# MEASURING PRACTICE OF DIGITAL WISDOM IN THE CLASSROOM

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## ABSTRACT

*A study on the digital wisdom of primary school teachers in Penang, Malaysia was conducted with 372 participants. A research questionnaire was used to collect data, and the findings suggest that most teachers moderately practice digital wisdom in their classrooms. The study also found that digital status has a significant but weak relationship with digital wisdom, while age has a significant and moderate relationship with it. However, there is no significant relationship between school location and gender with the practice of digital wisdom. Experience has a significant and moderate relationship with digital wisdom, while education level has no relationship. Overall, the results provide insights into teachers' digital wisdom levels and how they relate to demographic profiles.*

**Keywords:** *digital wisdom, instructional technology, teachers' technological integration, instructional technology, demographic profiles*

## INTRODUCTION

The growing trend in utilizing digital technology in schools has transformed the way teachers teach. The teacher-centered approach in teaching and learning has shifted to a student-centered approach. Along with this shift, the role of teachers has also changed. Teachers now play important roles in the classroom, and they need to carry out difficult tasks and perform various responsibilities. They also have to constantly change roles, update their pedagogical approach, and master the digital skills needed to keep themselves relevant to innovations in education (Mamat et al., 2020). Prensky (2014) asserted that current students need a curriculum based on requirements that allow them to be successful in the future. A curriculum intended for an earlier time would not be able to provide the necessary skills for the "real future." In such circumstances, teachers or educators must harness digital wisdom related to their teaching and learning practices to explore new pedagogical approaches that would benefit their students in the future.

The term digital wisdom was first used by Marc Prensky in 2009. Prensky (2009a) defined it as a twofold concept that refers to wisdom emerging from the use of digital technology to access cognitive power beyond our innate capacity, and wisdom in the prudent use of technology to enhance our capabilities. Research on digital wisdom is crucial in education because of the growing integration of technology in the learning process. Targeted professional development programs can be developed to improve digital wisdom in teachers. This study examines the level of digital wisdom practice among primary school teachers in Malaysia, as well as the relationship between the demographic variables of digital status (digital native or digital immigrant), age, location of the school (urban or rural), and the teacher's gender, experience, and education level to their practice of digital wisdom in the classroom.

### *Objectives And Research Questions Of The Study*

The objectives of this study were to explore teachers' practice of digital wisdom in Malaysian primary school and to study how the demographic variables of

**a.** digital status
**b.** age

**c.** location
**d.** gender
**e.** teaching experience
**f.** education level relate to the digital wisdom of primary school teachers.

There are seven research questions in this study. The questions formulated for this study were:

RQ1: What is the level of primary school teachers' practice of digital wisdom in the classroom?

RQ2: Is there a relationship between the teachers' practice of digital wisdom and digital status?

RQ3: Is there a relationship between the teachers' practice of digital wisdom and age?

RQ4: Is there a relationship between the teachers' practice of digital wisdom and location of the school?

RQ5: Is there a relationship between the teachers' practice of digital wisdom and gender?

RQ6: Is there a relationship between the teachers' practice of digital wisdom and teaching experience?

RQ7: Is there a relationship between the teachers' practice of digital wisdom and education level?

## LITERATURE REVIEW

*Wisdom to Digital Wisdom*

The need for people with wisdom to come together and discuss, compare, judge, and evaluate ideologies remains important in shaping a more informed society. With the advancement of digital technology, the means of facilitating such discussions have become more sophisticated and accessible. Guliciuc (2013) observed that from human wisdom, we have moved towards human digital wisdom—a symbiotic, nongeneric, and un-unitary form of wisdom. The perspectives and expectations in our education system have also undergone transformation due to the changes digital technologies have produced in learning practices. Therefore, teachers must guide their students, who are digital natives, to be digitally wise as technology is a big part of their lives and will continue to evolve over time. Apart from emphasizing the importance of the technical mastery of digital technologies, Prensky's term of digital wisdom shows that competence alone is not sufficient for one to thrive in the digital age (citation?). Digital wisdom involves making informed decisions, using technology responsibly, and adapting to the constantly evolving digital landscape (Paulus et al., 2019; Prensky, 2012b).

Garba et al. (2015) stated that Malaysia has become one of the countries making progress in education by implementing 21st century teaching and learning guidelines in its education policy. The Malaysian Ministry of Education has introduced the 1BestariNet project in collaboration with YTL Communications to provide 10,000 schools with 4G high-speed internet access and virtual learning programs to improve the quality of teaching and learning. Policy makers have made efforts to integrate technology into education, and teachers and educators should embrace the use of technology and adopt a digital mindset to adapt to the current environment. They should be able to combine technology with better pedagogy to produce the best approach for their students (Prensky, 2012a).

*Importance of Digital Wisdom among Educators*

Digital wisdom generally refers to using technology, especially new ones, to improve our minds, which makes us better thinkers who make wiser decisions and choices. In the context of education, educators harness digital wisdom when they do the following (Prensky, 2012a):

- play the role of guide, context provider, and quality controller in the classroom to facilitate learning;
- choose digital tools purposefully by aligning them with learning objectives and learner's' expectations;
    - **a.** encourage students to use digital tools to be creative and experiment with new technologies and ideas;
    - **b.** encourage learners to use digital technology wisely by modeling appropriate online behavior, encouraging critical thinking skills, and promoting ethical and safe online practices;
    - **c.** encourage collaborative learning and communication by using digital tools to facilitate group projects,

discussions, and idea-sharing among students,

**d.** stay updated with new technology and actively learn to utilize it to measure student learning and progress, provide feedback to students, track their progress, and personalize their learning experience; and

**e.** use digital tools to adapt and cater to different learning styles, including visual, auditory, and kinesthetic, by providing options for digital content such as videos, podcasts, and interactive games.

Leow et al. (2016) noted that effective learning is not solely ensured by the incorporation of digital learning technologies; it also involves improving students' social interaction and motivation. Similarly, the mere inclusion of technology in a lesson does not necessarily indicate a teacher's willingness to do so. Blau et al. (2016) highlighted that teachers who are not digital natives may still be in the initial stages of developing their digital wisdom, leading them to rely on technical interactivity and potentially limiting their focus on promoting technology among their students. Both studies imply that teaching strategies that emphasize technical interactivity can be particularly impactful in encouraging students to utilize digital technology for accessing, processing, and presenting educational content and information.

Kai Wen and Tan (2020) observed that many online platforms were created to facilitate students' learning. Therefore, teachers will need to upgrade their technical skills, which involve uploading materials or assignments and organizing resources among teachers and students. Although the availability of various platforms encourages educators to integrate technology in the classroom, they are still skeptical of its active utilization and its outcome in the classroom (Ishak et al., 2022). The technological readiness of the teachers is also a concern. Teachers have been found to be unprepared to utilize digital technology in the classroom due to a lack of skills and the need for more time to create teaching materials (Abdul Razak, et al., 2018).

Furthermore, harnessing a new pedagogical approach leads to extra workloads for teachers. Without technical knowledge to make use of virtual platforms, it can be challenging and time-consuming for teachers to prepare lessons and upload them to a digital platform (Adnan, 2020). Garba et al. (2015) stated that there are even cases of teachers requesting to be transferred from smart schools as they could not cope with the active utilization of technology in their profession. These setbacks can be resolved if teachers are willing to explore and embrace digital technology, as it can help them make informed decisions on how to incorporate technology into their teaching and learning environment. Teachers who lack digital wisdom may miss out on the many benefits that digital technology can offer for both students and teachers, which can negatively impact the learning experience and outcomes. This can lead to a missed opportunity for teachers to improve student engagement, collaboration, and access to resources.

Puttick et al. (2015) stated that when digital technology is embedded into a curriculum, teachers' roles in the classroom may become unclear. This is because digital technology can become an alternative source of authority in the classroom, and the teachers may no longer be in control of the instruction. They may even become alienated from their learners. This situation could be due to teachers who lack self-confidence and feel anxious around technology. According to Zhao and Bryant (2006), the possibility of facing failures can prevent teachers from implementing new technology in their lessons, because they may not want to go through emotional distress such as embarrassment and frustration. These insecurities in teachers must be quickly addressed. Harnessing digital wisdom would allow a teacher to overcome their fear in order to accommodate their students' learning and provide them with meaningful learning experiences. To harness digital wisdom, educators must address the digital divide and find innovative ways to facilitate effective learning for students from all socioeconomic backgrounds. It's crucial to eliminate any barriers that hinder students from accessing and utilizing digital resources (Prensky, 2009a).

### *Enhancing Students' Learning through Digital Wisdom*

Yieng and Saat (2013) insisted that Malaysian teachers need to move away from Confucian education culture, where a greater proportion of learning

is centered on textbooks and memorizing facts. Digital natives, who are accustomed to using multimedia sources and prefer visual and audio tools over text-based sources, require a different approach to learning (Zenios & Ioannou, 2018). Teachers can promote problem solving and inquiry-based learning by adopting digital wisdom, which enables students to collaborate and test their ideas in a supportive environment (Prensky, 2012b). To achieve this goal, teachers must acquire the skills and knowledge necessary to meet the diverse needs of their students.

Azidah Abu Ziden et al. (2011) conducted a study of Year 4 students in Malaysian primary schools, which found that the use of Information and Communication Technology (ICT) in teaching and learning was positively correlated with students' academic achievements. The study concluded that academic achievements increased when ICT was used in lessons, while they decreased in non–ICT-based lessons. Therefore, to enhance students' academic performance, teachers should prioritize the incorporation of digital technology in their lessons. However, Prensky (2012b) cautioned that students may not be inherently digitally wise, despite being born in the digital age. Therefore, teachers must first acquire digital wisdom to encourage their students to develop it as they grow in the 21st century world. Digital wisdom entails making wiser decisions, enhanced by technology, rather than simply being proficient in technology use. Teachers can identify suitable platforms for their students' learning by exploring the learning opportunities offered through digital technology (Prensky, 2009b).

Digital wisdom is required to enable one to figure out a better learning approach to cater to today's and tomorrow's children (Prensky, 2012c). In that regard, today's teachers need to find ways to produce 21st century citizens who have high digital skills. Teachers need to engage their students in their learning by talking less and avoiding spoon-feeding information. They are encouraged to utilize digital tools and resources to explore ideas and strategies that support the digital skills and expectations of their students. Prensky (2009a) argued in his article that a person who is considered wise but lacks technological proficiency will be unable to utilize the tools of wisdom that are available to a less wise but digitally competent person.

Empirical studies that focus solely on digital wisdom and its role in teaching and learning are scarce. Therefore, more research is needed to understand its impact and contribution in the field of education. Many students are digital natives, as they are surrounded by technology and expect to use it in their learning. Harnessing digital wisdom allows teachers to better meet the needs of such students. The use of terms such as "digital natives" and "digital immigrants" may not be well-received by some researchers. However, these terms are useful in the field of social science (Palfrey & Gasser, 2011). A digital native refers to a person who was born into a world where digital technologies were already present and has grown up using them as part of their daily life. On the other hand, a digital immigrant refers to a person who was born before the advent of digital technologies and has had to adapt to using them later in life. Using these terms in this study, we observe how the difference in the way that teachers of different ages and generations interact with technology correlates with the practice of digital wisdom. Further studies in digital wisdom will also uncover the potential benefits and challenges of using technology in the classroom. Teachers can learn how to effectively integrate technology into their instruction using methods that enhance students' learning and achievement.

## METHODOLOGY

This is a quantitative research study in which we measure the degree of relationship between two or more variables through a correlational study. Creswell (2013) stated that associations show whether these variables are related to one another, or if one can predict another. In this study, a correlational design is used to research the teachers' practice of digital wisdom and its relationship with selected demographic variables. Variables in this study include age, teaching experience, gender, digital status (digital immigrant or digital native), and the location of the school. Descriptive and correlational analyses were used to study the level and relationship between the teachers' practice of digital wisdom and the demographic variables in this research. We did not manipulate any of these variables.

### *Research Instruments*

The study used a questionnaire that consisted of two parts. Section one was background information. The second section was divided into six dimensions: (a) analysis of learners, (b) stating

standards and objectives, (c) selection of methods and digital tools, (d) utilization of media and digital tools, (e) requiring learners' participation, and (f) evaluation of digital tools. A four-point Likert-type scale was used (4 = *Strongly Agree*, 3 = *Agree*, 2 = *Disagree*, 1 = *Strongly Disagree*) to categorize the teachers' responses. (The questionnaire is shown in the Appendix.)

Initially, there were 63 items related to the dimensions in the instrument. The questionnaire for data collection was presented to three field experts. They were instructed to assess the items' relevance, clarity, simplicity, and ambiguity on an ordinal Likert scale of four. As a result, 16 items were modified based on their opinions. Later, the instrument was administered as a pilot study on 30 teachers, and the data were collected with the help of the administrators from the selected schools. The scale items were reduced to 38 after the Exploratory Factor Analysis (EFA). The reliability values in all the dimensions of the instrument were within the acceptable Cronbach alpha values, which are higher than 0.6, indicating an acceptable internal consistency (see Table 1). According to Hinton (2014), a Cronbach alpha of 0.6 or higher is sufficient for construct reliability and the values obtained for the instrument were higher than this threshold. This means that the instrument is reliable and can be used to evaluate teachers' practice of digital wisdom in the classroom.

*Table 1.*
*Summary of Cronbach Alpha Value of the Dimensions in the Instrument*

| Dimensions | Cronbach Alpha Value |
|---|---|
| Analysis of Learners involving Digital Technologies | *.90* |
| Stating Standards and Objectives for Instructions using Digital Technologies. | *.88* |
| Selection of Methods and Digital Tools for Instruction | *.86* |
| Utilization of Media and Digital Tools | *.77* |
| Requiring Learners' Participation Involving digital technologies | *.64* |
| Evaluation of Digital Tools in Instructions | *.88* |

### *Population and Sample of Study*

Teachers from primary school were randomly selected to avoid selection bias. According to Dattalo (2009), random sampling helps to minimize sampling bias. Furthermore, random sampling also enables the approximation of results that would be obtained from studying an entire population. Therefore, a random sampling method was used to select the participants of this study. The population of primary school teachers in the state of Penang, Malaysia was 10,920. Data screening was carried out to ensure the integrity of the data, and 372 samples were selected for this study. Descriptive data analysis was carried out to identify the level of teachers' practice of digital wisdom in the classroom. Correlational analysis between the variables and the teachers' practice of digital wisdom was carried out using the guidelines recommended by Bartlett et al. (2001). The following are the calculation methods used for continuous data and categorical data of the study:

### *Continuous Data*

$$no = \frac{(t)^2 \times (s)^2}{(d)^2}$$

$$= \frac{(1.96)^2 \times (0.67)^2}{(4x03)^2}$$

$$= \frac{4 \times 0.4489}{0.0144}$$

$$= 124.70$$

$$= 125$$

t = value for selected alpha level of .025 in each tail = 1.96

s = estimate of variance deviation for 7 point scale divided by 6 (number of standard deviations that include almost all [approximately 98%] of the possible values in the range).

d = acceptable margin of error; points on primary scale = 4; acceptable margin of error = .03 (error researcher is willing to except).

### *Categorical Data*

$$n_1 = \frac{n_0}{1 + n_0/population}$$

$$= \frac{384}{1+384/10920}$$

$$= 370.9$$

$$= 371$$

Population size = 10920

$n_0$ = required return sample size according to Cochran's formula = 384

### *Demographic Profile*

This study was conducted among primary school teachers in Penang, Malaysia. A total of 19 schools were randomly selected for the study, with 12 schools in rural districts and seven schools in urban districts. The list of schools was requested from the State Education Department. The schools were selected from the list using a mobile

application called Random Generator to avoid selection bias.

A total of 372 responses were obtained, of which 98 (26.3%) were male and 274 (73.7%) were female. In terms of age, 113 (30.4%) of the responses were from individuals between 25 to 34 years old, while 133 (35.8%) were between 35 to 44 years old, another 98 (26.3%) were between 45 and 54 years old, and the remaining 28 (7.5%) were older than 55 years.

Regarding teaching experience, 48 (12.9%) teachers had less than 5 years' experience, 172 (46.2%) had between 6 and 15 years of experience, 93 (25.2%) had 16 to 25 years of experience, and the remaining 59 (15.9%) had more than 26 years of experience. Of the teachers involved in this study, 163 (43.8%) were from urban schools and 209 (56.2%) were from rural schools. In terms of teachers' digital status, 113 (30.4%) were digital natives and 259 (69.6%) were digital immigrants.

Data on teachers' education level were also collected, showing that 22 (5.9%) teachers had certificates in teaching, 32 (8.6%) had a Diploma, while 278 (74.7%) teachers possessed a Bachelor's degree in education, 39 (10.5%) had a Master's degree, and 1 (0.3%) had a PhD. Table 2 shows the demographic distribution of the respondents in the study.

*Table 2.*
*Demographic Distribution of Study Sample*

| Demographic Variable | Group | Quantity | % |
|---|---|---|---|
| *Gender* | *Male* | *98* | *26.3* |
| | *Female* | *274* | *73.7* |
| | *Total* | *372* | *100* |
| *Age* | *25–34* | *113* | *30.4* |
| | *35–44* | *133* | *35.8* |
| | *45–54* | *98* | *26.3* |
| | *Above 55* | *28* | *7.5* |
| | *Total* | *372* | *100* |
| *Teaching experience (year)* | *Less than 5* | *48* | *12.9* |
| | *6–15* | *172* | *46.2* |
| | *16–25* | *93* | *25.2* |
| | *>26* | *59* | *15.9* |
| | *Total* | *372* | *100* |
| *Location* | *Urban* | *163* | *43.8* |
| | *Rural* | *209* | *56.2* |
| | *Total* | *372* | *100* |
| *Digital Status* | *Digital Native* | *113* | *30.4* |
| | *Digital Immigrant* | *259* | *69.6* |
| | *Total* | *372* | *100* |
| *Education level* | *STPM/HSC/STA* | *22* | *5.9* |
| | *Diploma/Certificate* | *32* | *8.6* |
| | *Bachelor's Degree* | *278* | *74.7* |
| | *Master's Degree* | *39* | *10.5* |
| | *PhD Degree* | *1* | *.3* |
| | *Total* | *372* | *100* |

*Data Collection and Analysis*

Descriptive and correlational analyses were used in this study. Table 3 shows the research questions and types of analyses used in IBM Statistical Packages for the Social Sciences version 23 (SPSS). According to Kumar (2011), statistics play a key role in providing the required information to answer the research questions. In this study, it enabled us to explore the level of digital wisdom of the respondents and measure the relationships between the dependent and independent variables in the research.

*Table 3.*
*Research Questions and Types of Analysis*

| Research Question | Types of Analysis |
|---|---|
| *What is level of the teachers' practice of digital wisdom in terms of:*<br>• Digital status<br>• Age<br>• Location of school<br>• Gender<br>• Teaching experience<br>• Education level | *Descriptive Analysis*<br>• Percentage<br>• Mean |
| *Is there a relationship between the teachers' practice of digital wisdom and:*<br>• Digital status<br>• Age<br>• Location of school<br>• Gender<br>• Teaching experience<br>• Education level | • Spearman's correlation (Categorical data)<br>• Point Biserial (Continuous data) |

## FINDINGS

All data were compiled and analyzed using IBM Statistical Packages for the Social Sciences (SPSS) version 23. The analysis for each research question is as follows:

RQ1: What is the level of primary school teachers' practice of digital wisdom in the classroom?

The total score for the items related to teachers' practice of digital wisdom is 152 (38 items × 4 of the maximum value on the given Likert Scale). The practice of digital wisdom among teachers was reported based on the quartile shown in Table 4. The mean value below M = 1.74 indicates no practice of digital wisdom, M = 1.75 to M = 2.49 shows a low level of practice of digital wisdom, M = 2.50 to M = 3.24 indicates a moderate level of practice of digital wisdom, and M = 3.25 to M = 4.00 indicates a high level of practice of digital wisdom.

*Table 4.*
*Quartile Range Based on the Total Mean Score*

| Quartile | Mean Score | Level of Practice |
|---|---|---|
| First Quartile (25%) | *1.00–1.74* | *None* |
| Second Quartile (50%) | *1.75–2.49* | *Low* |
| Third Quartile (75%) | *2.50–3.24* | *Moderate* |
| Fourth Quartile (100%) | *3.25–4.00* | *High* |

A similar approach was utilized in a study conducted by Tak et al. (2016), who measured mental disorders and social problems among the elderly. The frequencies of these mean values were then computed into percentages using SPSS.

*Table 5.*
*Level of Practice of Digital Wisdom among Teachers*

| Level | Number of Teachers | Percentage |
|---|---|---|
| *Do not Practice Digital Wisdom* | *0* | *0* |
| *Low level of Practice of Digital Wisdom* | *14* | *3.8* |
| *Moderate level of Practice of Digital Wisdom* | *273* | *73.4* |
| *High level of Practice of Digital Wisdom* | *85* | *22.8* |
| *Total* | *372* | *100.0* |

Table 5 shows that only 3.8% of the respondents have a low level of digital wisdom, while 73.4% have a moderate level, and 22.8% have a high level of digital wisdom in their classroom. Meanwhile, Table 6 provides the mean scores for each variable analyzed in the study and summarizes the central tendency of the data.

*Table 6.*
*Mean Scores of the Demographic Variables*

| Variables | Groups | Mean scores | Standard Deviation |
|---|---|---|---|
| Gender | Male | 3.02 | .31 |
| | Female | 3.04 | .31 |
| Age | 25–34 | 3.02 | .31 |
| | 35–44 | 3.05 | .30 |
| | 45–54 | 3.01 | .31 |
| | above 55 | 3.09 | .33 |
| Teaching | <5 | 3.02 | .32 |
| Experience | 6–15 | 3.05 | .31 |
| | 16–25 | 3.00 | .32 |
| | >26 | 3.07 | .29 |
| Location | Urban | 3.04 | .29 |
| | Rural | 3.04 | .32 |
| Digital | Digital Native | 3.02 | .31 |
| Status | Digital Immigrant | 3.04 | .31 |
| Education | STPM/HSC/STA | 3.08 | .24 |
| | Diploma/Certificate | 2.96 | .29 |
| | Bachelor's Degree | 3.04 | .32 |
| | Master's Degree | 3.03 | .27 |
| | PhD Degree | 3.47 | - |

Field (2005) suggests using the Spearman correlation coefficient to measure the strength and direction of association between two variables. The Likert scale is an ordinal scale, so the Spearman coefficient was used to measure relationships in RQ3, RQ6, and RQ7. Meanwhile, the Point Biserial was used to measure relationships in RQ2, RQ4, and RQ5. The statistical significance level of $\alpha$ is set at 0.01. A *p*-value less than 0.01 shows rejection of the null hypothesis and a *p*-value greater than 0.01 indicates that the null hypothesis should be accepted.

According to Cohen (1988), the strength of correlation should be interpreted as follows:

- Strong Relationship: r = ±.5
- Moderate Relationship: r = ±.3
- Weak Relationship: r = ±.1

RQ2: Is there a relationship between the teachers' practice of digital wisdom and digital status?

*Table 7.*
*Correlation between Practice of Digital Wisdom and Digital Status*

| | | Status | Score |
|---|---|---|---|
| **Status** | Pearson Correlation<br>Sig. (2-tailed)<br>N | 1<br>371 | -.237**<br>.000<br>371 |
| **Score** | Pearson Correlation<br>Sig. (2-tailed)<br>N | .237**<br>.000<br>371 | 1<br>371 |

**. Correlation is significant at the 0.01 level (2-tailed).

Table 7 shows a significant but negative relationship between the teachers' practice of digital wisdom and digital status, r = −.237 (two tailed) $p < .01$. However, the correlation between these two variables is weak.

RQ3: Is there a relationship between the teachers' practice of digital wisdom and age?

*Table 8.*
*Correlations between Practice of Digital Wisdom and Age*

| | | | Age | Score |
|---|---|---|---|---|
| **Spearman's rho** | Age | Correlation Coefficient<br>Sig. (1-tailed)<br>N | .000<br>.<br>125 | -.440**<br>.000<br>125 |
| | Score | Correlation Coefficient<br>Sig. (1-tailed)<br>N | -.440**<br>.000<br>125 | 1.000<br>.<br>125 |

**. Correlation is significant at the 0.01 level (1-tailed).

The result shown in Table 8 indicate a significant but negative relationship between the teachers' practice of digital wisdom and age ($r_s$ = −.440; $p$ <.01). The correlation coefficient shows the relationship is inversed and the strength of the relationship is moderate. This means that as the teachers get older, less practice of digital wisdom is observed among them.

RQ4: Is there a relationship between the teachers' practice of digital wisdom and location of the school?

*Table 9.*
*Correlations between Practice of Digital Wisdom and Location*

| | | Location | Score |
|---|---|---|---|
| **Location** | Pearson Correlation<br>Sig. (2-tailed)<br>N | 1<br><br>371 | -.021<br>.688<br>371 |
| **Score** | Pearson Correlation<br>Sig. (2-tailed)<br>N | -.021<br>.688<br>371 | 1<br><br>371 |

Correlation is significant at the 0.01 level (2-tailed).

Table 9 shows that there is a nonsignificant correlation between the teachers' practice of digital wisdom and location of the school ($r_s$ = −.021; $p$ = 0.688). The very weak negative correlation coefficient of −.021 shows that there is almost no correlation between the two variables.

RQ5: Is there a relationship between the teachers' practice of digital wisdom and gender?

*Table 10.*
*Correlations between Practice of Digital Wisdom and Gender*

| | Gender | | Score |
|---|---|---|---|
| **Gender** | Pearson Correlation | 1 | -.008 |
| | Sig. (2-tailed) | | .876 |
| | N | 371 | 371 |
| **Score** | Pearson Correlation | -.008 | 1 |
| | Sig. (2-tailed) | .876 | |
| | N | 371 | 371 |

Correlation is significant at the 0.01 level (2-tailed).

In Table 10, the result shows that there is a nonsignificant correlation between the teachers' practice of digital wisdom and their gender (r = −.008; $p$ = 0.876). The weak negative correlation coefficient of −.008 shows that there is almost no correlation between the two variables.

RQ6: Is there a relationship between the teachers' practice of digital wisdom and teaching experience?

*Table 11.*
*Correlations between Practice of Digital Wisdom and Teaching Experience*

| Experience Score | | | | |
|---|---|---|---|---|
| Spearman's rho | Experience | Correlation Coefficient | 1.000 | −.356** |
| | | Sig. (1-tailed) | . | .000 |
| | | N | 125 | 125 |
| | Score | Correlation Coefficient | −.356** | 1.000 |
| | | Sig. (1-tailed) | .000 | . |

**. Correlation is significant at the 0.01 level (1-tailed).

The result in Table 11 shows a significant but negative relationship between the teachers' teaching experience and their practice of digital wisdom ($r_s = -.356$ $p < .01$). The result also shows that the correlation between the two variables is moderate.

RQ7: Is there a relationship between the teachers' practice of digital wisdom and education level?

*Table 12.*
*Correlations between Practice of Digital Wisdom and Education Level*

| | | | Education | Score |
|---|---|---|---|---|
| Spearman's rho | Education | Correlation Coefficient | 1.000 | .202 |
| | | Sig. (1-tailed) | . | .012 |
| | | N | 125 | 125 |
| | Score | Correlation Coefficient | .202 | 1.000 |
| | | Sig. (1-tailed) | .012 | . |
| | | N | 125 | 125 |

**Correlation is significant at the 0.01 level (1-tailed).

Table 12 shows that there is no significant correlation between the teachers' practice of digital wisdom and their education level (r = .202; $p$ = 0.012). The weak correlation coefficient of .202 shows that there is almost no correlation between the two variables.

## DISCUSSION

### *Practice of Digital Wisdom of Primary School Teachers in the Classroom (Research Question 1)*

Based on the study, we found that all teachers exhibit some degree of digital wisdom in their teaching practices. Moreover, a detailed analysis of the data indicates that a significant number of primary school teachers in Penang demonstrate a moderate level of digital wisdom. However, the study also reveals that only a small proportion of primary school teachers in the Penang State are highly proficient in their implementation of digital wisdom during instruction.

Thang et al. (2015) pointed out that some students prefer more conventional styles of learning that require teachers to present concrete evidence and develop ideas. They also highlighted that Malaysian students were brought up with great expectations and respect for their teachers; therefore, they prefer a teacher-centered approach in using digital technology in the classroom. Haron et al. (2018) found that the teachers have a positive attitude towards computers as they perceive digital technology to be useful. The teachers may have to balance between the traditional classroom approach and student-centered learning approach, which explains the moderate level of digital wisdom among most of them.

The availability of the internet assists teachers in accessing information that can be useful in their lesson planning, improving the content of their notes, discovering recent technology, and updating their knowledge of pedagogy (Garba et al., 2015). A report from the Malaysian Communications and Multimedia Commission (2021) acknowledged several shortcomings, such as the lack of digital learning resources, poor connectivity, and a scarcity of devices, which may lead to a low level of practice of digital wisdom among teachers, as integrating digital technology in the classroom would be challenging.

### *Teachers' Practice of Digital Wisdom and their Digital Status (Research Question 2)*

The findings for this research question revealed that there is a significant relationship between digital status and the practice of digital wisdom. However, the relationship is weak and inverse. The mean scores observed for both statuses were almost equal, although teachers who are digital immigrants had slightly higher scores. There are a few possibilities as to why the weak and inverse relationship existed between digital status and the practice of digital wisdom. Prensky (2009a) argues that digital wisdom is not limited to a particular age group or digital status. Claims that digital natives possess sophisticated sets of ICT competence are unsupported by research evidence

(Smith, 2011). Teachers, despite their digital status, are able to harness digital wisdom and use of technology in effective and engaging ways to support students' learning. The difference between the two digital statuses is becoming less relevant as we have moved further into the 21st century and are familiarized to the era of digital technology (Prensky, 2012b).

*Teachers' Practice of Digital Wisdom and their Age (Research Question 3)*

There is a significant relationship between the teachers' practice of digital wisdom and age. The result shows that the relationship is inverse and moderate. The mean values for all the age groups are within the range of 3.02–3.09. This suggests that teachers of all age groups are moderately practicing digital wisdom in the classroom.

The youngest group of teachers in this study were born between 1983 and 1992. Individuals born within these years are known as the Net Generation (Tapscott, 2009). According to Tapscott, Net Geners are active users of interactive blogs, able to multitask using mobile phones, and utilize the internet often. Peral-Peral et al. (2015), in their study of the relationship between elderly people and their use of social networks, found that elderly people show more interest in knowledge and are active on the internet. They also exhibit more self-confidence, are more adventurous and innovative, and have less anxiety using digital technology. Social networking can help develop digital wisdom, as it offers opportunities for individuals to connect, collaborate, and communicate in a digital environment.

Jeste et al. (2010) suggest that traditional wisdom tends to increase with age. However, digital wisdom in education may differ in nature. It involves perceiving digital technology positively and using it wisely to make learning more meaningful for students (Prensky, 2012a). The way teachers perceive the use of digital technology is not influenced by their age (Sánchez-Mena et al., 2017).

This study's results indicate that teachers of any age can develop the skills and knowledge necessary to use technology effectively in their profession. To support their students' learning, it is essential for educators to stay up-to-date with the latest educational technology and continuously improve their abilities.

*Teachers' Practice of Digital Wisdom and the Location of the Schools (Research Question 4)*

There is no significant relationship between the teachers' practice of digital wisdom and the location of the school. However, the mean values for both rural and urban schools are almost equal. The result suggests that teachers from any location are capable of practicing digital wisdom in the classroom.

Garba et al. (2015) state that the basic infrastructure for digital technology is in place in rural schools in Malaysia. This means that teachers in rural areas have the same opportunity to practice digital wisdom as those in urban schools. The Malaysian Ministry of Education is committed to making digital technology accessible to all students, regardless of their location. Despite the challenges of rural locations, the facilities provided in Malaysian schools are excellent (Ministry of Education Malaysia, 2013).

The country's Ministry of Education has implemented several initiatives to bridge the gap between rural and urban schools, such as the 1Bestarinet project, Virtual Learning Environment (a learning management system), and the Malaysian smart school with an ICT education policy (Mai & Muruges, 2022; Zainal & Zainuddin, 2020). As a result, students in rural areas can now benefit from more engaging and interactive learning experiences and be better prepared for the digital future.

*Teachers' Practice of Digital Wisdom and their Gender (Research Question 5)*

The study found that there is no significant relationship between teachers' gender and their practice of digital wisdom. The mean values for both male and female teachers were almost equal, suggesting that digital wisdom is not influenced by gender.

While previous research may have shown significant gender differences in the use of digital technology, it was predicted that the gap between genders in ICT competence would be diminishing (Jordan, 2013). Early exposure to digital technology in schools may have helped to equalize the use of digital technology between genders (Koh & Sing, 2011). Furthermore, Baltes and Staudinger (2000) noted that gender differences do not have a significant impact on the practice of wisdom among adults. Similarly, the study's results suggest that the practice of digital wisdom is not influenced

by gender, indicating that everyone has the potential to learn and develop their professional skills through the use of digital technology.

*Teachers' Practice of Digital Wisdom and their Years of Teaching Experience (Research Question 6)*

There is a significant and moderate relationship between the teachers' practice of digital wisdom and their teaching experience. The relationship is also inverse, which suggests that teachers with less teaching experience have a higher practice of digital wisdom than the more experienced ones. Many early-career teachers use digital technologies in multiple ways compared to experienced teachers (Hamid, 2011). Based on the findings, we infer that experienced teachers do not condone the use of digital technology with their students. Their teaching experience may involve trainings and professional development opportunities related to technology, which can help to develop their digital wisdom. Yoke et al. (2019) urge that professional trainings, teacher learning communities, and self-directed learning should be continuously carried out as they help teachers cope with the changing needs of the workforce.

*Teachers' Practice of Digital Wisdom and their Level of Education (Research Question 7)*

There is no significant relationship between the education level of the teachers and the practice of digital wisdom. In other words, the level of education a teacher has attained does not necessarily determine how wisely they utilize digital technology in their teaching practice. Wisdom is a complex and multifaceted construct that involves the ability to make sound judgments, solve problems, and make decisions for the well-being of oneself and others (Baltes & Staudinger, 2000). Additionally, wisdom is often associated with life experience, which cannot be gained in schools. Wise individuals gain insights through years of self-reflection and observation of others (Glück et al., 2013). A study conducted by Ambrosi-Randić and Plavšić (2015) on differences in wisdom based on formal education found that the data did not confirm the importance of education in wisdom development, as the existing educational system focuses more on knowledge acquisition than its implementation.

Although some studies propose that education can play a role in the development of wisdom (Noh et al., 2011), it is not a strong determining factor. In fact, the practical experience of teachers in using digital technology might have a more significant impact on their effective implementation of these tools for their students' benefit. Consequently, several training programs are being conducted across the country to teach teachers how to leverage digital technology effectively in their instruction, regardless of their academic qualifications (Yoke et al., 2019).

## IMPLICATIONS OF THE FINDINGS

The main contribution of this study is to identify the level of teachers' practice of digital wisdom. This study also intends to examine the association of demographic variables with the teachers' practice of digital wisdom. The findings indicate that there is a significant relationship between the teachers' practice of digital wisdom and digital status, age, teaching experience, and level of education. However, there is no significant relationship between the teachers' practice of digital wisdom and school location and gender.

The findings of this study provide meaningful insight for the Ministry of Education and school administrators to explore and encourage the practice of digital wisdom among educators. Darling-Hammond (2006) observes that most of the technology integration courses designed for preservice teachers only introduce and teach teachers to use a particular technology or applications. Further studies on digital wisdom may improve the utilization of digital technology among teachers and improve the quality of learning. The findings of such extended studies can be used to benefit preservice teachers and also existing teachers.

## LIMITATIONS OF THE STUDY

In this study, digital wisdom was studied and discussed in the context of education. However, there are several limitations associated with this study. Self-report scales were used in this study, so the data solely depend on the teachers' openness and willingness while completing the questionnaire. While education in Malaysia has been historically segregated by ethnicity, this study has taken into account teachers from both national and vernacular schools. It should be noted, however, that the study's findings are limited as there are no settlements of the indigenous (Orang Asli) people in Penang. Another limitation of this study

is that it only represents primary school teachers in the state of Penang, and its findings do not represent teachers in other states. Private schools were not involved in this study. It was also challenging to obtain literature and articles that are related to digital wisdom due to its scarcity of research. Therefore, the findings of this study were synthesized with limited resources. It is suggested that further research should be carried out to extend the findings of this study to primary and secondary school teachers throughout Malaysia. Future research can also be carried out to evaluate the level of digital wisdom among school administrators.

## RECOMMENDATIONS FOR FUTURE RESEARCH

Previous studies on digital wisdom have not extensively explored the concept alone. Blau et al. (2016) focused their study on the development of digital wisdom by teachers in the context of implementing technology in one-to-one classrooms and how this overlapped with their professional development based on the TPACK model. Therefore, this paper serves as an impetus to explore the relationships and factors that allow for the practice of digital wisdom among educators.

Empirical studies regarding digital wisdom are scarce. More studies can be carried out in the context of education and digital wisdom. Similar studies can be conducted at the preschool, secondary, college, or university level. Factors that contribute to the effective practice of digital wisdom will yield useful findings. The findings can be used for planning preservice teachers' training modules and even be included in professional development programs for in-service teachers.

Pioneer studies in wisdom such as Baltes and Staudinger (2000) have discussed wisdom and its influence on sociocultural settings. Thus, a similar study on sociocultural settings and its relationship with the practice of digital wisdom can be carried out. This would make interesting research and a valuable contribution in the field of social sciences.

## CONCLUSION

Fullan (2001) highlighted that teachers can contribute to successful changes, especially in education, as they are important change agents that can influence students' learning. Therefore, they need to continuously upgrade their skills to enable them to become better facilitators for their digital native students. Teachers need to view the utilization of ICT positively because the wisdom that emerges from the use of digital technologies may enhance their teaching capabilities in their classrooms. Teachers' awareness and skills in integrating technology may also influence the practice of digital wisdom as it overlaps with the professional development of the teachers (Blau et al., 2016). Therefore, continuous training and workshops may equip teachers with essential digital skills that would enable them to practice digital wisdom in their profession.

As the digital world will continue to alter the physical world through technologies such as the internet of things, artificial intelligence, and augmented reality, we will also continue to experience new challenges. We will also need to keep adjusting ourselves to the shifts in various areas of our lives, including education. As Prensky (2012a) advocates, true digital wisdom is not just about allowing the integration of digital technology in the classroom, but its true practice lies in combining the human mind with digital technology to develop innovative ways of teaching and learning. Consequently, education and digital technology should go hand in hand as both are the keys to 21st century learning. Improved pedagogy combined with the use of digital technology can produce better results in students' learning outcomes.

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## APPENDIX

## PRACTICE OF DIGITAL WISDOM IN THE CLASSROOM

*Section A: Background Information*

**6. Gender**

- ❑ Male
- ❑ Female

**7. Age**

- ❑ 25–34
- ❑ 35–44
- ❑ 45–54
- ❑ 55 <

**8. Teaching experience**

- ❑ Less than 5 years
- ❑ 6–15 years
- ❑ 16–25 years
- ❑ 26 years <

**9. Location of school**

- ❑ Rural
- ❑ Urban

**10. Highest level of formal education**

- ❑ SPM/MCE/SC/
- ❑ SPVM/SPM(V)/MCVE
- ❑ STPM/HSC/STA
- ❑ Diploma/CertificateDegree
- ❑ Master's Degree
- ❑ PhD Degree

**11. Did you receive any training in teaching and learning using digital technologies as part of your educational degree or certification program?**

- ❑ Yes
- ❑ No

*Section B*

**INSTRUCTION:** Please indicate the strength of your agreement or disagreement with the statements given using four-point scale shown below.

**1 = Strongly Disagree**
**2 = Disagree**
**3 = Agree**
**4 = Strongly Agree**

| Analysis of Learners | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| I am aware of my pupils' digital skills. | ○ | ○ | ○ | ○ |
| I am mindful of my pupils' learning styles when using digital technologies. | ○ | ○ | ○ | ○ |
| I am aware of my pupils' motivation to use digital technologies | ○ | ○ | ○ | ○ |
| I am attentive to my pupils' expectations of using digital technologies. | ○ | ○ | ○ | ○ |
| I have made efforts to learn more about my pupils' interest in digital technologies. | ○ | ○ | ○ | ○ |
| I am mindful of my pupils' socioeconomic background when I conduct my lesson that involves digital technology (e.g., digital resources available to complete a given task). | ○ | ○ | ○ | ○ |
| I am aware of the physical needs of the pupils when I conduct my lesson that involves digital technology. (physical disability, typing speed, eyesight etc) | ○ | ○ | ○ | ○ |
| I am aware of the psychological needs of the pupils in relation to the use of digital technologies (stress level, mood state, beliefs, and attitude). | ○ | ○ | ○ | ○ |
| I am aware of the physiological needs of the pupils in relation to the use of digital technologies (rest, food, drink, air, and health). | ○ | ○ | ○ | ○ |

| Stating Standards and Objectives | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| I set the degree of which the new skills taught must be learnt in my lesson (e.g., able to state at least 2 solutions) using digital technologies. | ○ | ○ | ○ | ○ |
| I set objectives that can be achieved through the use of digital technologies. | ○ | ○ | ○ | ○ |
| I set my objectives based on the pupils' physical factors in my lesson that engages digital technologies (physical disability, typing speed, eyesight, etc.). | ○ | ○ | ○ | ○ |
| I set my objectives based on the pupils' physiological factors when I conduct lesson that engages digital technologies (learning environment, rest, drink, air, and health). | ○ | ○ | ○ | ○ |
| I set my objectives based on the pupils' psychological factors when I conduct lesson that engages digital technologies (stress level, mood state, beliefs, and attitude). | ○ | ○ | ○ | ○ |

| Selection of Methods and Digital Tools | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| I take into consideration pupils' digital skills before I select an appropriate digital tool. | ○ | ○ | ○ | ○ |
| I select suitable strategies in accordance to the progression of my lesson which employs digital technology. | ○ | ○ | ○ | ○ |
| My selection of digital tools enables my pupils to be more involved in the lesson I teach. | ○ | ○ | ○ | ○ |
| I select digital tools that prepare my pupils for real-world learning. | ○ | ○ | ○ | ○ |
| I select digital tools that match the curriculum of my lesson. | ○ | ○ | ○ | ○ |
| The selected instructional strategies using digital tools are appropriate for the grade/standard level. | ○ | ○ | ○ | ○ |
| The selected instructional strategies using digital tools are appropriate for the content area. | ○ | ○ | ○ | ○ |
| The selected instructional strategies using digital tools are appropriate for the instructional goals. | ○ | ○ | ○ | ○ |

| Utilization of Media and Digital Tools | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| I utilize digital tools in suitable teaching and learning situations. | ○ | ○ | ○ | ○ |
| I utilize digital tools to evaluate students' achievement. | ○ | ○ | ○ | ○ |
| I utilize digital tools to report students' achievement. | ○ | ○ | ○ | ○ |
| I utilize digital tools to access resources on best practices on teaching and learning. | ○ | ○ | ○ | ○ |
| I utilize digital tools to post information to a website to assist my pupils in their work. | ○ | ○ | ○ | ○ |

| Require Learners' Participation | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| The pupils participate better when they are able to practice what they have learnt in my lesson that engages digital technologies. | ○ | ○ | ○ | ○ |
| Pupils' participation increases when collaborative group work is carried out in the lesson that employs digital technologies. | ○ | ○ | ○ | ○ |
| The pupils' participation is better when I take the role as a facilitator in my lesson that engages digital technologies. | ○ | ○ | ○ | ○ |
| My pupils participate well because I keep records of my pupils' participation that involves digital technologies. | ○ | ○ | ○ | ○ |

| Evaluation of Digital Tools | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| The use of digital tools in my instructions increases the involvement of my pupils in the lesson. | ○ | ○ | ○ | ○ |
| The use of digital tools in classroom learning does not improve the pupils' academic achievements. | ○ | ○ | ○ | ○ |
| During the lesson it is difficult to incorporate digital tools in my instructions due to the design of the subject syllabus. | ○ | ○ | ○ | ○ |
| Materials used based on digital technology used during instructions are appropriate. | ○ | ○ | ○ | ○ |
| Different learning preferences of the pupils are addressed in instructions involving digital technologies. | ○ | ○ | ○ | ○ |
| Activities involving digital tools were able to develop the pupils' thinking towards 21st century competencies (e.g., communication, collaboration, information skills, etc.). | ○ | ○ | ○ | ○ |
| Pupils' use of digital skills is appropriate with the tasks given. | ○ | ○ | ○ | ○ |