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A Study of Challenges of Future Educator of Mathematic's Pedagogy of University Graduate

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ABSTRACT

Good teachers don't just know their subject knowledge; they also know how to teach it well. To learn these skills, education and schools offer courses that focus on teaching methods alongside the subject matter. Mathematics is very important subject. It plays a key role for development science and technology. The importance of mathematics is acknowledged as it was offered at all levels of the educational system. Universities is focusing on preparing mathematics teachers. The objectives of the study were determined the pedagogical challenges faced by prospective teachers, as well as the hurdles they encounter in developing pedagogical skills during their university's mathematics class. The study was quantitative in nature, and data was collected using the survey technique. The population of study was comprised of four universities students of Islamabad and Rawalpindi. Questionnaire was divided to the 300 participants however final collected sample were 175 through proportionate random sampling. Questionnaire was used for data collection. Questionnaire was properly validated from the experts. Reliability of the tool was checked through Cronbach's Alpha. Data were analysed through mean value and descriptive statistics. After collecting the data from the sample, a pattern for data analyse was prepared in SPSS, in which the data was comprised of the quantitative

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data, participant's answers obtained from the data collection tools. Major conclusion of the study was that to improve mathematics concepts need to hand practice rather than trust on theoretical teaching and learning along it exam oriented limits innovative thinking of learners. The study recommended that national curriculum planners must design competency-based curriculum that emphasis on deep learning and the real-world application of mathematics. In teacher education programs should include technology integration, supported by regular digital literacy workshops that build teachers' abilities to use ICT tools effectively. Strong coordination between coursework and field experience is required, with instructors and supervising teachers jointly designing projects, case studies, and practical assignments that link theory to classroom realities.

Key Words: Challenges, Pedagogy, Pedagogical skills, Prospective or future Teacher,

Introduction

The preparation of future educator of math at the university level plays a crucial role in shaping future generations of students. Mathematics, frequently perceived as an intellectual and complex subject, requires not only content mastery but also the pedagogical and instructional skills necessary to deliver concepts effectively and profoundly. Among all the courses taught in schools, mathematics is the most international (Anthony & Walshaw, 2009) because of its strong connections to other fields and its role in developing critical, analytical, and creative thinking skills, problem-solving techniques, and decision-making abilities (Köğce et al., 2009). The role that schools play in educating students for the real world makes mathematics a crucial subject. Because of this, mathematics is a vital component of many worldwide tests, including the Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS), which have a significant influence on the educational policies of the participating nations (Baird et al., 2011). One of the key elements influencing student achievement is now acknowledged to be teacher quality (Blömeke et al., 2016). PCK is the process of successful integration of the contents and pedagogies according to the student's interests and skills. However, prospective teachers (PTs) at the tertiary level face

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multiple, layered challenges during their training, which may hinder their pedagogical development and helpfulness in upcoming classrooms. Worldwide, there has been an increasing recognition of the need for pedagogical reforms in mathematics education due to low student achievement and engagement in the subject (OECD, 2019). In many developing and developed nations alike, there is growing concern that university programs preparing mathematics teachers focus heavily on content knowledge, often at the expense of pedagogical content knowledge (Shulman, 1986; Ball et al., 2008). Prospective teachers are often expected to learn how to teach effectively while still tackling with complex mathematical concepts themselves. This dual burden is aggravated by systemic, curricular, institutional and instructional challenges.

The central challenges faced by prospective teachers include like the gap between theoretical university-level mathematics and the practical school-level mathematics curriculum often leaves PTs not prepared to simplify concepts for school learners (Livy et al, .2018). Insufficient workshop opportunities or disconnected classroom experiences restrict the development of reflective teaching skills and classroom management techniques essential for effective pedagogy (Zeichner, 2012). PTs may carry personal histories of math anxiety, negatively impacting their confidence and instructional choices (Bekdemir, 2010). A key issue in mathematics teacher education is a lack of explicit development of pedagogy content knowledge the understanding of how to teach particular mathematical ideas effectively (Ball, Thames, & Phelps, 2008).Despite growing emphasis on digital teaching tools, PTs often lack sufficient training in integrating ICT in mathematics pedagogy, limiting their ability to design innovative, student-centred learning experiences (Koehler & Mishra, 2009). PTs frequently struggle with designing appropriate formative and summative assessments that align with learning outcomes and student needs (Black & Wiliam, 2009).These challenges necessitate an urgent need to re-evaluate mathematics of prospective teacher education at the university level to better train prospective teachers with the cognitive, affective, and practical competencies required in modern classrooms.

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The aim of this study is to explore and analyses the pedagogical, emotional, and institutional challenges faced by prospective teachers of mathematics at the university level. By identifying these barriers, the study aims to contribute valuable insights into teacher education practices and policies. The findings updated curriculum developers, teacher educators, and policymakers about the specific requirements and support systems necessary to foster effective pedagogical growth among mathematics PTs. Additionally, the study examine how factors such as teaching practices, mentorship availability, course arrangement, and access to pedagogical resources influence the overall preparation of mathematics teachers. Ultimately, this research delivered evidence-based recommendations for improving the structure and delivery of mathematics pedagogy courses at the tertiary level.

Statement of Problem

Merriam-Webster defines pedagogy as the "art, science, or profession of teaching." Teaching styles, feedback, and assessment are just a few of the many different elements of pedagogy that are included by this comprehensive concept. In terms of pedagogy and teaching issues, this study identified the difficulties experienced by prospective math teachers.

In spite of the increasing emphasis on quality mathematics education in higher education, prospective educators of mathematics at the university level remained to face a range of complex challenges in mastering and applying effective pedagogical strategies. These challenges encompass both teaching and pedagogical competence, especially when assimilating advanced teaching methodologies, digital technologies, and inclusive practices aligned with 21st-century educational standards.

Research shows that many prospective teachers effort with changing theoretical knowledge into practical classroom instruction, mostly in encouraging conceptual understanding, higher-order thinking skills, and student engagement (Bosica, 2022). Furthermore, anxiety, low confidence and inadequate exposure to real-world teaching atmospheres compound these difficulties, often leading to performance gaps during fieldwork and professional practice (Abdul-Mumin et al., 2025). Complicating the situation are institutional limitations, such as outdated

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curriculum designs, insufficient training in digital pedagogies like AI-TPACK, TPACK frameworks and limited mentorship during workshop.

In spite of increasing research in mathematics education, there is a clear gap in systematic studies that explore the interrelated pedagogical, emotional and technological challenges confronted by prospective teachers of mathematics at university-level. Without targeted curriculum reforms and interventions these challenges threaten to continue out-dated, ineffective teaching practices and hinder the development of reflective, creative, and equity-minded educators. Therefore, this study aims to identify, analyse, and address the multi-layered challenges faced by prospective teachers at the university level, providing evidence-based endorsements to improve teacher preparation programs and nurture more effective mathematics pedagogical instruction.

Research Objectives

The main objectives of the study, were to analysis the challenges of prospective teacher of math pedagogy. To assess the pedagogical challenges faced by future educators during their university's mathematics class along it to examine the perceptions of prospective teachers of mathematics regarding the challenges they face in developing pedagogical skills.

Significance of Study

This study determined to explore the existing challenges of future educator of maths pedagogy at university level, which was faced by mathematics, has taught as optional subject at university level. This study had valuable implication for the prospective teacher to improving their class, and evaluating the challenges and developing of pedagogy, and teaching techniques of mathematics of school learning program. Similarly, the study has the potential to contribute to the field of mathematics education.

The study was delimited in the following areas, only IIUL and NUML from Islamabad, Agriculture University and FJWU from Rawalpindi. The major concentration of the study was based on the present challenges of prospective teachers of mathematics pedagogy at university level.Only prospective teachers of these universities were included in this study.

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Review of Literatue

It is crucial to review the relevant research in order to compare the study and fully comprehend the problem. Many books, research reports, investigative articles, and other booklets about curriculum, teaching resources, classroom management, and physical facilities are examined. Only a little amount of research is conducted in related fields.

The current investigations are viewed as a turning moment in the research by many of them. **Pedagogical Approach Training can be understood as an occupation:** It includes tasks that need to be carefully planned in order to acquire specific knowledge in order to benefit the students who are being educated (Ball & Forzani, 2009). Teaching is a mathematical problem solving process in the study of mathematic (Ball & Bass, 2003).Teachers must possess in-depth knowledge of mathematical concepts, effective teaching strategies, and the ability to get pupils thinking critically and coming up with original ideas in order to solve difficulties during the learning process (NCTM, 2007). Knowledge about mathematics and the abilities needed to supervise the process of learning are prioritized over various pedagogical-related information. (Ball, et al, 2008). As a result, pedagogical expertise is crucial to the process of teaching. Anxiety about teaching mathematics is negatively correlated with self-efficacy in the subject (Bosica, 2022). Therefore, the effectiveness of preservice teachers in teaching mathematics may be improved through interventions that focus on reducing anxiety and enhancing self-efficacy (Priyanda, et al., 2025).

The study also shows that seniority and gender have no bearing on the efficacy of integrated teaching in high school math; math instructors with more training are more successful at it than those with less training. As a result, one of the key factors influencing how effectively kids learn is teacher quality; to put it another way, research has demonstrated the importance of instructors' credentials in helping students succeed in well-integrated math instruction (Hon et. al., 2023). According to this study, student characteristics have an impact on how well integrated teaching in high school math works. This finding is consistent with the theory that good teaching and learning can arise from interactions among students, teachers and the

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classroom environment (Seah,2007). Teachers must integrate pedagogical techniques, digital tools, and subject-matter expertise to effectively incorporate technology into mathematics instruction.

ICT Support to Enhance Mathematic Pedagogy: Using ICT integrated pedagogy in the teaching and learning process is one of the best strategies to handle a multicultural mathematics classroom. ICT integrated pedagogy is widely misunderstood in mathematics classes despite its ease of use and effectiveness in addressing student individual differences. This misperception stems from a lack of knowledge. By honouring the interests of each student and treating them as individuals rather than as numbers, the visionary teacher may effectively manage variety. Utilizing ICT technologies to facilitate student-teacher cooperation aids in pedagogical transformation and diversity management in mathematics classrooms (Lok Nath, 2019).

In order to become professional teachers, future teacher must complete coursework in pedagogy. A potential teacher can successfully and efficiently transmit their expertise (transfer of knowledge) to students by studying the subject material and pedagogic understanding. Teachers who have mastered the material and pedagogical skills will be able to comprehend the needs of their students on a deeper level and assist them in discovering their identity, character, potential, and appropriate solutions to challenges (Moh Zayyadi et al., 2020).

The majority of future educators believed that teaching mathematics will benefit from the learning environments developed in the teaching technology course. Additionally, they placed a strong emphasis on concepts like "encouraging use of technology," necessity, common effect, awareness, an engaging learning environment, practicality, time savings, visualization, permanent learning, professional development, and motivation. In addition, it was discovered that some educators were unwilling to produce and use new materials. Their primary worries were Turkey's university entrance exam system, time constraints, numerous problems with the curriculum and mathematically abstract problems. The assignments and activities related to instructional technology and material development caught the attention of aspiring educators. This is believed to be

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related to the Fatih Project's installation of smart boards in all Turkish high schools as well as the new curricula's emphasis on the use of dynamic software and information technology (Koparan & Timur, 2017). According to reports from the (NCTM, 2000, 2014) National Council of Teachers of Mathematics, Technology-assisted instruction to promote conceptual growth has gained attention in mathematics education in recent decades. In addition to topic knowledge, or knowing what to teach, teaching mathematics today calls for pedagogical skills, or knowing how to teach and how to address students' learning difficulties and challenges, as well as associate with the most effective learning tools (Nantschev et al., 2020).

The results of the study demonstrate how much teachers regard the importance of teaching and understanding theorems and their proofs, as well as how they help students enhance their general cognitive abilities and logical reasoning. However, in order to increase students' methodological, global cultural awareness and practicing teachers today tend to overlook the significance of teaching and studying theorems and their proofs. The first major obstacle that prevents pupils from developing the necessary mathematical and cognitive skills is their lack of drive to learn theorems. Educators argue that they do not have sufficient time in class to teach mathematics in general or theorems and their proofs in particular (Tarasenkova, 2019).

When creating lesson plans, most future teachers encountered difficulties since pupils occasionally lacked fundamental understanding of the material and occasionally struggled to decide which example and creative teaching technique to employ. They are also puzzled about how to create precise goals and questions for the evaluation of pupils' behaviour changes. Classroom management was an issue for the majority of prospective educators because pupils who had previously studied at home and only attended to class for attendance did not respond well and showed a lack of discipline (Ray, et al., 2023).

Consequently, the student has mental strain in trying to comprehend the specific lesson, which ultimately leads to dissatisfaction and failure. Therefore, for a student to become a proficient mathematician, an effective mathematics pedagogy

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must guarantee the development of a favourable attitude toward mathematics. It will result in the learners' overall development into responsible and productive members of the nation. Pedagogy should be set up in a way that gives students multiple chances to work both alone and together to understand diverse mathematical concepts. To help students understand diverse mathematical concepts, both solo and group work opportunities should be offered (Zaidi &Ali, 2019). The present study's findings align with other studies highlighting the beneficial correlation between teaching practice knowledge and belief. Beliefs are correlated with PCK and the system of instruction. The findings of this study can be utilized as input into the Mathematics Teacher Education program's curriculum to increase students' PCK capabilities and incorporate the philosophy of believing, thereby facilitating the integration of mathematical teaching knowledge and cognitive capacity (Muhtarom & Dwi, 2019).

TPACK) and PCK are framework that provides as a lens for understanding prospective teacher pedagogical thinking: During teacher education, pedagogical content knowledge (PCK) starts to take shape, and the teaching practicum helps to solidify this growth. The study suggests that teacher education should put more of an emphasis on analysing the mathematical content and providing opportunities for hands-on learning experiences, such as practicums and micro teaching, under the guidance of seasoned math mentors (Niiku, 2025). According to Jeschke et al. (2019), teaching mathematics involves both subject-mathematics CK (M-CK) and teaching-mathematics M-PCK understanding. According to Kadarisma et al. (2019), M-CK and M-PCK are both created through college mathematics or university courses as well as specialized courses for mathematics training. According to Ma rufi and Ilyas, (2019) there is need for a lot of practice to understand and apply mathematical terms and numerical concepts. Since students expressed concerns about their ability to modify teaching strategies to suit a range of learning styles and skills, it was determined that additional focused training in inclusive teaching methods is necessary. According to the study, aspiring teachers are typically excited about their future jobs, but they are also aware of the serious pedagogical hurdles they will face. They point to the necessity of a more targeted emphasis on useful abilities like

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classroom management and inclusive teaching methods (Margevuca & Šūmane, 2024).

The Technological Pedagogical Content Knowledge (TPACK) framework provides a lens for understanding teachers' pedagogical thinking when designing technology-enhanced lessons (Priyanda, et al., 2025).The vast majority of research focuses on digital technology use and identifies barriers to TPACK development among math teachers, such as insufficient resources, resistance to change, lack of institutional support, and lack of confidence. To enhance the teaching of mathematics, the study suggests that prospective teacher and teachers actively engage in pedagogical technology training. While there are numerous advantages to integrating technology into teaching and learning, there are drawbacks as well that must be resolved if math teachers are to successfully use technology into their lessons and further their TPACK development (Kholid et al., 2023).

Teaching of 21st-Century Skills Demands A Broad Strategy for prospective teacher: Teaching 21st-century skills demands a comprehensive strategy that takes into interpretation budget, systemic regulation, teacher training, assessment, pedagogy, and content in order to be implemented (Fitriati et al., 2024).

Classroom activities directly affect students' learning and are closely related to the quality of teaching and learning (Koponen et al., 2017; Vásquez et al., 2022). These activities heavily rely on the professional practices of teachers. According to Koponen et al. (2017), teacher education programs should provide prospective teachers with sufficient pedagogical and mathematical training throughout their initial training. They need to rethink strategies to nurture future teachers and equip them with adequate knowledge for teaching because the contents of mathematics teacher education are related to future teachers' knowledge, affecting student achievement (Chen & Zhang, 2019). In their post-field teacher education lessons, future teachers often share numerous stories of their successes and mistakes in various mathematics classrooms. However, instead of addressing the marginalization of many groups within educational settings, these reflective narratives frequently reinforce traditional math classes and existing practices (Nolan & Bjerke, 2024). A growing worldwide consensus on the importance of integrating 21st-century skills

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into educational curricula has made improving students' critical thinking and problem-solving, creativity, communication, and collaboration (4C) skills the main focus of current reform in mathematics education.

Theoretical Framework of Study

Pedagogical content knowledge (PCK), which determines what constitutes typical knowledge for teaching, is one of the seven categories that Shulman (1987) proposed when understanding teachers' professional knowledge base. According to Shulman (1987), Pedagogical content knowledge is an awareness of how specific knowledge is pedagogically arranged, depicted, and delivered to students. Since effective teaching necessitates an awareness of what styles learning simple or challenging for many learners, PCK involves formulating the material in a way that others may understand (Shulman, 1986). The volume and arrangement of teachers' knowledge on a particular subject is known as content knowledge (CK), which is another important category for their knowledge base. It is seen as a prerequisite for teachers' PCK (Agathangelou & Charalambous, 2021).

According to Ball et al. (2008), CK of fractions is a fundamental mathematical concept that includes using the right terminology such as numerator, denominator, unit fraction, and notations with fractions, as well as accurately calculating fractions, spotting wrong solutions, and executing different operations like decreasing, improving, and comparing fractions. Making the right connections, finding out the size, sequence, and equivalency of fractions, and assessing whether or not the solutions are reasonable are all necessary for carrying out fraction operations and effectively teaching fractions (Lamon, 2020).

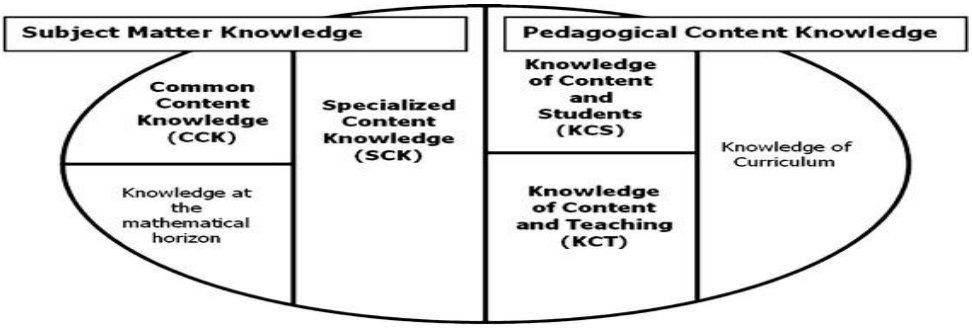


Figure 1. The MKT framework's knowledge categories (a modified graphic compared to Ball et al., 2008, p. 403)

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Based on activities associated with teaching mathematics, Ball et al. (2008) created the Mathematical Knowledge for Teaching structure (Fig. 1). They separated Shulman's (1986) PCK into KCS, KCT, and knowledge of content and curriculum (KCC), and his CK into common content knowledge (CCK), specialized content knowledge (SCK), and horizon content knowledge (HCK). It may be challenging to distinguish, for instance, SCK from KCS, despite the fact that they are presented as distinct categories in the MKT framework. Likewise, KCC may join with a number of the new types (Ball et al., 2008).

This study focuses on the MKT framework's PCK domain, where KCS links students' mathematical reasoning to particular mathematical knowledge and familiarity (Ball et al., 2008). For instance, KCS covers information on typical student errors, the cognitive mathematical processes pupils employ, and the consequences of these processes. According to Ball et al. (2008), Knowledge content teaching necessitates teachers to relate their mathematics expertise to the pedagogical concerns that impact pupils' knowledge. These concerns include the selection of numerical examples, the use of mathematical representations, and the relationship between mathematical and everyday language (Hill et al., 2005).The preparation and implementation of instruction depend heavily on a comprehension of the mathematics covered in the student course, according to Ball et al. (2008, p. 399), who discussed the KCC category. They cited Shulman (1986), who defined curricular knowledge as familiarity with various programs and educational resources designed to teach specific subjects at specific levels. After that, KCC mandates that teachers relate their specialized mathematics knowledge to what they have learned in class.

Research Methodology

The study was survey-style and descriptive in nature. A questionnaire was used to perform the study. The research data was collected from Arid University and FJWU in Rawalpindi, as well as IIUI and NUML in Islamabad. This study's main goal was to investigate prospective instructors' knowledge and practices regarding university-level mathematics education. The main objective of this quantitative study was to identify, recognize, and comprehend the lived experience that allowed the researcher to obtain the most insightful findings in terms of perspective. It

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focused on the perceptions of challenges of prospective teachers of mathematics pedagogy at the university level, on how to increase a prospective teacher's mathematical teaching ability. This chapter covered the quantitative phenomenological research technique in depth, as well as the justification for utilizing it to investigate challenges of mathematics pedagogy viewpoints on how to improve their pedagogical styles of mathematical skills.

This study was design to some extent descriptive and logical along statistical interpretation. In this study, a data analysis approach was applied. The questionnaire survey and observation approach were used for the study. For the meaningful data collection the quantitative methods, questionnaire survey were mainly used in the past studies.

The sample of the study consist of 175.For the selection of sample the random sampling technique was used from four universities of twin cities including Pir Maher Ali Shah University Rawalpindi (PMAS) and Fatima Jinnah Women University (FJWU) Rawalpindi and International Islamic University Islamabad (IIUI), National University of Modern Language (NUML) Islamabad.The total response rate was 30.1%.

Table Population and Sample size

Sr.No	Institution Name	Population	Sample	Response Rate
01	IIUI	200	58	29%
02	NUML	120	32	26%
03	PMAS	160	47	29%
04	FJWU	120	38	32%
	Total	**600**	**175**	

Data Collection Tools and Instruments

Primary as well as secondary data were used in this study; basic data was the main source of the analysis and explanation of the study, which was finished by utilizing a questionnaire, a discussion, and a form for class monitoring; secondary data was used to understand earlier research studies related to this research of the review of literature parts.The tools were developed in accordance with the requirements and features of the selected sample. A self-made questionnaire was utilized to gather

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study data. The contents of the questionnaire was related to challenges of prospective teachers of mathematics' pedagogy.

The questionnaires was created after an extensive review of relevant material, including theses, articles, and papers. Respondents were asked to comment at the conclusion of each questionnaire selection regarding the questions that did not cover the additional areas. The researcher conferred with university math instructors and professionals in the field before creating the aforementioned tools.

The questionnaires comprised of 20 statements pertaining problems to be faced by the future teachers of challenges mathematics' pedagogy and to develop pedagogical skills and each statement followed by ranked responses in the five points of likert scale. The statements of the questionnaire were constructed in such a manner that they could find out the problem of future teacher while teaching mathematics. The ability of a research tool to measure what it was designed to evaluate is referred to as validity. Therefore, any measure that measures everything it is intended to assess is considered valid (Merriam-Webster, 2007). Examining relevant literature, speaking with experts, and the researcher's personal interest all supported content validity.

Cronbach's Alpha are used to determine reliability. Internal consistency is measured by Cronbach's Alpha. The capacity to measure an item, characteristic, or construct using an independent but comparable measure and have comparable results is known as reliability(Enon, 1995). The Cronbach's Alpha coefficient is calculated to ensure the final instrument's dependability. Cronbach's Alpha is used in combination with SPSS to test the tool's reliability. Cronbach's Alpha is 0.85, indicating that the questionnaire is trustworthy.

Table 3.3: ***Likert Scale Rating***

Score	**Importance Level of Factors**
1.	Strongly Disagree(SD)
2.	Disagree(D)
3.	Uncertain(U)
4.	Agree(A)

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5. Strongly agree(SA)

Quantative Data Analysis

The researcher used a quantitative approach for analysis and interpretation after gathering the data. Initially, the researcher used tables and basic statistical techniques to analyze the quantitative data, as well as descriptive statistics to convey the data's meaning. These findings were then analyzed using quantitative techniques to a certain degree for data validation using a likert scale, coding, and categorization as the method of quantitative approach to data analysis. The primary theme of the data was understood and recorded by the researcher for the purpose of a meaningful analysis.

The mean was utilized to determine if the statement is challenging or not. It utilize to find the central positions of response to the statement of teachers in rating scale. If the calculated index is greater than 3 then it is concluded that the statement is problematic. If the calculated index is less than 3 then it is concluded that the statement is not a problematic. The information was analyzed in descriptive method. Finally, the results of the quantitative data questionnaire, was carefully related by the researcher.

Mean Score Ranking

Mean score ranking is mostly used to rank the criticality or importance of a set of factors on a Likert scale (Xu, Yeung et al. 2010) Chan & Adabre, 2019). Many researchers have used this analysis method in social science and management science research to study different aspects under several related themes (Chan et al. 2009; Zhang 2005c ,Ameyaw and Chan 2015b). The mean scores are computed using this Eq 3.1 (Zhang 2006a):

$$\bar{x} = \frac{\sum x}{N} \qquad (3.1)$$

$\bar{x}$ Indicates the mean score for ith factor.

Data Analysis and Results

The researcher incorporated the findings of data collection, statistical analysis of data and ranking of factors by mean score. The findings of the data analysis assisted the prospective teachers in decision making whether to improve the challenges of

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mathematics' pedagogy faced by prospective teachers during their university's mathematics class and the challenges they face in developing pedagogical skills.

Questionnaire Survey for Data Collection

The data collection was carried out by using questionnaire survey, which is mostly adopted in education fields. The targeted population was prospective teachers of selected areas. Data were collected by using proportionate random sampling techniques. The questionnaires were using a five-point likert scale (1=SD, 2=D, 3=U, 4=A, and 5=SA) to rank the significance of parts that effect maths' pedagogy faced by prospective teachers during their university's mathematics class and the challenges they faced in developing pedagogical skills.

Total 300 questionnaires were distributed among the potential respondents which have adequate qualification in respective field. The questionnaire was distributed to the agreed respondents and the responses were collected via, email, in-person and Google forms. Firstly, the participants were given two weeks to respond and after then, number of reminders was sent with intervals. In total (175) responsive questionnaire were received giving a responses rate of (29.1%).

Type of Academic respondents

Source of Respondents	**No of Participants**	**Prcntge (%)**
BS Education	110	63%
B.ed.	65	37%

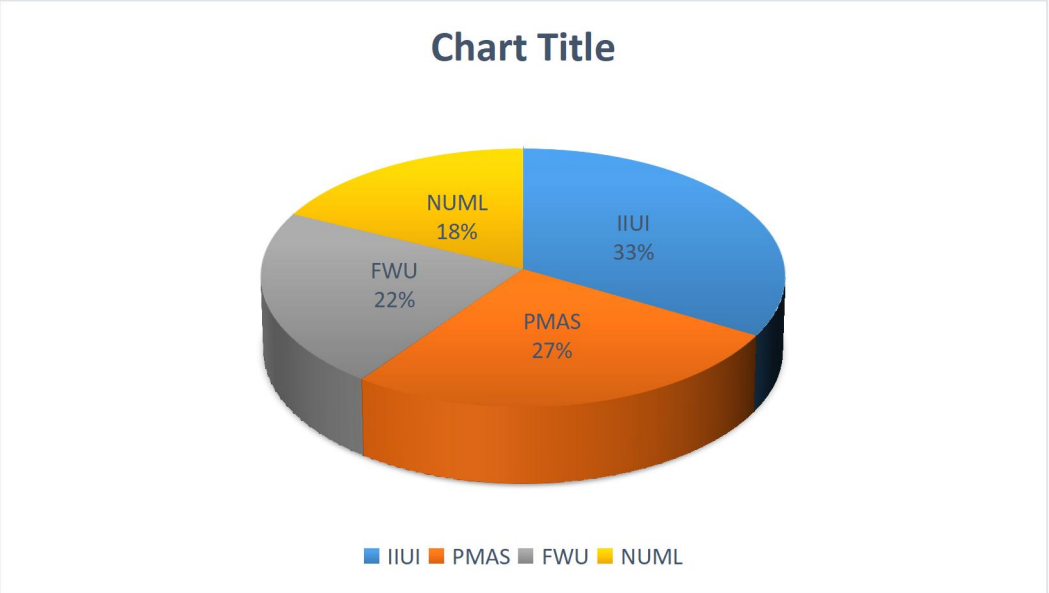
Above Table indicate that major of the respondents were BS Education(63%) as compare to B Ed (37%) .

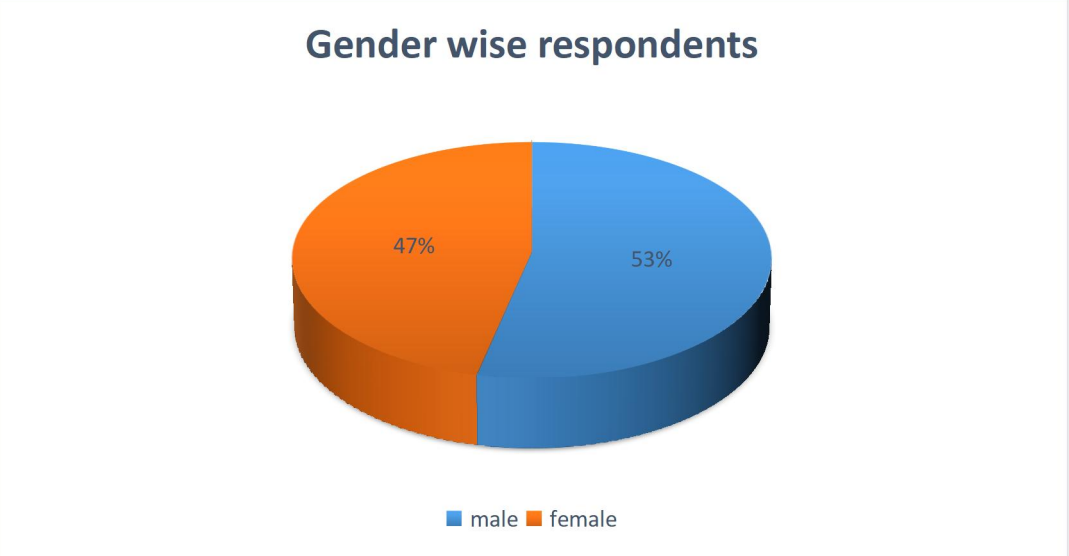
The participants were mainly evaluated upon the academic qualifications, which shows the validity of ranking of the challenging elements which impact the challenges of mathematics' pedagogy faced by prospective teachers during their university's mathematics class and the challenges they face in developing pedagogical skills.

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The above Fig indicate that majority of the participants were male having 53% respondents among the total response.

Reliability Test

The Cronbach alpha test was used to assess the reliability analysis for each respondent in the categories specified in the questionnaire survey (challenges of maths teaching faced by prospective teachers during their university's mathematics class and the challenges they face in developing pedagogical skills.).

The Table 4.3, Table 4.4 and cumulative analysis in Table 4.5 depicts the alpha values of challenges of mathematics' pedagogy faced by prospective teachers during

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their university's mathematics class and the challenges they face in developing pedagogical skills are

0.877 and 0.870 respectively, proposing a good inner consistency reliability of the instrument, which is above the recommended threshold of 0.7 Chen, Liu et al. (2011). These values are higher than the threshold of 0.7 in management sciences (Andrew et al. 2011; Kline 2013; Chan & Adabre, 2019; Adabre & Chan, 2019). Moreover, α values of 0.60 to 0.70 being deemed acceptable for internal consistency (Hair, Hult, Ringle, & Sarstedt, 2017; Mpofu, Godfrey, Moobela, & Pretorious, 2017). Therefore, it indicates that the survey results are reliable.

Objective 1, Challenges in mathematics Pedagogy

Challenges in Pedagogy	N	Means	St. Dev.	Var.
Practice has vital role in teaching and learning of mathematics.	75	4.19	0.800	0.640
Emphasis on course based teaching not for only examinations directed.	75	4.15	0.849	0.721
Effective models, strategies and practices to nurture the teaching style to understand student's about mathematics	75	3.91	0.720	0.518
There are limited opportunities to practice my teaching skills in real classroom settings.	75	3.80	1.000	1.000
Prospective teacher face challenges in using technology tools to enhance mathematics teaching.	75	3.79	0.920	0.846
It encounter challenges when assessing students understanding in mathematics.	75	3.77	0.798	0.637
Teachers usually initiate the Mathematics class by solving questions on board.	75	3.64	1.074	1.152
When teaching a mathematics topic, more than one representation (image, concrete material, symbol set, etc.) should be used.	75	3.57	0.774	0.599
Limited feedback from faculty on my pedagogical practices in mathematics	75	3.55	1.17	1.36
There is a lack of alignment between pedagogical training and current classroom demands in mathematics education	75	3.25	1.242	1.543

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Findings

This finding obtained the highest mean value 4.19 demonstrating strongly agreed among participants that hand on practices are crucial to improve mathematics knowledge. This findings also illustrate that future teacher strongly agree that regular problems solving, hand practices of numeric questions and cooperative engagement play a vital role in get to grips with mathematical perceptions and understanding.

This item is recorded a second highest mean value 4.15, indicate that respondents consider mathematics pedagogy should focus on all course based not merely included questions that are examination oriented. The third mean value is 3.91 demonstrate that future teachers adequately agree on the significances of instructive teaching strategies, models and diagram. The respondents believe various pedagogical techniques like models based teaching, interacting teaching and practices based learning support to improve student's maths understandings.

According the mean of value 3.80, indicating good response from respondents that future teachers get a shorted opportunity to practice during class. Mathematics is practices based subject not theoretical subjects, so there need a lot of time to practice of maths questions. With respect to mean value of 3.79, the respondents responded challenges and hurdles connecting digital tools into maths teaching. Respondents often confuse to use of technological tools due to limit and low training of digitals tools. The findings, which is recorded a mean value 3.77, show that learners confronted difficulties and challenges in understanding the perceptions and concepts of mathematical knowledge when being assessed on logic and critical thinking. The finding noted a mean value 3.64, indicate that outdated instructions techniques, such as opening classes by solving numerical questions on the board are still common.

The statement obtained mean score 3.57 express moderately agree. The future teacher consider the essential of utilizing manifold symbols and demonstrations to clarify maths perceptions and expressions.

The statement of mean value 3.55 indicate that prospective teachers are

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unsatisfactory and insufficient feedback from their teachers and administrators related to pedagogical practices and drill of mathematics. This statement has the lowest mean score 3.25, proposing that respondents adequately agree that their teaching and pedagogical training lies not fully match physical room opportunities and outlook

Conclusions after Findings of First Objective

According to the findings, it is concluded that future teachers significantly value hand practices and experience as a positive and effective tools for fostering together their teaching and their learners mathematics knowledge achievement. They identified that teaching mathematics positively needs to continue drill and practice rather than trusting especially on theoretic teaching and instructions.

With respect to finding, future teachers strongly agreed that exam directed teaching bounds innovative and creating thinking of respondents. So maths teaching should be teach all courses of maths to improve logic and problems solving skills in spite of root memorization. With respect to findings it is concluded that respondents agree and identify the worth of different instructive and constructive teaching method such as project based teaching, model based teaching and interacting teaching etc. promote the students cognitive and innovative thinking as well as can understands easily all basic concepts of mathematics knowledge. The respondents also unify that needs keenly exposure and training by utilizing advance digital strategies an effectively and precisely in maths classrooms. Regarding of above findings, it is concluded that a lack of suitable teaching and learning practices limits future educators from changing theoretical instructions into practical identifications. This drawback hurdles the cognitive capabilities, confidence and classroom management styles.

According to the finding's point of view, future teachers have knowledge and information of technological tools like Interactive simulations, desmos and Geogebra, but there are some challenges like limited resources and lack of confidence and training to utilize them efficiently. So digital skills play a key role to improve basic mathematics understanding.

According to findings It is concluded that participants agreed it is challenges and

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difficult to evaluate students understanding and knowledge away from written test. Majority of respondents trust on out dated examinations systems, which cannot return and reflect the correct understanding and thinking. Therefore teacher training and physical activity courses should integrate advancement learning courses.

Majority educators are kept continue to follow conservative, outdated and teacher centred methods that may bound and restrict students involvement, contribution and analysis. Whereas this method support in demonstration, it cannot continuously involve pupils effectively. So need to incorporate with advance teaching techniques. With respect to findings it is concluded that educators are aware of teaching importance of manifold signs and representations of maths knowledge, but they can lack access to resources or suitable training to apply them efficiently.

The deficiency of continuous feedback avoids future educators from improving their instruction techniques. Feedback is critical for replication, development, and the improvement of instruction practices. With regard to findings, it is concluded that the deficiency of continuous feedback avoids future educators from improving their instruction and training techniques. Feedback is critical for replication, development and the improvement of instructions practices.so there need an organised observation trick including post observation sessions, peer assessment and insightful negotiations to monitor learner educators in improving their pedagogical production. According to the findings it is concluded that there is a gap between educators' instructional programs and the practical facts of mathematics instruction. Many futures educators feel unprepared to tackle various classroom dynamics, curriculum demands and technological promoted l knowledge atmosphere.so it is mandatory to make training programs that report present teaching hurdles, including technological integration, inclusivity and advanced assessment practices.

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Objective 2, Prospective Teachers of mathematics regarding the Challenges They Face in Developing Pedagogical Skills.

The challenges they face in developing pedagogical skills	N	Mean	Std. Deviation	Variance
Instructive pedagogical skills in mathematics needs more practical coverage.	75	4.35	0.884	0.589
Current university training as insufficient for real-world mathematics pedagogical skills.	75	3.87	0.867	0.573
Digital pedagogy (e.g., use of technology in teaching math) should be emphasized more in our training to update pedagogical skills	75	3.55	0.894	0.878
Mathematics anxiety affects my ability to develop effective pedagogical approaches in mathematics.	75	3.49	1.040	1.162
Collaborative learning activities (e.g., peer teaching) as beneficial for building pedagogical skills.	75	3.42	0.976	0.982
Student mind-sets about math can tend to improve in pedagogical Mathematics skills.	75	3.43	1.067	1.249
Integration of theoretical and practical components in my training is unbalanced.	75	3.37	1.029	1.079
Current evaluation system does not accurately reflect my pedagogical progress	75	3.31	1.229	1.199
Curriculum reforms are needed to support prospective teachers in developing effective teaching skills.	75	3.25	1.305	1.461
Insufficient practice teaching opportunities hinder my pedagogical growth.	75	2.98	1.308	1.722

Findings

This item obtained the highest mean score = 4.35**,** displaying strong agreement

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among participants. Most prospective teachers believe that the development of pedagogical skills in mathematics requires more practice and experiential learning rather than purely theoretical instruction.

The mean value 3.87 demonstrated that most respondents decide their university training does not fully train and prepare them with the skills needed for digital era and real-world classroom teaching. The mean score of 3.55, respondents showed agree that training programs must place greater emphasis on using digital tools to improve mathematics instruction and digital tools related to mathematics. This item obtained a mean of 3.49, showing that many prospective teachers experience some level of mathematics stress and anxiety, which may obstruct with their teaching confidence and instructional creativity of mathematics.

The mean value 3.42 indicates that defendants agree, to an adequate level, that collaboration activities and peer teaching help improve pedagogical skills. This finding mean score of 3.43, suggest that respondents acknowledge that students focus and attitude toward mathematics influence how teachers plan and deliver instruction.

The mean score 3.37 indicate positive sense of the item that there is disparity between practical application and theoretical understanding in teaching and pedagogical skills in mathematics subjects. This item noted a mean value 3.31, indicate that participant's feel the current evaluation and grading systems fail to find and know their actual progress in pedagogical skills and aptitude.

This item noted the mean value 3.25, respondents reasonably agreed that the present syllabus and course needs revision to meet up-to-date educational needs. This item recorded the lowest value 2.98 indicate that some future teacher get practice exposure of teaching skills but majority prospective teacher feel their opportunities for real classroom teaching limited.

Conclusions after Two Objectives Findings

After finding it is concluded that prospective teachers feel a clear gap between theoretical coursework and its application in classroom situations. They value the importance of hands-on practice, real-life problem solving, and active teaching experiences for become skilled at pedagogical competence.

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According to second finding it is explained that teacher training programs may emphasis more on theory and less on the classroom realities of various learners, resource limitations, and modern teaching tools. As a result, graduates may struggle to translate learned theories into practice and skilful ways.

The finding reflects that technology boosted mathematics literacy and learning specially teaching and pedagogical trends to update creative thinking of future teacher related mathematics. But limited resources of digital pedagogy prevents them from applying digitals tools confidently.

Mathematics anxiety is a remarkable emotive obstacle that can effect both pedagogical skills and pupil academic achievement. Educators who feel nervous and anxious about mathematics often rely on rigid, procedural methods rather than engaging, student-centred strategies. So creating a supportive learning environment and integrating stress-management meetings can help to improve future teachers various pedagogical skills like self-confidence, creative thinking and self-reliance in teaching mathematical perceptions.

Collaborative learning enables prospective teachers to exchange ideas, observe varied teaching methods, and refine their instructional practices. However, limited use of team work teaching opportunities in many courses decreases these potential benefits. Working together enhance cooperative skill development, critical thinking and communication skill among future educators. Student enthusiasm and mind-set play a vibrant role in making teaching skills instructional and training strategies. Prospective teachers need to recognise how learner opinions and self-reliance levels can impact commitment and achievement in mathematics skills.

Theoretical coursework often controls training programs of pedagogical skills, leaving restricted opportunities for classroom practice based learning. This inequality limits learner educators' ability to convert theory into operative and effective teaching techniques.

The present assessment and evaluation procedure can attention too heavily on written exams rather assessing pedagogy and teaching capability, competence and innovative and classroom achievement. As an outcome, learner pedagogical development remain under evaluated.

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According to this finding the existing mathematics curriculum cannot suffiently equip the learner and pupil for the requirement of today's eras, of technology and digital driven classroom? Contemporary challenges like technological and digital literacy, inclusive education and competency based teaching need for progressing and growing system and structure.

With respect to the finding, insuffient and shortage of practice teaching and experience especially in mathematics subjects prevents prospective educator from understandings the basics skills of maths, lesson planning, developing classroom management and student's engagement skills during maths class.

Recomentions after the findings and conclusions of the study

Recommendation

Educator training programs require to place greater emphasis on practical learning , learning by doing (John Dewey) and align with contemporary classroom needs by integrating regular teaching demonstrations, peer teaching, and micro-teaching activities. Future educators should be given opportunities to apply mathematical theories through classroom workouts and real-life examples to support their theoretical understanding. National curriculum planners must design competency-based syllabi that emphasis on deep learning and the real-world application of mathematics, while assessments should measure reasoning and theoretical clarity rather than simple recall. Physical activity institutions should integrate model-based pedagogy and offer workshops on differentiated instruction, problem-solving tactics, and activity-based learning so that educators may better discourse various learner needs.

The conference component also requires firming up by increasing both its duration and variety, ensuring that student teachers gain sustained experience in actual classroom settings with proper supervision. Long-lasting partnerships between universities and schools are crucial to support this engagement. In addition, teacher education programs should include elements on technology integration, supported by regular digital literacy workshops that build teachers' abilities to use ICT tools effectively.

To support deeper learning, curriculums should incorporate assessment training

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that emphasizes formative evaluation, diagnostic practises, and performance-based tasks. Teacher educators must also promote student-centred approaches like inquiry-based learning and supportive problem-solving to replace virtuously lecture-driven teaching. Providing instructional materials that use visual, symbolic, and practical representations will help make abstract mathematical concepts more accessible. Finally, structured feedback systems such as post-observation conferences and peer assessments should be used to guide prospective teachers in improving their instructional and pedagogical skills. Continuous collaboration among universities, schools, and policymakers is needed to ensure that teacher education curricula reflect contemporary classroom demands, including inclusivity, technology use, and modern assessment practices.

Recommendation

Universities should revise their curricula to achieve an effective balance between theory and practice, while expanding partnerships with schools to provide internships, co-teaching opportunities, and regular classroom observation. Integrating digital pedagogy has also become essential; therefore, training programs should include modules on tools such as GeoGebra, Desmos, and interactive simulations to build technological confidence in mathematics instruction and pedagogy.

In addition to technical skills, teacher education programs must address emotional and psychological factors by offering counselling, confidence-building sessions, and reflective activities aimed at reducing mathematics anxiety. Collaborative learning structures such as peer observation, group lesson planning, and shared reflection should be promoted to enhance communication, teamwork, and constructive feedback among future teachers. Courses in educational psychology and motivation are equally important, enabling prospective teachers to recognize learning barriers and apply strategies that foster positive attitudes toward mathematics.

Stronger coordination between coursework and field experience is required, with instructors and supervising teachers jointly designing projects, case studies, and practical assignments that link theory to classroom realities. A comprehensive

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evaluation system, including teaching portfolios, classroom observations, reflective self-assessments, and performance-based tasks, will help track pedagogical growth more effectively. Finally, meaningful reform in teacher education depends on continuous collaboration among universities, schools, and policymakers, ensuring that innovation, technology integration, reflective practice, and sustained professional development remain central to teacher's mathematic pedagogical preparation.

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