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Digital Translanguaging and Santri Cognition: Enhancing English Comprehension through Arabic-English Repertoires

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ABSTRACT

This study investigates the integration of translanguaging within digital learning ecosystems to enhance English reading comprehension among bilingual Madrasah students, a context where Arabic religious literacy and academic English intersect. Using an integrated mixed-methods design, data were collected from 140 grade 11 students at two State Madrasahs in Indonesia. The quantitative phase employed a quasi-experimental design analyzed via ANCOVA, while the qualitative phase utilized screen-recording analysis and stimulated recall interviews. The results demonstrated that the translanguaging group significantly outperformed the monolingual group in reading comprehension ($p<.001$, $n^2_p = .26$). Qualitatively, the study revealed a "metacognitive bridging" mechanism where students strategically mobilized their Arabic grammatical logic (e.g., Mubtada-Khobar structures) to decode complex English syntactical patterns in digital spaces. These findings suggest that digital translanguaging does not merely function as a scaffold but acts as a cognitive resource that validates students' socioreligious linguistic identities. The study concludes by proposing a translingual digital pedagogy framework that integrates multilingual repertoires into formal English language teaching, particularly within Islamic educational institutions.

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1. INTRODUCTION

The "multilingual turn" in language education has significantly challenged monolingual ideologies in English Language Teaching (ELT), advocating for pedagogies that leverage learners' full linguistic repertoires (Anderson, 2024; Feltman, 2025). Translanguaging, defined as the dynamic deployment of multilingual resources without regard for named language boundaries (Nicolarakis & Mitchell, 2023; Yilmaz, 2021), has emerged as a transformative approach. Empirical studies affirm its pedagogical benefits, facilitating comprehension (Tai, 2024a), scaffolding critical thinking (Aba Sha'ar & Rofiah, 2024), fostering inclusive classrooms (Fang, Zhang, & Sah, 2022), and empowering marginalized linguistic identities (Yilmaz, 2021). At the same time, the digital education environment

has expanded pedagogical opportunities, enabling multimodal interaction and personalized learning (C. Li, Weng, Li, & Zhang, 2024). In contexts like Indonesia, where bilingualism (Bahasa Indonesia and local languages) is intrinsic to education, translanguaging aligns with sociolinguistic realities (Goodman & Tastanbek, 2021; Hamman-Ortiz, 2024).

Although many studies have confirmed the effectiveness of translanguaging in offline pedagogical contexts, three notable shortcomings remain. First, empirical studies of translanguaging manifestations in digital ecosystems, such as electronic platforms, AI interfaces, and multimodal texts, remain scarce. Although learning a language through technology is well documented (Shao, Wu, Li, Lu, & Wang, 2025), its convergence with translanguaging pedagogy has not been sufficiently studied. Second, there is a lack of studies on various aspects of Indonesian madrasas. These institutions educate students through the complex intersection of religious literacy (Arabic) and academic literacy (English/language) (Roshid & Le Ha, 2025), which is not considered through the prism of digital translanguaging practice. Third, the specific impact of these digital practices on Reading comprehension remains unexplored, especially regarding how multilingual repertoires are mobilized to transcribe and analyze digital texts (Qureshi & Aljanadbah, 2022). Addressing these challenges is critical as the potential of digital tools to enhance understanding in unique bilingual contexts remains untapped.

To address these critical gaps, this study argues that the unique linguistic landscape of madrasas requires a digital pedagogy that is inherently translingual rather than monolingual. By leveraging students' religious and academic literacy, this research aims to measure the efficacy of digital translanguaging in enhancing reading comprehension. Specifically, this study is guided by the following research questions: (1) To what extent does digital translanguaging impact the English reading comprehension scores of bilingual madrasah students? (2) How do students strategically mobilize their multilingual repertoires, including Arabic religious literacy, to navigate digital texts? and (3) In what ways does the digital ecosystem serve as an affective space for identity affirmation during the reading process?. By answering these questions, this study bridges the gap between translingual theory and digital learning, providing practical insights for equitable ELT policies in the Global South.

2. METHODS

Research Design

The study employs embedded mixed-methods constructs (Clark & Creswell, 2017), prioritizing quantitative data to measure the impact of translanguaging on Reading comprehension while introducing a qualitative avenue to explore students' strategic language use. This design was chosen to address the multidimensional nature of the research objective: namely, to measure the impact of digital translanguaging on understanding and to map the translanguaging strategies used by students in the digital ecosystem. The quantitative phase uses a quasi-experimental, non-equivalent control-group design. Participants were divided into experimental groups (using digital translinguaging texts) or control groups (using monolingual digital texts). At the same time, qualitative data is collected through screen analysis and triggers memory interviews to provide a "detailed description" of how students mobilize multilingual resources (English, Indonesian, Arabic) to transcribe texts.

Setting and Participants

This research was conducted in two public high schools located in East Java, Indonesia. For confidentiality, these institutions are referred to as School A (located in an industrial area) and School B (located in an agrarian area). These sites were deliberately chosen because they represent the "madrasah context" described in the literature, in which students navigate a complex linguistic landscape that includes academic literacy (English and Indonesian) and religious literacy (Arabic). Participants (N=140) were 11th-grade students aged 16 to 17 years. The entire class was randomly

assigned to the experimental group (n = 70) and the control group (n = 70). Preliminary tests were conducted to ensure homogeneity, and an independent-samples t-test showed no significant difference in initial English Reading level between groups ($p > 0.05$). All participants spoke several languages, Indonesian and Javanese, with varying levels of proficiency in Arabic and English. Ethics clearance is obtained from the School Board, and informed consent is obtained from all students and their guardians before data collection.

Table 1. Demographic characteristics and basic competencies of participants

Characteristic	**Experimental group (n=70)**	**Control Group (n=70)**	**Test of Difference**
Age (Years)			
Range	16-17	16-17	-
Mean (SD)	16.54 (0.50)	16.48 (0.52)	$p > .05$
Gender			
Male / Female	32 / 38	30 / 40	$X^2 = 0.12$, $p > .05$
Linguistic Profile			
L1 (Home Language)	Javanese	Javanese	-
L2 (National Language)	Bahasa Indonesia	Bahasa Indonesia	-
L3 (Religious Literacy)	Arabic (Intermediate)	Arabic (Intermediate)	-
English Proficiency			
Pre-test Mean (SD)	62.40 (8.12)	61.85 (7.95)	$t (138) = 0.40$, $p = .689$

Table 1 explains that participants were randomly assigned to the experimental group (n = 70) and the control group (n = 70). Demographic data confirm that the sample is homogeneous with respect to age and linguistic origin. Most importantly, all participants had a similar multilingual repertoire, characterized by proficiency in the local language (Javanese) and the national language (Indonesian), as well as specialized academic-religious literacy in Arabic, which is the primary focus of research on translingualism in the context of madrassas. To ensure a baseline comparison, an independent sample t-test is performed based on the initial results. Results showed no statistically significant difference between the intervention group ($M = 62.40$, $SD = 8.12$) and the control group ($M = 61.85$, $SD = 7.95$) before the intervention, $t(138) = 0.40$, $p > 0.05$. This fundamental equivalence allows subsequent differences in posttest outcomes to be explained by digital transfer interventions rather than initial capabilities. Institutional committees issue ethics permits, and written consent is obtained from all participants and their guardians.

Instruments

In line with the research hypothesis on decoding, engagement, and metacognition, three main tools have been developed and tested. First, reading skills were evaluated using a digital Reading comprehension test (DRCT). This instrument, consisting of 40 questions (administered as pre- and post-tests), was designed to assess literal, inferential, and evaluative comprehension. The questions were adapted from standard tests for English as a foreign language (EFL) knowledge and tailored for digital delivery. High-quality interview transcripts and screen recordings were analyzed using Braun and Clarke's (2021) six-phase thematic analysis. The process began with (1) data familiarization, followed by (2) generating initial codes (e.g., lexical bridging', religious referencing'), which were then (3) collated into potential themes. These themes were (4) reviewed against the dataset and (5) refined to define clear definitions. To ensure analytical rigor (trustworthiness), inter-coder reliability was assessed; a second researcher independently coded 20% of the data, achieving a 90% agreement rate (Cohen's Kappa > 0.80). Discrepancies were resolved through peer debriefing until consensus was reached.

Intervention and Data Collection Procedures

This study lasted 8 weeks and was divided into three stages. In stage 1: Preparation (week 1), both groups underwent training on the digital Reading platform to ensure technical readiness, followed by a preliminary test. The central part of the study was conducted in stage 2: Intervention (weeks 2–7). In this phase, the experimental group worked with digital texts equipped with pedagogical translation functions, specifically pop-up glossaries in Indonesian and Arabic for rarely used vocabulary, as well as "strategic hints" that encouraged the use of L1/L2 knowledge to analyze the text. In contrast, the control group used the exact digital text in monolingual mode (annotations and instructions in English only), reflecting traditional English-teaching methods. Finally, stage 3: Evaluation (week 8) included administering a post-intervention test. After the assessment, a selected sample of 10 students from the experimental group participated in a memory-enhanced interview, during which they viewed recordings of their Reading sessions on screen to explain their translation choices.

Data Analysis

Data analysis was carried out in two stages, according to the mixed-methods design. Quantitatively, to measure the impact on Reading comprehension, data were processed using SPSS 26.0. Covariance analysis (ANCOVA) was performed with a pre-test score as a covariate to control for pre-existing differences, and effect sizes were calculated using partial eta-squared (N2p) to assess the practical significance of the intervention. High-quality interview transcripts and screen recordings are the subject of thematic analysis (Braun & Clarke, 2006). The data was encoded to map translanguaging patterns, specifically highlighting evidence of "familiar use of linguistic resources" and "metacognition through code switching." To establish accuracy, researchers used a 90% score.

3. FINDINGS AND DISCUSSION

The Impact of Digital Translanguaging on Reading Comprehension

To test the hypothesis that intentional translanguaging enhances Reading comprehension, descriptive and inferential statistics were analyzed. Table 1 summarizes the descriptive statistics for the pre-test and posttest scores of the Experimental Group (translanguaging-mediated) and the Control Group (monolingual).

Table 2. summarizes the descriptive statistics for the pre-test and posttest scores

Group	n	Pre-test M	Pre-test SD	Posttest M	Posttest SD
Experimental (Translanguaging)	70	62.40	8.12	81.50	7.45
Control (Monolingual)	70	61.85	7.95	72.10	8.30
Total	140	62.12	8.02	76.80	9.15

As presented in Table 2, both groups initiated the study with equivalent proficiency levels ($p > .05$). However, post-intervention data reveals a sharp bifurcation. While the Control Group followed a standard linear progression, the Experimental Group demonstrated a steeper trajectory, reducing the standard deviation from 8.12 to 7.45. This indicates that the intervention effectively narrowed the achievement gap among students.

Table 3. ANCOVA Results

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4120.501 (a)	2	2060.250	35.102	.000	.339
Intercept	1540.204	1	1540.204	26.241	.000	.160
Pre_test (Covariate)	1850.302	1	1850.302	31.524	.000	.187

Group	2832.450	1	2832.450	48.253	.000	.261
Error	8041.050	137	58.693			
Total	856000.000	140				
Corrected Total	12161.551	139				

The ANCOVA results (Table 3) confirm that the translanguaging intervention accounted for 26.1% of the variance in reading scores (n^2_p = .261). This large effect size suggests that the integration of multilingual scaffolds is a transformative factor in reading comprehension, validating the statistical significance of the intervention ($p < .001$).

Mapping Translanguaging Strategies in Digital Ecosystems

Qualitative Data: Using Memory-Stimulated Interview Screen Recording and Data Triangulation to Explain Strategic Techniques Students Use to Navigate Digital Texts. Thematic analysis identifies three different mechanisms: strategic construction through conceptual alignment, metacognitive bridges through religious literacy, and affective engagement through identity affirmation.

Strategic L1/L2 scaffolding for lexical decoding: "Conceptual alignment."

Although there is a perception that students use translation tools only for lexical translation, research at School B (located in a rural area) reveals a deeper cognitive process we call "concept correction." Notes from the screen show that students often ignore the national language (Indonesian) and prefer religious terminology to understand the semantic depth of English words. For example, when encountering abstract nouns related to ethics, students look for equivalents in their spiritual framework. As stated directly by a student from School B:

> "When I read the word "charity," I was confused. But when the word 'sadaqah' [Arabic/Islamic term] appeared in the app, I immediately understood. It's not just giving money, but a religious term. If it were "sumbangan" [Indonesian term], I might have understood the deeper meaning." (Student S-14, School B)

This quote clearly shows that, for students, this understanding is not a linear translation (English - Indonesian), but a multi-layered display process. Digital reinforcement promotes deep decoding by directly anchoring the concept of English in students' sacred literacy, thereby enhancing inferential understanding that monolingual dictionaries cannot provide.

Connecting Metacognition Through Religious Literacy

The striking results obtained at School A (located in an industrial area) highlight the use of Arabic grammar logic as a metacognitive tool. Students demonstrated the application of complex syntactic rules from nahwu (Arabic grammar) to analyze complex English sentences. This phenomenon, called "santri cognitive ability," was observed when students used Arabic grammatical markers to analyze English sentence structure. One participant explained this strategy during a memory-triggered session.

> "English grammar is confusing because the subject and verb are far apart. To help myself, I marked the subject as "*Mubtada,*" and the Predicate as "*Khobar*" in my head. The digital marker helped me separate them. As soon as I saw the *Mubtada-Khobar* pattern, the long English sentences became easy to understand." (Student S-08, School A)

Critically, it suggests that student multilingualism operates hierarchically. The grammatical structure of Arabic serves as a better metalanguage for analyzing English syntax than that of Indonesian, which lacks a strict capitalization system. This supports the assumption that religious literacy serves as a mighty pillar of academic literacy when mediated by digital tools.

Affective Engagement and Identity Affirmation

Finally, the data confirms that the digital environment serves as a "safe and affective haven", effectively reducing the linguistic anxiety that is often present in face-to-face meetings. The anonymity and flexibility of the digital platform allow students from School A and School B to showcase their entire language repertoires, including local spoken languages, without fear of judgment. This shift in emotions is necessary for sustained engagement, as illustrated in the student's reflection:

> "In class, I was embarrassed to speak because my English accent was "*medok*" [a strong Javanese accent]. But here [on the platform] I can write notes that mix Javanese, English, and Indo. For example, I wrote "*Ojo lali* [don't forget] to check this verb." The feeling that the app accepts me. (Student S-22, School A)

This narrative provides strong evidence that the platform's "translingual" features affirm students' hybrid identities. By enabling the smooth use of L1 (Java), the technology transforms the learning environment from linguistic control to linguistic friendliness, thereby fostering the confidence needed to take risks when performing Reading comprehension tasks.

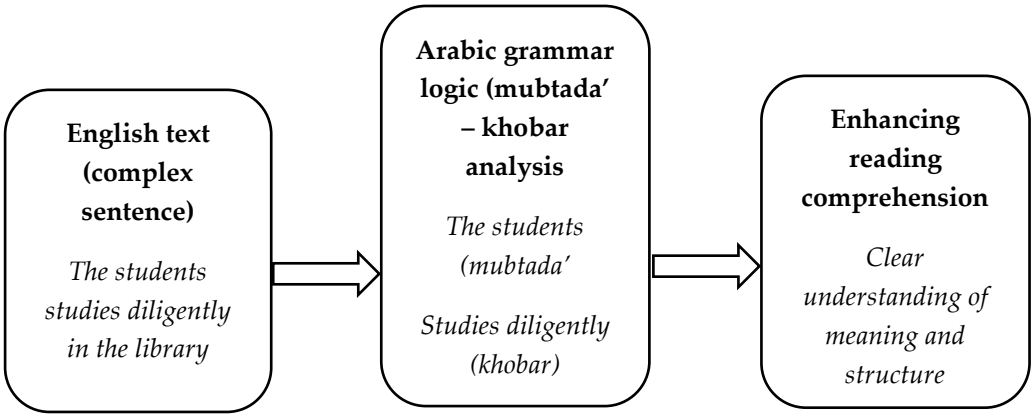

Figure 1. conceptual model of the "santri cognitive" process: utilizing arabic gramatical logic for English comprehension

Discussion

The Santri Cognitive Model

The most significant theoretical contribution of this study is the discovery of a unique cognitive mechanism that we call the "santri cognitive process," which is the strategic use of religious literacy to deconstruct academic English. Although general translinguistic theory holds that bilingual speakers use their entire linguistic repertoire, our research shows that, for madrasah students, this repertoire has a hierarchical structure, with Arabic grammatical logic functioning as a metalinguistic structure that transcends the national language (Indonesian). This study extends Translingual Theory by introducing a hierarchical structure where "sacred literacy" functions as a meta-tool to deconstruct "secular English literacy".

This phenomenon broadens the current understanding of metacognitive strategies in language learning. Veliz (2024) and Bao (2025) find that strategic code-switching supports metacognition, enabling students to control their knowledge. We agree with this assumption but significantly expand its scope by identifying the source of this metacognition. In the specific context of Indonesian Islamic boarding schools described by Djuaini (2025), students not only switch codes but also switch epistemologies. By using the strict syntactic rules of Arabic (*Ilmu Nahwu*) to analyze English sentences (Haris, 2022), students engage in a complex form of trans-systemic transfer. This contrasts with the conclusions of Aba Sha'ar and Rofiah (2024), who focus on the formation of critical thinking. Our data

show that for santri (Islamic students), critical thinking in English is closely related to their mastery of religious texts. Thus, a digital approach that ignores this "religious-academic" relationship fails to take advantage of the strong cognitive abilities of these students.

As a result, this conclusion requires us to rethink the concept of bilingual education in the context of religion in countries of the Global South. The dominant trend of "multilingual shift" (Anderson, 2024; Feltman, 2025) often views language as a horizontal resource (L1 and L2 are considered equal). However, our research assumes vertical integration, in which "sacred literacy" (Arabic) serves as a high-level metalanguage to unlock "secular literacy" (English). This has profound implications for the pedagogical concept proposed by Supriyanto et al. (2025) and Nawas, Darmawan, & Maadad (2023) effective reading instruction in madrasahs should not separate English from students' multilingual reality. Instead, such instruction should actively encourage "comparative syntax" activities using digital tools to highlight similarities between English and Arabic structures explicitly. Recognition of students' linguistic integrity, including their religious components, in line with Yilmaz's (2021) inclusive goals, demonstrates that recognition of "sacred knowledge" in "secular" digital spaces is key to strengthening marginalized linguistic identities.

Digital Scaffolding in Classrooms

Pedagogically, the results compel a shift in how educators view translation tools not as "cheating aids" but as "silent conversation partners" that facilitate deep decoding without interrupting the reading flow. The significant effect size (n^2_P = .26) confirms that when digital platforms act as an affective "safe haven," they effectively lower the affective filter, encouraging risk-taking among students who are typically marginalized in face-to-face interactions. Therefore, teachers in Islamic educational contexts should move beyond "English-only" policies. Instead, instruction should actively incorporate comparative syntax activities explicitly mapping English subject-predicate structures against Arabic *mubtada'-khobar* logic. This approach validates the students'/Santri identity and transforms their religious literacy from a passive background into an active pedagogical asset for mastering academic English.

Our research expands the discussion of digital learning by clarifying the scope of applications for multimodal interaction. Although that digital environments expand pedagogical opportunities through multimodal interaction and personalized learning (B. Li, Fei, Li, Chua, & Ji, 2025; Mhlongo, Mbatha, Ramatsetse, & Dlamini, 2023; Sharif & Uckelmann, 2024; Xie, Yang, Zhang, Chen, & Li, 2025), our data clarifies this by showing that for bilingual students, the quality of linguistic support is more critical than mere multimodal diversity. We observe that engagement is not solely driven by visual stimuli but also by the presence of specific semantic bridges between L1 and L2. This aligns with Tai (2025), whose empirical research confirms that translanguaging facilitates understanding. However, we expand on this understanding by showing that in the digital ecosystem, this ease is more related to carefully selected cognitive interventions than to spontaneous social interactions. Digital glossaries serve as "silent conversation partners," enabling students to resolve lexical ambiguities immediately without interrupting their Reading flow.

In addition, this study draws on the concept of "multilingual shift" proposed by Anderson (2024) and Feltman (2025), which challenges monolingual ideology in English language teaching (ELT) across face-to-face classrooms and digital interfaces. Previous research has primarily focused on translanguaging as a pedagogical strategy in face-to-face communication contexts (Canals, 2022; Tai, 2024b; Umam, Sugiharto, & Manara, 2023). However, our findings address a critical gap in technology-based language learning identified by Liu & Zhang (2025), namely the under-researched intersection with translanguaging. By integrating multilingual resources directly into digital texts, we demonstrate that translanguaging can be effectively systematized. This suggests that the "inclusive classroom" described by Fang et al. (Fang et al., 2022) can be reproduced in digital spaces through algorithmically integrated linguistic support, providing equal access to meaning even in the absence of bilingual teachers.

Perhaps the most important theoretical implication of this study is the phenomenon of "metacognitive bridging" observed through religious literacy. Although Veliz (2024) found that strategic code-switching contributes to metacognition, our conclusions expand on this by identifying specific grammatical logic unique to the madrasah context described by (Djuaini, 2025). By transforming religious literacy into a metalinguistic structure (e.g., utilizing Mubtada-Khobar logic), the findings challenge the traditional view of L1/L2 interference. Instead, this suggests a "vertical integration" of multilingual resources where sacred literacy validates academic acquisition and instead suggests that "multilingual shifts" in education, as noted by Anderson (2024), should be expanded to include "sacred literacy" as a legitimate cognitive reserve. Confirming this "santri cognitive model," this study implies that equitable ELT policies in classrooms should not only be bilingual (English-national language), but also actively utilize the entire linguistic repertoire of students, which is often based on religion, to deepen text analysis.

From a methodological perspective, the digital ecosystem developed in this study provides a basis for addressing gaps in research on translanguaging digital ecosystems, a recognized severe weakness. Unlike observational research in face-to-face classrooms, where "silent" cognitive processes are often overlooked, our platform's ability to collect detailed data, such as specific clicks on the "concept alignment" glossary, facilitates a more accurate analysis of how students mobilize their resources. Such "engineering" of the learning environment enables systematic follow-up research to test which types of digital support (e.g., lexical or structural) are most effective at triggering the comprehension mechanisms discussed by Tai (2025). Furthermore, by demonstrating how Lee et al.'s (2023) concept of multimodal interaction can be implemented to support specific linguistic identities, the platform serves as a replicable model for future research on how technology can be developed not only to deliver content but also to actively acknowledge the diverse linguistic realities of students in technology-mediated environments.

From a policy perspective, this study advocates for a fundamental redesign of Educational Technology (EdTech) in the Global South to align with UNESCO's mandate for inclusive education. The current dominance of 'monolingual design' in global learning platforms often fails to accommodate the hybrid linguistic realities of bilingual students. Consequently, policymakers and developers must prioritize the creation of a translingual user experience (UX). Such ecosystems should algorithmically recognize and welcome code-switching (e.g., Javanese, Indonesian, and Arabic inputs) rather than flagging them as errors. By integrating, rather than suppressing, local and religious identities, educational policies can dismantle cognitive barriers and foster a truly equitable learning environment for students at the intersection of religious and secular education.

Affective affordances in digital spaces

Finally, our finding emphasizes the important but often overlooked emotional aspect of digital translanguaging. Although most literature focuses on cognitive benefits, this study shows that the digital ecosystem functions as an emotionally safe space, a virtual space that neutralizes the stigma associated with foreign accents and grammatical imperfections (Codó & Collins, 2025). Qualitative data shows that students feel much safer using their local languages (Javanese/Madurese) in digital interfaces than in face-to-face classrooms. This aligns with Yilmaz (2021), (Tian & Yuan, 2025), and (Angermeyer, 2023) who argues that translation reinforces marginalized identities. However, we expand on this by showing that technology acts as an impartial intermediary. Unlike human teachers, who may unintentionally show disapproval of L1 use through body language, digital platforms accept multilingual input neutrally (Alon & Krtalić, 2025; Kusumaningputri, 2024). This "emotional openness" reduces emotional filters, which directly contributes to the sustained engagement and high levels of comprehension observed in the experimental group.

This finding significantly changes our understanding of the concept of "student engagement" in digital learning. Lee et al. (2023) associate student engagement primarily with interactive technology features (e.g., gamification). However, our research shows that for bilingual students in Global South

countries, student engagement is rooted mainly in identity recognition. The ability to use *Baso-Jowo* (Javanese) or Bahasa Indonesia alongside English creates a sense of "linguistic hospitality" in the application. This confirms the multimodal tools that affirm identity (Cenoz & Gorter, 2022), but adds an important nuance digital spaces allow for the practice of personal identity (Cenoz, Santos, & Gorter, 2024). Students can test their understanding using their entire linguistic repertoire without public scrutiny, thereby strengthening their confidence before participating in public presentations. Thus, "digital" not only replaces "face-to-face"; it also provides irreplaceable psychological protection for taking risks in language learning.

The impact of this emotionality extends beyond pedagogy and influences educational policy. As emphasized by Goodman and Tastanbek (2021), translinguistics is consistent with sociolinguistic reality (Y. Li, 2025; Maseko & Mkhize, 2021). Digital tools reflect students' real linguistic lives (which are chaotic, dynamic, and hybrid), their performance improves. This calls into question the "monolingual" design that dominates most global EdTech products. Future research and development should move towards "translinguistic user experience (UX)" interface design that essentially acknowledges and welcomes code-switching. Specifically, in madrasah education, this means recognizing that students' emotional connection to English is often influenced by their local and religious identities. Rejecting these identities in the classroom means rejecting the emotional roots of learning; accepting them in digital formats means creating an environment conducive to academic growth.

4. CONCLUSION

This study challenges the deeply rooted monolingual ideology in English language teaching (ELT) by empirically demonstrating that targeted use of digital technology for interlingual communication significantly improves Reading comprehension among multilingual madrasah students. By bridging the gap between digital pedagogy and linguistic flexibility, we conclude that "multilingual proficiency" in the context of religious education is realized through two distinct mechanisms: conceptual alignment, where digital support transforms translation into a deep semantic bridge, and the cognitive abilities of madrasah students, where religious literacy (Arabic grammatical logic) functions as a superior metalinguistic tool for deconstructing English syntax. Furthermore, the digital environment functions as an "emotional refuge," reducing linguistic uncertainty and affirming students' hybrid identities. These conclusions have profound implications for English language teaching (ELT) policies and practices in the Global South. We argue that ignoring students' local languages and religions in the learning process is not only a pedagogical oversight but also a cognitive barrier to achieving equitable learning. Therefore, we propose shifting to a "Translingual Digital Ecosystem" learning platform, specifically designed to leverage, rather than suppress, students' complex linguistic repertoires. Further research should extend this study longitudinally to examine the long-term preservation of these metacognitive strategies and investigate how such "*sacred-secular*" linguistic transfer can occur in the context of other religious education around the world. Ultimately, this research affirms that in the digital age, effective language education must take identity into account, recognizing that for madrasah students, learning English means orientation in a world where religion, culture, and modernity intersect.

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REFERENCES

Aba Sha'ar, M. Y. M., & Rofiah, N. L. (2024). Examining Indonesian English as a Foreign Language Lecturers' Attitudes Towards Translanguaging and Its Perceived Pedagogical Benefits: A Mixed-Methods Study. *Center for Educational Policy Studies Journal*, *14*(3), 117–141. https://doi.org/10.26529/cepsj.1833

Alon, L., & Krtalić, M. (2025). "I wish I could use any language as it comes to mind": User experience in digital platforms in the context of multilingual personal information management. *Journal of the Association for Information Science and Technology*, *76*(4), 686–702. https://doi.org/10.1002/asi.24964

Anderson, J. (2024). Translanguaging: a paradigm shift for ELT theory and practice. *ELT Journal*, *78*(1), 72–81. https://doi.org/10.1093/elt/ccad057

Angermeyer, P. S. (2023). Translation as discrimination: Sociolinguistics and inequality in multilingual institutional contexts. *Language in Society*, *52*(5), 837–859. https://doi.org/10.1017/S0047404522000422

Bao, P. (2025). Delineating translanguaging: theoretical distinctions from code-switching and a Vygotskian model of cognitive scaffolding in multilingual classrooms. *International Journal of Multilingualism*, 1–22. https://doi.org/10.1080/14790718.2025.2575886

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2021). *Thematic Analysis : A Practical Guide* (Second). England: SAGE Publications.

Canals, L. (2022). The role of the language of interaction and translanguaging on attention to interactional feedback in virtual exchanges. *System*, *105*, 102721. https://doi.org/10.1016/j.system.2022.102721

Cenoz, J., & Gorter, D. (2022). Pedagogical translanguaging in Content and Language Integrated Learning. *Journal of Multilingual Theories and Practices*, *3*(1), 7–26. https://doi.org/10.1558/jmtp.21812

Cenoz, J., Santos, A., & Gorter, D. (2024). Pedagogical translanguaging and teachers' perceptions of anxiety. *International Journal of Bilingual Education and Bilingualism*, *27*(9), 1234–1245. https://doi.org/10.1080/13670050.2021.2021387

Clark, V. L. P., & Creswell, J. W. (2017). *Designing and Conducting Mixed Methods Research* (Third). USA: Sage Publications. Retrieved from https://books.google.co.id/books?hl=en&lr=&id=iBr6Y7cBmOQC&oi=fnd&pg=PR14&dq=creswell+plano+clark+mixed+methods&ots=PYc_TpmILG&sig=Q1imQE_WzigVxi6aO0I2j5PFnxw&redir_esc=y#v=onepage&q=creswell plano clark mixed methods&f=false

Codó, E., & Collins, C. (2025). Stigma, self-styling and 'forced accents' among English L2 speakers in Spain. *World Englishes*. https://doi.org/10.1111/weng.12721

Djuaini, A. (2025). Internalization of Islamic Religious Education Values in Moral Development of Students in Madrasah. *Afkaruna: International Journal of Islamic Studies (AIJIS)*, *3*(1), 1–17. https://doi.org/10.38073/aijis.v3i1.3330

Fang, F., Zhang, L. J., & Sah, P. K. (2022). Translanguaging in Language Teaching and Learning: Current Practices and Future Directions. *RELC Journal*, *53*(2), 305–312. https://doi.org/10.1177/00336882221114478

Feltman, M. Y. (2025). Hybridity and eclecticism in rethinking the multilingual turn in English language pedagogies. *Reading & Writing*, *16*(1), 1–12. https://doi.org/10.4102/rw.v16i1.510

Goodman, B., & Tastanbek, S. (2021). Making the Shift From a Codeswitching to a Translanguaging Lens in English Language Teacher Education. *TESOL Quarterly*, *55*(1), 29–53. https://doi.org/10.1002/tesq.571

Hamman-Ortiz, L. (2024). Cultivating a critical translanguaging space in dual language bilingual education. *International Multilingual Research Journal*, *18*(2), 119–139. https://doi.org/10.1080/19313152.2023.2277101

Haris, A. (2022). Teaching Reading of Arabic Language in Indonesia: Reconstruction of the Contents

and Scope of Nahwu science. *Eurasian Journal of Applied Linguistics*, *8*(2), 122–136. https://doi.org/http://dx.doi.org/10.32601/ejal.911547

Kusumaningputri, R. (2024). Negotiating voices in English as a lingua franca: Indonesian multilingual identity in English digital interactions. *Journal of Multilingual and Multicultural Development*, *45*(10), 4554–4571. https://doi.org/10.1080/01434632.2023.2173758

Lee, M.-C., Trinh, M., & Deng, Z. (2023). Multimodal Turn Analysis and Prediction for Multi-party Conversations. *International Conference on Multimodal Interaction*, 436–444. New York, NY, USA: ACM. https://doi.org/10.1145/3577190.3614139

Li, B., Fei, H., Li, F., Chua, T.-S., & Ji, D. (2025). Multimodal Emotion-Cause Pair Extraction with Holistic Interaction and Label Constraint. *ACM Transactions on Multimedia Computing, Communications, and Applications*, *21*(11), 1–19. https://doi.org/10.1145/3689646

Li, C., Weng, X., Li, Y., & Zhang, T. (2024). Multimodal Learning Engagement Assessment System: An Innovative Approach to Optimizing Learning Engagement. *International Journal of Human–Computer Interaction*, 1–17. https://doi.org/10.1080/10447318.2024.2338616

Li, Y. (2025). Exploring Chinese multilingual addressees' attitudes and interpretation of translanguaging practices in social settings. *International Journal of Bilingualism*, *30*(1), 315–335. https://doi.org/10.1177/13670069251322371

Liu, T., & Zhang, Z. (2025). Language teachers as pedagogical designers in technology-mediated language education. *System*, *131*, 103662. https://doi.org/10.1016/j.system.2025.103662

Maseko, K., & Mkhize, D. N. (2021). Translanguaging mediating reading in a multilingual South African township primary classroom. *International Journal of Multilingualism*, *18*(3), 455–474. https://doi.org/10.1080/14790718.2019.1669608

Mhlongo, S., Mbatha, K., Ramatsetse, B., & Dlamini, R. (2023). Challenges, opportunities, and prospects of adopting and using smart digital technologies in learning environments: An iterative review. *Heliyon*, *9*(6), e16348. https://doi.org/10.1016/j.heliyon.2023.e16348

Nawas, A., Darmawan, I. G. N., & Maadad, N. (2023). Indonesian secular vs. Madrasah schools: assessing the discrepancy in English reading and listening tests. *Language Testing in Asia*, *13*(1), 52. https://doi.org/10.1186/s40468-023-00266-w

Nicolarakis, O. D., & Mitchell, T. (2023). Dynamic Bilingualism to Dynamic Writing: Using Translanguaging Strategies and Tools. *Languages*, *8*(2), 141. https://doi.org/10.3390/languages8020141

Qureshi, M. A., & Aljanadbah, A. (2022). Translanguaging and reading comprehension in a second language. *International Multilingual Research Journal*, *16*(4), 247–257. https://doi.org/10.1080/19313152.2021.2009158

Roshid, M. M., & Le Ha, P. (2025). Medium of education and the politics of distraction in school education in Bangladesh. *Current Issues in Language Planning*, *26*(3), 392–418. https://doi.org/10.1080/14664208.2024.2368381

Shao, Y., Wu, J., Li, Y., Lu, Q., & Wang, Z. (2025). The impact of digital technology use on EFL students' English academic performance: The mediating roles of emotional intelligence and learning engagement. *BMC Psychology*, *13*(1), 638. https://doi.org/10.1186/s40359-025-02967-8

Sharif, M., & Uckelmann, D. (2024). Multi-Modal LA in Personalized Education Using Deep Reinforcement Learning Based Approach. *IEEE Access*, *12*, 54049–54065. https://doi.org/10.1109/ACCESS.2024.3388474

Supriyanto, La Hadisi, Pairin, Dirman, & Raehang. (2025). Facing the Challenges of Globalization: Transforming Madrasah Education from Bilingual to International Classrooms. *Nazhruna: Jurnal Pendidikan Islam*, *8*(1), 17–30. https://doi.org/10.31538/nzh.v8i1.125

Tai, K. W. H. (2024a). Documenting students' conceptual understanding of second language vocabulary knowledge: a translanguaging analysis of classroom interactions in a primary English as a second language classroom for linguistically and culturally diverse students. *Applied Linguistics Review*, *15*(6), 2775–2822. https://doi.org/10.1515/applirev-2023-0181

Tai, K. W. H. (2024b). Transcending the boundaries of mode in online language teaching: A translanguaging perspective on ESL teachers' synchronous small group online tutorials. *System*, *121*, 103185. https://doi.org/10.1016/j.system.2023.103185

Tai, K. W. H. (2025). Transpositioning in English medium instruction classroom discourse: insights from a translanguaging perspective. *Language and Education*, *39*(4), 965–999. https://doi.org/10.1080/09500782.2024.2382748

Tian, X., & Yuan, B. (2025). Beyond Translation: Exploring the Stigmatization of Rainbow Works Translation Under Frame Theory. *Journal of Homosexuality*, *72*(6), 1151–1173. https://doi.org/10.1080/00918369.2024.2368205

Umam, A. H., Sugiharto, S., & Manara, C. (2023). Translingual practice in remote EFL tertiary education: How multilingual speakers create translanguaging spaces. *Indonesian Journal of Applied Linguistics*, *13*(2), 258–269. https://doi.org/10.17509/ijal.v13i2.63065

Veliz, L. (2024). Multilingual and Multicultural Education: from Policy to Pedagogical Practice. In *Multiculturalism and Multilingualism in Education* (pp. 1–8). BRILL. https://doi.org/10.1163/9789004709850_002

Xie, Y., Yang, L., Zhang, M., Chen, S., & Li, J. (2025). A Review of Multimodal Interaction in Remote Education: Technologies, Applications, and Challenges. *Applied Sciences*, *15*(7), 3937. https://doi.org/10.3390/app15073937

Yilmaz, T. (2021). Translanguaging as a pedagogy for equity of language minoritized students. *International Journal of Multilingualism*, *18*(3), 435–454. https://doi.org/10.1080/14790718.2019.1640705