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Head Teachers' Digital Leadership Practices in Co-Curriculum Management: A Survey Study in Putrajaya Primary Schools

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Abstract

This study was carried out to analyze the level of digital leadership among head teachers for the domain of co-curricular management in national primary schools in the Federal Territory of Putrajaya. By integrating the international competency framework of the International Society for Technology in Education (ISTE) Model (ISTE, 2014), this research uses a quantitative survey design that involves the use of questionnaires as the main instrument. The evaluation focuses on five core dimensions: visionary leadership, digital era learning culture, professional excellence, systemic improvement, and digital citizenship. A total of 302 teacher respondents were selected through a simple random sampling technique from a population of 1,498 teachers in 16 primary schools around Putrajaya. Data were analyzed descriptively using SPSS version 30.0 software to determine the level of leadership practice. The results show that the head teachers' digital leadership practices as a whole are at a high level, with a mean score value of 4.37. The "Cultivating Digital Era Learning" dimension was identified as the most dominant driver, with the highest mean score of 4.53. In conclusion, this finding provides empirical evidence about the importance of adaptive digital leadership in realizing the aspirations of the Digital Education Policy (DPD). This study offers practical implications for the need to strengthen school leader professional development programs to ensure the sustainability of innovation in co-curricular management in the digital era.

Keywords: Digital Leadership, Head Teacher, ISTE Model, Co-Curricular Management, Primary School, Putrajaya

Introduction

The global education system is currently going through a phase of drastic transformation as a result of the Industrial Revolution 4.0, which demands the integration of digital technology as a whole. In Malaysia, the Digital Education Policy (DPD) is the main driving force in producing technology-savvy human capital. The importance of studying the level of digital leadership of headmasters is very critical because failure to adapt to technology can cause an educational organization to fall behind (Zulkhairi et al., 2021). In this

context, Putrajaya as a "smart city" was chosen as the location of the study to serve as a yardstick for the extent to which the country's digital vision has been successfully implemented at the school level.

Since a specific study in Putrajaya has not yet been carried out, this study aims to fill the information gap with the objective of identifying the level of digital leadership of head teachers in 16 national primary schools in Putrajaya. This study focuses on co-curricular management, which is an important field apart from the academic field. Through the evaluation of 302 teachers as respondents, the five main dimensions of the ISTE Model (2014) will be assessed to determine the level of digital leadership practices of their headmasters.

The location of this study is specifically focused on the Federal Territory of Putrajaya, which is the center of government administration and a smart city model in Malaysia. Putrajaya has a unique educational ecosystem with well-equipped information technology infrastructure facilities. This study involved a total population of 1,498 teachers working in 16 national primary schools around Putrajaya (Source: JPWPP, August 2025). From the total population, 302 teachers were selected as the study sample through a simple random sampling technique to empirically assess the level of headmasters' digital leadership practices in co-curricular management.

The need for this study has become increasingly urgent considering that research on the level of headmasters' digital leadership practices in extracurricular management specifically has not yet been carried out in primary schools around Putrajaya. Most previous studies have focused more on rural areas or the secondary school level, thus creating a significant information gap for the context of primary schools in Malaysia. Therefore, the importance of this study lies in its contribution to providing data profiles that are much needed by stakeholders such as the Ministry of Education (KPM) and the State Education Department (JPN). These findings not only help to assess the extent to which the Digital Education Policy (DPD) is translated at the grassroots level, but also serve as a basis for reference in planning more impactful professional development programs for school leaders in order to preserve the country's digital transformation agenda.

Therefore, the main question to be resolved is to identify the extent to which headmasters' digital leadership practices in co-curricular management in Putrajaya primary schools have reached the expected standards. In order to measure the level of practice, this study is based on a conceptual framework adapted from the international standard ISTE Model (2014) for school leaders. This framework serves as an academic compass to assess the integration of technology elements in overall school governance and leadership. There are five core dimensions assessed: visionary leadership to set a digital direction; cultivating digital era learning to create an innovative environment; excellence in professional practice through the support of digital skills development; ensuring digital citizenship that emphasizes ethical aspects and social responsibility of technology; and driving systemic improvements in the sustainable management of infrastructure resources. Through the combination of these five dimensions, an accurate empirical picture of the level of digital leadership competence of headmasters can be produced.

The contribution of this research is expected to have a substantive impact on three key stakeholders. For school administrators, the results of this study provide best practice guidelines to optimize organizational management in the digital era. For the Malaysian Ministry of Education (KPM) and the State Education Department (JPN), these findings can be used as a solid reference base in designing more targeted and high-impact professional development programs for school leaders. Finally, this study successfully fills the gap in local literature that still lacks focus on the integration of technology in the co-curricular domain compared to the curriculum. This finding is in line with the AI-RMAP report (Sektor Kokurikulum, 2020), which emphasizes the importance of data-based monitoring in extracurricular management. Overall, this paper will discuss the literature highlights, methodology, data analysis, and implications of the study in a systematic way to answer the research questions that have been set.

Literature Review

Research Gaps

The literature review shows several research gaps. Most previous studies have focused on teaching and learning (PdP), while co-curricular management has received less attention. In terms of school context, more studies have been conducted at the secondary school level, while in terms of location, studies in Malaysia remain general without a specific focus on Putrajaya. Therefore, this study aims to examine the digital leadership practices of head teachers in co-curricular management in Putrajaya primary schools. It is hoped that this study will contribute to a deeper understanding of digital leadership in the context of primary school administration and serve as a reference for developing more effective co-curricular management strategies. Most previous studies in Malaysia have focused more on the impact of technology on academic subjects in secondary schools or on internet access issues in rural areas.

Therefore, there is still a lack of research that looks specifically at the level of head teachers' leadership in co-curricular management in Putrajaya primary schools. As a "smart city" with complete technological facilities, Putrajaya should be the best example of digital leadership. However, the extent to which these excellent facilities are actually used effectively by school leaders has yet to be fully researched. In addition, the level of digital leadership in co-curricular management is also rarely discussed in previous studies. Thus, this research was conducted to fill the information gap by collecting real data in Putrajaya, which has the best technology facilities in Malaysia.

At the global level, there is a real gap between developed and developing countries. Research by Kim and Park (2023) in South Korea found that the level of digital leadership there is at a very high level. This is driven by a mature technology ecosystem as well as very systematic government policy support. However, different challenges are faced in other regions. In Thailand, Phakamach et al. (2023) reported a high level of digital leadership for the vision aspect but admitted that a more structured professional development model is still needed for implementation in the field. Meanwhile, the study by Christiana et al. (2022) in Nigeria presents a more challenging picture, where digital leadership practices remain at moderate levels. Basic infrastructural constraints such as unstable electricity and internet access were identified as major barriers limiting the ability of school leaders to implement optimal systemic improvements.

In Malaysia, the trend of digital leadership practices shows significant increasing momentum, especially following the launch of the Digital Education Policy (DPD). This development reflects the readiness of educational institutions to adapt to digital transformation in management and organizational leadership. A study by Ming and Mansor (2024) conducted in the state of Perak found that the level of digital leadership practices was at a high level among educational leaders. However, the study also confirmed that continuous improvement efforts, especially in the aspect of technical skills, are very critical to ensure the sustainability of the quality of this practice and avoid the risk of performance deterioration in the future.

From a co-curricular perspective, strengthening digital leadership is not only limited to the context of formal administration but also needs to be translated practically through holistic and high-impact student activities. Co-curricular programs such as STEM clubs, robotics, and uniformed bodies can serve as strategic platforms to foster digital leadership skills among students, including the ability to manage projects online, virtual collaboration, data literacy, and cybersecurity. In addition, the integration of digital elements in co-curricular activities — such as the organization of hybrid programs, the use of event management applications, and the development of digital content can strengthen 21st-century skills such as critical thinking, creativity, communication, and collaboration.

Accordingly, education leaders need to play a proactive role in planning, coordinating, and evaluating the implementation of a digital-based curriculum in a systematic and inclusive manner. Support in the form of continuous training, the provision of digital infrastructure, as well as a culture of innovation among mentor teachers and students, is important to ensure the effectiveness of this implementation. This approach not only supports the aspirations of the Digital Education Policy but is also capable of producing a generation of students who are competitive, adaptive, and competent in facing the challenges of an increasingly complex digital world.

Concept of Digital Leadership in Education

Digital leadership refers to the ability of educational leaders to strategically integrate digital technology into the management of school organizations. In the context of 21st-century education, digital leadership not only involves the use of technology but also includes aspects of vision, innovation, change management, and capacity building of school members. A study by Arokiasamy et al. (2023) asserted that digital leadership plays an important role in driving educational transformation, especially in facing the challenges of globalization and rapid technological development.

In Malaysia, the implementation of the Digital Education Policy has accelerated the transformation of school leadership toward digital. Recent studies show that the level of digital leadership practices among principals and headmasters is high but still requires continuous improvement. A study by Ming and Mansor (2024) found that school leaders in Perak showed a high level of digital leadership practices, especially in the aspects of communication and information management. However, the study also emphasized the need for continuous training to ensure technical skills remain relevant.

In line with that, a study by Ismail and Ghazali (2025) found that although the level of digital leadership is high, there is a gap between perception and actual implementation due to time constraints, infrastructure, and teacher competence. Although most studies focus on teaching and learning, digital leadership also has significant implications for co-curricular management. Co-curricular activities are now no longer limited to physical implementation but also involve the use of digital platforms for planning, implementation, and evaluation purposes.

According to Thien and Philip (2025), digital leadership can increase collaboration and innovation among teachers through the use of technology. In the co-curricular context, this can be translated through the implementation of hybrid programs, systematic management of student data, and the use of digital applications for activity monitoring. In addition, Muda (2025) states that one of the main challenges in digital leadership is infrastructure constraints and the gap in digital skills among teachers. This has a direct impact on the effectiveness of digital-based co-curricular management.

Concepts and Dimensions of Digital Leadership

Digital leadership is defined as the strategic ability of leaders to leverage technology to drive cultural transformation and organizational success (Sheninger, 2019). In the modern education ecosystem, this practice has evolved from mere technical literacy to a "dynamic thinking" that involves the adaptation of traditional leadership styles toward the digital medium (Tutar et al., 2022). In order to systematically measure the level of this practice, this study relies on the ISTE Standards for Leaders Model (2014), which provides a holistic framework through five main dimensions. The use of this model as an assessment instrument is widely recognized by global researchers to determine the digital competence profile of school leaders (Rasdiana et al., 2024; Ellis et al., 2021).

Conceptual Framework of the Study

Digital Leadership of Head Teachers

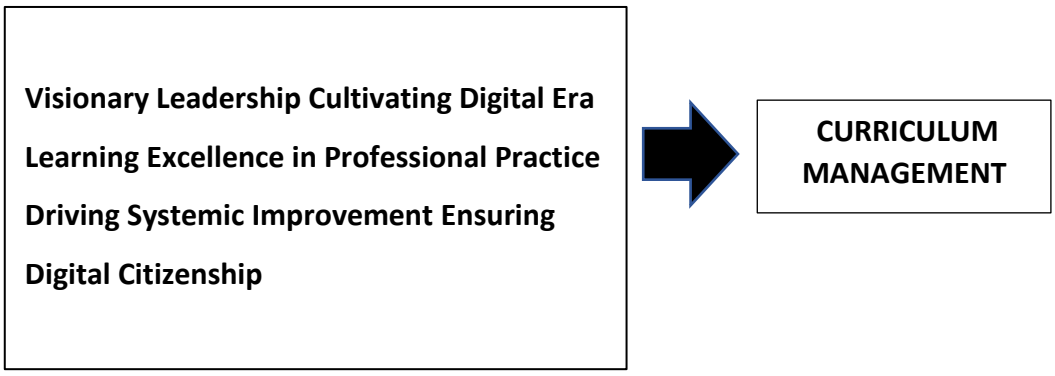

Figure 1: Conceptual Framework of the Study
Source: ISTE (2014)

The conceptual framework of this study was built based on the ISTE Standards for Leaders Model (2014), which is the main pillar in evaluating the level of head teachers' digital leadership practices (Figure 1). This model was chosen for its ability to provide a holistic framework that includes five critical dimensions to address the educational challenges of the 21st century. The first dimension is Visionary Leadership, which emphasizes the leader's

strategic ability to formulate and disseminate a clear technology vision aligned with the school's long-term goals.

In the context of co-curricular management, the Visionary Leadership dimension plays an important role in ensuring that the direction of co-curricular activities is aligned with the development of digital education. Al-Haderi's (2026) study in Saudi Arabia showed a high level when school leaders successfully aligned the vision of technology with the national transformation agenda. This situation has implications for co-curricular management through the planning of digital-based programs such as innovation clubs, robotics, and STEM activities. In Malaysia, Zainal and Mohamad (2024) also found a high level in Kuala Lumpur, which shows that school leaders have a clear direction in integrating technology into the curriculum. This proves that a strong digital vision helps school leaders plan and implement co-curricular activities in a more systematic and focused manner.

Next, the Digital Era Learning Cultivation dimension has a direct impact on the implementation of a more dynamic and innovative co-curriculum. Chen and Wong (2024) reported a high level in Singapore, particularly in the integration of artificial intelligence (AI), which is also translated into extracurricular activities such as digital innovation competitions and student design projects. However, Harun and Rahman (2024) found a moderate level in Kelantan due to limited access to devices among students. This constraint affects the effectiveness of the implementation of the digital co-curriculum as a whole. This situation shows that infrastructure support plays an important role in forming a technology-based co-curricular culture, in line with the Malaysian Ministry of Education's assertion (2021) that adequate digital facilities are the basis for the implementation of 21st-century education.

In addition, the Professional Practice Excellence dimension demands that head teachers demonstrate leadership through the use of technology in co-curricular management. A study by Smith and Lewis (2025) in Australia showed a high level when school leaders used collaborative platforms to coordinate activities, communicate with teacher advisors, and monitor program implementation. Nevertheless, the study by Ibrahim et al. (2023) in Johor showed a moderate level, which indicates that the use of technology in co-curricular management such as documentation and reporting is still not consistent. Therefore, the mastery of digital skills among school leaders is very important to ensure that co-curricular management can be implemented more efficiently and effectively.

The Systemic Improvement dimension is closely related to the efficiency of co-curricular management through the use of data and digital systems. The study by Adeyemi et al. (2023) in Nigeria showed a low level due to data system constraints, which made it difficult to monitor student participation and achievement in co-curricular activities. On the other hand, Mohd Noor et al. (2025) reported a high level in Selangor through the use of a systematic data dashboard to assess co-curricular performance. This proves that effective co-curricular management requires a stable technology support system, in line with the view of the Organisation for Economic Co-operation and Development (2021) that the strategic use of data can improve the efficiency of school management.

Finally, the Digital Citizenship dimension is very important in ensuring that co-curricular activities are carried out ethically and safely. Abdullah and Sidek (2023) showed a high level

in Putrajaya, which reflects school leaders' awareness of the importance of cybersecurity and digital ethics in school activities. On the other hand, Ozturk and Ayas (2023) found a moderate level in Turkey because more emphasis was placed on technical aspects than ethical values. In the co-curricular context, digital citizenship elements are important to produce responsible students when involved in technology-based activities, in line with the standards of the International Society for Technology in Education (2018).

In conclusion, all these dimensions of digital leadership show that different levels of practice provide insight into the extent to which head teachers integrate technology into co-curricular management. Although there are findings that show a high level in several locations including Putrajaya, the sustainability of the practice still depends on infrastructure support, leader competence, and a robust management system. Therefore, the assessment of the level of digital leadership practice is important to identify strengths and aspects that need to be improved in primary school co-curricular management.

Methodology

This study uses a survey design through a quantitative approach to measure the level of head teachers' digital leadership practices in co-curricular management in primary schools around Putrajaya. The selection of this survey method is considered the most appropriate because it allows the collection of data from a large number of respondents efficiently and objectively (Creswell & Creswell, 2023). The study population involved a total of 1,498 teachers from 16 national primary schools in the Federal Territory of Putrajaya (JPWPP, August 2025). The selection of this location is based on Putrajaya's status as the country's administrative center, equipped with advanced technological infrastructure. Teachers were chosen as the unit of study analysis because they interact directly and have an accurate perspective on head teachers' digital leadership in co-curricular management in their respective schools.

In order to ensure that the findings of the study can be generalized, a simple random sampling technique was applied. Based on Krejcie and Morgan's (1970) sample size determination table, a total of 302 teachers are required as respondents to represent the population. This step is in line with the recommendations of Lee and Landers (2022) to ensure that each individual in the population has an equal chance of being selected, thus reducing study error. Data were collected using a digital questionnaire through Google Forms, which consisted of two parts. Part A includes respondents' demographic information, while Part B contains 20 question items that assess the five main dimensions of digital leadership based on the ISTE Model (2014) and Sheninger's (2019) framework. The five dimensions assessed are: visionary leadership, cultivating learning in the digital era, excellence in professional practice, driving systemic improvement, and ensuring digital citizenship. Each item is evaluated using a five-point Likert scale, ranging from: 1 – Strongly Disagree, 2 – Disagree, 3 – Not Sure, 4 – Agree, and 5 – Strongly Agree.

Table 1
Reliability Index Classification

Cronbach's Alpha Score (α)	**Reliability Level**
α > 0.90	Very Good
0.80 - 0.89	Good
0.70 - 0.79	Acceptable
0.60 - 0.69	Moderate / Acceptable for pilot or exploratory studies
< 0.60	Weak / Items need to be reviewed o" removed

Source: Adapted from Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021)

The quality of the instrument was ensured through validity and reliability tests via a pilot study involving 30 teachers outside the actual sample. Table 1 shows the classification of the reliability index, and Table 2 presents the results of the validity and reliability test analysis that was carried out, showing that the Cronbach's Alpha coefficient for the entire instrument is very good, at α = 0.942. This value far exceeds the minimum level of 0.60 recommended by Hair et al. (2021), thus confirming the very high internal consistency of the instrument to be used in the context of education in Malaysia.

Table 2
Validity and Reliability Analysis of Head Teacher's Digital Leadership in Putrajaya Primary Schools

Reliability Statistics	
Cronbach's Alpha	N of Item
.942	20

The data collection procedure was formally initiated by obtaining approval from the Education Policy Planning and Research Division (BPPDP) through the e-RAS system and the Putrajaya Federal Territory Education Department (JPWPP) before the questionnaire link was distributed online to the 16 national primary schools involved. The data obtained were then processed using the Statistical Package for the Social Sciences (SPSS) software version 30.0. Descriptive statistical analysis, including the calculation of mean, frequency, and percentage, was used to formulate the profile of the respondents as well as determine the level of head teachers' digital leadership practices in co-curricular management. Overall, this orderly methodological procedure guarantees authentic research findings and reflects the real situation of head teachers' digital leadership in co-curricular management in Putrajaya primary schools.

Findings

Demographic Profile of Respondents

The following is a demographic analysis of the respondents involved in this study. Table 3 shows the demographic distribution of the 302 official respondent teachers from 16 national primary schools in Putrajaya who participated in answering this questionnaire.

Table 3
Demographic Distribution of Respondents

Item	Frequency	Percentage (%)
Gender		
Male	119	39.4
Female	183	60.6
Age		
20 - 30 years	55	18.2
31 - 40 years	102	33.8
41 - 50 years	114	37.7
51 years above	31	10.3
Education Level		
Diploma	1	0.3
Bachelor's Degree	225	74.5
Master's Degree	71	23.5
Doctor of Philosophy	5	1.7
Length of Service as a Teacher		
Less than 5 years	52	17.2
5 - 10 years	54	17.9
11 - 15 years	71	23.5
16 - 20 years	84	27.8
Lebih 20 years	41	13.6
Experience Working Under Current Head Teacher		
Less than 1 year	89	29.5
1 - 5 years	196	64.9
6 - 10 years	15	5.0
More than 10 years	2	0.7

N=302

Overall, this demographic analysis reflects the diversity of backgrounds of the 302 teachers who form the basis of this study's data. From the aspect of gender, the respondents were dominated by female teachers, with 183 (60.6%) compared to males, with 119 (39.4%). From an age perspective, the majority of respondents were in the mature age group of 41 to 50 years, with 114 individuals (37.7%). This trend shows that the data obtained represent the views of teachers who have maturity in terms of age and experience within the educational ecosystem in Putrajaya.

In terms of education level, the profile of the respondents shows a high level of professionalism, with a total of 225 individuals (74.5%) holding a Bachelor's Degree, while the rest hold postgraduate qualifications (Master's and PhD). The strength of this profile is reinforced by the stable length of service among teachers, where the largest group has served between 16 and 20 years, totaling 84 individuals (27.8%). However, from the aspect of working experience under the current head teacher's administration, the majority of respondents, totaling 196 individuals (64.9%), have served between 1 and 5 years. This period is considered very relevant and sufficient to enable teachers to provide an objective and fair assessment of head teachers' digital leadership practices in co-curricular management in their schools.

The Level of Head Teachers' Digital Leadership Practices in Co-Curricular Management in Putrajaya Primary Schools

The results of the study on the question "What is the level of head teachers' digital leadership in co-curricular management in Putrajaya primary schools?" are displayed in Table 4.

Table 4
Analysis of the Mean Score by Dimension for Head Teachers' Digital Leadership Level in Co-Curricular Management

Dimension	Mean	Level
Visionary Leadership	4.31	High
Cultivating Learning in the Digital Era	4.53	High
Excellence in Professional Practice	4.29	High
Driving Systemic Improvement	4.34	High
Ensuring Digital Citizenship	4.37	High
Overall (Head Teachers' Digital Leadership)	4.37	High

Source: Pallant, 2020 (Level: Low = 1.00–2.33, Medium = 2.34–3.66, High = 3.67–5.00)

This study measures the level of head teachers' digital leadership practices through five dimensions: Visionary Leadership, Cultivating Digital Era Learning, Excellence in Professional Practice, Driving Systemic Improvement, and Ensuring Digital Citizenship. Based on Table 4, the findings show that overall, the level of digital leadership practices of head teachers in Putrajaya primary schools is high, with an overall mean score of 4.37. From a dimensional perspective, the Cultivating Digital Era Learning dimension recorded the highest mean value of 4.53 (High Level). This result is followed by the Ensuring Digital Citizenship dimension with a mean value of 4.37 (High Level) and the Driving Systemic Improvement dimension with a mean value of 4.34 (High Level).

Next, the Visionary Leadership dimension recorded a mean value of 4.31 (High Level), while the Excellence in Professional Practice dimension showed the lowest mean value compared to the other dimensions, but the score remained at a high level of 4.29. Overall, these findings summarize that head teachers in Putrajaya primary schools have practiced excellent digital leadership in their schools' co-curricular management. This is proven primarily through the achievement of the highest score in the aspect of cultivating learning in the digital era among schoolchildren. Thus, the study shows that the level of head teachers' digital leadership practices in co-curricular management in Putrajaya primary schools is high across all dimensions measured. This situation indicates that school leaders successfully integrate digital elements into co-curricular management.

Table 5
Dimensions and Item Analysis of Head Teachers' Digital Leadership Level in Co-Curricular Management in Putrajaya Primary Schools

	Dimension	**Description**						
No	**Item**	**STS**	**TS**	**TP**	**S**	**SS**	**Mean**	**SP**
	Visionary Leadership							
B1	The head teacher sets a clear mission and vision regarding the use of technology to manage school activities, particularly in co-curricular areas.	0 (0%)	3 (1.0%)	13 (4.3%)	172 (57.0%)	114 (37.7%)	4.31	0.602
B2	The head teacher encourages teachers to use technology creatively in co-curricular activities conducted with students.	0 (0%)	1 (0.3%)	14 (4.6%)	127 (42.1%)	160 (53.0%)	4.48	0.603
B3	The head teacher Involves all teachers In planning technology use strategies for the Implementation of co-curricular activities.	0 (0%)	3 (1.0%)	36 (11.9%)	129 (42.7%)	134 (44.4%)	4.30	0.715
B4	The head teacher serves as a role modeling the use of technology for school management purposes.	0 (0%)	4 (1.3%)	34 (11.3%)	175 (57.9%)	89 (29.5%)	4.16	0.661
	Overall						**4.31**	**0.656**
	Cultivating Learning in the Digital Era							
B5	The head teacher encourages the use of technology in school management.	0 (0%)	1 (0.3%)	13 (4.3%)	144 (47.7%)	144 (47.7%)	4.43	0.593
B6	The head teacher supports the use of digital platforms such as Google Classroom, WhatsApp, and Telegram for co-curricular activities.	0 (0%)	4 (1.3%)	2 (0.7%)	110 (36.4%)	186 (61.1%)	4.58	0.580
B7	The head teacher trusts teacher advisors to manage co-curricular activities digitally.	0 (0%)	2 (0.7%)	3 (1.0%)	128 (42.4%)	169 (56.0%)	4.54	0.556
B8	The head teacher encourages communication between teacher advisors and external parties (e.g., PIBG, parents, and the community) using	0 (0%)	1 (0.3%)	2 (0.7%)	116 (38.4%)	183 (60.6%)	4.59	0.525

	technologies such as WhatsApp and Telegram.							
	Overall						**4.53**	**0.567**
	Excellence in Professional Practice							
B9	The head teacher ensures that teachers receive continuous professional training opportunities regarding technology In education.	0 (0%)	1 (0.3%)	13 (4.3%)	154 (51.0%)	134 (44.4%)	4.39	0.588
B10	The head teacher provides Individual guidance and support to teachers who need assistance with technology Issues.	1 (0.3%)	4 (1.3%)	51 (16.9%)	140 (46.4%)	106 (35.1%)	4.14	0.764
B11	The head teacher recognizes or rewards teachers who use technology creatively in co-curricular areas.	0 (0%)	2 (0.7%)	29 (9.6%)	146 (48.3%)	125 (41.4%)	4.30	0.667
B12	The head teacher creates professional learning communities (PLC) Where teachers can share best practices regarding the use of technology in school management, Including co-curricular areas.	0 (0%)	2 (0.7%)	12 (4.0%)	174 (57.6%)	114 (37.7%)	4.32	0.583
	Overall						**4.29**	**0.660**
	Driving Systemic Improvement							
B13	The head teacher ensures that technology facilities such as Wi-Fi and devices are sufficient for school management.	1 (0.3%)	3 (1.0%)	10 (3.3%)	140 (46.4%)	148 (49.0%)	4.43	0.641
B14	The head teacher plans ways to Improve the use of technology In the school from time to time.	1 (0.3%)	2 (0.7%)	35 (11.6%)	159 (52.6%)	105 (34.8%)	4.21	0.691
B15	The head teacher ensures that co-curricular records such as attendance and achievements are stored systematically In a digital system.	0 (0%)	3 (1.0%)	11 (3.6%)	149 (49.3%)	139 (46.0%)	4.40	0.612
B16	The head teacher ensures sufficient financial allocation to purchase necessary technology	0 (0%)	5 (1.7%)	22 (7.3%)	147 (48.7%)	128 (42.4%)	4.32	0.681

	equipment for school management.							
	Overall						**4.34**	**0.662**
	Ensuring Digital Citizenship							
B17	The head teacher consistently emphasizes the Importance of digital ethics and security to all school members.	0 (0%)	3 (1.0%)	6 (2.0%)	162 (53.6%)	131 (43.4%)	4.39	0.582
B18	The head teacher encourages teachers and students to use technology responsibly in all co-curricular activities.	0 (0%)	2 (0.7%)	13 (4.3%)	167 (55.3%)	120 (39.7%)	4.34	0.593
B19	The head teacher ensures that school technology use policies are clear and understood by all parties.	0 (0%)	1 (0.3%)	12 (4.0%)	166 (55.0%)	123 (40.7%)	4.36	0.575
B20	The head teacher ensures that all co-curricular activities using online platforms comply with student data privacy and security policies.	0 (0%)	2 (0.7%)	10 (3.3%)	162 (53.6%)	128 (42.4%)	4.38	0.585
	Overall						**4.37**	**0.583**

N= 302

Table 5 shows the dimensions and frequency analysis, percentages, means, and standard deviations for the 20 questionnaire items regarding the level of head teachers' digital leadership in co-curricular management in Putrajaya primary schools. Overall, the findings show that head teachers' digital leadership practices in co-curricular management are at a high level, with all dimensions recording a mean value above 4.00. This situation illustrates that head teachers in primary schools have generally applied digital leadership elements effectively in strengthening co-curricular management.

For the Visionary Leadership dimension, the overall mean value is 4.31 (SD = 0.656), showing a high level. Item B2 recorded the highest mean value of 4.48, indicating that head teachers strongly encourage the creative use of technology in extracurricular activities. However, item B4 obtained the lowest mean of 4.16. The aspect of leadership through example in the use of technology still needs attention to be strengthened.

In the Driving Systemic Improvement dimension, the overall mean value was recorded as 4.34 (SD = 0.662), which is at a high level. Item B13, with a mean of 4.43, shows head teachers' concern for the provision of technology facilities. However, item B14, which recorded a mean of 4.21, illustrates that technology improvement planning efforts can still be improved more systematically.

Finally, the Ensuring Digital Citizenship dimension recorded an overall mean value of 4.37 (SD = 0.583). Item B17 recorded the highest mean of 4.39, which shows continued emphasis on

ethical aspects as well as digital security. This finding shows that head teachers not only encourage the use of technology but also ensure that its use is carried out responsibly and ethically.

In conclusion, the findings of this study prove that head teachers have successfully integrated digital leadership into holistic co-curricular management. Although the level of practice is high, there are some aspects — such as individual guidance and the role as an example in the use of technology — that still need to be strengthened to achieve a superior level of digital leadership.

Discussion

Levels of Head Teachers' Digital Leadership Practices in Co-Curricular Management

This research comprehensively discusses the formulation, analysis, and implications arising from the research findings on head teachers' digital leadership practices in co-curricular management in primary schools around Putrajaya. Through a descriptive analysis of the responses of 302 respondents, this study successfully proved empirically that the level of digital leadership in the study location is high. This reflects the effectiveness of school leaders in translating the mandate of the Digital Education Policy (DPD) to the grassroots level. Putrajaya's position as the nation's center of smart administration is seen as a catalytic factor that provides a superior infrastructure ecosystem, thereby shaping the readiness of school leaders to lead digitally more effectively than in other areas.

Contribution and Implications

This study provides a profound contribution to enriching the literature related to digital leadership in the context of co-curricular management in primary schools, which previously received little attention. The findings prove empirically that head teachers' digital leadership is at a high level and plays an important role in improving the effectiveness of co-curricular management. In addition, this study also contributes to the understanding that digital leadership does not merely involve technical skills but includes the strategic ability of leaders in building a digital vision, cultivating the use of technology, and driving organizational change as a whole. This study also strengthens the role of head teachers as agents of change who are able to coordinate national aspirations with implementation at the school level.

Theoretical Implications

Theoretically, this study confirms that the ISTE Model (2014) is very suitable for use in the context of education in Malaysia. The results prove that the characteristics of visionary leadership, such as having a clear digital vision and promoting cyber ethics (digital citizenship), are the appropriate methods to evaluate the competence of head teachers in the country. Moreover, the evidence from this study supports the theory that digital leadership is not only about computer skills. Instead, it is the strategic ability of a leader to build a school environment that constantly supports innovation and the use of technology as a whole.

Policy Implications

The findings of this study provide a positive indication to the Malaysian Ministry of Education that the implementation of the Digital Education Policy (DPD) has been successfully translated at the school level, especially in areas with strong infrastructure support such as Putrajaya. Head teachers are seen as an important link between national policy and implementation on the ground. In addition, leadership training institutions such as the Aminuddin Baki Institute (IAB) need to improve leadership development programs by emphasizing more complex digital competencies such as data analysis, cybersecurity, and digital change management. This proposal is supported by the International Society for Technology in Education (ISTE, 2018), which emphasizes the need for educational leaders to master advanced digital skills to lead school innovation. Furthermore, Sheninger (2019) asserts that school leaders need to be equipped with the ability to manage digital change strategically to ensure the effectiveness of educational organization transformation.

Practical Implications and Practice

From a practical point of view, this study shows that effective digital leadership practices are able to improve the efficiency of co-curricular management through the use of technology. Communication processes, activity coordination, and data management become more systematic, fast, and transparent. In addition, the use of automation technology in co-curricular management — such as attendance recording, student participation management, and activity reporting — can reduce the manual workload of teachers and improve data accuracy. Digital leadership also opens up space for the use of digital platforms in strengthening the involvement of students and the school community.

From the perspective of school practice, head teachers need to continue to strengthen their role as digital leaders who not only set the vision but also become role models in the use of technology. Leadership by example is important to build the confidence and motivation of teachers in integrating technology into co-curricular management. In addition, professional development approaches such as individual guidance (coaching) and Professional Learning Communities (PLC) need to be strengthened to ensure that all teachers have a balanced level of digital competence. A culture of technology also needs to be made a daily practice in schools so that the use of technology becomes the norm in the management and implementation of co-curricular activities. Finally, the aspect of digital citizenship needs to be given constant attention by emphasizing the values of ethics, safety, and responsibility in the use of technology. This is important to ensure that the use of technology occurs in a prudent and safe manner among the school community.

Limitations and Recommendations for Further Study

Although this study provides a profound impact, several limitations should be taken into account, especially the focus of the population, which is limited to schools in Putrajaya that have the advantage of excellent digital infrastructure. These findings may not reflect the actual situation in rural or interior areas that still face significant digital divide issues. Therefore, for future studies, the researchers suggest conducting a comprehensive comparative study between urban and rural zones to identify gaps in leadership practices more holistically. In addition, the use of qualitative methods through in-depth interviews with head teachers is highly recommended to explore psychological dimensions, financial

constraints, and technical challenges faced in the field, which cannot be fully explored through questionnaire methods.

Furthermore, future studies are recommended to use qualitative approaches or mixed methods to gain a deeper understanding of the challenges and best practices of digital leadership in schools. In addition, there is a need to develop a holistic digital leadership model that includes various new dimensions in line with the speed of digital creative innovation today. Therefore, further studies also need to focus on the relationship between digital leadership and student success, especially from the aspects of digital literacy, involvement, and achievement in co-curricular activities, to assess the real impact on the holistic development of students. Future researchers are also encouraged to examine implementation challenges such as lack of technology skills, teacher workload, and infrastructure issues to help design more effective intervention strategies.

Conclusion

Overall, head teachers' digital leadership practices in co-curricular management are at a high level. Head teachers have successfully played an important role in integrating technology into the management of the co-curriculum in a systematic and effective manner. However, continuous improvement needs to be made, especially in the aspects of individual guidance, role as a technology model, and strategic planning. Strong digital leadership will ensure more innovative, efficient, and relevant co-curricular management aligned with today's educational needs.

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