Application of the Fuzzy Delphi Method in Evaluating a Malay Language Writing Skills Model for Orang Asli Schools in Malaysia

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ABSTRACT

Addressing low literacy achievement among Indigenous pupils in Malaysia, particularly in Malay language writing, remains a key challenge in achieving inclusive and equitable education. Conventional instructional approaches often fail to align with the cultural, linguistic, and contextual realities of Indigenous learners. In response, this study evaluates the appropriateness and usability of a newly developed instructional framework "Model Kemahiran Menulis Bahasa Melayu Sekolah Orang Asli" (KMBMSOA), or the "*Malay Language Writing Skills Model for Indigenous Schools*" which aims to enhance writing proficiency in Malay among primary-level Indigenous pupils. A quantitative design was employed using the Fuzzy Delphi Method (FDM) to obtain expert consensus from 30 experienced educators who teach in Indigenous school settings. Seven research questions guided the validation process, addressing the model's core components: instructional objectives, learning activities, pedagogical strategies, formative assessment and reflection, mastery-level clusters, and overall classroom usability. The results indicate strong expert consensus on the model's suitability and cultural relevance. Learner-centred, experience-based, and context-responsive strategies were identified as particularly effective. Experts highlighted the importance of clear, developmentally appropriate objectives, hands-on writing activities, and structured, flexible pedagogical approaches. The progressive mastery-level clusters were validated as useful in scaffolding learners' writing development. In conclusion, the KMBMSOA model demonstrates strong potential for supporting literacy instruction in Indigenous educational contexts. It offers a holistic, culturally adaptive framework for teaching writing. Future research should explore implementation in classroom settings, as well as sustained professional development and culturally aligned teaching materials for Indigenous education.

Keywords: Malay writing skills, Indigenous pupils, Fuzzy Delphi Method, culturally responsive pedagogy, model validation

INTRODUCTION

The low literacy achievement of Indigenous pupils in Malaysia, especially in writing the national language, remains a significant challenge to achieving inclusive and equitable education (Ganapathy et al., 2022). Despite a variety of policy interventions designed to enhance educational outcomes for Indigenous communities, the literacy gap, particularly in written Malay, persists and remains inadequately examined. Conventional pedagogical models used in mainstream schools are often ill-suited to the sociocultural, linguistic, and cognitive profiles of Indigenous learners. These models tend to overlook the importance of contextual relevance, experiential learning, and flexible instructional strategies that align with the lived realities of pupils in Indigenous school settings.

To address these limitations, this study introduces and evaluates the Model Kemahiran Menulis Bahasa Melayu

Sekolah Orang Asli (KMBMSOA), or the *Malay Language Writing Skills Model for Indigenous Schools*. This model was specifically designed to enhance the writing proficiency of primary-level Indigenous pupils through culturally responsive pedagogical approaches. The model incorporates key components such as clear instructional objectives, active learning activities, context-sensitive pedagogies, formative assessment, structured reflection, and a progressive cluster of mastery levels for writing skills development.

The objective of this study is to assess the appropriateness and usability of the KMBMSOA model based on the consensus of expert educators experienced in Indigenous education. The research applies the Fuzzy Delphi Method (FDM) to systematically capture expert judgments from 30 teachers regarding the effectiveness and contextual relevance of the model's components. Accordingly, this study seeks to answer the following research questions:

1. What is the level of expert consensus regarding the appropriateness of each component in the KMBMSOA model, including instructional objectives, activities, pedagogy, reflection and assessment, and mastery clusters?

2. How do experts evaluate the overall usability of the KMBMSOA model in real classroom contexts within Indigenous schools?

By addressing these questions, this study contributes to the development of a validated, contextually grounded instructional model that has the potential to significantly improve writing outcomes among Indigenous pupils in Malaysia, while also offering broader implications for inclusive curriculum design in multicultural education systems.

LITERITURE REVIEW

A. Writing Skills Development in the Malay Language Curriculum

Writing is a central component in Malaysia's national language curriculum, functioning as both a means of communication and a tool for cognitive development. The curriculum emphasises mastery in basic mechanics such as grammar, spelling, punctuation, and sentence structure, along with higher-order skills including idea organisation, coherence, and genre awareness (Kementerian Pendidikan Malaysia, 2020). However, many pupils across the nation, particularly those in rural or underserved communities, struggle to meet the prescribed learning standards. Several studies (e.g., Ismail et al., 2021) have found that deficiencies in writing are often rooted in early literacy experiences, limited exposure to standard written Malay, and teacher-centred approaches that underemphasise active and contextualised learning. These issues are more pronounced for pupils from Indigenous communities, who often encounter additional linguistic and cultural barriers (Delprato, 2021). The current approach to teaching writing tends to rely heavily on rote copying, textbook drills, and fixed assessments, leaving little room for creativity or personal voice. Such pedagogical limitations constrain pupils' ability to construct meaning through writing and hinder their development of authentic communicative skills. Therefore, a shift towards more contextualised, process-oriented, and learner-responsive writing instruction is essential.

Efforts to improve writing skills must also acknowledge the multifaceted nature of writing as a socio cognitive act. Writing is not only the product of linguistic competence but also shaped by cultural norms, personal identity, and cognitive strategies. Scardamalia and Bereiter (1987) distinguished between knowledge-telling and knowledge-transforming models of writing, the latter of which requires conscious structuring of arguments and ideas, skills that must be explicitly taught and scaffolded. In Malaysia, however, writing instruction in many classrooms still treats writing as a mechanical skill rather than a meaning-making process (Li & Razali, 2019). Teachers often lack the professional development needed to implement writing pedagogies that support idea development, drafting, and revision (Chandran et al., 2022). This is further complicated in Indigenous schools, where teachers may not have the cultural tools or resources to contextualise writing instruction in a way that resonates with pupils lived experiences (Anuas et al., 2024; Thulasi et al., 2015). As such, there is an urgent need for writing instruction models that integrate cognitive scaffolding, cultural sensitivity, and iterative practices.

Furthermore, writing pedagogy in the Malaysian context often overlooks the importance of formative assessment and metacognitive reflection, which are vital to improving writing proficiency (Norizan Mamat & Zakaria Mat Nawi, 2023; Yunus et al., 2020). Assessment practices remain largely summative and product-focused, measuring surface-level features such as spelling accuracy and grammar rather than the development of ideas or rhetorical strategies (Broadbent et al., 2018). This can disadvantage Indigenous pupils who may express ideas differently or who are still in the process of acquiring academic Malay as a second or third language (Shaid et al., 2022). Incorporating formative assessment strategies such as self-assessment, peer review, and portfolio compilation can enhance pupils' awareness of their writing processes and growth. Pedagogical models that embed opportunities for reflection, feedback, and revision align with the goals of 21st-century literacy and support long-term writing development. These approaches are particularly crucial for Indigenous pupils, whose writing skills may develop through alternative linguistic pathways or cultural narratives. Thus, writing instruction must be reimagined not only in terms of content but also in terms of pedagogy, assessment, and cultural alignment.

B. Indigenous Education in Malaysia: Barriers and Cultural Mismatches

Indigenous pupils in Malaysia, commonly referred to as Orang Asli, continue to experience structural educational disadvantages despite national initiatives aimed at inclusive education. According to the Ministry of Education, literacy rates and academic performance among Indigenous pupils remain significantly below the national average (Kementerian Pendidikan Malaysia, 2022). These disparities stem not only from socioeconomic disadvantages but also from systemic neglect and an education system that fails to accommodate cultural and linguistic diversity (Abd Jalil et al., 2024; Majzub & Rais, 2011; Primus et al., 2017). Most Indigenous communities are in geographically isolated areas with limited access to qualified teachers, infrastructure, and culturally relevant teaching resources. The mismatch between school culture and Indigenous worldviews leads to disconnection, demotivation, and high dropout rates. Education in such contexts becomes a process of assimilation rather than affirmation, resulting in pupils' alienation from formal learning structures (Iturra, 2019; Shuhidan et al., 2024).

Language poses a significant barrier in Indigenous education. Many Indigenous pupils speak their native tongues as their first language and only begin learning Malay, the medium of instruction upon entering school (Shaid et al., 2022). This creates a steep linguistic learning curve, particularly in mastering the writing system, grammar, and formal structures of academic Malay (Austrus et al., 2025). Unfortunately, the school system rarely accommodates these pupils' bilingual or multilingual repertoires, often adopting a monolingual ideology that overlooks the potential of translanguaging practices. Research by Chin (2021) and Salleh (2023) has shown that the lack of culturally and linguistically responsive instruction is one of the most critical factors contributing to low achievement among Indigenous pupils. Teachers often lack training in intercultural pedagogy and second language acquisition, leading to classroom practices that do not scaffold or affirm Indigenous learners' linguistic identities (Wang & Yuan, 2025). This deficit-oriented perspective impedes both academic progress and learner self-efficacy.

Indigenous knowledge systems, rooted in holistic, experiential, and land-based practices, are often marginalized in formal education. These approaches contrast with the decontextualized, linear pedagogy typical of Malaysian classrooms. Scholars such as Gay (2018) and McKinley and Smith (2019) advocate for culturally responsive pedagogy that integrates learners' cultural contexts into teaching. However, Malaysia's standardized curriculum limits local adaptation, and writing instruction neglects Indigenous oral traditions and lived experiences (Schroeder et al., 2022). Integrating these narratives can enhance literacy by making learning more meaningful and affirming cultural identity. Thus, any instructional model for Indigenous learners must be grounded in their sociocultural realities to promote both academic success and cultural relevance.

C. Instructional Model Development and the Role of the Fuzzy Delphi Method

Instructional models serve as structured frameworks that guide teaching and learning processes by linking theory, pedagogy, and practice. In developing models for marginalised or underrepresented groups, it is crucial that the design reflects both academic rigour and contextual relevance. Joyce and Calhoun (2024) argue that effective instructional models are not only theoretically grounded but also empirically validated and adaptable

across diverse contexts. In the Malaysian context, most instructional models have been generalised from mainstream education without sufficient consideration of cultural diversity or minority educational needs. Richey and Klein (2014) emphasize that robust model development should be informed by iterative design, field testing, and stakeholder feedback. This is especially pertinent in Indigenous education, where top-down models often fail to capture the nuanced needs of learners and communities. By integrating both academic and practitioner knowledge, instructional models can better serve as tools for transformative practice.

The Fuzzy Delphi Method (FDM) has emerged as a valuable methodological tool for model validation in complex, multi-stakeholder environments such as education. FDM refines the traditional Delphi technique by incorporating fuzzy set theory, allowing for the quantification of subjective expert opinions while addressing ambiguity and imprecision (Murry & Hammons, 1995). In educational research, FDM has been applied to validate curriculum elements, pedagogical frameworks, and instructional tools (Chu & Hwang, 2008). Its iterative nature allows researchers to converge expert judgments over multiple rounds, producing a collective consensus that is both rigorous and flexible. This is particularly beneficial in contexts where qualitative nuances and local knowledge are vital to model accuracy and usability. Applying FDM to Indigenous education ensures that the voices of practitioners especially teachers who understand the linguistic, cognitive, and emotional needs of their pupils, are central to the development process.

In this study, the FDM was used to validate the components of the KMBMSOA model, involving 30 expert educators from Indigenous school settings. The method enabled systematic evaluation of the model's core dimensions, including objectives, activities, pedagogy, reflection and assessment, and mastery-level clusters. This process not only confirmed the internal coherence of the model but also revealed specific areas requiring refinement based on field realities. The expert panel’s insights helped align the model with pedagogical practices that are culturally relevant, developmentally appropriate, and practically implementable. Moreover, using FDM helped establish the credibility of the model among stakeholders (Tsai et al., 2020), thereby increasing the likelihood of its acceptance and sustainability in Indigenous classrooms. Ultimately, the integration of the FDM within instructional model development represents a significant advancement in culturally responsive curriculum design. It demonstrates how rigorous research methods can be adapted to uphold inclusivity and cultural relevance in educational innovation.

METHODOLOGY

This study employed a quantitative research design using the Fuzzy Delphi Method (FDM) to evaluate the usability of the Model Kemahiran Menulis Bahasa Melayu Sekolah Orang Asli (KMBMSOA). The objective of this final research phase was to validate the internal coherence and practical applicability of the model in the context of Indigenous primary schools. Emphasizing internal validation (Richey & Klein, 2014), the study focused on determining the relevance, clarity, and implementability of the model’s instructional components including objectives, pedagogy, materials, assessment, and progression clusters.

A purposive sampling technique was used to recruit 30 expert practitioners, specifically teachers from Indigenous primary schools, in accordance with FDM recommendations (Jones, H., & Twiss, 1978). Selection criteria included a minimum of five years' teaching experience, academic qualifications in education, and direct involvement with Indigenous learners. The FDM was chosen due to its ability to address ambiguity and imprecision in expert consensus using fuzzy set theory (Chang et al., 2000; Hsu et al., 2010).

Data were collected using a structured questionnaire designed to assess various dimensions of model usability, utilizing a seven-point Likert scale. Items were categorized into model design, instructional relevance, implementation feasibility, and overall usability. Analysis was conducted using fuzzy aggregation techniques as outlined by Ishikawa et al. (1993), with iterative cycles applied where consensus was not initially achieved. The high recovery rate and clarity of consensus demonstrated the method’s effectiveness in refining model components.

Content validity was established through expert review by two independent panel members who confirmed the clarity, coherence, and relevance of the instrument items. Guided by established validation procedures (Wallen & Fraenkel, 2013), the process ensured alignment with the study's objectives. Reliability was strengthened

through careful item construction, iterative refinement, and expert cross-verification. As summarized in Table I, the data collection involved six structured phases encompassing validation, expert briefing, administration, data preparation, Fuzzy Delphi analysis, and interpretation. This systematic approach enhanced the methodological rigour and credibility of the findings.

Table I Data Collection Process

Step	Description	Details
1. Instrument Design and Validation	Development and content validation of the questionnaire to assess model usability.	Questionnaire designed based on key components of the KMBMSOA model (objectives, pedagogy, activities, materials, assessment, and mastery clusters). Content validity was verified by two expert reviewers using Content-Related Evidence of Validity (Wallen & Fraenkel, 2013).
2. Expert Selection and Briefing	Purposive sampling and orientation of expert participants.	30 Indigenous school teachers were selected based on qualifications and ≥5 years of teaching experience (Berliner, 2004). A workshop was held where experts were briefed on the model before completing the assessment.
3. Questionnaire Administration	Distribution and completion of the usability assessment form.	Experts rated each item using a 7-point Likert-type fuzzy linguistic scale (e.g., "Strongly Disagree" to "Strongly Agree") mapped to triangular fuzzy numbers as per Chang et al. (2000).
4. Data Preparation and Encoding	Transformation of responses into fuzzy numbers.	Responses were converted to fuzzy triangular values (e.g., (0.5, 0.7, 0.9)) using predefined scales to represent expert judgments.
5. Fuzzy Delphi Analysis	Systematic analysis using threshold, consensus, and defuzzification procedures.	Using Excel, threshold values ($d \leq 0.2$) were computed via vertex method (Chen, 2000). Items achieving ≥75% consensus (Chu & Hwang, 2008) were retained. Defuzzification was conducted to obtain prioritised values (a_i), with α-cut ≥ 0.5 as acceptance criterion (Bodjanova, 2006).
6. Interpretation of Findings	Validation of the model's usability and refinement based on expert input.	Analysis confirmed expert agreement on the model's suitability and effectiveness for classroom application. No second round was required. The validated model was then finalised for potential implementation.

RESULT AND DISCUSSION

This section presents and discusses the findings from the expert evaluation of the Malay Language Writing Skills Model for Orang Asli (KMBMSOA), focusing on three key aspects: the demographic background of the participating implementer experts (teachers), the level of expert consensus on the appropriateness of the model's core components (Research Question 1), and the overall usability of the model in real classroom contexts within Indigenous schools (Research Question 2).

The study involved 30 implementer experts with diverse professional profiles. Most participants were male (60.0%), while 40.0% were female. Most held a Bachelor's degree (83.3%), followed by a smaller proportion with a Master's degree (10.0%) and a Doctor of Philosophy (6.7%). In terms of teaching experience, half of the respondents (50.0%) reported between five to 10 years of teaching service, while 20.0% had accumulated over 26 years of experience. These demographic characteristics are detailed in Table II. This distribution indicates a balanced representation of mid-career and veteran educators, enabling a broad yet credible interpretation of the model's practicality. Such diversity is critical, as educators' judgments regarding the appropriateness and usability of pedagogical models are often influenced by their academic qualifications, professional maturity, and exposure to heterogeneous learning environments, particularly within linguistically and culturally complex Indigenous contexts (Bowe & Gore, 2017; Carpena-Méndez et al., 2022; Mensah & Attachie, 2024).

The use of purposive sampling was strategically aligned with the objectives of this design and development study. Participants were selected based on their direct instructional involvement with Indigenous pupils and their capacity to provide informed judgments grounded in real-world classroom conditions. Rather than relying on random sampling, the researchers prioritized contextual expertise and experiential relevance to ensure that the data collected would meaningfully reflect the pedagogical realities of Orang Asli education (Nash et al., 2024; Zal et al., 2025). As such, the findings offer authentic insights into the functionality of the KMBMSOA model, validated not only through methodological rigor but also through the lived professional experiences of those most closely situated within the target educational settings (Gümüsay & Amis, 2021).

TABLE II DEMOGRAPHIC PROFILE OF IMPLEMENTING EXPERTS (TEACHERS) (n = 30)

Item	Category	Frequency (n)	Percentage (%)
Gender	Male	18	60
	Female	12	40
Education Level	Bachelor's Degree	25	83.3
	Master's Degree	3	10
	Doctor of Philosophy (Ph.D.)	2	6.7
Teaching Experience	5–10 years	15	50
	11–15 years	6	20
	16–20 years	1	3.3
	21–25 years	2	6.7
	26 years and above	6	20

Research Question 1: What is the level of expert consensus regarding the appropriateness of each component in the KMBMSOA model, including instructional objectives, activities, pedagogy, reflection and assessment, and mastery clusters?

The findings related to the first research question, which examined expert consensus on the appropriateness of the core components of the KMBMSOA model, demonstrate a strong level of agreement among implementing experts. As presented in Table III, all four core components, namely Teaching and Learning Objectives, Teaching and Learning Activities, Pedagogical Strategies, and Reflection and Assessment, achieved threshold values (d) below 0.2, expert agreement of 80.0 percent, and fuzzy score (A) values between 0.833 and 0.852. These results affirm that the model meets the minimum criteria of the fuzzy Delphi method and is thus valid in structure, aligned with pedagogical realities in Indigenous school settings, and theoretically coherent. The high score for Teaching and Learning Objectives (A = 0.852) indicates that this component is perceived as clearly articulated and closely aligned with curriculum standards. This supports the argument made by Scardamalia and Bereiter (1987), who emphasised that clearly defined instructional goals are essential in supporting knowledge transformation in writing development. On the other hand, Pedagogical Strategies received the lowest fuzzy score (A = 0.833), suggesting that some teachers may face difficulty translating the pedagogical approach into culturally responsive practices. This reflects findings from Chin (2021) and Salleh (2023), who reported that teachers working in Indigenous schools often struggle with applying intercultural pedagogy due to limited training and lack of relevant teaching materials.

Table Iii Findings Of Expert Consensus on The Appropriateness of Kmbmsoa Model Components (Rq1)

Component	Threshold (d)	Expert Agreement (%)	Fuzzy Score (A)	Consensus Status
Teaching and Learning Objectives	0.156	80.0%	0.852	Suitable
Teaching and Learning Activities	0.170	80.0%	0.835	Suitable
Teaching Pedagogy	0.154	80.0%	0.833	Suitable
Reflection and Assessment	0.144	80.0%	0.840	Suitable
Interpretation: All core components of the KMBMSOA model meet the fuzzy evaluation criteria ($d \leq 0.2$, agreement $\geq 75\%$, $A \geq 0.5$), indicating strong consensus among expert practitioners regarding their appropriateness.				

Table Iv Expert Consensus Data on The Appropriateness of Core Components of The Kmbmsoa Model

Implementer Expert (Teacher) – IE	Expert Opinion
IE 3	It is appropriate and should refer to the prescribed Content Standards and Learning Standards.
IE 4	Very good as a guide for teachers.
IE 9	Important to ensure that the teaching and learning process remains aligned with the educational curriculum.
IE 11	All components are easy to understand.
IE 22	Suitable as a reference for teachers.
IE 29	All components should also refer to the Content Standards and Learning Standards.
IE 30	The model components are excellent.

Complementing these statistical results, the real-time annotations made by implementer experts during the fuzzy Delphi process provide interpretive depth to the data. As detailed in Table IV, these qualitative insights reinforce the model's practical relevance. IE3 and IE29 both stressed the importance of ensuring that Teaching and Learning Objectives remain aligned with national Content Standards and Learning Standards, underscoring the need for curriculum fidelity. IE4 and IE22 highlighted that the model offers practical and structured guidance for lesson planning, while IE11 noted that all components are easy to understand, which is particularly important in under-resourced Indigenous classrooms (Levitan et al., 2025; Martin & Evans, 2019). IE9 observed that maintaining alignment with the formal curriculum is crucial in preventing instructional fragmentation, especially in Indigenous schools facing systemic pedagogical challenges (Anderson et al., 2023; Linds et al., 2020). Finally, IE30 described the model as excellent overall. These practitioner remarks strengthen the consensus already evident in the fuzzy scores and threshold values.

The model's responsiveness to context-specific challenges in Indigenous language education reflects broader concerns in the literature. Scholars such as Hudson and Angelo (2020), and Siekmann et al. (2017) have argued for pedagogical models that directly address the complex sociolinguistic realities faced by Indigenous learners. In particular, the model's integration of reflective assessment and structured objectives offers a counterpoint to rigid, teacher-centred instructional models that dominate many rural classrooms and fail to meet the needs of diverse learners (Burgess & Evans, 2019; Lembit & Burgess, 2024). By promoting contextualised, process-

based instruction, the KMBMSOA model aligns with contemporary frameworks of culturally responsive literacy and supports authentic writing development. Together, the findings confirm that the KMBMSOA model offers a theoretically sound and practically effective framework for writing instruction in Orang Asli education. The integration of both quantitative consensus data and contextual teacher feedback underscores the model's relevance and adaptability, making it a promising tool for enhancing literacy outcomes in marginalised educational contexts.

Research Question 2: How do experts evaluate the overall usability of the KMBMSOA model in real classroom contexts within Indigenous schools?

As summarised in Table V, the results of the fuzzy Delphi analysis indicate a strong consensus among implementer experts regarding the overall usability of the KMBMSOA model. All 13 usability indicators exceeded the minimum fuzzy thresholds ($d \leq 0.2$, expert agreement $\geq 75\%$, and fuzzy score $A \geq 0.819$) (Chu & Hwang, 2008), confirming that the model is suitable and feasible for classroom implementation in Indigenous school contexts.

Among the most highly rated indicators were "Clear pedagogical strategies for Indigenous schools" ($d = 0.098$; $A = 0.872$) and "Clear implementation of reflection and assessment" ($d = 0.136$; $A = 0.856$), demonstrating that experts valued the model's ability to support effective, structured, and culturally responsive teaching practices. Similarly, "Clear teacher planning on activities" ($A = 0.860$), "Clear objectives for teachers" ($A = 0.848$), and "Guiding teachers to understand learners' abilities" ($A = 0.848$) were also positively evaluated, suggesting that the model provides actionable instructional guidance aligned with classroom realities.

The open-response comments recorded by experts in the FDM questionnaire reinforce the statistical outcomes and provide insight into the rationale behind their ratings. For instance, PP1 noted that the model's tiered structure offers flexibility and allows adaptation to different levels of learner proficiency. This feedback supports the concept of differentiated instruction as stated by Valiandes et al. (2018), which is crucial for Indigenous classrooms characterised by linguistic and academic diversity. PP8 described the model as a useful guide, appreciating its clear instructional flow, while PP15 indicated that the items in the model were easy to understand and apply. These comments suggest that the usability of the model is enhanced by its structural simplicity and practical focus.

Notably, PP13 underscored the importance of wider dissemination and systematic training to equip teachers with the necessary confidence and fidelity in implementing the model, aligning with the recommendations of.Bishop and Vass (2021) research. Although this does not detract from the model's inherent usability, it highlights the importance of systematic professional development for scaling up adoption. Despite this, the lowest fuzzy score recorded ($A = 0.819$ for "usability as a reference for newly posted teachers") still met the required consensus level, indicating that experts believe the model has nationwide applicability with appropriate support.

In summary, the integration of fuzzy consensus data and expert feedback affirms the KMBMSOA model's contextual relevance and practical usability. Its clear structure, adaptability to diverse learner needs, and alignment with Indigenous pedagogical practices make it a promising tool for enhancing writing instruction in Orang Asli schools. Sustained impact, however, requires strategic teacher training and systematic dissemination to support effective implementation.

Table V Findings of Expert Consensus on The Overall Usability of the Kmbmsoa Model (Rq2)

Usability Element	Threshold (d)	Expert Agreement (%)	Fuzzy Score (A)	Consensus Status
Clear objectives for teachers	0.128	83.3%	0.848	Suitable
Clear planning of teaching activities	0.188	80.0%	0.837	Suitable

Clear pedagogical strategies for Indigenous schools	0.098	83.3%	0.872	Suitable
Clear implementation of reflection and assessment	0.136	83.3%	0.856	Suitable
Practicality for teachers in Indigenous schools	0.190	76.7%	0.821	Suitable
Guiding teachers to understand learners' abilities	0.152	80.0%	0.848	Suitable
Enhancing Indigenous students' writing skills	0.166	80.0%	0.831	Suitable
Supporting rural teachers to teach Malay language effectively	0.156	83.3%	0.843	Suitable
Supporting material/activity selection based on learners' abilities and interests	0.152	80.0%	0.848	Suitable
Planning flexible activities for diverse learner backgrounds	0.166	80.0%	0.845	Suitable
Usability as reference for newly posted teachers in Indigenous schools nationwide	0.201	76.7%	0.819	Suitable
Clear teacher planning on activities	0.140	83.3%	0.860	Suitable
Clear pedagogical guidance specifically for Indigenous school contexts	0.15	83.3%	0.843	Suitable
Interpretation: All usability indicators achieved the required threshold for fuzzy agreement, confirming the model's strong practical applicability in real classroom settings within Indigenous school contexts.				

Implication

The findings of this study offer several substantive implications for instructional practice, curriculum development, and teacher professional training in Indigenous education contexts. Firstly, the strong expert consensus regarding the appropriateness of the core components of the KMBMSOA model, including teaching and learning objectives, instructional activities, pedagogical strategies, and reflection and assessment, demonstrates the pressing need for context-responsive and culturally grounded teaching frameworks (White, 2022). The clarity, adaptability, and alignment of these components with actual teaching realities in Indigenous classrooms suggest that the model has the potential to serve as a pedagogical scaffold that bridges curricular standards with learner diversity. In particular, the model supports the development of writing as both a cognitive and cultural process, accommodating various levels of language proficiency and enabling meaningful learning for Indigenous pupils.

Secondly, the model's high usability ratings highlight its practical relevance and pedagogical coherence (Vlachogianni & Tselios, 2023). Experts affirmed the model's flexibility, clarity of instructional planning, support for differentiated learning, and capacity to facilitate culturally responsive teaching. These findings underscore the importance of embedding practical usability within instructional models, especially in

linguistically and culturally diverse classrooms. The structured design of the model enables teachers to plan lessons that respond to student needs and local contexts. This enhances teacher agency, pedagogical confidence, and instructional relevance (Jenkins, 2020). The findings indicate a strong case for integrating the KMBMSOA model into teacher induction programmes and continuous professional development, particularly for educators assigned to underserved Indigenous school settings.

Overall, this study confirms that instructional design based on localised needs analysis and validated by expert consensus can significantly enhance the suitability and usability of teaching frameworks in Indigenous education (Sianturi et al., 2018). The results advocate for pedagogical models that are not only aligned with the national curriculum but also culturally sustaining and inclusive. These findings contribute meaningfully to discussions on educational equity, especially in settings where marginalised learners face systemic challenges in developing literacy and language mastery. The study further calls for educational policies that acknowledge the sociocultural complexities of teaching in Indigenous communities and that invest in tools and training grounded in authentic classroom experiences.

Fig. 1 Implication of the study

Further Research

The findings of this study offer a strong foundation for advancing research on culturally responsive writing instruction in Indigenous education contexts. However, to further refine and validate the applicability of the KMBMSOA model, several directions for future inquiry are recommended Firstly, empirical investigations should be undertaken to examine the classroom implementation of the KMBMSOA model, ideally through intervention-based or quasi-experimental research designs, as advocated by .Schrader et al. (2020) in their work on implementation research and its role in advancing educational system improvements. Such studies could examine the model's impact on Indigenous pupils' writing proficiency, engagement, and motivation over time. Classroom-based data will help assess the model's pedagogical effectiveness beyond expert consensus, offering more robust evidence of its practical utility. Secondly, future research should explore students' perspectives, aligning with the recommendation by Bourne and Winstone (2021)in their study *Empowering Students' Voices: The Use of Activity-Oriented Focus Groups in Higher Education Research*, which emphasizes the importance of incorporating learner insights to enrich educational development and model refinement. While this study centered on expert feedback, it is essential to investigate how Indigenous learners perceive the model in terms of clarity, cultural relevance, and linguistic accessibility. Gathering student voices through interviews, reflective journals, or learning portfolios would contribute valuable insights into the learner experience and inform model refinement. Future studies may adapt the KMBMSOA model for other Indigenous or marginalized communities in Malaysia and neighboring regions, as recommended by Yasin et al. (2017), who emphasized the need for culturally grounded educational frameworks to support sustainable Indigenous development. Comparative studies will allow researchers to evaluate whether the core pedagogical elements of the model are transferable and culturally resonant across diverse sociolinguistic settings. Such efforts would support the development of contextually nuanced teaching models grounded in equity and inclusivity. Moreover, given the challenges of educational access in remote Indigenous areas, it is recommended that future studies investigate how the model may be digitized or integrated with mobile and

online learning platforms (Veeramanickam et al., 2025). Research in this area would help determine the feasibility of using technology to expand access to quality writing instruction and support differentiated learning needs. Another promising direction involves the development of structured training modules based on the KMBMSOA model for pre-service and in-service teachers. Studies assessing the outcomes of such professional development programs would help evaluate how well teachers are able to internalize and apply the model in their instructional practices, thereby supporting systemic improvements in Indigenous education. Finally, interdisciplinary research that incorporates perspectives from psycholinguistics, second language acquisition, and sociocultural theory is warranted (Pfenninger & Festman, 2021). Investigating how the model supports metacognitive awareness, language development, and identity formation among Indigenous pupils can strengthen its theoretical foundations and pedagogical coherence (Dubiner, 2018; Salari & Farahian, 2023). These perspectives are especially crucial in contexts where language learning and cultural affirmation are deeply intertwined. Taken together, these avenues for further research underscore the importance of continuous, context-sensitive refinement of instructional models that serve linguistically and culturally diverse learners. Advancing this agenda will require collaboration across disciplines, communities, and educational systems.

CONCLUSION

This study demonstrated the relevance and practical value of the Malay Language Writing Skills Model for Orang Asli Schools (KMBMSOA) in addressing persistent challenges in writing instruction among Indigenous learners in Malaysia. Through the application of the Fuzzy Delphi Method, expert consensus confirmed the appropriateness of the model's core components including learning objectives, instructional activities, pedagogy, and reflection and assessment. Each element was found to be pedagogically sound and contextually aligned with the needs of Indigenous classrooms, supporting both curriculum requirements and culturally responsive teaching.

In addition to structural validation, the findings confirmed the model's overall usability in real teaching contexts. Experts noted its clarity, flexibility, and alignment with student diversity, particularly in its ability to scaffold differentiated instruction and support teachers in planning effective writing lessons. The model also received strong endorsement for its potential to enhance student engagement, improve writing outcomes, and support novice teachers in rural Indigenous schools. These results underscore the significance of context-sensitive and inclusive instructional models that move beyond traditional, monolingual, and decontextualised writing pedagogies.

The KMBMSOA model thus contributes meaningfully to existing frameworks by incorporating local cultural narratives, flexible learning trajectories, and formative assessment practices. This positions the model as a viable solution for reducing literacy disparities and strengthening teacher competencies in Indigenous education settings. Future research should investigate its longitudinal effects on student writing performance and examine adaptation possibilities across diverse Indigenous communities in Malaysia and beyond. By embedding the sociocultural realities of learners within a structured instructional framework, the KMBMSOA model offers a powerful step toward equity-driven language education.

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