

The Readiness and Competence of Secondary School Mathematics Teachers in Implementing Distance Learning

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Abstract

Following the global spread of the Covid-19 pandemic in 2019, there has been a change in the perception of schools. Approaches to teaching mathematics have evolved beyond the traditional classroom setting, embracing distance learning as a viable alternative. Emphasizing the use of the internet, social applications, and online educational resources for mathematics, this survey study aims to assess the readiness and competence of mathematics teachers in implementing distance learning. This study involved 156 randomly selected secondary school teachers from the Seremban district, Negeri Sembilan, who were surveyed using a questionnaire. Data analysis was carried out descriptively and inferentially using Statistical Packages of Social Sciences computer software for Windows 27.0. By comparing mean scores, the study assessed mathematics teachers' readiness and competence level. In addition, Pearson's correlation test was used to identify the relationship between their willingness and competence in implementing distance learning. The findings of the study show that mathematics teachers exhibit a high level of readiness but a moderate level of competence. Furthermore, the study shows a significant correlation between the willingness and competence of teachers in practicing distance learning methods.

Keywords: Readiness, Competence, Math Teacher, Distance Learning, Online Learning

Introduction

In an era defined by rapid technological advancement and evolving learning paradigms, distance learning in mathematics education has emerged as a transformative force in the field of education. This innovative approach to learning transcends the traditional boundaries of time and space, enabling individuals to access education remotely, anytime, and anywhere (Salleh et al., 2020). The importance of distance learning in mathematics has grown exponentially, reshaping the educational landscape and offering unprecedented opportunities for diverse learners to acquire knowledge and skills (Elyana et al., 2022). This paper delves into the realm of distance learning in mathematics, highlighting its significance, the reasons for its study, and the compelling need to explore its multifaceted dimensions.

Distance learning in mathematics, often interchangeably termed online learning or e-learning, has become an indispensable facet of modern education. Its significance lies in its ability to democratize education by making learning accessible to a broader spectrum of individuals. Whether it's a working professional seeking to enhance their skill set, a student in a remote area striving for quality mathematics education, or an individual with various commitments requiring flexibility, distance learning offers a flexible and adaptable solution (Murphy, 2020). This mode of mathematics learning has gained even more prominence in recent times due to unforeseen circumstances, such as the global pandemic, which disrupted traditional educational practices and underscored the need for resilient and versatile learning alternatives.

Studying mathematics distance learning holds the key to unlocking a deeper understanding of its intricacies and potential. As this educational methodology continues to evolve, it becomes imperative to investigate its pedagogical underpinnings, technological advancements, and societal implications (Abidin et al., 2020). By delving into the study of mathematics distance learning, researchers and educators can identify best practices, optimize learning experiences, and develop innovative strategies to address challenges that may arise (Ahmad et al., 2021). Furthermore, exploring this field provides valuable insights into the intersection of technology, education, and human interaction, shedding light on how to harness its advantages while mitigating potential pitfalls.

The ever-expanding digital landscape has catalyzed a paradigm shift in education, making it essential to explore mathematics distance learning comprehensively. Traditional educational models are no longer sufficient to meet the diverse needs and demands of today's learners. The need for personalized, accessible, and flexible education has never been more pronounced. By studying mathematics distance learning, educators can refine their instructional methodologies to cater to a global audience, incorporating multimedia tools, interactive platforms, and collaborative spaces. Additionally, policymakers can make informed decisions about resource allocation, infrastructure development, and curriculum design, ensuring that quality education reaches every corner of society.

Teachers need to prepare to carry out the task of imparting knowledge to their students. The readiness of teachers with pedagogical skills is different from traditional learning to implement effective learning. This is supported in a study conducted by Ee (2003) who stated that the wisdom of the teacher in choosing an approach and competence in planning learning methods and techniques will provide a better impact on student understanding in the learning process. According to Ali and Abd Rahman (2016), teachers need to review learning approaches and methods to apply mathematics education pedagogy that can be applied to convey knowledge by using ICT. Teaching methods and learning materials that can attract students' attention become new materials that need to be reviewed and studied to ensure that learning objectives can be achieved (Ibrahim & Subari, 2021).

The competence of a mathematics teacher is the ability of a person who has personality as a teacher by integrating it with knowledge of learning content and mathematical pedagogical skills in implementing effective distance learning of mathematics. Competence can be defined as the ability and ability of an individual to do something (Eraut & Boulay, 2000). Teacher competence includes teacher skills in mathematics pedagogy determining the effectiveness

of distance mathematics learning. The results of the study obtained by Ahmad and Jingga (2017) found that teacher competence in the skills of determining teaching strategies, the skills of assessing students as well as the skills of using technology have an impact on implementing efficient mathematics learning. remotely. The teacher's ability to plan and implement mathematics learning remotely by applying the right pedagogical skills, helps students understand the content of mathematics learning well (Mihaela, 2015).

Next, the competence of mathematics teachers in having knowledge of the content of mathematics learning is also one of the factors in ensuring that the implementation of distance mathematics learning can be implemented effectively. This is because it has been proven in a study conducted by Kulgemeyer and Riese (2018) which aims to identify the effect of mathematics content knowledge on the quality of a teacher's teaching, showing that there is an influence of content knowledge capable of having an effective impact in mathematics learning. In addition, Elvyanti (2012) states that the content knowledge of mathematics teachers has an impact on student achievement during learning sessions.

Research Objective

This study focuses on the following research questions

1. What is the level of readiness of mathematics teachers in implementing distance learning?
2. What is the level of competence of mathematics teachers in implementing distance learning?
3. Is there a significant relationship between the readiness and competence of mathematics teachers in implementing distance learning?

Methodology

The research design used in this study uses a quantitative approach through survey research. The research was conducted in a secondary school located in Seremban district, Negeri Sembilan, with a total population of 245 mathematics teachers. According to the sample size determination table of Krejcie and Mogan (1970), 156 national secondary school mathematics teachers were randomly selected to participate in this study.

To assess the readiness and competence of secondary school mathematics teachers in implementing distance learning, a questionnaire adapted from Jaafar (2022); Banu (2022) was used. The questionnaire is divided into three parts, namely part A, part B, and part C. In part A, demographic information about the study respondents, including gender, age, race, teaching experience, highest level of education, and school location, is collected through six items. Part B contains 15 items related to the first research question, which aims to identify the level of readiness of secondary school mathematics teachers in implementing distance learning mathematics. Part C includes 13 items that address the second research question, which aims to identify the competence of mathematics teachers in implementing distance learning mathematics effectively. All items in sections A, B, and C are rated on a five-point Likert scale.

A pilot study was conducted with 30 mathematics teachers in the district of Kuala Pilah, Negeri Sembilan aimed at assessing the appropriateness of the questionnaire items, as well as assessing the validity and reliability of the instrument. To ensure content validity and face

validity, four experts checked the constructed items. Reliability analysis showed a Cronbach Alpha value of 0.97.

Data Analysis

After that, the collected data were analyzed using the computer software Statistical Packages of Social Sciences for Windows 27.0, enabling the generation of descriptive and inferential statistical data. By comparing the mean scores, the findings show mathematics teachers' readiness and competence level. The mean score categories were as follows: "Low" (1.00 to 2.33), "Moderate" (2.34 to 3.66), and "High" (3.67 to 5.00). Furthermore, the study uses the Pearson correlation test for inferential statistical analysis, aiming to explore the relationship between the readiness and competence of mathematics teachers regarding the implementation of distance learning.

Findings

This analysis was conducted using two main factors: the readiness and competence of secondary school mathematics teachers in the Seremban district in implementing distance learning. The information collected from the questionnaire was analyzed using descriptive statistics, which presented the mean and standard deviation. This helps assess the level of readiness and competence among mathematics teachers regarding the implementation of distance learning. In addition, the Pearson Correlation Test was used to identify any potential relationship between teacher readiness and competence in implementing distance learning for mathematics.

The Level of Mathematics Teacher Readiness

This study aims to evaluate the readiness of secondary school mathematics teachers in implementing distance learning for their subjects. The assessment takes into account several aspects, including availability and familiarity with digital devices, technology skills, distance mathematics pedagogy, learning aids, and assessment readiness. According to the findings presented in Table 1, the overall readiness level of secondary school mathematics teachers in implementing distance learning is high, with a mean score of 3.78 and a standard deviation of 0.77. However, when focusing specifically on technology skills readiness, the level is moderate, with a mean score of 3.64 and a standard deviation of 0.82.

Table 1

Distribution of Mathematics Teacher Readiness Levels

Component of Teacher's Readiness	Mean	Standard Deviation	Score Interpretation
Digital Device Readiness	3.96	0.76	High
Technology Skills Readiness	3.64	0.82	Moderate
Readiness for Distance Mathematics Pedagogy	3.68	0.81	High
Availability of Learning Aids	3.91	0.86	High
Readiness In Making Assessment	3.72	1.01	High
Total Mean	3.78	0.77	High

The Level of Mathematics Teacher Competency

An analysis was conducted to assess the competence of secondary school mathematics teachers in effectively implementing distance learning mathematics. This assessment covers

several competencies, including personal attributes, content knowledge, and pedagogical skills. The results, as presented in Table 2, reveal that the overall competency level of mathematics teachers is moderate, with a mean of 3.61 and a standard deviation of 0.81. However, when focusing on specific aspects of mathematical content knowledge, the level of competence was high, with a mean of 3.88 and a standard deviation of 0.75.

Table 2
Distribution of Mathematics Teacher Competence Levels

Component of Teacher's Competence	Mean	Standard Deviation	Score Interpretation
Teacher's Personal Competence	3.37	0.94	Moderate
Competence in Content Knowledge of Mathematics Teachers	3.88	0.75	High
Competence in Pedagogy	3.58	0.89	Moderate
Total Mean	3.61	0.81	Moderate

The Relationship between the Level of Readiness of Mathematics Teachers and the Competence of Teachers in Implementing Distance Learning Mathematics

According to the data presented in Table 3, statistical analysis using Pearson's correlation shows a significant relationship between the readiness of mathematics teachers and their competence in implementing distance learning for mathematics. This correlation is positive and robust, with a correlation coefficient value of $r=0.783$, and a significance level of $p<.05$. In simpler terms, this shows that in the studied population, there is a clear pattern: when the level of readiness among mathematics teachers increases, their competence in delivering distance learning for mathematics also increases, or vice versa, if their readiness decreases, so does their mastery in the implementation of distance learning in mathematics.

Table 3
Results of the Pearson Correlation Test for the level of readiness of mathematics teachers with teacher competence in implementing distance learning

		Mathematics Teacher Competence	
Mathematics Readiness	Teacher	Pearson Correlation	.783**
		Sig (2- end)	.000
		N	156

Discussion

The Level of Mathematics Teacher Readiness

The findings of the study show that the level of readiness of secondary school mathematics teachers in implementing distance learning is high. This is consistent with the findings of a study conducted by Jaafar (2022); Rou et al (2022) as well as Azizan and Nasri (2020) who show that the level of teacher readiness is high to implement distance learning. Of the five factors studied in determining a high level of teacher readiness, four factors show a high level, namely the first, the digital device readiness factor. According to Batan and Jamaludin (2022), teachers are more enthusiastic to implement distance learning with the availability of appropriate and easy-to-operate digital devices. Second, the readiness of distance mathematics pedagogy also reaches a high level. Students will understand easily when the

teacher can use the correct and accurate teaching approach, method, and strategy and adapt to the student's level (Ee, 2003). Readiness in providing learning aids is also a high factor. The preparation of study aids online is easier to provide than physical study aids (Mahat et al 2020). The next factor that is high is readiness in making an assessment. Maslan and Mohd Nor (2020) stated that remote assessment gives teachers the opportunity to assess students individually in more detail. While readiness in technology skills only shows at a moderate level. This is because Nasir and Mansor (2021) found that teachers need to improve their digital knowledge and skills to help deliver effective mathematics sessions. However, the findings show that secondary school mathematics teachers are ready to implement teaching and learning remotely when taking into account all the factors that have been stated.

The Level of Mathematics Teacher Competency

Next, the findings of the study show that the level of competence of secondary school mathematics teachers in implementing distance learning is moderate. This finding is consistent with the results of (Kaviza's study, 2022). However, it is contrary to the study of Banu (2022) who found that teachers achieve a high level of competence in using media as a teaching and learning medium. Studies conducted by Bakar (2022); Ong and Hamid (2023) also found that the level of competence of teachers to implement distance learning is high. Three aspects that are studied in determining the level of competence of mathematics teachers in implementing distance learning, the first is competence from the aspect of a teacher's personality. The results of the study show that teachers are less able to control and build good relationships during learning sessions. Ruslan et al (2022) found that the personality of a mathematics teacher who is attentive, friendly, caring, respectful of students and always motivated and able to control student discipline can implement effective mathematics learning. Second is the competence factor in pedagogy also at a moderate level. Ahmad (2020) found that teachers have expertise in mathematics pedagogy but have problems adapting it to distance learning that uses online technology as the main medium of knowledge delivery. While the third factor which is competence in knowledge of mathematical content shows at a high level. A study conducted by Kulgemeyer and Riese (2018) which aims to identify the effect of knowledge of mathematics content on the quality of a teacher's teaching shows that there is an influence of content knowledge capable of having an effective impact in distance learning mathematics.

The relationship between the level of readiness of mathematics teachers and the competence of teachers in implementing distance learning mathematics

Inferential analysis using the Pearson correlation test shows that there is a significant relationship between the readiness and competence of secondary school mathematics teachers in implementing distance learning. Findings show that the level of readiness of mathematics teachers has increased, and the competence of teachers in ensuring that distance learning can be implemented has also increased. The availability of digital devices, technological knowledge, the provision of learning aids, and the implementation of assessments show a positive relationship with teacher competence from the aspects of a teacher's personality, pedagogy, and knowledge of mathematical content. This is to ensure that distance learning mathematics can be implemented effectively. Teachers who are ready and have the potential to implement distance learning are more likely to invest time and effort in developing their competence in this field. Teachers will actively seek opportunities for professional development, engage in self-directed learning, and collaborate with

colleagues to improve their online teaching skills. To achieve successful distance learning outcomes in mathematics education, it is important for educational institutions and policymakers to provide adequate support and training to improve teacher readiness and competence. Offering professional development programs, technical assistance, and ongoing support can help empower math teachers to be effective facilitators of online learning, leading to better student engagement and achievement in virtual classrooms. The ministry and school leadership who care about the needs of teachers in adding knowledge and skills become the catalyst for improving the quality of teacher teaching remotely (Bahtiar et al 2020).

Conclusion

In conclusion, this study shows that the level of readiness of mathematics teachers is high to implement distance learning. However, the competence of mathematics teachers is at a moderate level and needs to be paid attention to by the relevant parties such as the Malaysian Ministry of Education. The results of the study can determine further actions that need to be implemented by the District Education Office, the State Education Department, and then the Malaysian Ministry of Education by holding professional development training specifically about distance learning mathematics to ensure that teachers are always competent and prepared with the necessary knowledge and skills. However, further research can be carried out by expanding the study population. In addition, it is possible to carry out a mixed quantitative and qualitative study by conducting an interview session to obtain broader findings.

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