

The role of mathematics teacher-interns past learning experiences in teaching geometric proofs



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Abstract Teaching and learning mathematics, particularly in geometry, has been viewed as one of the most difficult to deal with due to its complexity. In this paper, initial identified concerns linked to unwillingness and frustration among mathematics teacher-interns in geometric proofs instruction. The author explored the mathematics teacher-interns recent experiences in teaching geometric proofs and how their past experiences as students influenced their learning of geometry. Case study approach was employed to determine the distinctive patterns from past and recent experiences of ten (10) mathematics teacher-interns that belong to 22-26 age group with four males and six females. Data were acquired through in-depth interviews and examined thematically. The results showed that particular experiences were highlighted by the mathematics teacher-interns that make them hesitant when instructing geometric proof. Their recent experiences are linked to their inability to teach geometry effectively due to lack of fundamental conceptual knowledge, apprehension and lack of confidence. They also understand that their current circumstances in teaching geometric proofs are outcomes of their cognitive issue, persistent emotion, and instructional gaps from previous experiences. If not addressed, both the current and future learners as well as the mathematics educators may experience the same by these recognized significant issues. Accordingly, to help enhance and mitigate the experiences among mathematics teacher-interns, educational institutions may undertake skill enhancement program that emphasize subject matter mastery, effective teaching strategies, and team coaching initiative to enhance confidence and reduce anxiety carried out by higher education experts. Additionally, future scholars may contemplate conducting a large-scale investigation of the same topic to examine developing trends in this field due to sample size of the current study is very small that perhaps limits the generalizability of the findings.

Keywords: case study approach, education students, geometric proofs, thematic analysis

1. Introduction

Many researchers have recognized geometry as a complex subject, particularly in the context of geometric proofs. However, it is vital in mathematics education since it supports individual students in improving their ability to think critically and rationally, which are required for the comprehension of more advanced mathematical topics (Öçal & Güler, 2010). Notably, geometric proofs are very intricate for some students, and because of this individual state, significant issues, such as reluctance and anxiety toward learning this aspect of mathematics, exist (Buagayan et al., 2024; Jones, 2002). Indeed, this condition has a long-term impact on students' learning capacities, ultimately impeding their ability to excel in mathematics (Baştürk, 2010; Ni'mah et al., 2020; Zhang, 2022). Moreover, other studies (Mamiala et al., 2021; Silmi Juman et al., 2022) have suggested that the underlying cause of this trend is teachers' inadequate skills and anxiousness in instructing them in this area of mathematics.

For many years, several researchers have well documented this issue in mathematics education. Previous studies have demonstrated the negative consequences of teachers' anxiety in the field of mathematics instruction for students' academic success (Atoyebi & Atoyebi, 2022; Wahyuni et al., 2024; Maloney et al., 2013; Murat, 2016; Núñez-Peña et al., 2013). In fact, a specific study (Novak & Tassell, 2017) has provided evidence that when teachers lack confidence and fear when teaching mathematics, undesirable outcomes are expected in students' overall learning of the subject. Similarly, the apprehension experienced by the teacher can lead the student to develop unfavorable perceptions of mathematics, hindering their performance and proficiency in the subject (Musa & Maat, 2021; Ramirez et al., 2018). Moreover, existing studies (Gerez, 2021; Simkhada et al., 2025) have further indicated that some prospective teachers and even seasoned teachers feel anxious when faced with challenging and complex mathematical problems while they are teaching, which affects students' learning. This condition in mathematics education is not an isolated issue but rather a widespread one that has an impact on teacher efficacy and student performance worldwide.

There are related existing studies in other contexts and neighboring countries that have investigated preservice mathematics teachers' issues in terms of their inability to teach mathematics, poor knowledge and understanding of the subject matter, and other related issues in teaching and learning mathematics. These studies have revealed an interesting



pattern regarding instructional practices and learning outcomes, which primarily stems from a deficiency in knowledge that impedes the successful implementation of mathematics instruction, resulting in subsequent issues in the field of mathematics (Ofiaz et al., 2016; Lee, 2015; Övez & Özdemir, 2024; Lo, 2021; Edo et al., 2024). In fact, studies on the attitudes of preservice teachers toward mathematics, particularly geometry, have revealed a significant problem, as they struggle and feel inadequate with respect to the subject, despite their interest in it (Yorulmaz & Çilingir, 2021). Similarly, Larbi (2021) noted that mathematics teacher interns often experience problems in teaching geometry, particularly in structuring valid mathematical arguments and understanding geometric proofs. In addition, Doruk and Kaplan (2016) reported that future mathematics teachers are struggling with mathematical proof procedures and evaluating proof correctness.

Furthermore, few studies (Dejoras & Vistro-Yu, 2022; Manero & Arnal-Bailera, 2021) have provided information about similar situations of some mathematics preservice teachers in the Philippine setting. They exhibited a lack of mastery of geometry, particularly geometric proofs, indicating potential challenges in teaching proof effectively. To a greater extent, other reports have also indicated that even experienced teachers face difficulties in creating engaging learning experiences that improve students' proficiency in geometric proofs because traditional teaching methods focus more on verification than on exploration and explanation (Armah & Kissi, 2019; Güler, 2016; Mbatha & Bansilal, 2023). Evidently, teaching geometrical proofs is challenging and somewhat problematic, especially considering that mathematics preservice teachers are still developing pedagogical skills and confidence in the classroom.

Relatedly, in the context of the study, mathematics teachers encountered various obstacles and pressures during their practice teaching. One significant concern that has been initially verified was their anxiety in teaching proving geometric proofs due to insufficient foundation, which in turn contributes to their tendency to hesitate when they are asked to teach topics related to geometric proofs. In fact, when the author asked about this issue with three mathematics teacher interns, they affirmed their lack of understanding and confidence in this area of mathematics, specifically in connecting definitions, axioms, and theorems to construct proofs. They also expressed their frustration in handling these topics because they feared that they would not be able to provide the necessary knowledge to their students, which could negatively affect the students' performance of the subject as what they conveyed. These experiences encountered by mathematics teacher interns are expected to result from their past learning experiences as students in that subject. Consequently, this concern must be considered because of the clear potential that further hampers teacher interns' effectiveness in the classroom and the prospect of worsening the existing adverse influence of this issue from both present and future student learning outcomes.

Given this argument and substantial proof of the presence of the problem as discussed, this would warrant further study, as it can be realized on the basis of the existing studies cited here; however, it is still unexplored because of the inadequate extent of research that has investigated the combination of mathematics teacher-interns' past learning experiences as students and their current situation as teaching-interns while teaching geometric proofs, especially in the Philippine context. A similar study may exist, but it is most likely not the same in the current study. Thus, the author argues that establishing this specific area of concern could contribute to the body of knowledge, particularly in mathematics education. It could also help researchers gain a deeper understanding with respect to this matter to offer specific preventive measures and support strategies to alleviate mathematics teacher-interns' conditions in teaching geometric proofs and enhance their professional development. Additionally, the current study aimed to explore mathematics teacher interns' recent experiences in teaching geometric proofs and how their past experiences as students influenced their learning of geometry.

2. Methods

2.1. Research design

A qualitative approach study, particularly a case study method, was employed with the main objective of giving participants the ability to articulate themselves and express their experiences through in-depth interviews. The author's objective was to offer an in-depth understanding of the current situation in relation to their past learning experiences as students while instructing geometrical proofs as mathematics teacher interns. An analysis of their past and recent experiences may reveal trends in their ability to teach geometric proofs. Moreover, this research could also uncover unique analytical ideas that strengthen people's awareness of this field and yield important discoveries that could lead to different approaches in this situation.

2.2. Sampling

The research participants consisted of ten (10) mathematics teacher interns belonging to the 22–26 age group, with four males and six females at State Universities, Eastern Visayas, Philippines. The ten participants are sufficient to capture the essential aspects of the mathematics teacher-interns program. This assertion is corroborated by Yin (2018), who indicated that in a qualitative study, particularly when a case study method is utilized, a modest sample size of 5-10 participants is adequate to provide significant qualitative evidence. Moreover, the author utilized purposive sampling to select the participants with the following criteria. The first criterion was that the teacher intern is a mathematics major who graduated from 2024-2025, and the second criterion was that the teacher interns experienced challenges and anxiety in teaching geometric proofs.

2.3. Data collection procedure

Approval was obtained from the dean of the student teaching department and the higher key official of the College of Education prior to data collection. After providing permission, the participants were notified and were given consent forms. The participants were informed in advance that the interview would take place and would be recorded for transcription purposes. Participation was entirely voluntary and conducted without any form of coercion. The author emphasized to the participants that they had the option of declining to participate in the study. The information provided by the participants was solely accessed by the researcher. Transparency and trust were established with the participants during the interviews. Additionally, they were urged to elaborate on the information they had disclosed during the course of the conversation.

Semi-structured questions were used by the researcher that matched the study's goal. The guide questionnaire was divided into three sections: general questions about the participants; the second section identified the recent experiences of the mathematics teacher-interns in teaching geometric proofs; and the third section determined how their past experiences as students affect their learning in geometry. The research experts validated the interview guide, and a pilot interview was conducted to resolve any concerns prior to data collection to ensure reliability and accuracy. As previously stated, the data were collected through a recorded in-depth interview, which was followed by verbatim transcription; immediately after this process, the data were transcribed via email, and the remaining data were handed personally to the participants. This action helped the author validate and verify the accuracy of the data and ensure that the information obtained was reliable and reduced the risk of biases and inaccuracies.

To maintain the secrecy of the information that was gathered, the researcher assigned unique codes to each participant and kept a record of all of their personal information in a file. As a general principle, the audio recordings and the data transcribed were stored securely on a hard drive that had a duration of between three and five years. This information would be kept for the purposes of legal and compliance objectives, as well as to ease the resolution of disputes and serve as a historical record for future reference, training, or analysis. On the other hand, to comply with privacy requirements and safeguard sensitive information, all of the data recorded on the hard drive are removed after the aforementioned period of time.

2.4. Data analysis

Thematic analysis was employed through a systematic and rigorous approach, encompassing familiarization to grasp the depth and breadth of the content, generating initial codes by producing preliminary descriptions that encapsulate key concepts, developing themes by scrutinizing the coded data for significant overarching patterns that convey essential insights, reviewing themes to refine them, ensuring that they narrate a compelling story about the data, defining themes by elucidating the essence of each, and ultimately composing the report by integrating the analytical narrative with data extracts. Moreover, to confirm the credibility of the thematic analysis, after the data were extracted, the author asked two research experts to review the coding themes and framework twice to ensure consistency and correctness and reduce potential biases. Their knowledge and valuable insights significantly enhanced the quality of the data analysis.

3. Results

Four themes were acquired from the two objectives, specifically mathematics teacher interns' recent experience responses with regard to their ability to teach geometrical proofs and how their past experiences as students influence their learning in geometry. Themes include conceptual difficulties, anxiety and a lack of confidence in teaching geometric proofs, cognitive struggles in geometry and persistent emotional impact, and instructional gaps in their past learning experiences.

3.1. Conceptual difficulties in teaching geometric proofs

Mathematics teacher interns reported facing considerable difficulties in their teaching of geometric proofs. Many participants had issues comprehending and explaining proofs, resulting in feelings of confusion. One participant noted, "I experienced uncertainty while preparing my lesson in geometry due to the many proofs I needed to solve (P2)". Another participant expressed their struggles in dealing with proof-based problems during practice teaching: "During my practice teaching, there was one time that I tried my best to keep up with the class lessons in geometry, but I was truly struggling with the concept of proving topic, and it is confusing. It was embarrassing because I could hardly explain and provide proof (P3)". Additionally, the participants stressed their difficulty in grasping theorems, postulates, and their applications. Despite seeking multiple online resources, understanding the idea and teach of the proving aspect of geometry has remained challenging. This frustration was reflected in one participant's statement, "The specific topic that is complex for me is geometry, especially proving, because it is difficult to understand even though I am watching many references from the internet (P1)". Another participant noted, "I had a hard time at first in understanding the relationship between the figures and axioms and memorizing the postulates and theorems was also a struggle (P3)". Additionally, the participants conveyed concerns about handling class discussions involving geometric proofs. One participant cited a situation in which a student's unanticipated question left them feeling unprepared: "During class discussions, students sometimes ask questions about geometric proofs that I struggle to explain well, and I am sure that they do not fully understand my explanation (P7)". In some cases, the difficulty of teaching

proofs can be ascribed to insufficient knowledge and competence to aid students in understanding what is being taught. One participant expressed, "It is so hard to teach the students when I, myself, is not knowledgeable about the mathematical theories that support the idea of a geometrical proof (P6)".

3.2. Anxiety and lack of confidence in teaching geometric proofs

Mathematics teacher interns also experienced fear of failure and self-doubt when teaching geometric proofs. They expressed a deep concern about making mistakes, which they believed could weaken their credibility as future mathematics teachers. In fact, one participant stated, "I might be wrong in teaching the concept of geometry, which is embarrassing for me, especially because I am a math major student (P5)". Similarly, one participant admitted, "That triggers my worry as well, because I feel that I may not be correct, or I might teach the wrong way (P6)". Beyond this situation, some teacher interns feared judgments from their peers and students, leading to reluctance in teaching geometric proofs. One participant asserted, "Yes, when I was preparing my lesson, I struggled with how to learn and teach geometric proofs. I was afraid of being laughed at or receiving negative comments from others, so I avoided it to prevent embarrassment (P4)". The apprehension of judgment hindered their willingness to engage with geometric proofs during practice teaching. Additionally, many participants recognized that proficiency in the subject area is essential prior to confidently instructing geometric proofs. One participant labeled their insecurity in contributing to discussions, affirming, "I felt insecure about participating in a specific math class, and even now, I feel uneasy about presentations because I lack solid foundational knowledge, especially in geometry (P8)". Another participant echoed this sentiment, saying, "Yes, teaching geometric proofs is difficult, and I feel uncomfortable because I struggle to explain our lesson to my students (P9)". Moreover, their lack of confidence led some teacher interns to avoid teaching geometric proofs. In fact, one participant admitted, "Yes, I avoid geometrical proofs because, in geometry, I need to be more knowledgeable about the topic, and it requires critical thinking skills (P1)". Another participant added, "Sometimes, there are topics I avoid teaching because I have not yet mastered the concept in geometry, and I did not learn it well during my studies, especially in geometrical proofs (P2)".

3.3. Cognitive struggles in geometry and persistent emotional impact

Mathematics teacher interns demonstrated their struggles in dealing with geometrical proofs from their past learning experiences. During interviews, they provide information related to their inability to address abstract concepts in geometry and poor logical reasoning, and their ability to solve geometric proofs is difficult. In fact, one of the participants asserted, "the biggest challenges I faced in learning mathematics include geometry, solving word problems in algebra, and trigonometry (P10)". Similar experiences from the participants added, "One of the challenges I encountered in learning mathematics was understanding different concepts, theorems, proving, and memorizing formulas (P3)". Moreover, several mathematics teacher interns described their difficulties in grasping thoughts from geometric proofs to practical applications. This statement reflected, "In regard to abstract ideas, I struggled so hard to visualize or relate them to real-world experiences (P2)". Another participant stated, "I experienced intense apprehension and discouragement when I first encountered geometry. It was a new concept in math that I could not immediately understand, especially in proving (P3)". In addition, other participants admitted that their insufficient understanding reinforced their struggle in geometric proofs. One participant asserted, "Whenever I answered a problem, my solution was incorrect, which means that I did not understand the lesson (P8)". Moreover, the participants acknowledged that they encountered significant challenges in formulating and understanding logical arguments within geometric proofs. This struggle was reflected in one participant's statement: "It is very hard for me since I have very little knowledge of proving (P5)".

Furthermore, the mathematics teacher interns experienced emotional difficulties from the past that left a lasting effect in learning mathematics, particularly in geometry, as they described during the interviews, which was related to self-doubt, frustration, and math-related anxiety during their studies. In fact, one participant reported, "I felt anxious because of the complexity of certain concepts, which sometimes led me to question myself and the path that I am on (P5)". The current anxiety of the participants is also caused by their fear of failing the subject, and even if they seek assistance from others, their situation is still the same as what they have reflected in the interview saying, "Yes, I did feel apprehensive back then because I was afraid it might cause me to fail the subject. Even though I asked for help, it was still not enough for me to learn it (P4)". Additionally, other participants reported that their emotional frustration was exhausted and that they felt weak in learning the concept in geometry. They illustrated their experience by asserting, "I have experienced intense frustration and despair, pleading for divine intervention to pass a difficult math course. I felt completely lost and unable to comprehend the topics (P7)".

3.4. Instructional gaps in their past learning experiences

The mathematics teachers and interns pointed out instructional gaps in their past mathematics education, which contributed to their current difficulties in teaching geometry. Some interns mentioned that certain topics, including geometric proofs, were not covered in depth or were skipped entirely by their teachers. One participant stated, "This happened maybe because my teacher usually skipped some topics, especially in geometrical proving (P3)". Another participant shared, "I have

also experienced that feeling where even after asking questions, I could still not fully understand the explanation of my teacher. One example of this is when we were studying geometrical proofs; no matter what I did, I truly struggled. Even though I asked the teacher, it felt like she kept giving me the same answer that was still not clear to me (P5)". Moreover, some participants revealed that inadequate teaching approaches affected their ability to grasp mathematical concepts. One participant shared, "My experiences led me to avoid participating in class discussions when I was unprepared (P9)". Others expressed that their learning struggles were intensified by a lack of proper instructional strategies, particularly in geometry and proof-based learning. One participant reflected, "They were my major subjects, trigonometry, Calculus 1-2-3, and geometry. All of those were difficult for me because maybe the strategy of my teacher before does not fit our level of understanding (P6)".

4. Discussion

On the basis of the results, the author was able to establish the recent experiences of mathematics teacher interns while they were teaching geometric proofs and the influence of their past experiences as students in learning geometry. The findings revealed concerns about conceptual difficulties among mathematics teacher interns in teaching geometric proofs. They experienced difficulties articulating concepts in geometry during their practice teaching, and they also encountered unfavorable experiences, especially when they responded to students' unexpected inquiries regarding geometric proof lessons. An existing study (Andamon & Tan, 2018) has documented a similar concern: when teachers are not conceptually skilled in mathematics, they usually feel uncertain, which inhibits their ability to effectively elaborate concepts to students, particularly when students are confused and need clarification. Cabuquin and Abocejo (2024) reinforced this idea and highlighted that inadequate conceptual knowledge from mathematics teachers has diverse effects on students' comprehension and problem-solving skills. Tekin-Sitrava (2017) noted that the absence of conceptual understanding influences teachers' effectiveness in teaching and poses difficulties for students. The study further revealed that this concern can impede students' capacity to comprehend intricate mathematical concepts, ultimately affecting their overall educational outcomes.

In addition, the results further highlighted the lack of a solid foundation and strategies for teaching geometric proofs that could be applied effectively. In fact, Toor (2021) emphasized that to effectively present mathematical subject matter, teachers must possess both knowledge and mastery of the subject, as this is essential for fostering a classroom atmosphere that supports learning and ensures students' overall academic growth. Similarly, Wriston (2015) noted that without a necessary foundation in mathematics, learners are likely to struggle to comprehend higher-level mathematical ideas or draw essential connections within the topic. Hence, mathematics teacher interns' recent experiences clearly suggest serious potential consequences. When these future education teachers do not possess sufficient knowledge and are less likely to teach well, their students are more likely to continue struggling in learning mathematics, particularly in geometric proofs. In fact, Haron et al. (2021) explained that teachers who lack instructional skills in a subject tend to rely on ineffective teaching strategies, which can hinder student engagement and limit their interest in learning the subject. Moreover, Lee et al. (2018) highlighted that teachers who acquire advanced knowledge of mathematics demonstrate greater effectiveness in teaching the subject. Their study also indicated that those educators who dominate strong expertise are able to articulate concepts more effectively, thereby assisting students in developing fundamental mathematical skills. This means that if mathematics teachers and interns struggle with geometry, they may also find it difficult to teach students effectively. Therefore, the findings of the present study could perhaps exacerbate students' learning from their mathematics teacher interns and eventually reduce overall student interest in mathematics, particularly in geometric proofs. Additionally, their experiences further suggest that it could make them more ill equipped to create an engaging learning environment. Moreover, it could restrict students' exposure to essential mathematical reasoning abilities.

The findings also revealed that mathematics teacher interns not only feared committing errors in front of students but also self-doubt in their ability to teach the subject well. The mathematics teacher interns consider that their experiences are caused by the alleged strong absence of fundamental understanding as well as the fear of peer and student criticism. Syuhada and Retnawati (2020) support this finding, as they listed few causes of teacher anxiousness in teaching mathematics, such as a lack of necessary knowledge, strategies, and handling of students' behaviors. Their study also highlighted that the apprehension experienced by teachers not only worsens the learning process but also affects students' performance in the subject. This idea also strengthened the findings of Sağlam et al. (2011), who reported that teachers' inability to deal with some areas in mathematics is due to their anxiety and weak confidence. Moreover, few existing studies (Mercado et al., 2025; Shimizu, 2022) have emphasized that when mathematics teachers are well equipped and knowledgeable, they are more confident and tend to perform better in dealing with geometric proofs.

Interestingly, it is also essential to consider other aspects influencing teacher confidence in teaching mathematics, including the link between teacher self-efficacy and curriculum understanding. Existing studies (Davies, 2000; Yu & Mocan, 2018) have shown that when teachers have a deep understanding of the curriculum and the flexibility to integrate their instructional strengths, they are more likely to feel confident in their teaching. They further noted that this confidence, in turn, directly enhances the quality of instruction and positively impacts student outcomes. However, Umugiraneza et al. (2016) emphasized that when teachers lack such confidence, they may struggle to implement effective teaching strategies and instead resort to rigid or overly simplified instructional methods. This finding also supported the assertion of the current study on

mathematics teacher interns' circumstances with respect to a lack of confidence and unpleasant experiences, which may also result in an overly approach to teaching geometrical proofs that could limit students' ability to explore complex mathematical ideas, diminishing their capacity to become interested in the subject. Norton (2017) emphasized that when mathematics teachers lack confidence, they may exhibit a variety of behaviors, such as avoiding teaching certain aspects of mathematics, relying on a lack of variation in pedagogy, and relying on either a tightly scripted or very unscripted pedagogy with minimal teacher input. The research also highlighted that both rigidly structured and entirely unstructured classroom communication were deemed inadequate teaching practices. Additionally, Aydın (2021) noted that when teachers are hesitant to utilize different strategies that are more efficient for teaching, they may rely instead on prescriptive instructions and inflexible techniques rather than promoting deep conceptual comprehension.

The research further revealed a remarkable concern at the intellectual level and continued emotional influence from their past experiences studying geometry proofs and abstracts. The mathematics teacher interns recognized that this problem came from the accumulation of unfavorable experiences, anxiety of mathematics learning, demotivation, mental tension, inadequate support, external pressure, and feelings of failure. Previous studies (Mangarin & Caballes, 2024; Timonera et al., 2023) have documented facts related to these concerns from students in learning mathematics. They explained that when students encounter negative situations, such as cognitive and emotional issues, their involvement in mathematics activities usually hinders their ability to work effectively. Other studies (Foley et al., 2017; Namkung et al., 2019) have shown a similar situation in which students' experiences limit their working memory capacity, reduce their response levels, and impair their information processing, which ultimately affects their mathematical ability and contributes to poor mathematics performance. Waswa and Al-kassab (2023) noted that students have difficulty learning mathematics because of inadequate cognitive ability, solving processes, and external factors such as a lack of foundation and teaching factors.

Furthermore, Arslan and Yıldız (2010) noted that even though mathematical proofs are an important part of education, students and prospective math teachers across different levels continue to face difficulties in geometry, affecting both their academic performance and teaching readiness. This idea supported the findings of the current study, as they acknowledge their difficulty and inability to relate abstract mathematical concepts such as applying theorems, formulas, logical reasoning and practical uses in geometry. Sevgi and Filiz (2023) reinforced this claim that graduating mathematics educators often make incorrect decisions about theorems and proofs, use proving words inaccurately, and are unable to distinguish between terms that are often used in proving. The current situation of mathematics teachers during their practice teaching is seemingly a result of their past experiences, which inhibits their exposure and performance in teaching geometric proofs. Banson et al. (2023) support this argument, as they clearly described how one's experiences, both past and present, are shaped by the learner's perspective in mathematics, particularly in geometry, where they are influenced by a variety of factors, including the teacher, the classroom environment, and past experiences with instructional approaches. Thus, this identified a cognitive and emotional burden from mathematics teacher interns, suggesting that it may not only hinder their students' learning and future career opportunities but also present another significant concern that could contribute to broader disengagement in learning and teaching geometric proofs.

Remarkably, the participants' past learning experiences revealed a substantial instructional gap in learning geometry. The teachers in the past did not effectively convey essential knowledge in teaching geometry, particularly in geometric proofs, which is why, despite seeking help from others, they still struggled to grasp explanations from their previous teachers. The situation was perceived as a result of teachers neglecting certain topics and failing to deliver effective explanations, which reflects a lack of preparation, a deficit in knowledge regarding the subject matter, and concerns about teaching methods on the basis of their prior experiences. Some researchers (Saro et al., 2022; Lee Shing et al., 2015) have reported that without the necessary knowledge and preparation, mathematics educators face difficulties in identifying the most suitable teaching and instructional strategies to provide the necessary knowledge for students. Tsao (2017) also provided evidence that students' learning was significantly influenced by their teachers' way of teaching. Additionally, this finding also supported the argument of Fabiyi (2017), who listed several factors that have been linked to learners' struggles with geometry, including inadequate geometric reasoning abilities of the teacher, poor geometric language comprehension, teaching strategies, and a lack of teaching resources.

Interestingly, a lack of resources is also a common concern in many schools in the context of study, and one of the reasons for failure to obtain support from their respective workplace is the lack of funding. In fact, Tingzon and Buyok (2022) underscored that inadequate school funding results in a scarcity of instructional resources, which impedes mathematics teachers from meeting the fundamental requirements of the students they serve in the classroom. Moreover, Maffea (2020) contends that, despite the allocation of funding to each school, the provision of adequate resources is not a top priority. Given this situation, it is evident that the difficulties from recent experiences by mathematics teachers while teaching geometric proofs are reflected in their own past learning experiences. This suggests that when teachers possess these concerns, they may restrict students' enrichment in geometry, eventually affecting their learning outcomes. Mercado and Morante (2024) support this argument, highlighting that when teachers lack knowledge and expertise in a certain topic, they may give students a lesson that is too superficial, which makes it difficult for them to absorb and understand new knowledge that ultimately leads to problems later on with the students' progress. Consequently, this may also lead to the same pattern of their current situation,

such as a lack of foundation, issues related to teaching, long-term problems, and persistent difficulties in comprehending mathematical ideas.

5. Final Considerations

The established issues from the current experiences when teaching geometric proofs are undoubtedly an outcome of previous learning experiences as a student among mathematics teacher interns, as demonstrated by the aforementioned discussion. Their recent experiences, as explained above, are associated with a lack of foundational conceptual knowledge, anxiety, and weak confidence, which hinder their effectiveness in geometry instruction. Moreover, the confirmed concerns from past experiences, such as cognitive, emotional, and instructional gaps, that shaped their current situation are also critical issues that could negatively impact their current students' success and those of future mathematics educators in this field. If this concern is left unaddressed, then it may contribute to a long-term and repeated problem in the field of mathematics education. Thus, the researcher strongly recommends that state universities and colleges that offer mathematics education programs at the undergraduate level may consider implementing long-term and continuous seminars and training programs. This program is a weekly basis skill enhancement that lasts for two to three years, and it should focus on content mastery and effective strategies for teaching geometric proofs led by experts to train both high school mathematics teachers and graduating mathematics teachers to further enhance their foundational knowledge, leading to their professional growth. The institution may also consider implementing team coaching initiatives that enhance confidence and reduce mathematics anxiety for future mathematics educators led by mathematics experts from higher education sectors every week for one to two years. In addition, educational institutions and policymakers may consider reviewing the curriculum alignment to ensure that it is reflective of the evolving needs of both teachers and students. This could absorb the need to integrate practical teaching experiences with theoretical knowledge, encouraging a stronger connection between academic training and real-world classroom dynamics. These cited alternatives could help improve and alleviate the abovementioned experiences of mathematics teacher interns. Moreover, future researchers may consider investigating the same study on a wide scale to explore emerging trends in this area of study, as the limited sample size of the current research may restrict the potential for generalization of the findings and may not be sufficiently broad to be applicable to a wider population of mathematics teacher interns. Consequently, it might not accurately represent the diverse experiences and challenges encountered in different regions, educational institutions, or cultural communities.

Acknowledgment

The author expresses gratitude for the reviewers' time and effort in reviewing his research article. Their helpful critique played a key role in improving the paper's quality. The author also appreciates the participants' input and their willingness to take part in the study.

Ethical Considerations

The research protocol received approval from the head of the institution where the author gathered the data. All of the participants in the study provided informed consent. As mentioned in the previous section, unique codes were assigned to participants to maintain the secrecy of the information. Personal information and recordings were stored in a file accessible only to the researcher for confidentiality. Moreover, the disclosure of private information that may damage the integrity of the participant or the family is withheld.

Conflict of Interest

The author confirms that there are no conflicts of interest.

Funding

The study was not sponsored by any funding agency or research institution.

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