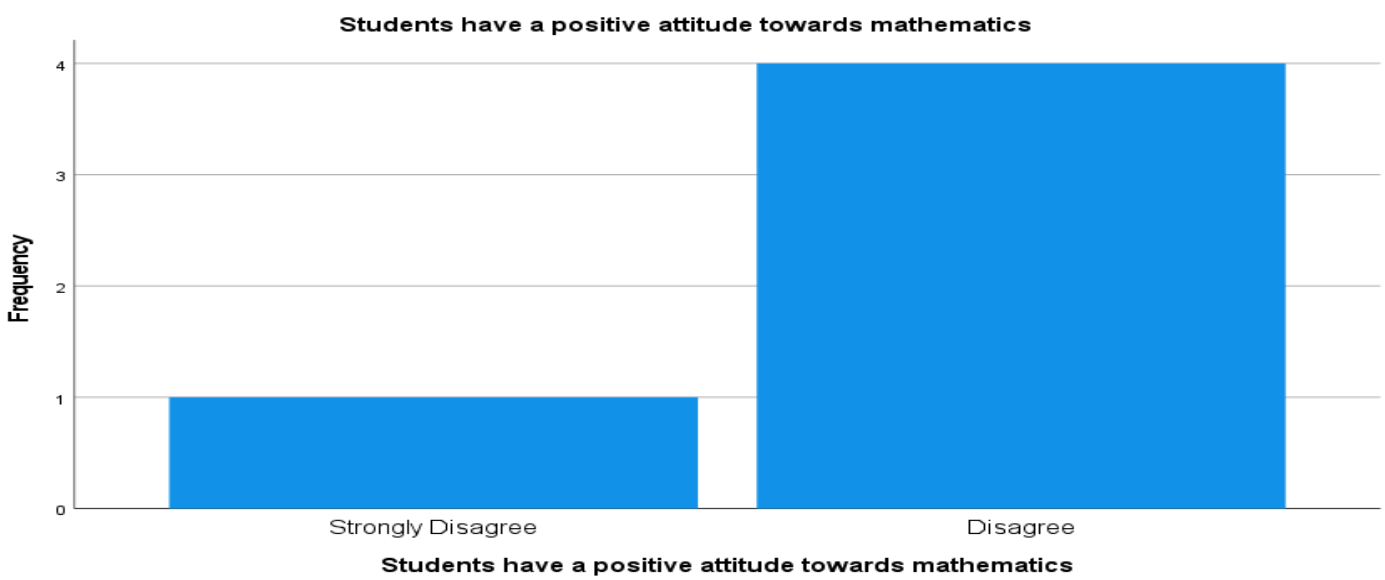

Figure 4.7: Lecturers' perception of whether students have a positive attitude

The figure above displays the responses of 5 lecturers on their perceptions of whether students have a positive attitude toward mathematics. 1 lecturer out of the 5 strongly disagreed that students have a positive attitude toward mathematics, the remaining 4 lecturers disagreed that students have a positive attitude toward mathematics. The results show that the students do not have positive attitudes toward mathematics. This may be because most of the students who see themselves studying mathematics did not apply to study mathematics in PLASU. Most of them were given mathematics as a course and did not have any other choice.

4.2.3 Foundation in Mathematics of Secondary School Students

The lecturers' perception of the statement "Students have a poor foundation in mathematics from secondary school" is summarized in figure 4.8. Most lecturers agreed with this statement.

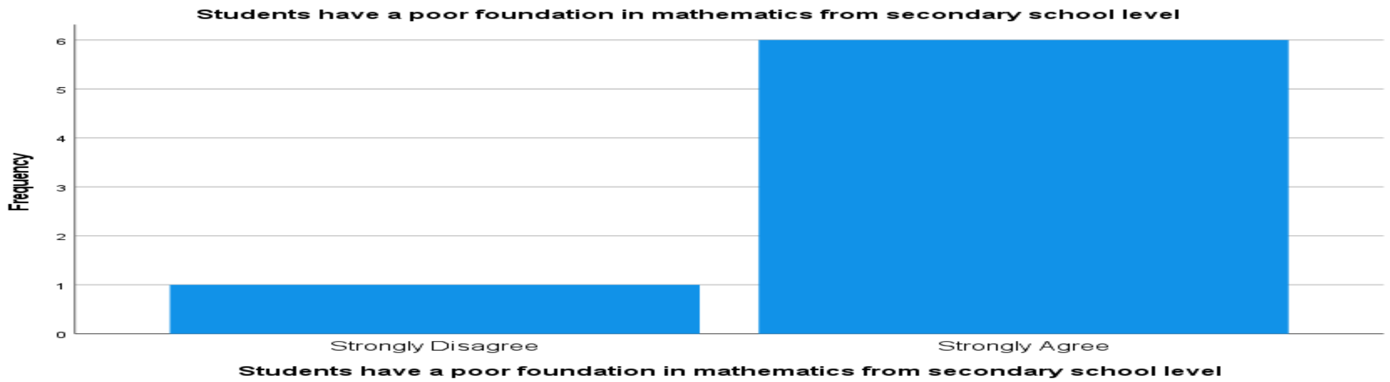

Figure 4.8: Lecturers' perception of whether students have a poor foundation

Figure 4.8 shows perception of 7 lecturers on whether students have a poor foundation in mathematics from the secondary school level. Only 1 of 7 lecturers strongly disagreed withto the statement that students have a poor foundation in mathematics from the secondary school level. However, 6 of the 7 lecturers strongly agreed that students have a poor foundation in mathematics from the secondary school level. These results reflect the true situation at the mathematics department of PLASU, where most of the students have a poor foundation in mathematics from secondary school.

4.2.4 Preparedness to study mathematics at university

Lecturers were asked to indicate whether secondary school mathematics prepared the students adequately or not for the rigors of mathematics that students encounter at the university. The lecturers' perceptions of the statement "Secondary school mathematics prepared students adequately for university mathematics" are shown in Figure 4.9.

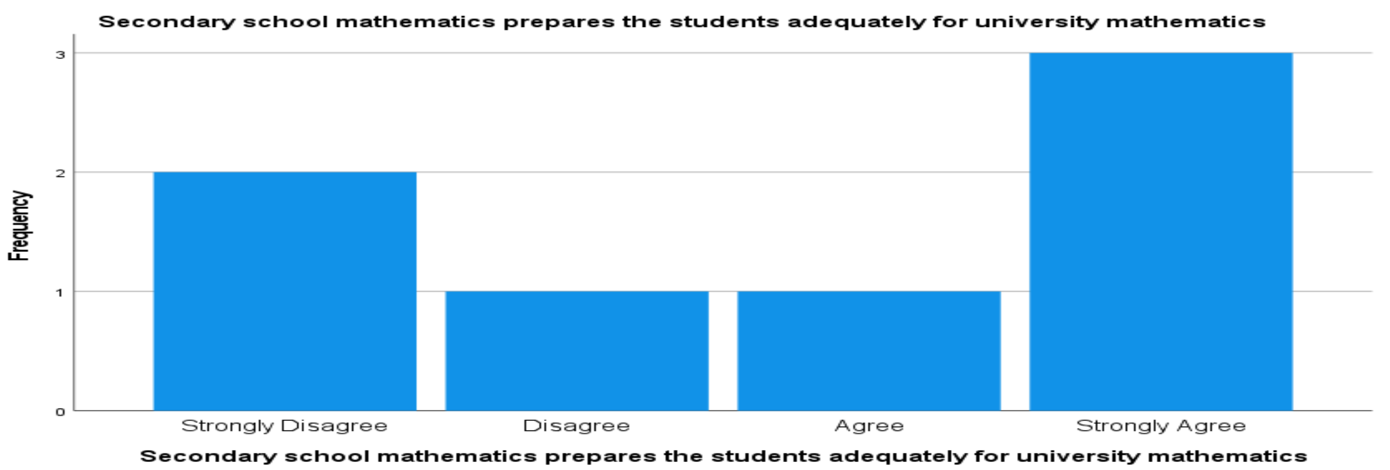

Figure 4.9: Secondary school mathematics prepared students adequately

The figure above shows the perceptions of 7 lecturers to whether secondary school mathematics adequately prepares students for university mathematics. 2 lecturers strongly disagreed, 1 lecturer disagreed, 1 lecturer was greedy, and 3 lecturers strongly agreed that secondary school mathematics adequately prepares students for university mathematics. Here 3 out of 7 of the lecturers disagreed and 4 of 7 lecturers agreed that secondary school mathematics adequately prepares students for university mathematics.

4.3 Challenges faced by PLASU Students when Learning Mathematics

In this section, students were asked to present the challenges they faced when learning mathematics. The section begins by detailing the attitude students had toward mathematics, the class room environment, and the effect of lack of accommodation on campus on their studies in mathematics. The section ends by examining the activity that lecturers and students engaged in while learning mathematics and providing an overview of challenges that were peculiar to first-year students.

4.3.1 Attitude of students toward mathematics

This section details the students' responses to the three statements on attitude toward mathematics. Table 4.17 shows the responses to all the three statements.

Table 4.17: Attitudes of the students toward mathematics

Level of study	Attitude	Strongly Disagree (%)	Disagree (%)	Agree (%)	Strongly Agree (%)
100	Mathematics is for a select few	9(28.1)	5(15.6)	15(46.9)	3(9.4)
	I am not naturally good at mathematics.	6(18.8)	6(18.8)	19(59.4)	1(3.1)
	I am confident in a mathematics class.	1(3.1)	5(15.6)	20(62.5)	6(18.8)
200	Mathematics is for a select few	3(23.1)	2(15.4)	2(15.4)	6(46.2)
	I am not naturally good at mathematics.	1(7.7)	7(53.8)	2(15.4)	3(23.1)
	I am confident in a mathematics class.	2(15.4)	1(7.7)	7(53.8)	3(23.1)
300	Mathematics is for a select few	7(28.0)	3(12.0)	7(28.0)	8(32.0)
	I am not naturally good at mathematics.	5(20.0)	3(12.0)	13(52.0)	4(16.0)
	I am confident in a mathematics class.	1(4.0)	8(32.0)	8(32.0)	8(32.0)
400	Mathematics is for a select few	5(12.2)	7(17.1)	19(46.3)	10(24.4)
	I am not naturally good at mathematics.	8(19.5)	13(31.7)	17(41.5)	3(7.3)
	I am confident in a mathematics class.	2(4.9)	13(31.7)	17(41.5)	9(22.0)

The table presents the attitudes of 100, 200, 300, and 400-level students toward mathematics. Among 100 level respondents, 9 (28.1%) strongly disagreed, 5 (15.6%) disagreed, 15 (46.9%) agreed, and 3 (9.4%) strongly agreed that mathematics is for a selected few—indicating 18 (56.3%) agree with that view. Regarding whether they are naturally good at mathematics, 6 (18.8%) strongly disagreed, 6 (18.8%) disagreed, 19 (59.4%) agreed, and 1 (3.1%) strongly agreed—20 (62.5%) believing that they are not naturally good. Regarding confidence, 1

(3.1%) strongly disagreed, 5 (15.6%) disagreed, 20 (62.5%) agreed, and 6 (18.8%) strongly agreed that they are confident—26 (81.3%) expressing a lack of confidence.

Of the 200 level students, 8 (61.6%) agreed that mathematics is for a selected few, 8 (61.5%) disagreed that they are not naturally good, and 10 (76.9%) said they are not confident. Among the 300 level students, 15 (60%) viewed mathematics as a "selected few," 17 (68%) felt it was not naturally good, and 16 (64%) lacked confidence. In the 400 level, 29 (70.7%) believed mathematics is for a selected few, 21 (51.2%) disagreed about lacking natural ability, and 23 (63.5%) still lacked confidence. Overall, many students with levels hold limiting beliefs about mathematics.

4.3.2 Transition and foundation in mathematics

This section begins by looking at the preparedness of first-year mathematics students to study mathematics at the university and concludes by looking at the teaching and learning environment that is found at the university.

4.3.2.1 Preparedness to study mathematics at university

Students were asked to indicate whether the mathematics they learned at secondary school adequately prepared them for the rigors of mathematics at university. The responses to the statement "Secondary school mathematics prepared me adequately for university mathematics" are shown in Table 4.18.

Table 4.18: Preparation of mathematics for secondary school

Level of study	Strongly Disagree (%)	Disagree (%)	Agree (%)	Strongly Agree (%)
100	4(12.5)	6(18.8)	14(43.8)	8(25.0)
200	1(7.7)	2(15.4)	6(46.2)	4(30.8)
300	2(8.3)	7(29.2)	13(54.2)	2(8.3)
400	2(4.9)	14(34.1)	17(41.5)	8(19.5)

Table 4.18 presents responses from 100 to 400 level students regarding whether secondary school mathematics adequately prepared them for university mathematics. Among 100 level respondents (n=32), 4 (12.5%) strongly disagreed, 6 (18.8%) disagreed, 14 (43.8%) agreed, and 8 (25%) strongly agreed, with a majority of 22 (68.8%) in agreement.

For 200 level students (n=13), 1 (7.7%) strongly disagreed, 2 (15.4%) disagreed, 6 (46.2%) agreed, and 4 (30.8%) strongly agreed. A total of 10 (77%) respondents believed they were adequately prepared.

Among the 300 level students, 2 (8.3%) strongly disagreed, 7 (29.2%) disagreed, 13 (54.2%) agreed, and 2 (8.3%) strongly agreed. A combined 15 (62.5%) agreed.

Lastly, of the 41 students in the 400 level, 2 (4.9%) strongly disagreed, 14 (34.1%) disagreed, 17 (41.5%) agreed, and 8 (19.5%) strongly agreed. Overall, 25 (61%) patients affirmed adequate preparation. The data show that most students with levels felt that secondary school mathematics provided a sufficient foundation.

4.3.3: Teaching and learning environment at university: When students arrive at the university, they find "freedom" to do many things that they were not allowed to do in secondary school. The responses to the statement "Freedom at university interferes with my studies in mathematics" are shown in Table 4.19.

Table 4.19: University freedom interferes with studies

Level of study	Never (%)	Sometimes (%)	Often (%)	Always (%)
100	11(42.3)	12(46.2)	3(11.5)	0(0)
200	4(36.4)	7(63.6)	0(0)	0(0)
300	10(47.6)	2(9.5)	3(14.5)	6(28.6)
400	12(30.0)	14(35.0)	11(27.5)	3(7.5)

Table 4.19 presents responses from 100, 200, 300, and 400-level students on whether university freedom interferes with their mathematics study. Among the 26 students in the 100 level, 11 (42.3%) reported that freedom never interfered, 12 (46.2%) said it sometimes interfered, and 3 (11.5%) said it often interfered with their studies.

Of the 11 students in the 200 level, 4 (36.4%) stated that freedom never interfered, whereas 7 (63.6%) said it sometimes interfered.

Of the 21 students in the 300 level, 10 (47.6%) said that freedom never interfered, 2 (9.5%) said that it was sometimes, 3 (14.3%) said that it was often, and 6 (28.6%) said that it always interfered with their mathematics study.

Of the 40 students in the 400 level, 12 (30%) said never, 14 (35%) said sometimes this informs that moderate tutorial activity at this level. 11 (27.5%) said often, and 3 (7.5%) said always interfered.

Overall, the data reveal that many students have experienced some level of interference due to freedom of university. The impact was more pronounced in the 300 and 400 levels, where more distractions were experienced than at the 100 and 200 levels.

4.3.3.1: Learning in a large class: Sometimes, students learn in large classes.

They were asked if they felt intimidated by learning in large classes. Their responses are presented in Table 4.20.

Table 4.20: Intimidation by learning in a large class

Level of study	Never (%)	Sometimes (%)	Often (%)	Always (%)
100	4(12.5)	17(53.1)	4(12.5)	7(21.9)
200	4(30.8)	7(53.8)	1(7.7)	1(7.7)
300	12(48.0)	13(52.0)	0(0)	0(0)
400	12(29.3)	18(43.9)	7(17.1)	4(9.8)

Table 4.20 shows the responses of 100 to 400 level students when asked if they felt intimidated learning in large classes. Among 100 level students, 4 (12.5%) said they never feel intimidated, 17 (53.1%) said sometimes, 4 (12.5%) said often, and 7 (21.9%) said they felt intimidated always.

Of the 200 level students, 4 (30.8%) reported never feeling intimidated, 7 (53.8%) felt intimidated sometimes, 1 (7.7%) felt intimidated often, and 1 (7.7%) felt intimidated always.

At the 300 level, 12 (48%) said they never feel intimidated, while 13 (52%) said they sometimes feel intimidated in large classes.

Among the 400 level students, 12 (29.3%) said they never felt intimidated, 18 (43.9%) said they felt intimidated sometimes, 7 (17.1%) often, and 4 (9.8%) always feel intimidated.

Overall, the data indicate that while a significant number of students across all levels sometimes feel intimidated in large classes, feelings of frequent intimidation decrease with academic level.

4.3.3.2: The physical classroom environment

The students were asked if there was enough furniture for everyone in the classroom where they learned mathematics. Students were also asked if they could hear their lecturer when they were learning mathematics from any part of the class where they were seated. Table 4.21 shows their responses.

Table 4.21: Physical environment of the classroom

Level of study	Statement	Never (%)	Sometimes (%)	Often (%)	Always (%)
100	There is enough furniture	22(68.8)	7(21.9)	1(3.1)	2(6.3)
	I could clearly hear	5(15.6)	22(68.8)	2(6.3)	3(9.4)
200	There is enough furniture	10(76.9)	2(15.4)	0(0)	1(7.7)
	I could clearly hear	4(30.8)	7(53.8)	1(7.7)	1(7.7)
300	There is enough furniture	4(16.0)	10(40.0)	5(20.0)	6(24.0)
	I could clearly hear	7(28.0)	12(48.0)	3(12.0)	3(12.0)
400	There is enough furniture	15(36.6)	16(39.0)	4(9.8)	6(14.6)
	I could clearly hear	10(25.0)	22(55.0)	3(7.5)	5(12.5)

The table above presents responses from 100, 200, 300, and 400 level students regarding the adequacy of lecture hall furniture and audibility during lectures. Among 100 level students, 22 (68.8%) reported that there was never enough furniture, 7 (21.9%) said that it was sometimes, 1 (3.1%) said it was often, and 2 (6.3%) said. Regarding hearing clarity, 5 (15.6%) said they never hear clearly, 22 (68.8%) sometimes, 2 (6.3%) often, and 3 (9.4%) said they heard clearly always.

For 200 level students, 10 (76.9%) stated that furniture was never enough, 2 (15.4%) stated that it was sometimes enough, and 1 (7.7%) stated that it was always enough. On hearing, 4 (30.8%) never heard clearly, 7 (53.8%) sometimes, 1 (7.7%) often, and 1 (7.7%) always.

Among the 300 level students, 4 (16%) reported that the furniture was never enough, 10 (40%) sometimes, 5 (20%) often, and 6 (24%) always. Regarding audibility, 7 (28%) never heard clearly, 12 (48%) sometimes, 3 (12%) often, and 3 (12%) always.

Among the 400 level students, 15 (36.6%) said furniture was never enough, 16 (39%) said it was sometimes, 4 (9.8%) said it was often, and 6 (14.6%) said it was always. Concerning hearing, 10 (25%) never heard clearly, 22 (55%) sometimes, 3 (7.5%) often, and 5 (12.5%) always. Overall, many students reported insufficient furniture and poor audibility across levels.

4.3.3.3 Accommodation availability on campus

The students were asked if they were accommodated on campus. Table 4.22 shows the number of students who were accommodated on campus and those who were not. The respective percentages are enclosed in brackets. The responses are shown according to the year of study to highlight which year of study was the most affected by lack of accommodation.

Table 4.22: Student accommodation on campus

Level of study	Statement	Yes (%)	No (%)
100	I am accommodated on campus	9(29.0)	22(71.0)
	Lack of accommodation affects my mathematics study	5(23.8)	16(76.2)
200	I am accommodated on campus	6(46.2)	7(53.8)
	Lack of accommodation affects my mathematics study	4(57.1)	3(42.9)
300	I am accommodated on campus	18(75.0)	6(25.0)
	Lack of accommodation affects my mathematics study	2(40.0)	3(60.0)
400	I am accommodated on campus	24(58.5)	17(41.5)
	Lack of accommodation affects my mathematics study	6(37.5)	10(62.5)

The table above summarizes responses from 100, 200, 300, and 400 level students regarding campus accommodation and its effect on their mathematics study. Among the 100 level students, 9 (29%) reported not being accommodated on campus, while 22 (71%) were. When asked about the lack of
Accommodation affected their study, 5 (23.8%) said yes, and 16 (76.2%) said no. At PLASU, all 100-level students are entitled to hostel accommodation; those not on campus likely chose not to stay there. Overall, the lack of accommodation does not significantly affect their mathematics study.
Among the 200 level students, 6 (46.2%) were not accommodated, while 7 (53.8%) were. When asked about the impact, 4 (57.1%) said lack of accommodation affects their study, while 3 (42.9%) said it does not. Although not officially entitled, they may be accommodated depending on space availability.
Of the 300 level students, 18 (75%) were not accommodated, and 6 (25%) were. On impact, 2 (40%) respondents said yes, while 3 (60%) said no. Thus, the lack of accommodation seems to have a minimal effect.
Among 400 level students, 24 (58.5%) lacked accommodation, and 17 (41.5%) had it. While 6 (37.5%) reported that it affected their study, 10 (62.5%) reported that it did not. Most opted not to stay on campus, resulting in minimal impact on their studies.

4.3.4.1 Students‟ Practices in Mathematics

Students were asked if they practiced solving mathematics problems on their own. They were also asked if they practiced solving mathematics problems in groups with other course mates. Table 4.23 presents their responses.

Table 4.23: Solving mathematics problems

Level of study	Statement	Never (%)	Sometimes (%)	Often (%)	Always (%)
100	I practice solving Math problems on my own	3(9.4)	6(18.8)	4(12.5)	19(59.4)
	I practice solving Math problems in groups	4(12.5)	11(34.4)	8(25.0)	9(28.1)
200	I practice solving Math problems on my own	0(0)	3(23.1)	1(7.7)	9(69.2)
	I practice solving Math problems in groups	1(7.7)	9(69.2)	1(7.7)	2(15.4)
300	I practice solving Math problems on my own	1(4.0)	5(20.0)	9(36.0)	10(40.0)
	I practice solving Math problems in groups	1(4.0)	13(52.0)	5(20.0)	6(24.0)
400	I practice solving Math problems on my own	3(7.3)	10(24.4)	16(39.0)	12(29.3)
	I practice solving Math problems in groups	0(0)	15(36.6)	12(29.3)	14(34.1)

The table above presents responses from 100, 200, 300, and 400 level students on whether they practice solving mathematics problems individually or in groups. Among the 100 level students, 3 (9.4%) reported never practicing on their own, 6 (18.8%) sometimes, 4 (12.5%) often, and 19 (59.4%) always. Regarding group work, 4 (12.5%) said never, 11 (34.4%) said sometimes, 8 (25%) said often, and 9 (28.1%) said always. These results indicate that many 100-level students engage in both individual and group practice.
Of the 200 level students, 3 (23.1%) reported practicing on their own, 1 (7.7%) often, and 9 (69.2%) always. On group practice, 1 (7.7%) said never, 9 (69.2%) said sometimes, 1 (7.7%) said often, and 2 (15.4%) said always, suggesting that most practice both ways.
Among 300 level students, 1 (4%) never practiced,, 5 (20%) practiced, 9 (36%) practiced often, and 10 (40%) practiced individually. Group practice responses were as follows:: 1 (4%) never, 13 (52%) sometimes, 5 (20%) often, and 6 (24%) always.
Of the 400 level students, 3 (7.3%) never, 10 (24.4%) sometimes practiced,, 16 (39%) often practiced,, and 12 (29.3%) always practiced on their own. Group practice responses were as follows:: 15 (36.6%) sometimes, 12 (29.3%) often, and 14 (34.1%) always. Results consistently show high levels of engagement in both individual and group practice.

4.3.4.2 Participation of students in class

Some of the ways in which students participated in learning were by freely asking questions in class, especially when they needed clarification, and by freely voicing their opinions. Students were asked if they were allowed to freely ask questions and voice their opinions in class. Table 4.24 shows their responses.

Table 4.24: Participation of students in class

Level of study	Statement	Never (%)	Sometimes (%)	Often (%)	Always (%)
100	Allowed to freely ask questions in class	0(0)	6(18.8)	3(9.4)	23(71.9)
	Allowed to freely voice opinions in class	4(12.5)	9(28.1)	3(9.4)	16(50.0)
200	Allowed to freely ask questions in class	0(0)	4(30.8)	0(0)	13(69.2)
	Allowed to freely voice opinions in class	0(0)	7(53.8)	3(23.1)	3(23.1)
300	Allowed to freely ask questions in class	1(4.0)	3(12.0)	1(4.0)	20(80.0)
	Allowed to freely voice opinions in class	0(0)	8(32.0)	0(0)	17(68.0)
400	Allowed to freely ask questions in class	0(0)	11(26.8)	9(22.0)	21(51.2)
	Allowed to freely voice opinions in class	6(14.6)	9(22.0)	13(31.7)	13(31.7)

The table above presents responses from 100 to 400 level students regarding their freedom to ask questions and express opinions in class. Among 100 level students, 6 (18.8%) reported being allowed to ask questions occasionally,, 3 (9.4%) often, and 23 (71.9%) always. On voicing opinions, 4 (12.5%) were never allowed, 9 (28.1%) were sometimes, 3 (9.4%) were often, and 16 (50%) were always. Overall, 26 (81.3%) and 19 (59.4%) respondents felt free to ask questions and voice opinions, respectively.

Of the 200 level students, 4 (30.8%) said they were sometimes allowed to ask questions and 13 (69.2%) said they were always allowed to ask questions. Regarding expressing opinions, 7 (53.8%), 3 (23.1%), and 3 (23.1%) responded sometimes, often, and always, respectively. A majority, 13 (69.2%) felt free to ask questions, but only 6 (46.2%) felt free to express opinions.

Among the 300 level students, 1 (4%) reported never, 3 (12%) sometimes, 1 (4%) often, and 20 (80%) always being allowed to ask questions. Regarding voicing opinions, 8 (32%) said that they were sometimes and 17 (68%) said that they were always. Most respondents,, 21 (84%) and 17 (68%), felt free to ask questions and express opinions.

For the 400 level students, 11 (26.8%) were sometimes allowed to ask questions,, 9 (22.0%) were often allowed to ask questions, and 21 (51.2%) were always allowed to ask questions. Regarding opinions, 6 (14.6%) were never allowed, 9 (22.0%) were sometimes allowed, 13 (31.7%) were often allowed, and 13 (31.7%) were always allowed. Overall, 30 (73.2%) and 26 (63.4%) respondents reported being allowed to freely ask questions and express opinions.

4.3.4.3 Respect for students

Students were asked if they thought that lecturers respected them as learners. Their responses to the statement “Lecturer respects me as a learner” are presented in Table 4.25.

Table 4.25: The lecturer respects me as a learner

Level of study	Strongly Disagree (%)	Disagree (%)	Agree (%)	Strongly Agree (%)
100	1(3.2)	1(3.2)	17(54.8)	12(38.7)
200	1(7.7)	1(7.7)	8(61.5)	3(23.1)
300	0(0)	1(4.0)	13(52.0)	11(44.1)
400	3(7.3)	0(0)	20(48.8)	18(43.9)

Table 4.25 presents responses from 100 to 400 level students on whether lecturers respect them as learners. Among 100 level students, 1 (3.2%) strongly disagreed, 1 (3.2%) disagreed, 17 (54.8%) agreed, and 12 (38.7%) strongly agreed. For the 200 level, 1 (7.7%) strongly disagreed, 1 (7.7%) disagreed, 8 (61.5%) agreed, and 3 (23.1%) strongly agreed. In the 300 level, 1 (4.0%) disagreed, 13 (52.0%) agreed, and 11 (44.1%) strongly agreed. Among 400 level students, 3 (7.3%) strongly disagreed, and 20 (48.8%)

Agreed, and 18 (43.9%) strongly agreed. Across all levels, most students felt respected by the lecturers. The few dissenting responses may stem from isolated negative experiences. Overall, the Mathematics Department lecturers at PLASU are perceived to respect their students.

5. DISCUSSION, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1. Discussion

This study investigated the teaching and learning conditions of mathematics at Plateau State University (PLASU), revealing multiple systemic and pedagogical challenges. First, the qualifications of mathematics lecturers were largely adequate, with most holding at least a master's degree and substantial teaching experience. This aligns with Ferrini-Mundy et al. (2001), who stressed the importance of mathematical knowledge for effective teaching. However, staff shortages, especially in Real Analysis and Algebra, significantly impacted the quality of teaching.

Although tutorials were available, they were overcrowded—frequently exceeding 80 students—which undermined their effectiveness (Boylan, 2002; Hendriksen, 2005). Moreover, although most lecturers completed the syllabus, excessive teaching loads hindered research output (Joyner, 2012). Consultations were available and beneficial (Belward, 2009), but not all students could take advantage of them due to time constraints.

Although accessible, the university library lacked sufficient seats and current mathematics resources. Off-campus students faced safety challenges in accessing the library at night. The scarcity of up-to-date textbooks and journals affected both teaching and learning, consistent with the findings of de Jager (2002), who linked library use with academic performance.

Lecturers mostly used traditional lecture methods, which limited student engagement and understanding. As observed by Wentzel (2002), active learning strategies are more effective. However, PLASU's reliance on passive instruction often discouraged student participation, despite educators like Waterhouse (1990) and Kyriacou (1992) advocating for learner-centered approaches.

Limited departmental funding affected the procurement of essential teaching tools and materials. The Central Administration's budget allocation did not meet the department's specific needs, further constraining instructional capacity.

5.2. Findings

The findings highlighted three key domains:

1. **Teaching and Learning Conditions:** Although the faculty was academically qualified, the faculty had inadequate staffing in critical areas, insufficient tutorial effectiveness, poor library resources, and an over-reliance on lectures. Physical facilities, such as classrooms, lacked ventilation, functional boards, and PA systems.
2. **Lecturers' Challenges:** Lecturers faced challenges including students' low engagement with problem-solving, negative attitudes toward mathematics (Aiken, 2000), and weak foundational knowledge

(Rylands&Coady, 2009; Ulovec, 2006). Tapia (2004) noted that students' low self-confidence correlates with poor learning outcomes.

3. **Challenges: Students struggled to adjust to university life.** Many found the newfound freedom distracting (Chase, 1968; Boyer, 1986). Physical classroom conditions and lack of accommodation limited their academic performance (MacAuley, 1990; Pascarella&Terenzini, 2005). Overcrowded classrooms, rapid pacing, and information overload are particularly burdensome for first-year students. McLeod (1998) confirmed that large classes often reduce student participation. A lack of differentiation in teaching further disadvantaged students without Further Mathematics backgrounds.

5.3. Conclusions

This study confirmed that although PLASU maintains some essential infrastructure and employs qualified staff, numerous challenges impair its teaching and learning of mathematics. The overuse of the lecture method, lack of modern instructional resources, insufficient budgetary support, and inadequate classroom environments weaken the effectiveness of mathematics instruction. The Lecturers are have excessive workloads, while students face academic and environmental challenges, especially during their transition from secondary to tertiary education. A mismatch exists between teaching approaches and diverse backgrounds and preparedness levels of students.

5.4. Recommendations

To address these issues, the following measures are recommended:

- Curriculum and Pedagogical Reforms: Shift from a lecture-dominant method to interactive, student-centered strategies. Incorporate active learning and group problem-solving sessions as advocated by Davidson (1990).
- Infrastructure Development: Improve classroom conditions—better seating, ventilation, and public address systems. Expand hostel facilities to reduce the academic burden on off-campus students.
- Resource Enhancement: Increase funding for mathematics resources, including software, journals, and updated textbooks. Ensure that the library has sufficient seating and relevant materials for mathematics courses.
- Staffing and Training: Recruit additional lecturers in critical areas, such as algebra and real analysis. Provide ongoing professional development focused on innovative teaching strategies.
- Policy Enforcement and Assessment: Ensure compliance with senate regulations through continuous assessment and timely feedback (Yorke, 2003).
- Student Support: Offer remedial programs to students lacking foundational knowledge. Provide mentorship schemes to help new students adapt and stay academically engaged.

5.5. Area for Further Research

Future studies should replicate this research across other Nigerian tertiary institutions to gain broader insights into the systemic issues affecting mathematics education and inform national education policy.

REFERENCES

Ball, D. (2005). Understanding mathematics for teaching. American Educator, 29(3), 14-16.

Ball, J., Bekolle, D., Clemens, H., Hastings, A., Lungu, E., and&Ogana, W. (2009). Mathematics in Africa: Challenges and Opportunities. Retrieved from http://www.mathunion.org/fileadmin/IMU/Report/Mathematics-in-africa-challengesopportunities.pdf.

Cresswell, J. (2003). Research design: Qualitative, quantitative, and mixed methods approaches. Thousand Oaks, CA:: Sage Publications.

Denbel, D. G. (2023). Challenges of teaching and learning mathematics courses in online platforms. International Journal of Online Pedagogy and Course Design, 13(1), 1-14. Retrieved from https://www.igi-global.com/article/challenges-of-teaching-and-learning-mathematics-courses-in-online-platforms/321155.

Education Week. (2025). How 3 top math teachers nurture students'' ability to tackle challenges. Retrieved from https://www.edweek.org/teaching-learning/how-3-top-math-teachers-nurture-students-ability-to-tackle-challenge/2025/01.

Emizie, P. S. (2010). Are we having fun yet? How teachers use manipulative to teach mathematics. Educational Studies in Mathematics, 175(197), 47.

Enoh, A. O. (1996). Main Currents in Nigerian Educational Thoughts. Midland Press (Nigeria) Ltd.

Fuson, K. C., Wearne, D., Hiebert, J. C., Murray, H. G., Human, P. C., &Fennema, E. (2017). Children's conceptual structures for multi-digit numbers and methods of multi-digit addition and subtraction. Journal of the American Statistical Association.. Journal for Research in Mathematics Education, 28(2), 130-162.

Igwe, I. O. (2003). Principles of science and science teaching in Nigeria. Jonnes Communication Publishers.

Inana, O. and, &Agbedeyi, O. (2010). Challenges of mathematical science education at the tertiary level: The way forward. Paper presented at a workshop for lecturers of mathematical sciences in tertiary institutions at National Mathematical Center, 20th-25th June 2010, Abuja.

Key challenges in Nigeria's mathematics education. (2024). Journal of Educational Research and Development, 8(2), 45-58.

Koehler, M. and, & Mishra, P. (2009). What is knowledge of technological pedagogical content? Contemporary Issues in Technology and Teacher Education, 9(1), pp. 57-76..

Kouba, V., & Franklin, K. (2013). Multiplication and division: Sense-making and meaning. In R. J. Jensen (Ed.), Research Ideas for the Classroom: Early Childhood Mathematics (pp. 103-126). New York: Macmillan.

Lassa, P. N. (1978). A study of the mathematics program for elementary school teachers in Nigeria. University of Wisconsin-Madison, Ph. D. Dissertation.

Ma, L. (1999). Understanding and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States. New Jersey: Lawrence Erlbaum Associates, Inc.. Retrieved from http://www.educa.univpm.it/inglese/matthews.html.

Mukuka, A., Shumba, O., &Mulenga, H. M. (2024). Readiness of mathematics teacher educators in Zambia to integrate digital technology in teaching. African Journal of Educational Studies in Mathematics and Sciences, 20(1), 23-37.

Munn, P. and, &Drever, E. (1996). Using questionnaires in small-scale research. Edinburgh: The Scottish Council for Research in Education; 2018..

National Council of Supervisors of Mathematics (NCSM). (2021). Mathematics learning in the COVID-19 era: Challenges and adaptation strategies. Retrieved from https://www.mathedleadership.org/docs/resources/publications/NCSMPositionPaper2021.pdf.

Niss, M. (Ed.). (1997). The International Commission on Mathematical Instruction, Bulletin 43. Roskilde.

Nkoya, S. (2009). General performance in mathematics at Grade 9 and Grade 12 levels in the 2007 final examinations. Journal of Research and Practice of International Cooperation in Science, Mathematics, and Technology Education, 1(1), 34-47.

Ohiri, S. C. (2024). Challenges affecting mathematics education in Nigerian secondary schools. Nigerian Journal of Mathematics and Applications, 37, 112-126.

Pfundt, H., &Duit, R. (2000). Bibliography: Students' alternative frameworks and science education (5th ed.). New York: Routledge.. Kiel: University of Kiel.

Polit, D., & Beck, C. (2004). Nursing research: Appraising evidence for nursing practice (7th ed.). Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.

Post, T. (1988). Some notes on the nature of learning mathematics. In T. Post (Ed.), Teaching Mathematics in Grades K-8: Research-Based Method. Boston: Allyn and Bacon.

ResearchGate. (2023). Mathematics learning challenges and difficulties: students' perspective. Retrieved from

https://www.researchgate.net/publication/369885263_Mathematics_Learning_Challenges_and_Difficulties_A_Students'_Perspective.

Reimagining mathematics to save the world. (2024). ASCD Education Update, 66(4), 1-4.

Robinson, T. and Burns, C. (2009). Computer algebra systems and their effects on cognitive load. Paper presented at the 9th International Conference on Naturalistic Decision Making, London, UK..

Scheurich, J. (1997). Research methods in the post-modern era.. London: Falmer Press.

Shulman, L. (1986). Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4-14.

Ukeje, B. O. (1990). Teaching mathematics in secondary school. Anambra: Anachun Educational Books; 2012..

Varsavsky, C. (2010). Chances of success in and engagement with mathematics for students with weak mathematics background who enter university. International Journal of Mathematical Education in Science and Technology, 1(1), 1-13.