

Maths Teachers' Readiness towards Digital Transformation of Education in Nabawan

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Abstract

Covid-19 pandemic has accelerated the transformation of digitizing education, especially for mathematics subjects. This transformation is important to meet the challenges of Industrial Revolution 4.0 and produce a generation that can compete globally. This desire is in line with Shift 7 in the Malaysian Education Development Plan (PPPM 2013-2025) which is to utilize ICT to improve the quality of learning in Malaysia. However, previous studies have found that teachers' readiness is at a moderate level for implementing the teaching and learning of 21st Century mathematics. This study was conducted to examine the level of readiness of mathematics teachers towards the digital transformation of education in teaching and learning, especially in rural schools within Nabawan, Sabah and to identify if there is a difference in the level of teacher readiness based on gender. This study uses a survey research design using a quantitative questionnaire instrument distributed through Google Form. A total of 76 study respondents, consisting of 39 male teachers and 37 female teachers who taught mathematics subjects in primary school, were randomly selected. The results of a descriptive test using the Statistical Package for Social Science (SPSS) software found that the level of teacher readiness was at a high level, with a mean of 3.88. The results of the t-test show that there is no difference in the level of teacher readiness based on gender. Therefore, this study is expected to provide information to the Ministry of Education to help teachers especially in rural schools and face the digital transformation of education.

Keywords: Digitalize Education, Mathematics, Readiness, Transformation, Primary School

Introduction

Industrial revolution 4.0 (IR 4.0) brings a great influence on all the system in a country including the education system. This technological revolution demands that schools prepare students to face the challenges of the digital era and produce students who can compete globally. This desire is in line with Shift 7 in the Malaysian Education Development Plan (PPPM 2013-2025) which is to utilize ICT to improve the quality of learning in Malaysia. To face the challenges of IR 4.0, educators need to be prepared to face changes to ensure that the field of education does not fall behind the modernity of the digital system (Haslin & Hamzah, 2023)

The pandemic opened the eyes of educators when the readiness of teachers was challenged in the face of changing learning norms from face-to-face to online. The lack of teacher readiness during home-based teaching and learning (PdPR) opened the eyes of

various parties to find a solution (Ab Aziz & Maat, 2021). The results of the Ling & Suziyani (2022), found that the level of teacher readiness was at a moderate level during online learning. Nagaretnam & Mahmud (2022), found that the readiness of mathematics teachers is still at a moderate level. Teachers are said to be unprepared when they do not have the knowledge and skills to implement digital in teaching and learning practice.

A study found that almost only 20% of teachers use online digital learning while 70% of 165 teachers do not use digital equipment (König et al., 2020). This finding shows that teachers do not fully use digital facilities in teaching and learning practice due to the lack of preparedness of teachers towards the implementation of digital. The negative attitude of teachers towards the development of educational technology causes teachers to be less prepared in implementing digital education in teaching and learning practice.

Research findings from past researchers show that there are several constraints and challenges faced by teachers in implementing digital teaching and learning practices. The lack of access to the internet and electronic devices as well as the lack of cooperation from parents are constraints in implementing digitization in mathematics education (Idawarna et al., 2022). While the study of Rani & Yusoff (2019), stated that poor infrastructure facilities and technological constraints are among the factors that influence the readiness of primary school mathematics teachers in integrating the use of technology in teaching and learning practice.

Therefore, this study aims to examine the level of readiness of mathematics teachers towards the transformation of digital education, especially in the interior of Sabah. The research findings obtained can be used as added value and reference to the Malaysian Ministry of Education (KPM) for the development of teacher professionalism and to ensure that schools in rural district not being left behind in the current of educational modernization. The findings of this study are also for mathematics teachers to respond towards the challenge of globalization of education in producing a generation that is not only ICT literate but creative and innovative in line with IR 4.0.

Literature Review

Digitization of education is an effort undertaken by the government to transform the country towards future development in line with the development of education towards the era of technology globally. This is in line with the Malaysian Education Development Plan (PPPM) 2013-2025 in the first and sixth shifts, which is to provide equal access to international quality education and utilize information and communication technology (ICT) to improve the quality of learning in Malaysia.

A survey study conducted by Borba et al (2016), identify recent studies involving digital technology in mathematics education over a decade. The findings of the study found that digital technology in mathematics education shows a good future in helping mathematics learning. However, there are issues raised by researchers stating that the use of technology has not been fully accepted by teachers because it can interfere with the learning interaction between teachers and students. This study shows that mathematics teachers are still comfortable with the traditional approach even though the development of technology in mathematics education is increasing.

The pandemic has given mathematics teachers the opportunity to change traditional practices and beliefs to the use of digital technology in the teaching and learning practice (Nazri & Azhar, 2022). Teachers who were initially comfortable with only using paper and pen in teaching and learning mathematics are now starting to use digital platforms to carry out teaching and learning activities. A study from (Hajis et al., 2022), found that mathematics

teachers use *Google* and *Telegram* applications a lot as an integration practice during teaching and learning from home (PdPR) while *YouTube* and *Facebook* as digital teaching materials, *Quizziz* and *Booklet* for digital game-based learning.

Teachers' readiness to apply the digitization of mathematics education improves the quality of student learning. The use of technology in teaching and learning practice requires teachers to constantly try to explore various skills as an effort to meet changes in the education system and the learning needs of students (Hajis et al., 2022). Norfaizah & Mahizer (2019), stated that there is a significant relationship between the level of teacher readiness and the teacher's skills in digital technology to implement 21st century learning among primary school mathematics teachers. Through developments in digital education technology, teachers must indirectly have high knowledge and skills in the use of digital technology for positive learning (Agir & Matore, 2022). Apart from that, digital communication skills and information technology are an important element in teachers' readiness to implement online teaching and learning practice (Izzat, 2021)

Kanafadzi & Jamaludin (2021) categorize teachers' attitudes towards reforms consist of teachers' knowledge about certain reforms, personal responses to changes, and attitudes towards reforms. The attitude of teachers who look positively towards changes in the digitization of education shows the readiness of teachers to adapt the use of digital technology in teaching and learning practice. Apart from that, motivation also affects teachers' readiness to use digital teaching aids for mathematics based on a study carry by (Kolin & Siew, 2023). Teachers who are motivated will usually work harder to achieve progress and excellence in their teaching to produce a generation that will meet the country's educational aspirations.

Apart from that, digital devices and materials as well as internet networks are also one of the aspects affecting teachers' readiness in implementing the digitization of mathematics education. Rani & Yusoff (2019) stated that the technological infrastructure facilities and weak internet networks affect the integration of ICT in teaching and learning practice. Furthermore, the absence of devices and a poor internet network is a challenge for mathematics teachers in rural schools to deliver online teaching and learning (Izzat, 2021). Therefore, the lack of infrastructure facilities and the internet network to some extent can affect the readiness of teachers.

A study related to the readiness of teachers to implement digital curriculum in Kuwaiti schools conducted by Al-Awidi & Aldhafeeri (2017), showed a moderate level of readiness in terms of technology pedagogy and technology skills in implementing digital curriculum. This study involving 532 teachers shows that there are several factors that hinder teachers' readiness in implementing digital curriculum, namely obstacles in terms of time, knowledge and skills, infrastructure, and technical support.

While the study of Norfaizah & Mahizer (2019), related to the readiness of mathematics teachers in implementing 21st century learning shows that teaching and learning practice based on 21st century learning needs to be increased from time to time. This study involves 200 teachers in the Kuala Langat district. The findings of the study found that the ICT skill level of mathematics teachers in implementing 21st century learning was at a moderate level. The same study was conducted by Mohamed Faisal & Adnan (2021) to examine the level of readiness and acceptance of teachers in practicing the use of IR 4.0 technology as a teaching aid in education.

Research Question

1. What is the level of readiness of primary school mathematics teachers towards the implementation of digitization of education in teaching and learning practice?
2. Is there a difference in the level of readiness of primary school mathematics teachers towards the implementation of digitalization of education in teaching and learning practice based on gender?

Methodology

This quantitative study uses a survey design conducted specifically for rural schools in Nabawan. Survey research is a form of research that is used to examine the level of readiness and in the implementation of educational digitization (Haslin & Hamzah, 2023). This survey aims to identify the level of readiness of mathematics teachers and differences in the level of readiness based on gender towards the implementation of digitalization of education in teaching and learning practice in rural schools in Nabawan.

This study uses quantitative data collection by using questionnaires. The respondents of this study consist of primary school mathematics teachers who teach in rural schools consisting of four categories which are 10%, Interior 1, Interior 2 and also Interior 3. The selection of this population is because schools in the rural district of Nabawan being one of the farthest schools to be entered by teachers and make it difficult to develop infrastructure based on technology digital. In addition, the mathematics achievement in UASA (Ujian Akhir Sesi Akademik) for the primary schools in Nabawan for 2022 and 2023 sessions (sources from PPD Pensiangan) shows an unimpressive result where a total of 688 students consisting of years 4, 5 and 6 got TP2 and TP1 which were the lowest out of the 6-mastery level given in the classroom-based Assessment (PBD).

This study uses a questionnaire instrument that has been adapted from (Faisal & Adnan, 2021). This teacher readiness level instrument is used to measure the level of readiness of mathematics teachers towards the implementation of educational digitization transformation in teaching and learning. The selection of this questionnaire instrument is due to RI 4.0 technology as a teaching aid closely related to the transformation of educational digitalization in mathematics education. This study also maintains the semantic scale of the five-point score (1= Strongly Disagree to 5=Strongly Agree) according to the original questionnaire.

The face validity and content validity of this research instrument was done by three experts in the field of mathematics. A pilot study using an instrument that has been modified and reviewed by experts was conducted on 30 primary school mathematics teachers in Lahad Datu, Sabah. The criteria for selecting the respondents of this pilot study were the same as the respondents for the actual study, which was based on their demography and included in the category of rural school areas which are categorized based on hardship allowance of the teachers (10%, rural 1, 2 and 3). The results of this pilot study show that the Cronbach's Alpha coefficient is at a value of more than 0.7 and is considered satisfactory.

This study uses descriptive and inferential statistics through the Statistical Package for the Social Sciences (SPSS) software version 29. Descriptive analysis is recorded in the form of mean, frequency and percentage to answer research question 1 while inferential analysis (independent t-test) is used to answer the research question 2. Table 1 is a mean interpretation of five points (Pallant, 2016).

Table 1
Interpretation of the mean readiness score

| Mean Skor | Interpretation |
|-----------------|----------------|
| 1.00 until 2.33 | Low |
| 2.34 until 3.67 | Medium |
| 3.68 until 5.00 | High |

Research Findings

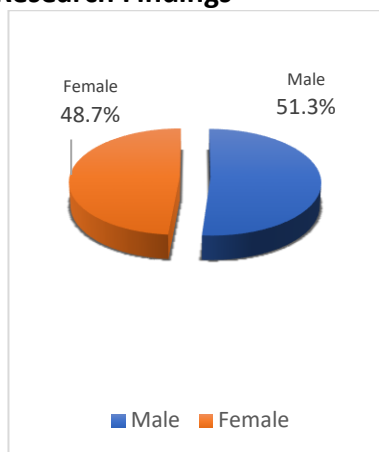


Figure 1: Gender

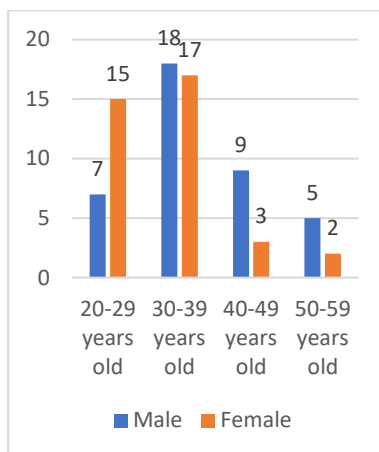


Figure 2: Age

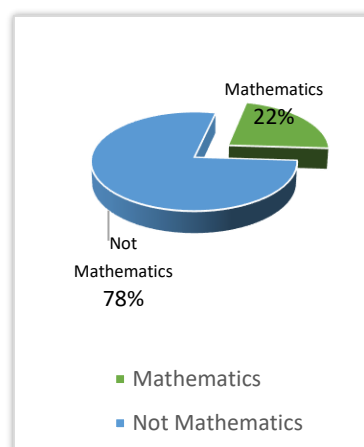


Figure 3: Option

A total of 76 mathematics teachers from primary schools in Nabawan district, Sabah participated in this study. This survey was carried out from August to October 2023. Details of the respondent's profile involving gender, age and options are included in Figures 1, 2 and 3. A total of 39 (51.3%) male teachers dominated this study compared to 37 (48.7%) female teachers.

Level of Teacher Readiness

Table 2 shows the mean score for teachers' readiness for the implementation of digitalization of education among primary school mathematics teachers is at a high, low, medium level. 10 of the 14 items given show a mean at a high level while 3 items at a moderate level. Of the 14 items, there is only 1 item that is at a low level, which is that "I am worried about practicing the use of digital technology as a new approach to teaching mathematics" (Mean = 2.67). 3 out of 10 items that show the highest mean readiness (Mean = 4.32) which is item 1 "I understand the meaning of digitization of mathematics education", item 9 "students should be encouraged to use digital materials actively in class" and item 12 "I am ready to follow a course that can increasing my skills related to digitization specifically for mathematics subjects". Overall, the mean level of readiness of mathematics teachers towards the implementation of digitization of education in teaching and learning in schools in Nabawan is at a high level with a mean score 3.88 and standard deviation 0.373.

Table 2

Descriptive analysis of the construct of mathematics teachers' readiness for the implementation of digitalization of education in teaching and learning.

| No | Questions | Mean | Mean Score Level |
|-----|---|-------------|------------------|
| 1. | I understand the meaning of digitization of mathematics education. | 4.32 | High |
| 2. | I am ready to implement digitization in mathematics education. | 3.78 | High |
| 3. | I am ready to give students the opportunity to participate and contribute to the success of learning objectives using digital. | 4.01 | High |
| 4. | I think the lecture method is sufficient for elementary students. | 2.71 | Medium |
| 5. | I am willing to try new activities using digital as an approach in my PdPc. | 4.25 | High |
| 6. | I am worried about practicing the use of digital technology as a new approach to teaching mathematics. | 2.67 | Medium |
| 7. | I look for opportunities to apply digital materials that are suitable for mathematics subjects. | 4.08 | High |
| 8. | The use of digital technology is less suitable for use in mathematics subjects. | 2.11 | Low |
| 9. | Students should be encouraged to actively use digital materials in class. | 4.32 | High |
| 10. | I am comfortable with a non-digital teaching approach. | 3.11 | Medium |
| 11. | I am always looking for space and opportunities to strengthen the PdPc implementation method for my class with the help of digital materials. | 4.18 | High |
| 12. | I am willing to follow a course that can increase my skills related to digitization specifically for mathematics subjects. | 4.32 | High |
| 13. | I am willing to spend more time to follow collaboration activities using digital with the students. | 4.20 | High |
| 14. | I don't mind using a non-digital teaching approach as long as the students can follow and understand what is being said. | 4.01 | High |
| | Total mean | 3.88 | High |

The Level of Mathematics Teacher Readiness Based on Gender

An independent t-test was conducted using the SPSS 29 version program to see the difference in the readiness of mathematics teachers towards the implementation of educational digitization based on gender, male and female teachers. The results of the t-test conducted are included in table 3. The results show that the mean readiness of males is higher than females which is 3.95 compared to 3.80. However, the value of $P = 0.837$ which is not

significant at $P > 0.05$ shows that there is no difference in the readiness to implement the digitization of education in the teaching and learning of mathematics between male and female teachers.

Table 3

Results of the t-test for the difference in readiness between male and female teachers towards the implementation of digitalization of education in mathematics teaching and learning

| | Male Mean (SD) | Female Mean (SD) | t-value | Significant |
|-----------|-------------------|---------------------|---------|-------------|
| Readiness | 3.95 (0.37) | 3.80 (0.36) | 1.769 | 0.837 |

Discussion

Table 3: Results of the t-test for the difference in readiness between male and female teachers towards the implementation of digitalization of education in teaching and learning mathematics. The results of the study found that the level of readiness of mathematics teachers towards the implementation of digitalization of education in teaching and learning practice, especially in rural schools within Nabawan, is at a high level. This is because mathematics teachers in Nabawan rural schools have a high awareness the importance of digitization in the education system, especially for mathematics subjects in. This is in line with the findings of a study by Faisal & Adnan (2021), who found that mathematics teachers in rural areas have a high level of readiness to practice IR 4.0 digital technology as a teaching aid. Mathematics teachers in rural schools in Nabawan show a high readiness to accept the transformational changes in education that are increasingly moving towards digital. Teachers are looking forward for opportunities to strengthen their teaching and learning methods with the help of digital materials.

The high readiness of teachers towards the implementation of digitization of education is a post-pandemic effect of Covid-19 that occurred in 2021 where all sectors including the education sector were closed to prevent the spread of Covid-19. The sudden closure of the education sector came as surprise to all school members including teachers and students. Before the pandemic happened, teachers felt that the use of ICT in teaching and learning practice was limited due to the level of teachers' skills which were at a moderate level and still left behind in terms of ICT application (Norfaizah & Mahizer, 2019). Therefore, it is not surprising if teachers and students face difficulties in implementing virtual teaching and learning during the pandemic. However, the pandemic has opened spaces for the digital transformation of education, especially in rural schools in Nabawan. A study from the Ministry of Education (2023), shows that the experience of teaching and learning from home has provided opportunities in increasing the use of digital technology for teachers and students. Despite facing constraints in terms of less facilities and unstable internet access, this does not prevent teachers from implementing digital teaching and learning of mathematics. Mathematics teachers in rural schools in Nabawan are always looking for opportunities and other alternatives to encourage students to actively use digital materials in class so that they do not fall behind with the current of technological development.

In addition, the study found that there was no significant difference between male and female teachers for the level of readiness for the implementation of digitalization of education in teaching and learning mathematics. This study shows that the readiness of teachers in implementing the digitization of education is not influenced by gender. The findings of this study are in line with the findings of a study conducted by Ab Aziz & Maat

(2021), which there in no difference in teachers' readiness to integrate technology between male and female teachers. This may be due to teachers in Nabawan receiving the same exposure from the school, PPD and JPN in following the development of educational technology. Male and female teachers receive equal opportunities in improving their knowledge related to educational technology to face the challenges of changes in education that are moving towards digital. This change does not consider gender aspects because an individual's knowledge does not depend on the individual's gender (Poobalan & Mahmud, 2022).

Apart from that, teachers who teaches in these rural schools show the same interest and motivation from male and female teachers in implementing digitalization of education in teaching and learning. These rural schools from Interior 1 to 3 and 10% are schools that categorized based on difficulties in terms of school transport where 70% of rural schools in Nabawan use four-wheel cars or boats to enter the school area. Therefore, the development in terms of educational technology and infrastructure facilities is quite behind compared to schools in the city or the countryside. However, the readiness shown by the teachers who teach in these rural schools shows their determination to ensure that students in these rural areas are not left behind in receiving the digital transformation of education. Teachers who are highly motivated will usually act diligently to achieve progress and excellence in their teaching as well as produce a generation that meets the national educational aspirations (Kolin & Siew, 2023)

Conclusion

Overall, the findings of this study can be used as a guide for teachers in rural schools to not miss out and always up to date with the development of digitization of education, especially for mathematics subjects and use it as a new teaching practice. Through the digital transformation of education, teachers have wide access to improve their knowledge and skills that match the needs and development of students at school. Mathematics teachers also need to master the skills of handling technology and the best way to integrate this is in teaching and learning so that the teaching and learning of mathematics subjects is more effective (Nagaretnam & Mahmud, 2022). The use of digital in the teaching practice of teachers can help to create meaningful learning that is more interactive and attracts students to learn. A study by Faisal & Adnan (2021), shows that teachers agree that by practicing the use of IR 4.0 digital technology as a teaching aid in education can further increase the students' IQ level. Therefore, the relevant parties should take drastic action in helping teachers to prepare in the face of new educational norms that are moving towards digital. Support from PPD (Pejabat Pendidikan Daerah) and JPN (Jabatan Pendidikan Negeri) will bridge the gap between teachers who are less prepared for the implementation of digitization of education in mathematics teaching and learning.

Development of educational digital technology that is increasingly becoming a focus in the world of education in line with IR 4.0 requires teachers to always follow developments and update existing knowledge related to digitization in education. The suggestions and details presented can be used as a guide and reference for conducting progressive studies in the future. It is hoped that future studies will examine in more detail the readiness of teachers in terms of infrastructure to face the digital transformation of education specifically for teachers who teach in rural schools (interior 1, 2, 3 and 10%) based on the hardship allowance given to teachers. It is also hoped that the criteria for the selection of study respondents can

be expanded by involving mathematics teachers from rural schools throughout Malaysia so that the results of this study can be generalized specifically for teachers who teach in rural schools. Apart from that, a comparative study between the readiness of primary and secondary school mathematics teachers in rural areas is suggested to ensure that the transformation of digitization continues up to secondary school.

The results of this study show that primary school mathematics teachers, especially teachers who teach in rural schools in Nabawan, show a high readiness in accepting digitalization transformation in education and ready to apply it in teaching and learning practice. It is the teacher's responsibility to be an agent of change and bring about change in education in their respective schools. The readiness of teachers in the digital transformation of education can reduce the gap between urban schools and rural schools. Apart from that, the findings of this study also show that an individual's gender does not affect a person's readiness to face changes and challenges, especially in the world of digitalization of education. Teachers who receive adequate training and support in the integration of technology in the teaching and learning of mathematics will be prepared to accept the transformation in the digitization of education. Support from all parties, especially the MoE and JPN, is important to provide opportunities for all teachers to develop technology skills in line with the development of educational technology. The increasing interest among teachers in the use of digital in teaching and learning mathematics indicates a change in the learning culture in the world of education towards digitalization.

Apart from that, this study adds value to Gagne's Instructional Theory (1985) in helping teachers to be ready in transformation of educational. Gagne's Instructional Theory provide a guide for teachers to plan and deliver effective and interesting lessons with the use of digital technology. Although previous studies show that teachers' readiness is at a moderate level, the results of this study show encouraging results even though teachers in these rural schools facing constraints in terms of infrastructure facilities and internet facilities. This study can also add value to Rogers' Diffusion of Innovation theory (1983) to help the Ministry of Education and NGOs (Non-Government Organization) to help make the transformation of digital education a success by considering the needs and readiness of teachers in the digitization of education. These theories provide insights into how new ideas, products, or technologies spread within a society or social system. Therefore, the conceptual framework of this study can be used and improved by focusing in more detail on the skills of teachers in digital innovation for teaching and learning mathematics for the next study.

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