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The Challenges Faced by Lecturers in Matriculation College in Distance Learning for Mathematics

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Abstract

Distance learning is seen as one of the potential methods to improve the quality of education in the face of modernization. Mathematics is often considered a critical subject due to its difficulty in being taught and understood by both lecturers and students at all levels of education, including higher education. The implementation of mathematics teaching by lecturers at the matriculation college level presents various issues and challenges. Therefore, a study exploring the challenges faced by lecturers in ensuring the effectiveness of distance mathematics learning needs to be conducted. This study is significant for the advancement of the national education system, as distance learning is increasingly becoming a preferred choice in line with technological advancements. The research design used in this study is qualitative, involving six respondents selected from Negeri Sembilan Matriculation College and Penang Matriculation College. The findings reveal that the challenges faced by matriculation college lecturers in implementing distance mathematics learning can be categorized into three main aspects: technical challenges, knowledge challenges, and assessment challenges. Consequently, the findings of this study provide insight into the challenges faced by lecturers, which may encourage relevant authorities to take steps in overcoming these challenges to enhance the quality of distance mathematics learning for the benefit of future education.

Keywords: Lecturers, Matriculation College, Distance Learning, Challenges

Introduction

The Distance Learning method has long existed in Malaysia (Fadil & Satari, 2021). However, this learning method has rarely been applied in the Malaysian education system. The Covid-19 pandemic that affected the country opened doors for the transformation of educational methods from traditional face-to-face learning to distance learning. Although the post-pandemic period has seen mathematics learning returning to in-person sessions, distance learning remains essential in the field of education (Pangodian et al., 2019). According to UNESCO (2020), distance learning is a learning process that takes place without physical meetings between instructors and students.

Mathematics is often considered a difficult subject to learn and teach, including at higher education levels (al-Kassab & Wafula, 2022). Mathematics is a complex subject that requires students to master various skills, such as critical thinking, problem-solving, deductive and inductive reasoning, arithmetic, and analytical skills (Noor Khairunnisa & Siti Mistima, 2020). Many students struggle to master mathematics during face-to-face learning, making it even more challenging when the subject is taught through distance learning (Juwairiah Mustapah & Roslinda Rosli, 2021).

Distance learning has posed numerous challenges for lecturers at the higher education level, especially in mathematics courses. Dawadi (2023) argues that higher-level mathematics is more challenging as it requires the exploration of complex mathematical algorithms and theories, making it difficult for educators to effectively deliver the curriculum, particularly in a distance learning setting. Research on the challenges faced by lecturers in higher education is essential to better prepare them for effective distance mathematics learning (Kurti, 2023).

The challenges experienced by lecturers in conducting distance mathematics learning at the higher education level need to be explored to help them prepare for effective teaching, even without face-to-face interactions. Pokhrel (2023) states that challenges in distance learning include educators' attitudes, practices, characteristics, and the nature of the mathematics subject, which requires specific and strategic learning approaches. According to a study by Kadir and Yusof (2023), educators face challenges in utilizing technology for distance learning (e-learning) due to technical knowledge limitations, lack of evaluation of technological effectiveness, structural management, and organizational administration issues, which hinder the effective implementation of distance learning at the higher education level.

Firmansyah (2023) emphasizes that addressing challenges in distance mathematics learning is crucial for creating a more efficient, inclusive, and flexible education system. This view is supported by a literature review by Çelik and Gülsah (2022), which highlights numerous past studies that examine the challenges educators face in distance learning, helping to adapt and improve education for the future. Several past studies have shown that the most significant challenge for educators in conducting distance mathematics learning is technological proficiency, as indicated in the studies of Kıyıcı & Övez (2021), Alenenzi (2022), and Milenković. et al. (2024). This indicates that some educators face difficulties in mastering technology as a tool for distance mathematics learning. Additionally, the study by Julie et al. (2022) highlights the challenge for educators in designing distance mathematics teaching that encourages students' self-learning and active participation, even without face-to-face interaction.

Based on past studies on distance learning, numerous studies have successfully explored the challenges faced by educators in implementing distance learning. However, previous research has primarily focused on distance learning in other subjects, such as Geography (Maulana et al., 2023), Islamic Education (Rahman &Rosli, 2022), Arabic (Nasimah Abdullah & Mohd @ Mohammad Zin, 2022), and general education contexts (Mahalingan & Khairul Azhar, 2021). Although some studies have examined the challenges of mathematics education, they are often focused on other countries, such as Quebec (Nongni, 2022), Morocco (el-Abbadi & Alaoui, 2023), Italy (Cassibba et al., 2021), and Kuwait (Alenezi et al., 2022). For the Malaysian context, many previous studies have examined the challenges of distance mathematics

learning but have not specifically focused on higher education levels, such as those conducted by Noor Khairunnisa & Siti Mistima (2020), Saifudin & Hamzah (2021), Hanushaa & Muhammad Sofwan (2022), and Noor Kasemawati & Siti Mistima (2022). Therefore, a study focusing on higher education lecturers is necessary to explore the challenges they face in conducting distance mathematics learning.

This study aims to explore in greater depth the challenges faced by mathematics educators, specifically higher education lecturers, in terms of technical aspects, knowledge, and assessment implementation during distance mathematics learning. However, this study is limited to lecturers from Matriculation Colleges, which are among Malaysia's Higher Education Institutions (HEIs) that require mathematics as a compulsory subject for all students, regardless of whether they are in Module 1, Module 2, or Module 3. In conclusion, the following sections will present the literature review, research methodology, research findings, and discussion for this study.

Literature Review

According to UNESCO (2020), Distance Learning occurs without direct interaction between educators and students, where information sources are physically separated, preventing traditional classroom meetings. UNESCO (2020) further explains that Distance Learning includes Online Learning and other technology-based learning methods with lower digital maturity levels, such as television, radio, and postal correspondence. Moore (1990) defines Distance Learning as a planned learning process that takes place at different times or locations between instructors and students, involving instructional delivery through printed materials or electronic communication. Although Distance Learning has long been introduced in the education system (Sharoni et al., 2019; Fadil & Satari, 2021), this method was less frequently utilized before the global pandemic.

Distance learning can be implemented through various methods. According to Zawiah Baharom (2020), Distance Learning can be carried out using three approaches: Home-Based Learning (PdPR), Remote Learning, and Online Learning. Fakhrunisa and Prabawanto (2020) explain that online mathematics learning can be conducted in three ways:

1. Providing learning materials in the form of videos, modules, or readable learning materials, after which students are required to discuss online and answer questions via Quizziz.
2. Using applications such as WhatsApp and Google Classroom for distributing learning materials, discussions through platforms like Zoom, Google Meet, Jitsi, and Microsoft Teams, and assessing students via Google Forms and Quizziz.
3. Conducting monotonous discussions via WhatsApp or Google Classroom.

Additionally, students in Higher Education Institutions (HEIs) are familiar with using Learning Management Systems (LMS) as a platform for Distance Learning. LMS is a platform or software that allows students and educators to access, plan, and deliver learning content online. It also includes features for course management, assessment, and communication between students and educators (Yudhana & Kusuma, 2021). These methods are among the approaches used by educators during the implementation of Distance Learning.

With advancing technology, Distance Learning should receive greater attention due to its various benefits for the national education system. According to Pereira (2022), the advantages of Distance Learning for higher education students include better interaction through synchronous and asynchronous activities, high flexibility, ease of resource sharing, and cost- and time-efficiency.

This is supported by Fatma (2023), who states that Distance Learning benefits students in terms of flexibility, time management, lower tuition fees, and addressing weaknesses in the education system by fostering social and community-based learning. A study conducted by Mhilwa (2015) found that distance and student mobility in the Philippines contributed to declining mathematics performance. Many students struggle to attend physical classes due to the long distance between their homes and schools. In such cases, Distance Learning ensures equal access to education.

Mathematics learning requires educators to help students understand and apply concepts, carry out procedures, and solve problems. These requirements make mathematics a complex and difficult subject to teach and learn (Niño-Rojas et al., 2023; Halim et al., 2022). Juwairiah Mustapah and Roslinda Rosli (2021) agree that mathematics is difficult to teach even in face-to-face settings, let alone through Distance Learning. This is due to the inherent nature of mathematics, which requires students to develop strong visualization skills, particularly in topics like orthogonal projections, calculus, algebra, and more.

This is supported by Yohannes et al. (2020), whose study on Geometry found that 70% of educators agreed that they struggled with teaching the subject because Geometry requires students to master high-level visualization skills. Consequently, Distance Learning in mathematics at HEIs presents multiple challenges for lecturers in ensuring that learning objectives are met despite the absence of face-to-face interaction.

Distance Learning is an unfamiliar situation for lecturers, leading to various challenges in ensuring that students do not fall behind during the pandemic. One major challenge faced by HEI lecturers during Distance Learning sessions is limitations in Information and Communication Technology (ICT). Although the Malaysian government introduced ICT implementation in education through the ICT framework policy in 1996 (Zakaria et al., 2006), the pre-pandemic period saw lecturers not widely incorporating ICT into their teaching practices. ICT refers to digital information and communication technology that allows lecturers and students to share information and communicate online or through telematics (Zakaria et al., 2006). ICT played a significant role in education during the pandemic since 100% of education was conducted virtually. However, a challenge faced by educators was their lack of experience and knowledge in fully integrating ICT into education. A study by Flhoinn and Fitzmaurice (2021) revealed that 90% of higher education lecturers had little to no experience in Distance Learning instruction. This could hinder the mathematics learning process in HEIs, as lecturers would struggle to focus entirely on teaching due to their inadequate mastery of communication and information technology. Additionally, a study by Li and Maat (2022) identified other challenges educators faced during Distance Learning, including economic factors, self-discipline, and environmental conditions.

The implementation of Distance Mathematics Learning requires educators to possess various knowledge areas, including content knowledge, technological knowledge, and pedagogical knowledge, to create a conducive and effective learning environment (Zolhilmi Adnan & Hazrati Husin, 2024). However, many educators struggle with technological knowledge, as highlighted by Kebar (2020), who stated that one of the biggest challenges in conducting Distance Learning is the lack of knowledge among educators in implementing technology in their teaching process. Before the pandemic, educators had not been exensively exposed to technology-based teaching methods and preferred using the traditional "Chalk and Talk" approach in physical classrooms.

Garrison and Kanuka (2004) stated that educators face difficulties in implementing project-based and performance-based assessments for students engaged in online mathematics learning, as students tend to be less engaged if not assessed in person. Hodges et al. (2020) also found that virtual assessments fail to comprehensively and deeply evaluate students, particularly in mathematics courses. The rise of advanced learning applications and Artificial Intelligence (AI) systems further complicates assessment integrity, as students can easily cheat using tools such as MathSolver, MathLab, Symbolab, PhotoMath, and ChatGPT. The academic integrity of assessments is at risk due to AI tools, as they allow students to directly copy answers required for their evaluations (Silverman, 2020; Williamson & Piattoeva, 2021).

Methodology

The design of a study is a procedure and plan for conducting research, encompassing research outcomes from broad assumptions to detailed data collection analysis and techniques (Creswell, 2009). This study aims to explore the level of readiness and competencies required by lecturers in conducting distance learning (PdP) for mathematics among higher education students. Therefore, this study adopts a qualitative research design. The choice of this design is due to the suitability of qualitative research in exploring lecturers' readiness and competencies in depth when conducting distance learning for mathematics (Merriam & Tisdell, 2016). A qualitative research approach was chosen as it allows for a comprehensive, complete, and in-depth response to the research questions.

This study focuses on lecturers from one of Malaysia's Higher Education Institutions (IPT), specifically Matriculation Colleges. However, due to limitations, the researcher selected lecturers from Negeri Sembilan Matriculation College (KMNS) and Penang Matriculation College (KMPP) as study participants. The sampling technique used in this study is Purposive Sampling, allowing the researcher to select participants who can provide in-depth and relevant information related to the research questions. This is supported by Creswell (2013) and Patton (2003), who argue that Purposive Sampling helps researchers select participants who are appropriate for the study based on their significant experience in the field. Table 1 below lists the participants selected for this study.

Table 1
List of Study Participants

No	Participants	Teaching Experiences	Teaching Location
1	Shukri	9 Tahun	KMNS
2	Syazwan	9 Tahun	KMNS
3	Helmi	25 Tahun	KMNS
4	Junaidah	7 Tahun	KMNS
5	Syazwani	9 Tahun	KMNS
6	Salawathy	10 Tahun	KMPP

The research instrument used is a semi-structured interview developed by the researcher, based on the Community of Inquiry (CoI) framework established by Garrison et al. (2000). The purpose of designing semi-structured questions is to gather initial information about the challenges faced by mathematics lecturers in Matriculation Colleges in conducting distance learning. The semi-structured questions serve as a guide for detailing the interview questions in greater depth. The final interview questions were refined through discussions with supervisors and several experts.

To collect data, the researcher conducted online interview sessions with the study participants via Google Meet, and all sessions were recorded. The researcher spent a total of 3 hours interviewing 5 participants from KMNS in May 2023, and another 1-2 hours interviewing 1 participant from KMPP on a different day.

The interview recordings were transcribed using the ATLAS software, as Ali et al. (2005) suggest that ATLAS has specialized features that allow researchers to encode data through document diagram scanning techniques. From the conducted interviews, the researcher obtained audio recordings, interview notes, and interview transcripts.

Additionally, Nvivo software was used for data analysis as it aids in managing, interpreting, and analyzing qualitative research data efficiently (Hamid et al., 2000). Nvivo helped the researcher identify constructs, themes, and patterns related to the study topic, which focuses on the challenges lecturers face in teaching mathematics at Matriculation Colleges.

Yin (1994) suggests that to assess the reliability of interview data, researchers should use Cohen's Kappa Reliability Index to validate the interview data themes. Therefore, for this study, the researcher engaged three experts to review and provide feedback on the research protocol developed. These three experts were selected based on their expertise in qualitative research and mathematics education in higher education. Table 2 below presents the interpretation of Cohen’s Kappa Coefficient Index.

Table 2
Cohen's Kappa Coefficient Index

Kappa Value	Interpretation
< 0.00	Very Weak
0.00-0.20	Weak
0.21-0.40	Moderately Weak
0.41-0.60	Moderate
0.61-0.80	Good
0.81-1.00	Very Good

After calculating the Cohen's Kappa coefficient, the researcher found that the obtained value was 0.76, which falls within the "Good" category according to the interpretation suggested by Landis and Koch (1997). Additionally, to ensure the validity of the study, the researcher applied the researcher bias approach, which involves avoiding personal assumptions in analyzing the interview transcripts. This was achieved by seeking verification from study participants to ensure the accuracy of the transcribed interviews. Spending extended time in the field also contributed to enhancing the study's reliability and validity (Padgett, 1998; Cho & Trent, 2006). Therefore, the researcher dedicated several months to collecting information for this study.

Findings

Based on the interview data, 3 main themes were obtained regarding to the challenges faced by the lecturers in matriculation college in distance learning for mathematics. The themes are challenges from a technical perspective, challenges from a pedagogical perspective and challenges from an assessment perspective. The themes are explained as follows.

Challenges from a Technical Perspective

The findings of the study indicate that the challenges faced by matriculation college lecturers in conducting remote mathematics teaching include technical aspects. The study participants mentioned that one of the constraints they experienced was in using technology, as some of them stated that they were not proficient in integrating technology throughout the implementation of remote mathematics classes. This is evident from the statement made by Lecturer A.

Lecturer A:…the first month was really difficult to adapt. We only had a laptop, and for writing and calculations, we had to use a mouse.

Lecturer A's statement, "difficult to adapt," shows that they had trouble transitioning from traditional teaching methods to using technology, such as a laptop. Lecturer A's statement is supported by Lecturer C, as shown in the following excerpt.

"*…when teaching mathematics, there are issues because it involves equations. We can't just use any app since they are quite limited… For mathematics, we need something like a whiteboard, but we are not skilled in using it yet…*"

According to Lecturer C, teaching mathematics remotely is quite challenging because mathematics often involves equations that are usually written directly on a whiteboard. However, remote learning requires teachers to master technology to ensure the process runs smoothly. Lecturer D also expressed similar concerns.

"…for mathematics, we need something like a whiteboard, but we are not skilled in using it yet…"

Additionally, the analysis of the interviews conducted revealed that another challenge in remote mathematics learning in matriculation colleges is internet connectivity. This is evident from the following feedback.
Lecturer A:…some students don't have strong internet access to attend online classes. So, we also conduct classes via Telegram. Sometimes, I record the lessons using my phone and send them through Telegram so students can download them slowly because we know some students don't have WiFi at home.

Lecturer A's feedback indicates that some students do not have strong internet connections to join synchronous online mathematics classes, forcing lecturers to use Telegram for asynchronous learning. Lecturer A's statement is supported by Lecturer A.
"*…students from Sabah and Sarawak, for example, have weak internet access…"*

This excerpt highlights that students, particularly those in Sabah and Sarawak, face weak internet connections, making remote mathematics learning more challenging. The issue of poor internet access affects students' ability to participate in learning effectively.

Furthermore, the study also found that one of the challenges faced by mathematics lecturers in matriculation colleges is the lack of adequate infrastructure, such as essential devices. This is evident from Lecturer A's statement.
"*…from the start of the lockdown, we were only provided with one laptop, which we had to return to the office after the classes ended… I struggled, especially for mathematics, which requires specific software, so I had to spend almost RM2000 to buy Surface software…*"

This statement shows that mathematics lecturers in matriculation colleges face a lack of necessary devices or software for teaching, forcing them to use personal funds to acquire the needed resources. Lecturer C also supported this claim.
"*…for mathematics, we need to emphasize certain things, like circling or highlighting them, which requires specific gadgets. Everything comes from our own pockets—there is no allocation for it…*"

However, the necessary teaching gadgets were not provided, requiring lecturers to bear the costs themselves. The issue of infrastructure constraints is not only faced by lecturers but also by students, particularly those from lower-income families (B40), who lack adequate devices for remote mathematics learning. This is highlighted in Lecturer D's statement.
"*…if we look at students from regular backgrounds, there's no issue. But for those from Sabah and Sarawak, especially from B40 families, sometimes they only have a mobile phone and no laptop…*"

Challenges from a Knowledge Perspective
Apart from technical challenges, some lecturers also face challenges in terms of knowledge, such as understanding how to support weaker students during remote mathematics learning. This is reflected in the following statement.

Lecturer D: "We have to consider the different levels of students. For bright students, we are not too worried, but for weaker students, we need different teaching techniques and knowledge about those techniques."

This indicates that the varying abilities of students pose a challenge for mathematics lecturers in matriculation colleges, as they need to adapt their teaching methods accordingly. Lecturer E also commented on this issue.
"It is difficult because we have to deal with students who are weak in mathematics from school, and we need to know how to handle them properly."

The word “difficult” used by Lecturer E shows that handling weaker students is challenging. Teaching mathematics remotely is already complex, and it becomes even harder when dealing with students who struggle with the subject. Therefore, lecturers need knowledge on how to manage weaker students effectively.

Students not only have different abilities but also different learning styles, such as visual, auditory, and kinesthetic (VASP). This diversity poses a challenge for mathematics lecturers, who must adapt their pedagogical knowledge to suit remote learning. Lecturer A highlighted this issue.
"It is quite challenging to meet the learning styles of different students because the knowledge is not the same as in physical classes, especially in mathematics."

Lecturer A’s view was supported by Lecturer B.
"Meeting the learning styles of VASP students is difficult. For example, visual learners struggle with remote learning."

For visual learners, remote learning is particularly challenging as lecturers must provide teaching aids that can be easily visualized. However, in remote mathematics learning, this becomes difficult, requiring lecturers to have knowledge on how to meet students’ needs. This issue affects syllabus completion, as noted by Lecturer C.
"In class, there are students of varying abilities. If we spend time addressing their needs, we may not be able to complete the syllabus."

From the feedback above, it can be concluded that the limited knowledge of lecturers in managing students with different learning styles is a challenge in remote mathematics learning.

Challenges from an Assessment Perspective
To evaluate learning effectiveness, various forms of assessment are conducted by lecturers. However, remote mathematics assessment in matriculation colleges is challenging, particularly in terms of effectiveness, as it primarily relies on Multiple-Choice Questions (MCQs). MCQs are considered less effective because students can randomly select answers without fully understanding the questions. This concern was raised by Lecturer B.
"Honestly, it’s not sufficient because with MCQs, students can just guess or answer randomly… In my opinion, it is not enough to assess students over a whole semester just using MCQs."

The performance of students also reflects this issue, as noted by Lecturer C:

"Honestly, I don't think it's valid. In my opinion, it's not valid to assess students using only MCQs. At that time, we saw that most students achieved excellent results because everything was online."

Remote assessment also presents challenges in terms of integrity. This is evident from Lecturer D's statement.
"MCQ-based assessments make it easier for students to cheat… Honestly, it's difficult to detect cheating in objective questions."

Lecturers acknowledge that remote assessments make it easier for students to cheat since they are not monitored directly, making plagiarism detection difficult. Lecturer D also supported this concern.
"For mathematics, it is difficult to determine whether students have plagiarized or not."

Thus, remote mathematics assessments pose challenges for lecturers in terms of effectiveness and integrity, requiring them to find alternative assessment methods.

Discussion

This study was conducted to explore the challenges faced by matriculation college lecturers in conducting remote mathematics learning. The study findings indicate that mathematics lecturers face challenges in three main aspects: technical, knowledge, and assessment.

Matriculation college lecturers experience difficulties in using technology as a teaching medium, particularly for mathematics, which involves equations, visualization processes, and simultaneous explanation while writing. These findings align with the study by Muhazir and Retnawati (2020), which found that educators struggle to conduct remote learning effectively without mastering technology. According to Nogni (2021), technology usage in remote mathematics teaching is crucial to ensure students understand mathematical concepts effectively. Additionally, the study found that mathematics lecturers in matriculation colleges face issues with weak internet connectivity during remote learning. This is supported by the research of Mohd Zin and Mahmud (2024) and the study by Fauziah and Sufyani (2021), which state that poor internet connections hinder the remote learning process by disrupting communication and student engagement in class. Infrastructure weaknesses also impede the remote teaching of mathematics. From the school context, challenges such as insufficient teaching resources, inadequate infrastructure, and overcrowded classrooms (Rusdin & Ali, 2019) have hindered the creation of a conducive learning environment, particularly for developing students' skills in solving sentence-based mathematics problems during online instruction (Ling & Mahmud, 2023). The study found that the lack of funding for matriculation lecturers to access specialized applications or software forces them to cover the costs themselves. However, for complex subjects like mathematics, specialized software such as Desmos and Geogebra helps provide dynamic visualization, enabling better student understanding (Lin, 2022). It shows that a mathematics lecturer should maintain a consistently positive attitude and strive to master advanced technologies that can enhance the effectiveness of remote learning. A study conducted by Johari et al. (2022) explains that teacher's attitudes play a crucial role in being professional during mathematics remote learning while instilling technology, in addition to utilizing advanced technology in mathematics education.

This study also identified that mathematics lecturers in matriculation colleges face challenges in handling students with different abilities. These findings are consistent with the study by Nordin et al. (2020), which found that college lecturers struggle to teach weak students in mathematics courses. Cassibba et al. (2021) also state that mathematics lecturers face difficulties in adapting their teaching methods in a new learning environment since mathematics involves frequent use of symbols and formulas. Moreover, students have different learning styles, requiring lecturers to adapt their pedagogical knowledge to ensure effective learning for all students. According to Dunn and Dunn's Theory, there are three types of learning styles: visual, auditory, and kinesthetic. Visual learners benefit from graphical displays such as diagrams, charts, and images, while auditory learners benefit from lectures or audio explanations. Meanwhile, kinesthetic learners learn best through hands-on activities (Douiri & Ibn Elfekih, 2024). It is widely recognized that managing diverse students in remote learning differs significantly from traditional classroom teaching, where direct interaction is possible. Consequently, this study found that matriculation lecturers struggle to accommodate students' varied learning styles during remote mathematics learning. Bayona (2023) suggests that lecturers' knowledge should be enhanced to ensure the application of diverse teaching techniques and strategies to meet students' needs, especially in mathematics courses. Mahmud et al. (2022) suggests that lecturers should master pedagogical reasoning because it will help lecturers to transform their subject matter knowledge into instructional strategies that are responsive to the diverse backgrounds, learning styles and abilities of their students according to the circumstances. The study also found that mathematics lecturers in matriculation colleges face difficulties in adapting to new educational situations while ensuring the syllabus is covered within the allocated semester period. This is a major concern for mathematics lecturers as they must equip themselves with knowledge such as Technological Pedagogical Content Knowledge (TPACK) to effectively integrate technology into their teaching techniques (Tan et al., 2022).

Assessment is a crucial element in evaluating the effectiveness of students' learning. The study found that assessments in matriculation college mathematics courses primarily consist of multiple-choice questions (MCQs), posing a challenge for lecturers in ensuring the effectiveness of such assessments. According to lecturers, MCQs may not accurately measure students' understanding, as they allow students to guess answers without fully grasping the underlying mathematical concepts. The primary challenge for lecturers in assessment is designing evaluation methods that comprehensively measure students' understanding in a remote learning environment, as traditional assessment methods are less suitable for remote learning (Almake, 2023). These findings align with the study by Okonkwo (2010), which states that conducting assessments in a remote learning setting is complex and difficult, especially due to the large number of students, making the validity and effectiveness of assessments questionable. Matriculation lecturers in this study suggested that subjective questions would be more effective in assessing students' mathematical understanding, as they provide a more comprehensive evaluation. Therefore, in designing assessments for remote mathematics learning, lecturers should utilize applications such as Learning Management Systems (LMS), Moodle, Quizizz, and Kahoot (Kudarov et al., 2023; Kochneva & Romanova, 2019). The study also revealed that integrity issues arise in remote assessments. This finding is supported by Garg and Geog (2023), who found that the absence of direct supervision by lecturers during assessments increases the likelihood of academic dishonesty. Academic misconduct is a significant issue that negatively impacts both students and educational institutions (Adzima,

2020). Mahmud and Md Yunus (2018) stated that it is crucial that teachers or lecturers to give feedbacks in student's assessment in order to help them in reflecting their achievement or their progress in mathematics subject. A major challenge faced by lecturers in assessment is detecting cheating, especially in mathematics, due to advanced applications such as Photomath, which allows students to obtain solutions simply by uploading a picture of the problem. This encourages students to take shortcuts, fostering a habit of academic dishonesty (Akimov & Malin, 2020). Therefore, it is recommended that academic staff in matriculation colleges modify and improve the assessment system to ensure academic integrity in remote learning. For example, Nor Ain Najiha et al. (2023) suggest that remote assessment systems should include biometric security, facial recognition, and surveillance cameras to prevent cheating during major examinations.

Conclusion

Overall, this study successfully explored the challenges faced by matriculation college lecturers in conducting remote mathematics courses. The study findings provide insights for relevant authorities to take appropriate actions to enhance the effectiveness of remote learning. Various alternatives must be implemented by all stakeholders to improve higher education quality and address challenges in technical, knowledge, and assessment aspects. However, this study cannot be generalized to all matriculation colleges in Malaysia due to the limited number of respondents, as data was collected only from two matriculation colleges in Negeri Sembilan and Penang. Additionally, the study was restricted to online interviews, which lacked face-to-face interaction with respondents, leading to less effective engagement compared to in-person research. Therefore, future studies should involve lecturers from all states to represent a broader population. Future research should also include physical observations, allowing researchers to directly examine remote mathematics learning environments in matriculation colleges. This approach would enable researchers to gain deeper insights and produce more impactful findings. However, the essence of this study can provide significant informations and motivation to the authorities in the education sector to intensify their efforts in improving the progress and effectiveness of distance learning mathematics education. This is because the educational landscape is constantly changing according to the advancement and sophistication of technology. This study will also help educators to be more prepared in terms of technical skills, knowledge, and assessment in mathematics courses if mathematics education needs to continue through distance learning in the future.Through this study, it can provide ideas to the authorities to develop relevant and appropriate courses to enhance the professionalism of teachers in conducting distance learning in mathematics.

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