Enhancing Mathematics Teaching in Open Distance and e-Learning: Effective External Supervision Strategies

Mphahlele Ramashego Shila[*] ⓘD **, Gabriel Tshepo Mphuthi** ⓘD **and**
Mbazima Amos Ngoveni ⓘD
University of South Africa
Pretoria, South Africa

Abstract. This study explores strategies for enhancing mathematics teaching within the context of Open Distance & e-Learning (ODeL) through effective external supervision. The researchers address the critical challenge of ensuring quality teacher preparation in the ODeL context, where student teachers often face unique challenges related to geographical distance, limited resources and minimal direct interaction with external supervisors. Grounded in the principles of experiential learning theory, particularly concrete experience and reflective observation, the study seeks to answer the research question: How can external supervision strategies be effectively designed and implemented to enhance mathematics teaching in open distance and e-learning environments? A qualitative descriptive phenomenology was employed to gain in-depth insights into external supervision. Semi-structured interviews were conducted with a purposive sample of eleven (11) external supervisors, for their extensive experience in supervising student teachers in the ODeL context. Data were analysed thematically, revealing three main categories of challenges: educational, organisational, and interpersonal, encompassing issues such as academic pressure, resource limitations and interpersonal conflicts. The researchers highlight support strategies used by external supervisors, including personalised feedback sessions, mentoring programmes and reflective conferencing. These strategies aim to facilitate the professional development of student-teachers and improve their pedagogical practices in mathematics instruction. The findings underscore the importance of incorporating reflective practices into teacher training programmes, enhancing resources and training, promoting collaboration between educational institutions, and fostering a culture of continuous reflection and growth among student-teachers. This study suggests avenues for effectively enhancing mathematics teaching in ODeL environments through robust external supervision strategies that promote concrete experience and reflective observation.

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[*] Corresponding author: *Mphahlele Ramashego Shila, Emphahrs@unisa.ac.za*

1. Introduction

Teaching practice is used in the South African Open Distance and e-learning (ODeL) context, known as work-integrated learning in other institutions. Teaching practice aims to bridge the gap between theory and practice, where student-teachers experience teaching and learning in an actual classroom setting. Sethusha (2020) confirms that with teaching practice, student-teachers are prepared to apply theory in practice under professional guidance and supervision. The present study focuses on how external supervisors conduct teaching practice at one of the South African ODeL Universities, which produces more than 50% of the teachers in South Africa. The National Qualifications Framework Act 67 of 2008 Policy on the Minimum Requirements for Teacher Education Qualifications states that students should be placed at schools with a great teaching and learning environment which will allow proper supervision and formal assessment (Department of Higher Education and Training [DHET], 2011). In order to comply with the DHET requirements, the College of Education (CEDU) at this ODeL university established a teaching practice office. This office ensures that the student-teachers are placed at selected schools where they will do their practice teaching. This office further ensures that external mentors and supervisors fully support the students during their teaching practice (University of South Africa, 2012).

The external mentors are qualified and experienced teachers who work at the schools identified by this ODeL university and provide student-teachers with guidance during their teaching practice (Kuze & Shumba, 2011). The external supervisors should offer the initial training to the school-based mentor teachers and provide continuous support, which will allow mentoring support to student-teachers during teaching practice (Sethusha, 2020; University of South Africa, 2012). As mentioned above, this ODeL university annually produces over 50% of South Africa's teachers, with student-teachers located across the country and around the globe, reflecting the decentralised nature of ODeL. It is not possible to use only the lecturers employed within the university for the supervision of all its students due to the high numbers and the geographic spread of the students. Therefore, this ODeL university uses external supervisors alongside lecturers to ensure effective supervision. External supervisors are usually experienced or retired teachers or lecturers with a minimum of a Master's degree. The other 25 on-site (traditional learning) universities in South Africa, however, make use of their full-time lecturers to supervise all their students because they enrol fewer students.

Numerous studies such as (Atkinson, 2016; Nel et al., 2021; Sethusha, 2020; Venville et al., 2018) emphasise the pivotal role of well-prepared and supported teachers upon entering the profession. They highlight that student-teachers benefiting from quality teaching practice mentoring and supervision demonstrate remarkable improvements in classroom practices and yield outstanding results.

However, despite these insights, limited research has specifically focused on the strategies external supervisors can adopt to support mathematics student-teachers in ODeL environments. Additionally, the lack of subject-specific expertise among external supervisors poses a critical gap in understanding how effective supervision can bridge the disconnect between theoretical knowledge and practical application in mathematics teaching practice.

Moreover, more recent researchers like Msimango et al. (2020) suggest that this is not what happens all the time in practice. Msimango et al. (2020) report that the training provided by the university to the teaching practice external supervisors does not equip them with skills that will enable them to help the student-teachers develop. The implications are that students could not build comprehensive conceptual models, which are critical for teaching practice in mathematics. At this ODeL university, the teaching-practice external supervisor for mathematics does not necessarily have to be a specialist in the subject. This study aims to investigate the strategies that could be used to enhance the quality of external supervision of mathematics supervisors, bearing in mind that not all supervisors have taught mathematics before.

Thus, training can play a crucial role in overcoming the challenges posed by external supervisors' limited specialization in mathematics. Targeted professional development programs can enhance supervisors' mathematical content knowledge, providing them with a deeper understanding of essential concepts and enabling them to critically evaluate instructional practices. Additionally, training in subject-specific pedagogical approaches such as strategies for promoting conceptual understanding and problem-solving skills, will empower supervisors to offer more focused and effective support to teachers.

The general objective of this study was to investigate and propose effective strategies for enhancing the quality of external supervision for mathematics teaching practice in ODeL environments. This objective is grounded in the need to address the unique educational, organisational, and interpersonal challenges faced by external supervisors and mathematics student-teachers. It should be noted that it is imperative to contextualise the foundation upon which the exploration of strategies for enhancing external supervision within an ODeL environment will be built. The foundation of this study is the theoretical framework, which will be discussed in the next section.

2. Theoretical Framework

A theoretical framework encapsulates the perspectives of thought leaders in a given field of study on a particular research subject (Kivunja, 2018). These points of view could include ideas for how to tackle a problem and, most crucially, how the findings could be understood. Furthermore, Kivunja (2018) contends that what the gurus have to say about a particular study subject is critical in building a specialised and informed lens for examining, analysing and interpreting the data. Moreover, Tamene (2016) claims that without a theoretical framework, the study will lack a foundation and direction and cause confusion during the literature review.

To connect to the existing knowledge and generalise the various aspects of strategies for enhancing external supervision for mathematics teaching practice within an ODeL environment, the researchers used Kolb's Experiential Learning Theory. Kolb's Experiential Learning Theory (Kolb, 1984) defines experiential learning as "*the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience*".

The cycle begins with the student's experience, followed by an opportunity to reflect on that experience. Then students may conceptualise and draw conclusions about what they experienced and observed, leading to future actions in which the students experiment with different behaviours. This begins the cycle anew as students have new experiences based on their experimentation (Oxendine et al, 2010). Although this continuum is presented as a cycle, the steps may occur in any order. This learning cycle involves both concrete components (Steps 1 and 4) and conceptual components (Steps 2 and 3), which require a variety of cognitive and affective behaviours. Experiential learning theory is about the learner experiencing things for themselves and learning from them. Kolb (1984) proposed a four-stage model, the experiential learning cycle presented in Figure 1.
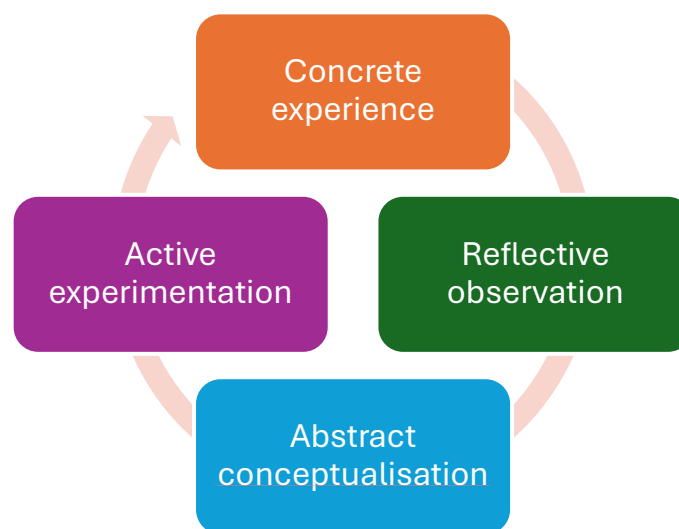

Figure 1: Experiential learning cycle

Although Mcleod (2024) asserts that effective learning only occurs when a learner can execute all four stages of the model, this study focused on concrete experience and reflective observation stages. This study acknowledges that the process of learning can begin at any stage and is continuous, i.e., there is no limit to the number of cycles which can be made in a learning situation. It is noteworthy that there are studies such as those conducted by (Anh & Duong, 2023; Loan, 2024) that emphasise the importance of experiential learning in mathematics education, highlighting its potential to enhance student engagement and comprehension. Loan (2024) further attests that experiential learning in mathematics could nurture interactive and effective learning experiences. This theory suggests

that people would continue to repeat their mistakes without reflection. The reason for using experiential learning theory is to determine the strategies teaching practice external supervisors in the experiential learning of student-teachers can employ to enhance mathematics teaching.

3. Literature Review

Supervision of student-teachers during teaching practice is a critical component of pre-service teacher education. In an ODeL environment, the challenges faced by external supervisors and mathematics student-teachers are unique. The researchers reviewed studies conducted in the past 10 years to identify and discuss the challenges faced by external supervisors and mathematics student-teachers in providing and receiving adequate supervision for mathematics teaching practice in an OdeL environment.

3.1 Challenges Faced by External Teaching Practice Supervisors

The role of external supervisors in OdeL is crucial for guiding and supporting student-teachers through their teaching practice experiences. However, navigating the challenges inherent in this environment is paramount for effective supervision. Research by Lenka and Bouroche (2023) underscores the importance of supervisors possessing prior knowledge of policies and their direct application in OdeL contexts. Manyike (2017) echoes these sentiments, emphasising additional hurdles such as financial constraints and alignment with institutional goals.

Koşar's (2023) study sheds light on external supervisors' specific challenges in online teaching practice, including communication breakdowns, motivation issues and the need for guidance. Furthermore, barriers like limited face-to-face interaction, as identified by Mujiarti et al. (2022), impede trust-building and observation opportunities critical for feedback on classroom dynamics. Moreover, Andrade-Arenas et al. (2022) emphasise the struggle with limited access to technology and resources, hindering continuous support and feedback during remote teaching practice. Additionally, Musingafi et al.'s (2019) research at Zimbabwe Open University highlights geographical distance, varying expertise levels, resource constraints and discipline issues as significant challenges external supervisors face. For one to address these challenges, requires support strategies tailored to the unique demands of ODeL environments. However, the strategies will be relevant when one identifies challenges faced by the mathematics student-teachers in the ODeL environment.

3.2 External Teaching Practice Supervision Challenges of Mathematics Student-Teachers in the ODeL Environment

Mathematics student-teachers in ODeL settings encounter myriad unique challenges, particularly in external supervision. Jarrah (2020) conducted interviews with 14 mathematics student-teachers in the United Arab Emirates, uncovering various obstacles they face. These challenges encompass difficulties in applying theoretical knowledge to practice, a lack of access to manipulatives, struggles with student discipline and classroom management, limited

opportunities to experiment with innovative pedagogical approaches and concerns regarding the structure and timing of student teaching programmes. Furthermore, Mendes et al. (2022) used interpretive formative experiments to elucidate challenges associated with mathematical reasoning during external supervision. Similarly, Mokoena (2017), through a mixed-methods study involving 65 fourth-year student-teachers, identified issues such as inadequate supervision, delayed placement in schools and a lack of mentorship, all of which impact the effectiveness of teaching practice.

Gerez and Şengül (2022) highlight a pivotal challenge: the absence of hands-on teaching experience in mathematics. Unlike traditional face-to-face instruction, ODeL environments necessitate self-directedness and independence from student-teachers, making it challenging to access guidance and support when needed. Moreover, Zhou et al. (2023) suggest that student-teachers may struggle with adapting to the diverse e-learning platforms utilised in ODeL, potentially impeding their ability to integrate technology effectively into their teaching methods, thereby diminishing engagement and learning outcomes for their studies.

The challenges mathematics student-teachers face in the ODeL environments underscore the complexities of external supervision and teaching practice in non-traditional settings. From difficulties in applying theoretical knowledge to practical contexts to concerns about supervision adequacy and technology integration, these challenges present multifaceted challenges that require careful consideration and innovative strategies.

3.3 Innovative Strategies to Enhance the Quality of External Supervision for Mathematics Teaching Practice in an ODeL Environment

Mathematics is fundamental across various disciplines, emphasising the significance of effective teaching practices. In ODeL environments, external supervision is critical in shaping the quality of mathematics teaching practice. Innovative strategies such as video recordings and analysis, online teaching observation tools and peer observation offer promising avenues for enhancing external supervision in mathematics teaching within ODeL environments.

3.4 Use of Video Recordings and Analysis

The use of video recordings and analysis is viewed by Er et al. (2022) as an innovative strategy that can be employed to enhance the quality of external supervision for mathematics teaching practice. This strategy involves recording and analysing the teaching practice session later with the student teacher. This approach enables the student teacher to see what they did right and wrong and understand the feedback given by the external supervisor. According to Meline et al. (2023), video recordings and analysis can help to improve the teacher's pedagogical skills, enhance their reflective practice and increase their self-efficacy in teaching. Video recordings and analysis can also help the supervisor provide more detailed and specific feedback, which can lead to improved teaching practice.

The implementation of video recordings and analysis in Open and Distance e-Learning (ODeL) environments faces significant challenges, including limited access to recording devices, unreliable internet connectivity, and the labor-intensive nature of video editing. These barriers can hinder effective teaching practices and data collection efforts, as highlighted during the COVID-19 pandemic when researchers had to adapt to remote protocols for video data collection (McLean et al., 2024). To address these constraints, targeted investments in affordable, portable recording technologies are essential, alongside institutional support for training educators in their effective use (Shayeb & Daher, 2024). Additionally, adopting streamlined platforms for secure video sharing can alleviate concerns regarding data privacy and accessibility, thereby enhancing the overall educational experience in virtual learning environments (Ahmad et al., 2024; Snelson et al., 2021).

3.5 Use of Online Teaching Observation Tools
Integrating online teaching observation tools represents an innovative approach to enriching the quality of external supervision within mathematics teaching in an OdeL environment. As delineated by Agnew et al. (2023), these tools, characterised as software applications, facilitate supervisors in scrutinising and assessing student-teachers' online instructional methodologies, thereby bolstering teacher education irrespective of geographical boundaries. This study highlights that adopting online teaching observation tools enables external supervisors to provide real-time feedback, thereby fostering immediate enhancements in teaching practices. Furthermore, Kanat Mutluoğlu and Balaman, (2023) assert that such tools enhance the objectivity of the observation process, mitigate the supervisor's workload and establish a platform for collaborative supervision. By leveraging these tools, the quality of feedback delivered to student-teachers is elevated, subsequently enhancing teaching practices.

Integrating online teaching observation tools in Open and Distance e-Learning (ODeL) contexts presents several challenges, primarily stemming from technological constraints such as limited bandwidth and insufficient familiarity with digital tools among supervisors. These issues can significantly impede the effectiveness of digital supervision, as highlighted by Astuti et al. (2024), who emphasize the necessity of adequate training and support for both supervisors and student-teachers to enhance the implementation of digital academic supervision. Additionally, the digital divide exacerbated during the COVID-19 pandemic has further complicated e-learning efforts, necessitating innovative solutions like e-learning workshops and blended learning methods to improve teacher competencies and course quality (Singh & Grobbelaar, 2022). The effectiveness of virtual observations, as explored by Mynott et al., underscores the importance of skilled observers and the value of visual information, suggesting that tailored training can mitigate some of these challenges (Mynott et al., 2021). Ultimately, adopting cost-effective, user-friendly observation tools that function well in low-bandwidth conditions is crucial for enhancing usability and scalability in diverse educational settings (Seoudi & Carter, 2022).

3.6 Use of Peer Observation

Peer observation emerges as an innovative strategy wherein student-teachers engage in reciprocal observation of each other's teaching practices, followed by constructive feedback exchange. Ridge and Lavigne (2020) advocate for this approach, highlighting its potential to enrich instructional practices. They assert its efficacy in bolstering external supervision quality within mathematics teaching in an ODeL environment. Building upon this, Whittaker et al. (2023) emphasise the reciprocal feedback exchange in peer observation, emphasising its role in fostering learning, reflection and confidence among both observers and observed individuals, thus enhancing teaching practices. Moreover, as Katal et al. (2022) posit, peer observation cultivates a collaborative culture and facilitates continuous improvement, fostering trust among teachers and facilitating professional development. This process also serves as a platform for student-teachers to glean insights from each other's strengths and weaknesses, thereby contributing to enhanced teaching practices. Bell and Mladenovic (2015) further support peer observation, noting its potential to enhance pedagogical skills, increase self-efficacy in teaching, elevate the quality of feedback provided by supervisors, and foster professional growth. Against this background, this paper recommends that these strategies be integrated into the external supervision process to elevate the standard of mathematics teaching within the ODeL environment.

4. Methodology

This paper used descriptive phenomenology as recommended by Rangarajan et al. (2022) to provide a detailed, systematic description of external supervisors' lived experiences without imposing preconceived theories or interpretations. According to Sinfield et al. (2023), descriptive phenomenology is situated in the interpretivist paradigm to elicit subjective responses and employs an evolving analytic process, so it is well suited to qualitative methodology. The researchers sought to uncover the essential structures and meanings inherent in external supervisors' experiences through a rigorous data collection and analysis process. The researchers obtained Ethical clearance from the university where the researchers are employed, and a clearance certificate, reference number is 2021/11/10/90194969/41/AM.

After obtaining ethical clearance from the University, the researchers contacted all contracted external supervisors using an e-mail inviting them to the information-sharing session about this research project. Only 31 prospective participants responded and attended the session. After the information-sharing session, the prospective participants were given information sheets with consent forms to sign if they agreed to participate. Only 11 participants sent back the signed consent form. The researchers conducted online in-depth semi-structured interviews with the 11 external supervisors on MS Teams and systematically analysed their narratives to identify common themes, patterns and essences. The reason for online semi-structured interviews was the distance because the external supervisors are located throughout the country. This strategy ensured that the distance between the supervisors and the researchers was breached.

4.1 Participants

The 11 participants who agreed to participate, are all retired teachers who have Masters Degrees as it is a requirement for employing external supervision at the ODeL institution under this study. The biographical data of the external supervisors who participated are presented in Table 1 and Figures 2 to 4.

Table 1: Participants' geographic information

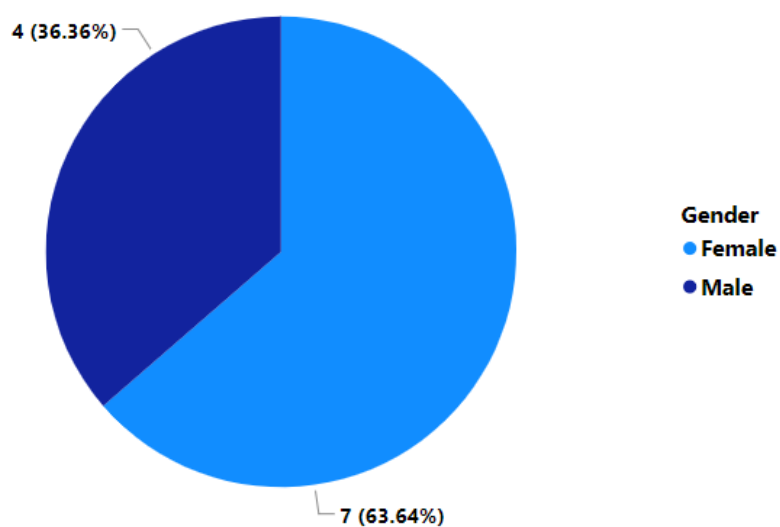| Number of participants	Location in South Africa
2	Eastern Cape
2	Gauteng
2	KwaZulu-Natal
2	Limpopo
1	Northern Cape
1	North West
1	Mpumalanga
11	**7 provinces**

Figure 2: Gender

As shown in Figure 2, four male and seven female external supervisors participated in this study.
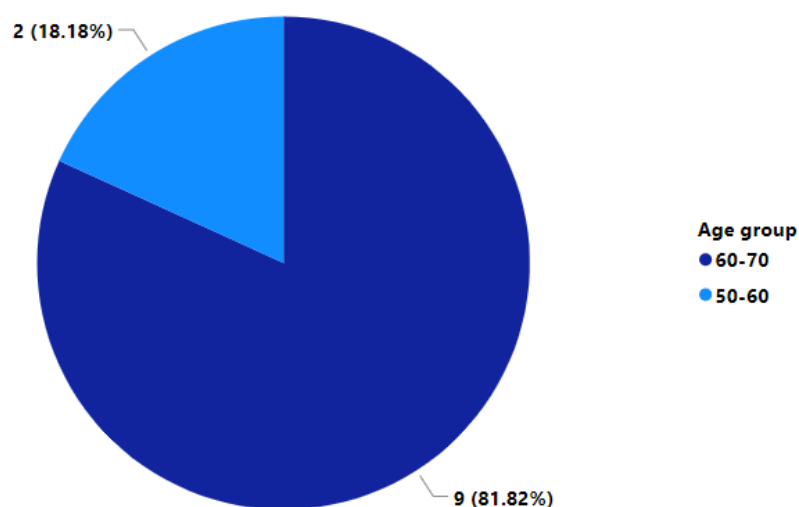
Figure 3: Age group

The university contracts external supervisors who are retired teachers whose ages range from 50 to 70 years. As seen in Figure 3, the majority of the external supervisors who participated in this study were between the ages of 60 and 70.
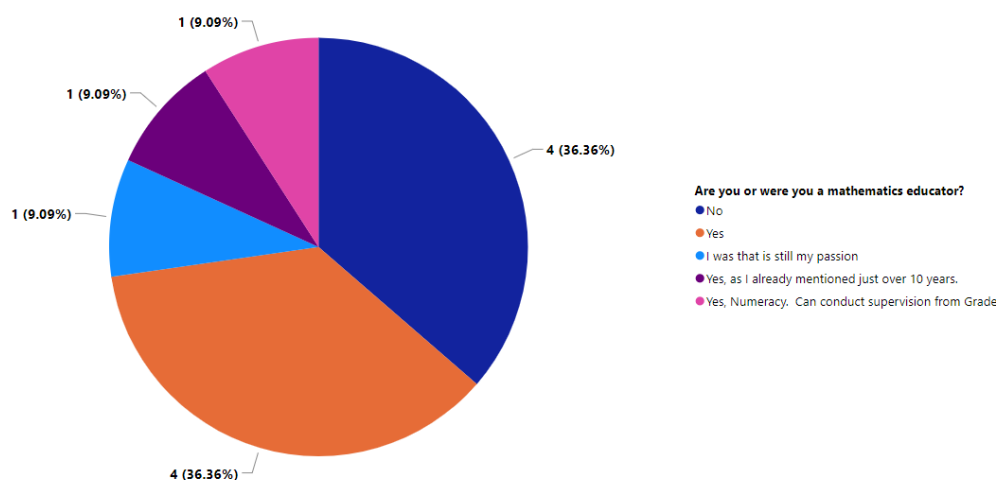

Figure 4: Mathematics teaching experience

One of the first questions to start the interviews was about the experience of teaching mathematics. Figure 4 shows that seven external supervisors were mathematics teachers but four were not.

4.2 Data collection and analysis

Using semi-structured interviews in this study allowed the researchers to capture the nuances and intricacies of external supervision challenges and strategies for mathematics teaching practice in the ODeL environment, providing a comprehensive understanding of external supervision from their perspectives. Data was collected one-on-one online using MS Teams. Since this study employed

a descriptive phenomenology design, thematic analysis was found to be suitable for identifying recurring patterns, themes and meanings within participants' narratives. The researchers began by familiarising themselves with the data through repeated readings of transcripts, followed by initial coding through Atlas.ti to identify relevant themes and categories. The open coding tool in Atlas.ti was used where the first researcher assigned codes that represented recurring patterns identified during familiarisation. Atlas.ti generated 34 codes which are presented in Figure 5.
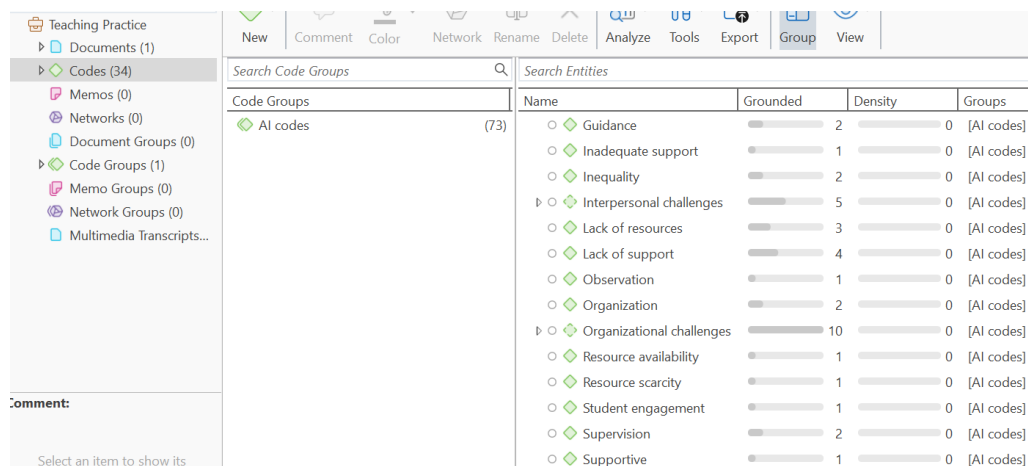

Figure 5: Codes

Atlas.ti allows for grouping related codes into categories, helping to organise and structure the data. The researchers organised the codes into categories and iteratively refined and revised them as they probed deeper into the data. The researchers then interpreted the categories' overarching patterns that emerged and identified the themes in relation to the research question, drawing connections between external supervisors' experiences and perceptions of their external supervision strategies.

5. Findings
This study aimed to explore strategies to enhance mathematics teaching within the context of ODeL through effective external supervision. In response to this aim, the findings of this research offer valuable insights into the challenges faced by external supervisors and student-teachers during their teaching practice and the support strategies used by external supervisors to address these challenges. The researchers present a detailed analysis of the challenges identified and the corresponding support strategies employed, drawing upon the principles of experiential learning and reflective observation to inform the discussion and conclusions.

5.1 Challenges

The external supervisors' challenges can be classified as educational, organisational and interpersonal.

5.1.1 *Educational challenges*

As theorised by Maddock and Maroun (2021), educational challenges include academic pressure, technology, resources, time management, inequality and insufficient teacher training. External supervisors highlighted punctuality, discipline, lack of resources and lack of support. Participant 8 described the educational challenges she identified as order, cleanliness, punctuality and learner discipline: "*In other schools there is no discipline, to the extent that at times the student will only start a lesson when there is only 10 minutes left for the student to be supervised.*" Another educational challenge mentioned by Participant 5 is limited content knowledge: "*Some of the students don't know how to explain the formula or the language of mathematics.*" Participant 10 added: "*Most students don't have a deeper understanding of CAPS*". Pedagogical knowledge was also identified as one of the challenges. "*I had to spend the entire period teaching the student how to teach*" (Participant 6); "*Some students come to class not prepared, with no lesson plans and resources*" (Participant 3). Participant 8 emphasised that student-teachers need to be guided through workshops, if possible, on how to teach.

5.1.2 *Organisational challenges*

Organisational challenges raised emanated from the schools and the university. From the schools, external supervisors noted overcrowding: "*Overcrowding is a problem in some schools, so it is difficult for students to control learners*" (Participant 3). In addition, there was a lack of cooperation from the organisations' authorities: "*I wrote a report to Unisa, and I never received any response*" (Participant 2). Participant 3 mentioned a lack of cooperation from the school principals: "*When I reported the matter to the principal, she did not care…*" Another challenge is the rigid rules which disadvantage the student-teachers. Participant 4 said: "*Some schools do not want student-teachers to change mentors…*".

5.1.3 *Interpersonal challenges*

The external supervisors complained about the student-teachers' conduct and interpersonal relations. They pointed out that some school principals are reluctant to employ them. "*In one school, they said they don't want any students from Unisa because they are lazy and only want to go to class*" (Participant 2). Participant 5 cautioned about the student-teachers' dress code: "*Unisa students need more attention on how to teach and to dress formally.*" Participant 9 highlighted that some students deliberately avoided being supervised, which sometimes leads to tension, resentment and a breakdown in trust between the students and external supervisors. "*Some students play hide and seek…*" (Participant 9). Despite all the challenges identified in this section, external supervisors noted some good practices from students that encourage them to support those in need. The next section presents the support strategies.

5.2 Support strategies

For student-teachers to cultivate more specialised teaching methods, teaching practice sessions must offer more than just chances to gain experience in school settings and imitate common practices. Seeing that few students demonstrate an understanding of mathematics and try to handle most topics well, like Data Handling and Number Patterns. Participant 1 explained that some of these students give just one example instead of a few examples to ensure that learners understand the topic. So, he adopted a bespoke support strategy where he had a one-on-one meeting after the lesson to give feedback and guidance. The support strategy employed by Participants 2 and 3 was mentoring. Participant 2 referred the student-teachers for mentoring to good mathematics teachers that she knows. Participant 4 named her support strategy as conferencing. She held a feedback session with the student-teachers and allowed them to share their reflections: "*I do conferencing, by providing feedback to the student and also allow the student to reflect*" (Participant 4). Having outlined the key findings regarding the challenges and support strategies faced by external supervisors during mathematics teaching practice supervision, the next section turns to a deeper analysis of these findings to explore their implications for effective supervision and teacher development.

6. Discussion of Findings

This study highlights critical challenges and support strategies in mathematics teaching practice within the ODeL context, addressing gaps in teacher preparedness and supervision. This discussion is presented in the context of the reviewed related literature and the principles of experiential learning theory as the theoretical framework underpinning this study to explore implications for professional development and effective external supervision. The findings revealed key challenges faced by external supervisors: educational, organisational and interpersonal. These include limited pedagogical and content knowledge among student-teachers, resource constraints, lack of cooperation institutional authorities and personal conflicts. Despite these challenges, supervisors employed various support strategies, such as personalised feedback, mentoring and reflective conferences, to mitigate these challenges and enhance teaching practice.

6.1 Educational Challenges

The educational challenges identified such as inadequate content and pedagogical knowledge resonate with Maddock and Maroun (2021), who emphasise the persistent gaps in teacher training and preparedness. The educational challenges identified, such as academic pressure, lack of resources and insufficient teacher training, highlight areas where student-teachers can reflect on their own knowledge gaps and teaching methods. For instance, Participant 10 mentioned that students lack a deeper understanding of the curriculum, indicating a need for reflection on teaching strategies to enhance comprehension. Moreover, Participant 6's experience of spending the entire period teaching the student how to teach underscores the importance of self-reflection on pedagogical techniques and preparedness.

In discussing these findings with reference to concrete experience as a concept of experiential learning, it is essential to highlight how these challenges directly impact student-teachers' learning process and professional development. Concrete experience, as described by Wang et al. (2022), refers to direct engagement with real-life situations, which is precisely what student-teachers encounter during their practicum.

The literature reviewed in this study from researchers such as Andrade-Arenas et al. (2022), Koşar (2023) and Sethusha (2020) presents challenges such as academic pressure, technology integration, resource availability, time management and insufficient teacher training. The concrete experiences shared by external supervisors and participants vividly illustrate these challenges. For instance, Participant 8's description of discipline issues and time mismanagement directly reflects student-teachers' real-life situations in managing classrooms effectively. Similarly, Participant 5's observation regarding limited content knowledge among students and Participant 6's experience of teaching students how to teach, highlight the gap between theoretical knowledge and practical application, a fundamental aspect of experiential learning. The lack of classroom discipline and resource constraints mirrors findings by Andrade-Arenas et al. (2022) who emphasised the impact of unequal resource distribution on teaching effectiveness.

Baia and de Souza Machado (2021) posit that interpersonal challenges, such as student-teachers' conduct and relations with school personnel, directly impact their professional image and integration into the school environment. Participant 2's encounter with a school that stereotypes students from a particular university underscores the interpersonal biases student-teachers may face. Similarly, Participant 9's experience of students avoiding supervision reflects challenges in establishing trust and rapport within the school community. These concrete experiences shed light on the importance of interpersonal skills and professional demeanour in the teaching profession.

6.2 Organisational Challenges
Concrete experiences related to organisational challenges, as presented by Sethusha (2020) are pedagogy and classroom management. The findings of this study revealed overcrowded classrooms, a lack of cooperation from school authorities, and rigid rules that impede student-teachers' professional growth. Participant 3's account of overcrowding directly exposes student-teachers' challenges in maintaining classroom control and delivering effective instruction. Participant 4's experience of facing resistance from schools unwilling to change mentors demonstrates how institutional structures can hinder learning opportunities. These real-life scenarios provide valuable insights into the complexities of navigating organisational dynamics during teaching practice.

As Penny (2022) emphasised, reflective observation is crucial in navigating organisational challenges, combining old and new wisdom to address organisational obstacles effectively. Participant 3's experience of reporting issues to the school principal and university without resolution emphasises the need for

student-teachers to reflect on alternative strategies for addressing bureaucratic obstacles. Additionally, Participant 4's observation of rigid rules hindering student-teachers' development suggests a need for reflection on advocacy and negotiation skills to effect change within institutional frameworks.

6.3 Interpersonal Challenges

Interpersonal challenges, such as student-teachers' unprofessional behaviour and strained relationships with school authorities, reflect the findings by Baia and de Souza Machado (2021) who argue that professional conduct and interpersonal skills are essential for fostering trust and integration in school communities. Participant 2's encounter with a school that stereotypes students from a particular university underscores the interpersonal biases student-teachers may face. Similarly, Participant 9's experience of students avoiding supervision reflects challenges in establishing trust and rapport within the school community. These concrete experiences shed light on the importance of interpersonal skills and professional demeanour in the teaching profession. In the literature reviewed in this study, Agnew et al. (2023) identified online teaching observation tools, which the researchers regard as effective strategies for fostering reflective observation, and the support strategies outlined by the participants demonstrate the application of reflective observation in addressing challenges.

6.4 Support Strategies

The support strategies identified in this study, including mentoring and reflective practices, align with the recommendations by Agnew et al. (2023) who advocate for innovative tools such as online teaching observations and feedback systems to enhance reflective observation. Participant 1's personalised feedback sessions after lessons exemplify a reflective approach to improving teaching methods based on individual student needs and lesson outcomes. Similarly, mentoring initiatives for Participants 2 and 3 reflect a commitment to continuous improvement through learning from experienced educators and reinforce Xu and Jumaat's (2023) assertion that experienced teachers play a pivotal role in shaping novice teachers' growth. Participant 4's use of conferencing for feedback and reflection encourages student-teachers to evaluate their performance and identify areas for growth critically. One innovative strategy that promotes concrete experiences is video recordings and analysis by Meline et al. (2023), which is used in the literature reviewed in this study.

7. Conclusion

This research aimed to explore strategies to enhance the quality of external supervision for mathematics supervisors, acknowledging that many supervisors may lack a background in mathematics teaching. Additionally, it investigated methods to improve mathematics instruction within the ODeL setting through effective external supervision. The study explored strategies for enhancing external supervision for mathematics teaching practice within ODeL. By identifying challenges experienced by both external supervisors and student-teachers, it became clear that effective supervision plays a critical role in shaping the pedagogical skills and professional growth of student-teachers. The findings revealed the importance of integrating experiential learning, specifically concrete

experience and reflective observation, into teacher training and supervision frameworks.

Through the lens of experiential learning theory, researchers note that tailored strategies such as personalized feedback, mentoring, reflective conferencing, and the use of technology have the potential to significantly improve the quality of mathematics teaching within ODeL environments. Addressing both the challenges and implementing these innovative support strategies will not only foster better teaching practices but also equip student-teachers with the skills and confidence needed for their professional careers. Ultimately, by refining external supervision and fostering reflective practice, institutions can ensure the development of highly competent mathematics educators in the ODeL environment.

The findings of the study have significant implications for theory, practice, and policy, offering valuable insights for improving teacher education. From a theoretical perspective, the research highlights the importance of experiential learning and reflective observation as foundational frameworks for enhancing teacher training. As stated in the article, "*the principles of experiential learning and reflective observation inform the discussion and conclusions,*" highlights the need to prioritize these theories in teacher education curricula. On a practical level, the study identifies key challenges, including "insufficient teacher training", overcrowding, and a "lack of resources", which call for targeted professional development initiatives and robust support systems for student-teachers. These measures are essential to equip educators with the skills and resilience needed to navigate complex teaching environments effectively. From a policy standpoint, the study emphasizes the importance of providing external supervisors with adequate training and resources to ensure effective mentorship. Moreover, addressing organizational challenges, such as fostering greater cooperation from school authorities, could substantially enhance the teaching and learning environment. These combined efforts have the potential to improve teacher preparedness and elevate the quality of education.

The study's adoption of descriptive phenomenology, as advocated by Rangarajan et al. (2022), offers a systematic method for examining the lived experiences of external supervisors. However, the reliance on Kolb's Experiential Learning Theory introduces notable limitations. The population under investigation may have been limited in both size and diversity, which could restrict the findings to a particular demographic or professional context. While Kolb's theory serves as a valuable lens for understanding the learning processes described by participants, its application within a phenomenological framework may unintentionally shape the data analysis despite efforts to remain free from preconceived notions. This interaction between theory and method risks aligning the findings too closely with the theoretical framework, which can curtail the exploration of alternative interpretations. Additionally, the rich and contextual nature of phenomenological insights makes it difficult to generalize the results to wider populations. Therefore, although the study yields significant insights into supervisors'

experiences, its conclusions should be interpreted within the specific context and theoretical framework employed.

8. Recommendations

The literature and the findings of this study as reviewed through the lens of experiential learning theory, guided the researchers to recommend the following strategies for enhancing external supervision for mathematics teaching practice within an ODeL environment. The universities responsible for training and preparing future teachers, especially in mathematics education within an ODeL setting, should:

- Develop pre-service teacher training programmes that incorporate real-world simulations and practical experiences to better prepare student-teachers for the educational, organisational and interpersonal challenges they may encounter during their teaching practice.
- Establish mentorship programmes that pair student-teachers with experienced external supervisors who can provide ongoing support, feedback and guidance throughout their teaching practice on the Learning Management System. This mentorship should focus on pedagogical skills, navigating organisational dynamics and building effective interpersonal relationships.
- Foster collaboration between universities and schools to address organisational challenges such as overcrowding, lack of resources and rigid rules. Universities can provide support to schools by offering resources, professional development opportunities and ongoing communication channels to address concerns and implement effective solutions.
- Offer professional development workshops for both student-teachers and school staff (mentor teachers) to enhance pedagogical knowledge, classroom management skills and interpersonal communication strategies. These workshops should be interactive and hands-on, providing concrete strategies and resources that can be immediately applied in the classroom.
- Encourage student-teachers to engage in reflective practice throughout their teaching practice, encouraging them to critically analyse their experiences, identify areas for growth and develop action plans for improvement. Mentors and external supervisors who can provide constructive feedback and guidance should support this reflective process.
- Promote inclusive teaching practices that address all children's diverse learning and developmental needs, including those with disabilities or special needs. This may involve providing differentiated instruction, adapting teaching strategies and creating a supportive learning environment that values diversity and fosters inclusion.

To overcome the limitations noted in the existing research, future studies should utilize a mixed-methods approach that combines quantitative and qualitative methodologies. This strategy would enable the inclusion of a wider and more diverse participant base, thereby improving the generalizability of the findings across different demographic contexts. While Kolb's Experiential Learning

Theory provides a useful framework for examining experiential learning, future research could significantly benefit from investigating alternative theoretical frameworks.

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10. References

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