

A Content Validity Study of the Middle Leader Digital Leadership Instrument in Malaysia Primary Schools

Kesahan Kandungan Instrumen Kepimpinan Digital Pemimpin Pertengahan di Sekolah Rendah Malaysia.

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ABSTRACT - This study evaluated the content validity of the newly developed Middle Leader Digital Leadership instrument, which was designed to measure seven dimensions of digital leadership among middle leaders in Malaysian primary schools. Quantitative content validity design was employed, and seven experts in educational technology, curriculum design, educational leadership, and psychometrics were selected through purposive sampling. The experts independently reviewed 35 items for relevance, clarity, and construct alignment using a four-point rating scale. The Item-Level Content Validity Index (I-CVI) ranged from 0.71 to 1.00, while the Scale-Level Content Validity Index based on average agreement (S-CVI/Ave) was high across all seven dimensions (0.94-0.97). Modified kappa statistics further indicated substantial to perfect expert agreement for most items, although one item in the Vision and Goal Setting dimension required revision due to low chance-corrected agreement. Overall, the findings provide strong preliminary evidence that the instrument is content-valid and contextually appropriate for assessing middle leaders' digital leadership competencies in Malaysian primary schools. The instrument may support self-assessment, targeted professional development, policy implementation, and school-level digital transformation planning. However, the study is limited to expert-based content validation. Future research should conduct pilot testing, exploratory and confirmatory factor analyses, reliability testing, and assessments of convergent and discriminant validity using a larger sample of middle leaders.

ABSTRAK - Kajian ini menilai kesahan kandungan instrumen Kepimpinan Digital Pemimpin Pertengahan yang dibangunkan untuk mengukur tujuh dimensi kepimpinan digital dalam kalangan pemimpin pertengahan sekolah rendah di Malaysia. Reka bentuk kajian kesahan kandungan kuantitatif digunakan dengan persampelan purposif yang melibatkan tujuh orang pakar dalam bidang teknologi pendidikan, reka bentuk kurikulum, kepimpinan pendidikan dan psikometrik. Sebanyak 35 item dinilai dari segi kesesuaian, kejelasan dan penjajaran konstruk menggunakan skala empat mata. Nilai Indeks Kesahan Kandungan Item (I-CVI) adalah antara 0.71 hingga 1.00, manakala nilai Indeks Kesahan Kandungan Skala (S-CVI/Ave) bagi tujuh dimensi adalah tinggi, iaitu antara 0.94 hingga 0.97. Analisis kappa terubah suai turut menunjukkan persetujuan pakar yang besar hingga sempurna bagi kebanyakan item, kecuali satu item dalam dimensi Visi dan Penetapan Matlamat yang memerlukan penambahbaikan lanjut. Dapatan ini menunjukkan bahawa instrumen mempunyai asas kesahan kandungan yang kukuh untuk digunakan dalam penilaian sendiri, perancangan

pembangunan profesional dan inisiatif transformasi digital sekolah. Walau bagaimanapun, kajian ini terhad kepada kesahan kandungan melalui panel pakar sahaja. Kajian masa depan disarankan melaksanakan kajian rintis, analisis faktor penerokaan, analisis faktor pengesahan, analisis kebolehpercayaan serta analisis kesahan konvergen dan diskriminan bagi mengukuhkan bukti psikometrik instrumen.

INTRODUCTION

Digital leadership has become a central concern in educational administration because schools increasingly depend on leaders who can guide the purposeful, ethical, and pedagogically meaningful use of technology. In primary schools, this responsibility is not carried only by principals or headmasters. Middle leaders, including subject panel heads, programme coordinators, digital teams, and project leaders, frequently translate school-level digital priorities into classroom practices, mentor colleagues, and coordinate implementation across teaching teams. Their position between senior leadership and classroom teachers makes them especially important in sustaining digital transformation at the operational level. Therefore, a contextually grounded instrument is needed to assess the digital leadership competencies of middle leaders and to guide their professional development.

Although digital leadership has received growing scholarly attention, existing instruments tend to emphasise principals, senior administrators, or generic leadership competencies. These measures do not sufficiently capture the distributed, relational, ethical, and pedagogical responsibilities of middle leaders in school digital transformation. Recent studies on digital leadership and middle leadership highlight the importance of modelling, mentoring, collaborative goal setting, digital pedagogy, and responsible technology use (Lee & Jung, 2025; Mashudi et al., 2025; Sheninger, 2019; Zaka, 2022). This gap is particularly important in the Malaysian primary school context, where digital initiatives must be aligned with national policies, school realities, teacher readiness, and classroom-level implementation. Hence, the present study develops and validates a Middle Leader Digital Leadership instrument through a structured content validation process.

LITERATURE REVIEW

2.1 Middle Leaders' Digital Leadership

Digital leadership has become a crucial skill for navigating the 21st-century educational landscape, particularly amid the rapid pace of technological change and the need for structural transformation. Leadership studies in the digital age, conducted by top-level administrators (Avolio et al., 2014; Sheninger, 2019), are well-researched, yet assessments often fail to consider the indispensable contributions of middle leaders. As Fourie and Naidoo (2022) and Liu (2023) state, a middle leader is an agent of change and the "connective tissue" that turns school-wide visions of digital transformation into feasible plans for implementation at the level of teaching teams and departments. Middle leaders are agents of change who make digital transformations possible and enable the development of significant connections that foster collaboration in challenging situations, including during the global COVID-19 pandemic, requiring new approaches to leadership (Bhandari et al., 2025; Henderikx & Stoffers, 2023). However, existing scales of digital leadership either generalise leaders' qualities or focus on their executive functions, failing to reflect the complex nature of leaders' distributed relational roles.

2.2 Past Studies and Frameworks

Avolio et al. (2014) highlighted the changing nature of leadership in digitally mediated environments, while Sheninger (2019) emphasised communication, community building, and innovation as core components of digital leadership. These components are highly relevant to middle leaders because they often operationalise digital transformation within subject panels, departments, and teacher teams. Zaka (2022) showed that middle leaders influence digital pedagogy through modelling, mentoring, and policy-practice alignment. In the Malaysian context, recent scholarship has further indicated that middle leaders face challenges related to resource limitations, top-down expectations, and uneven teacher digital competencies (Lee & Jung, 2025; Mashudi et al., 2025; Tan et al., 2023). These studies collectively support the need for an instrument that reflects the specific roles and contextual demands

of middle leadership in digital transformation. The ISTE Standards for Educators and the European Commission's DigCompEdu framework have also shaped international discussions on digital competence and leadership (International Society for Technology in Education, 2016; Redecker, 2017). ISTE emphasises leadership, collaboration, design, citizenship, and data-informed practice, while DigCompEdu focuses on professional engagement, digital resources, teaching and learning, assessment, learner empowerment, and the development of learners' digital competence. However, these broad frameworks must be translated into role-specific competencies for middle leaders, whose work is collaborative, practice-based, and situated between policy and classroom implementation. The present instrument, therefore, integrates international frameworks with Malaysian policy expectations and the realities of primary school leadership.

2.3 Dimensions of Middle Leaders' Digital Leadership

In response to the identified deficiencies in existing instruments, the current study evaluated and validated the Middle Leader Digital Leadership instrument, structured around seven conceptual dimensions derived from policy and empirical literature: (i) Vision and Goal Setting, (ii) Support and Empowerment, (iii) Professional Learning and Modelling, (iv) Standards and Practice Alignment, (v) Assessment and Feedback, (vi) Change Leadership and Cultural Building, and (vii) Ethics and Digital Responsibility. The following are operational definitions of these dimensions:

a) Vision and Goal Setting

For school-wide goals to align, middle leaders need to be able to set and communicate a clear, future-focused vision for digital transformation. In essence, this entails collaborating to set digital objectives, promoting innovation, and scrutinising plans to remain adaptive and relevant in the dynamic environment of the education sector. The literature shows that effective vision setting, together with collaborative goal setting, will not only enhance workforce engagement but also create collective commitment to digital efforts (Utami et al., 2022; Ott & Tiozzo, 2022). In addition, since middle leaders link administrative functions to classroom practice, it is imperative that they communicate an inspiring vision for realising digital goals (Komalasari & Anggraini, 2020).

b) Support and Empowerment

Empowerment refers to the concerted actions of middle leaders that will provide teachers with enough time, materials, flexibility, and equal access to make effective use of technological means. Within this dimension, it becomes possible to create an environment that encourages mentoring and personalised coaching, enabling teachers to generate creative ideas for technology-based teaching. For example, organising professional learning communities where teachers exchange materials and strategies has been found to positively impact the effectiveness of technology integration in teaching (Fu & Satrianawati, 2022). Practices that empower teachers not only increase their confidence but also foster a culture of experimentation among them.

c) Professional Learning and Modelling

This dimension involves the extent of participation in digital professional development activities and the demonstration of exemplary technology integration skills among middle leaders, which greatly impacts their ability to contribute to teachers' professional development. The process of continuous professional development ensures that middle leaders remain aware of emerging technologies and pedagogical approaches, enabling them to guide their colleagues' professional development and monitor their staff's progress in digital competence (Matusevych & Zadorozhna, 2023; Babalola et al., 2023). Besides, by demonstrating exemplary technology integration, they serve as powerful role models whose skills may inspire other educators (Gillern et al., 2024).

d) Standards and Practice Alignment

This dimension assesses the effectiveness of middle leaders in linking instructional practices to digital competency models, such as the ISTE Standards, which is vital to ensuring that digital projects are

successfully embedded in learning processes. This is achieved by ensuring that children are taught how to behave digitally and make data-informed decisions, thereby encouraging responsible online behaviour among educators (Isdendi et al., 2023; Kalir & Dillon, 2019). The consistent incorporation of these standards into instructional practices will help close the gap between policy and practice and highlight the significance of ethical digital practices and citizenship.

e) Assessment and Feedback

This dimension entails facilitating the adoption and implementation of digital assessment instruments, which are among the qualities of a good middle leader in the contemporary digital environment. The following dimension captures the efforts made by middle leaders to empower students to take responsibility for their learning by enabling them to conduct self-assessment and understand digital feedback effectively. Through digital assessment techniques, they can facilitate the modification of instruction and the customisation of the learning process to cater to learners' needs (Harmanto et al., 2022; Kusuma & Wicaksono, 2024). Moreover, a feedback-oriented culture encourages transparency and continuous improvement of pedagogy.

f) Change Leadership and Cultural Building

The phenomenon of change leadership refers to the ability of middle managers to lead system-level digital innovation and foster an experimental culture that benefits all parties involved. It implies promoting constructive discussions about potential obstacles and continuous improvement within the organisation (McPherson et al., 2019; Hong, 2024). An effective middle manager takes into account feedback from different sources, ensuring that the digital revolution remains inclusive and serves the interests of all students. While emphasising the necessity for leaders to be adaptable, this feature also highlights that cultural transformation should occur constantly to sustain digital initiatives.

g) Ethics and Digital Responsibility

The level of awareness and support from middle leaders concerning the responsible, ethical, and secure use of digital tools is essential. This component addresses critical issues such as privacy, online security, and bias in artificial intelligence, thereby ensuring that digital ethics are well integrated into the learning environment (Kumari et al., 2023; Sari et al., 2020). Middle leaders contribute to the development of a digital culture by setting an example through respectful digital communication. This is crucial when addressing the challenges of integrating technology into learning. Promoting digital responsibility helps prepare students for critical thinking within digital environments (Wulandari et al., 2021).

In summary, these seven dimensions illustrate the complex nature of digital leadership necessary for middle leaders, highlighting the significance of strategic vision, support systems, and ethical considerations in technology deployment (Ming & Mansor, 2024; Henderikx & Stoffers, 2023). In addition, the instrument is based on guidelines from the Malaysian Ministry of Education and aligns with international standards such as ISTE. This ensures it is useful and relevant across many educational settings, especially in Malaysia (Yip et al., 2025; Yasin, 2024). This study seeks to assist researchers, policymakers, and school leaders in evaluating and improving the digital competencies of middle leaders by creating a contextually pertinent instrument.

METHODS AND MATERIALS

This study adopted a quantitative content validity design to evaluate the newly developed Middle Leader Digital Leadership instrument for Malaysian primary schools. The purpose was to establish evidence-based on experts that the items adequately represented the intended construct before proceeding to wider empirical validation. The instrument development process began with an extensive review of digital leadership literature, international digital competence frameworks, and Malaysian educational policy expectations. Based on this review, 35 items were generated and mapped to seven conceptual dimensions: (i) Vision and Goal Setting, (ii) Support and Empowerment, (iii) Professional Learning and Modelling, (iv) Standards and Practice Alignment, (v) Assessment and Feedback, (vi) Change

Leadership and Cultural Building, and (vii) Ethics and Digital Responsibility. Items were refined for construct alignment, clarity of wording, and relevance to the Malaysian primary school context.

Seven content experts were selected through purposive sampling to ensure relevant domain expertise across educational technology, curriculum design, educational leadership, and psychometrics. The use of seven experts was consistent with established CVI guidance recommending expert panels of approximately five to ten members for content validation. Inclusion criteria were: (i) a postgraduate qualification in education, educational technology, leadership, or a related field; (ii) at least ten years of professional experience in relevant roles, such as university academic, district officer, ministry specialist, or teacher educator; and (iii) evidence of scholarly publication, professional leadership, or recognised contribution to digital education initiatives. Item retention decisions followed conventional thresholds of I-CVI ≥ 0.78 for panels of six or more experts and S-CVI/Ave ≥ 0.90 at the scale level (Lynn, 1986; Polit & Beck, 2006).

Each expert independently evaluated the relevance, clarity, and construct alignment of the 35 items using a four-point rating scale. Ratings of 3 or 4 were recoded as agreement, while ratings of 1 or 2 were recoded as non-agreement for the calculation of the Item-Level Content Validity Index (I-CVI). Scale-level content validity was examined using S-CVI/Ave, and modified kappa statistics were calculated to account for chance agreement. Items that fell below the recommended thresholds or received expert comments indicating ambiguity were retained only if theoretically important and were revised for clarity, specificity, and contextual appropriateness. Expert qualitative comments were used to refine item wording and strengthen dimensional precision before the instrument proceeded to pilot testing and further psychometric analysis.

Table 1. The Qualifications and Expertise of Experts

Expert	Institutions	Area of Expertise	Years of Experience
Expert 1	National University	Educational Technology	15 years
Expert 2	Teacher Training Institution	Teacher Professional Development, Instructional Design	20 years
Expert 3	National University	Digital Assessment, ICT Integration in Schools	18 years
Expert 4	National University	Leadership and Psychology	12 years
Expert 5	District Education Officer	Digital Pedagogy, ICT in Education	22 years
Expert 6	National University	Educational Technology	25 years
Expert 7	Ministry of Education	Educational Technology	17 years

RESULTS AND DISCUSSION

For Dimension 1: Vision and Goal Setting, Items 1-4 achieved perfect expert agreement (I-CVI = 1.00; kappa = 1.00), indicating strong relevance and clarity. Item 5 obtained an I-CVI of 0.71, which met the minimum retention criterion for seven raters but yielded a low modified kappa (kappa = 0.17), suggesting that the agreement was weak after adjustment for chance. Therefore, Item 5 was retained for theoretical coverage but marked for substantive wording revision. The dimension-level S-CVI/Ave was 0.94, supporting adequate content representation.

Table 2. The Relevance of Dimension 1: Vision and Goal Setting

Items	E1	E2	E3	E4	E5	E6	E7	Experts in Agreement (n)	I-CVI	Pc	Kappa Statistic
1	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
2	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
3	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
4	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
5	1	1	1	1	0	0	1	5	0.71	0.65625	0.17

Note. S-CVI/Ave = 0.94 (accepted). I-CVI = content validity index for items; S-CVI = content validity index for scales; Pc = Probability of chance agreement

For Dimension 2: Support and Empowerment, four items achieved perfect agreement, while Item 6 recorded an acceptable I-CVI of 0.86 and a substantial kappa value of 0.82. The S-CVI/Ave of 0.95 indicates strong content validity for this dimension. All items were retained, with minor wording refinement recommended for Item 6 to improve precision and expert consensus.

Table 3. The Relevance of Dimension 2: Support and Empowerment

Items	E1	E2	E3	E4	E5	E6	E7	Experts in Agreement (n)	I-CVI	Pc	Kappa Statistic
6	1	1	1	1	1	0	1	6	0.86	0.21875	0.82
7	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
8	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
9	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
10	1	1	1	1	1	1	1	7	1.00	0.03125	1.00

Note. S-CVI/Ave = 0.95 (accepted). I-CVI = content validity index for items; S-CVI = content validity index for scales; Pc = Probability of chance agreement

For Dimension 3: Professional Learning and Modelling, Items 12, 13, and 14 achieved perfect agreement. Items 11 and 15 recorded acceptable I-CVI values of 0.86 and substantial kappa values of 0.82. The dimension obtained an S-CVI/Ave of 0.94, indicating strong content validity. All items were retained, while Items 11 and 15 were identified for minor revision based on expert feedback.

Table 4. The Relevance of Dimension 3: Professional Learning and Modelling

Items	E1	E2	E3	E4	E5	E6	E7	Experts in Agreement (n)	I-CVI	Pc	Kappa Statistic
11	1	1	1	1	1	0	1	6	0.86	0.21875	0.82
12	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
13	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
14	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
15	1	1	1	1	0	1	1	6	0.86	0.21875	0.82

Note. S-CVI/Ave = 0.94 (accepted). I-CVI = content validity index for items; S-CVI = content validity index for scales; Pc = Probability of chance agreement

For Dimension 4: Standards and Practice Alignment, Items 16, 18, and 19 achieved perfect agreement, while Items 17 and 20 recorded acceptable I-CVI values of 0.86 with substantial kappa values of 0.82. The S-CVI/Ave of 0.94 supports the adequacy of this dimension in representing alignment between digital leadership practices, standards, and classroom implementation. Items 17 and 20 were retained with minor wording refinement.

Table 5. The Relevance of Dimension 4: Standards and Practice Alignment

Items	E1	E2	E3	E4	E5	E6	E7	Experts in Agreement (n)	I-CVI	Pc	Kappa Statistic
16	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
17	1	0	1	1	1	1	1	6	0.86	0.21875	0.82
18	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
19	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
20	1	1	1	1	0	1	1	6	0.86	0.21875	0.82

Note. S-CVI/Ave = 0.94 (accepted). I-CVI = content validity index for items; S-CVI = content validity index for scales; Pc = Probability of chance agreement

For Dimension 5: Assessment and Feedback, Items 22, 23, and 24 achieved perfect agreement, whereas Items 21 and 25 obtained acceptable I-CVI values of 0.86 and substantial kappa values of 0.82. The dimension-level S-CVI/Ave was 0.94. These results support retaining all items, with targeted refinement of Items 21 and 25 to improve clarity on digital assessment practices and the use of feedback.

Table 6. The Relevance of Dimension 5: Assessment and Feedback

Items	E1	E2	E3	E4	E5	E6	E7	Experts in Agreement (n)	I-CVI	Pc	Kappa Statistic
21	1	1	1	1	1	0	1	6	0.86	0.21875	0.82
22	1	1	1	1	1	1	1	7	1.00	0.03125	1.00

23	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
24	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
25	1	1	1	1	1	0	1	6	0.86	0.21875	0.82

Note. S-CVI/Ave = 0.94 (accepted). I-CVI = content validity index for items; S-CVI = content validity index for scales; Pc = Probability of chance agreement

For Dimension 6: Change Leadership and Cultural Building, Items 27 to 30 achieved perfect expert agreement, while Item 26 recorded an acceptable I-CVI of 0.86 and a substantial kappa value of 0.82. This dimension achieved the highest S-CVI/Ave value (0.97), indicating very strong expert consensus. All items were retained, with Item 26 refined to clarify the middle leader's role in supporting change and building a digitally responsive culture.

Table 7. The Relevance of Dimension 6: Change Leadership and Cultural Building

Items	E1	E2	E3	E4	E5	E6	E7	Experts in Agreement (n)	I-CVI	Pc	Kappa Statistic
26	1	0	1	1	1	1	1	6	0.86	0.21875	0.82
27	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
28	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
29	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
30	1	1	1	1	1	1	1	7	1.00	0.03125	1.00

Note. S-CVI/Ave = 0.97 (accepted). I-CVI = content validity index for items; S-CVI = content validity index for scales; Pc = Probability of chance agreement

For Dimension 7: Ethics and Digital Responsibility, Items 31, 32, and 33 achieved perfect agreement, while Items 34 and 35 recorded acceptable I-CVI values of 0.86 and substantial kappa values of 0.82. The S-CVI/Ave of 0.94 confirms strong content validity for this dimension. Items 34 and 35 were retained with minor refinement to strengthen their focus on ethical, safe, and responsible digital leadership practices.

Table 8. The Relevance of Dimension 7: Ethics and Digital Responsibility

Items	E1	E2	E3	E4	E5	E6	E7	Experts in Agreement (n)	I-CVI	Pc	Kappa Statistic
31	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
32	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
33	1	1	1	1	1	1	1	7	1.00	0.03125	1.00
34	1	1	1	1	1	0	1	6	0.86	0.21875	0.82
35	1	1	1	1	0	1	1	6	0.86	0.21875	0.82

Note. S-CVI/Ave = 0.94 (accepted). I-CVI = content validity index for items; S-CVI = content validity index for scales; Pc = Probability of chance agreement

Across the seven dimensions and 35 items, the findings provide strong evidence of content validity for the Middle Leader Digital Leadership instrument. The S-CVI/Ave values ranged from 0.94 to 0.97, exceeding the recommended threshold of 0.90. Thirty-four items demonstrated acceptable to perfect content validity after adjustment for chance agreement, while one item (Dimension 1, Item 5) required more substantial revision. Rather than repeating identical statistical interpretations for each dimension, the results show a consistent pattern: the instrument demonstrates strong scale-level representation, most items are clearly aligned with their constructs, and a small number of items require wording refinement before pilot testing.

Table 9. Summary of Content Validity Indices by Dimension

Dimension	Item (n)	I-CVI Range	Items with Perfect Agreement (I-CVI = 1.00)	Lowest Kappa (item)	S-CVI/Ave	Decision
1. Vision and Goal Setting	5	0.71-1.00	4	0.17 (Item 5)	0.94	Retain all; revise Item 5 for clarity/specificity.

2. Support and Empowerment	5	0.86-1.00	4	0.82 (Item 6)	0.95	Retain all; minor wording refinement for Item 6
3. Professional Learning and Modelling	5	0.86-1.00	3	0.82 (Items 11, 15)	0.94	Retain all; revise Items 11 and 15.
4. Standards and Practice Alignment	5	0.86-1.00	3	0.82 (Items 17, 20)	0.94	Retain all; refine Items 17 and 20
5. Assessment and Feedback	5	0.86-1.00	3	0.82 (Items 21, 25)	0.94	Retain all; refine Items 21 and 25.
6. Change Leadership and Cultural Building	5	0.86-1.00	4	0.82 (Item 26)	0.97	Retain all; clarification to Item 26.
7. Ethics and Digital Responsibility	5	0.86-1.00	3	0.82 (Items 34, 35)	0.94	Retain all; refine Items 34 and 35

This study provides expert-based evidence for the content validity of a seven-dimensional Middle Leader Digital Leadership instrument comprising 35 items. The overall results were strong: all dimensions exceeded the accepted S-CVI/Ave threshold, with values ranging from 0.94 to 0.97, and most items achieved acceptable to perfect I-CVI and modified kappa values. The strongest dimension was Change Leadership and Cultural Building (S-CVI/Ave = 0.97), suggesting that experts viewed cultural transformation, change facilitation, and innovation support as central to middle leaders' digital leadership. Only one item, Item 5 in the Vision and Goal Setting dimension, showed weak chance-corrected agreement and therefore requires substantive revision before empirical testing.

The findings support the conceptual argument that digital leadership among middle leaders is multidimensional rather than a single general leadership trait. The seven dimensions reflect the layered responsibilities of middle leaders: setting digital direction, empowering teachers, modelling professional learning, aligning practice with standards, using assessment and feedback, leading change, and promoting ethical digital responsibility. This role-specific framing is important because middle leaders operate at the interface between policy direction and classroom enactment. Their leadership is therefore relational, collaborative, and practice-based, rather than limited to administrative authority.

4.1 Alignment with International and Malaysian Frameworks

The instrument is theoretically aligned with the ISTE Standards for Educators and the European Commission's DigCompEdu framework (International Society for Technology in Education, 2016; Redecker, 2017). Vision and Goal Setting, Change Leadership and Cultural Building, and Support and Empowerment correspond with leadership, professional engagement, and collaborative capacity-building. Standards and Practice Alignment and Assessment and Feedback reflect the need for evidence-informed digital pedagogy, while Ethics and Digital Responsibility reflect the growing importance of privacy, online safety, awareness of artificial intelligence, and responsible digital citizenship. By adapting these international expectations to the Malaysian primary school context, the instrument offers a more context-sensitive alternative to generic digital leadership measures.

4.2 Practical Implications

Practically, the instrument can be used by schools, district education offices, teacher education institutions, and policy implementers as a diagnostic and developmental tool. At the school level, middle leaders may use it for self-assessment, professional goal setting, and reflection on their readiness to lead digital initiatives. At the professional development level, the seven dimensions can guide targeted training modules, coaching cycles, professional learning communities, and mentoring programmes. At the policy level, the instrument may support monitoring of school digital transformation initiatives by

identifying areas where middle leaders require additional support, such as digital assessment, ethical use of technology, or change leadership. These applications strengthen the manuscript's contribution beyond instrument development by showing how the validated construct may inform teacher professional development and educational leadership practice.

4.3 Methodological Contribution

Methodologically, the study followed recognised content validation procedures by using a purposively selected panel of seven experts, reporting I-CVI and S-CVI/Ave values, and applying modified kappa statistics to account for chance agreement. This combination strengthens the interpretability of expert ratings and reduces the risk of retaining items based only on raw agreement. The inclusion of expert qualitative comments also ensured that item refinement was guided not only by numerical thresholds but also by construct clarity and contextual relevance.

CONCLUSIONS

In conclusion, the Middle Leader Digital Leadership instrument demonstrates strong content validity and conceptual coherence for assessing digital leadership competencies among middle leaders in Malaysian primary schools. The instrument addresses an important gap in educational leadership research by shifting attention from principal-centred digital leadership to the distributed, practice-based role of middle leaders. With further empirical validation, the instrument has the potential to support leadership development, professional learning, and evidence-informed digital transformation in schools.

Several limitations should be acknowledged. First, the study focused only on content validity and had not yet examined the instrument's internal structure, reliability, or criterion-related validity in a larger sample of respondents. Second, although the expert panel was purposively selected to represent relevant domains, the number of experts was limited to seven, which may not capture all possible perspectives across different Malaysian school contexts. Third, the study did not include response-process evidence from actual middle leaders, so future research should examine whether respondents interpret the items as intended. Future studies should conduct pilot testing with middle leaders in Malaysian primary schools, followed by Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) to examine dimensionality and model fit. Reliability should be assessed using Cronbach's alpha, composite reliability, and test-retest reliability where appropriate. Convergent and discriminant validity should also be examined, and criterion validity may be assessed by correlating instrument scores with external indicators such as teachers' digital pedagogy practices, participation in professional development, or school-level digital transformation outcomes. Larger studies may also test measurement invariance across school type, location, leadership role, and demographic background.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

AUTHORS' CONTRIBUTION

Author 1: Conceptualisation, Methodology, Software, Data curation, Writing-Original draft preparation, Writing- Reviewing and Editing.

AVAILABILITY OF DATA AND MATERIALS

Data subject to third-party restrictions.

DECLARATION OF GENERATIVE AI

During the preparation of this work, the author(s) used ChatGPT to enhance the clarity of the writing. After using ChatGPT, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication's content.

ETHIC STATEMENTS

Not applicable

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