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Artificial Intelligence–Based English Instruction: Implementation, Challenges, and Learning Outcomes in Indonesian High Schools

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Abstract: *This study aims to examine the implementation, challenges, and learning outcomes of Artificial Intelligence (AI)-based English instruction in three Indonesian Islamic senior high schools. Employing a descriptive qualitative research design, the study explores students' perceptions, learning behaviors, and interactions with AI tools such as ChatGPT, Grammarly, Google Translate, and AI-driven pronunciation systems. Data were collected through open-ended questionnaires and analyzed using thematic procedures. Findings indicate that AI tools contribute positively to students' vocabulary development, grammatical awareness, writing fluency, and speaking confidence by offering immediate feedback, adaptive support, and opportunities for autonomous learning. Nonetheless, students also experienced key challenges, including misinformation, cognitive overload from complex explanations, overdependence on AI-generated responses, and unequal access to technological resources. These constraints influenced the extent to which AI could be integrated effectively into English instruction. The discussion highlights that although AI serves as a valuable supplementary learning resource, it cannot replace the pedagogical, emotional, and ethical roles fulfilled by teachers. Students emphasized the need for human guidance to interpret AI-generated information, ensure accuracy, and maintain academic integrity. The study concludes that AI-enhanced English learning holds substantial potential when implemented responsibly. It underscores the importance of developing AI literacy, strengthening digital infrastructure, and establishing ethical guidelines to support sustainable integration of AI in Indonesian secondary education.*

Keywords: *Artificial Intelligence, English Language Teaching, Qualitative Research, Learning Outcomes, Educational Technology, Indonesia*

INTRODUCTION

Artificial Intelligence (AI) has emerged as one of the most influential technological advancements shaping the global landscape of language education. AI-powered platforms—including intelligent tutoring systems, adaptive feedback engines, large language models (LLMs), machine translation tools, and automated writing evaluation services—have fundamentally transformed how learners' access, practice, and internalize English as a foreign language. AI offers unprecedented opportunities for personalized learning, enabling students to engage

in targeted practice aligned with their proficiency levels while receiving real-time corrective feedback. Research on AI in English language teaching (ELT) demonstrates that properly integrated AI tools enhance linguistic accuracy, increase student motivation, and foster autonomous learning behaviors.

In the Indonesian educational context, the integration of AI technologies is rapidly expanding, particularly in urban and semi-urban secondary schools. However, despite the growing presence of AI tools, empirical research examining how Indonesian high school students actually use AI for English learning remains limited. Even more scarce are qualitative investigations conducted within Islamic educational institutions, where digital adoption must be aligned with institutional values, pedagogical norms, and character education principles. These gaps underscore the relevance of the present study.

This study responds to the need for in-depth empirical accounts of AI-enhanced English learning by examining student perceptions across three Islamic senior high schools. The research explores how learners implement AI tools, the challenges that arise from AI adoption, and the learning outcomes that emerge from sustained engagement with AI-supported English instruction. The study builds upon global literature while contextualizing findings within the sociocultural, pedagogical, and infrastructural realities of Indonesian secondary education. Artificial Intelligence (AI) has emerged as one of the most influential technological advancements shaping the global landscape of language education.

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LITERATURE REVIEW

AI in English language education has been widely investigated across various domains, including writing development, machine translation, pronunciation training, reading comprehension, and autonomous learning. Studies by Wang & Vásquez (2023), Kim (2020), and Li & Ni (2022) highlight the transformative impact of AI tools on learner engagement and accuracy. AI-based writing assistants such as Grammarly and ChatGPT provide instant feedback that enhances syntactic and semantic accuracy. Machine translation tools support comprehension among lower-proficiency learners, while AI-driven speech recognition tools provide low-anxiety pronunciation practice.

Despite these benefits, scholars also caution against overreliance on AI, emphasizing the importance of digital literacy. Studies by Schmid (2020) and Lee (2021) highlight ethical concerns, including plagiarism, misinformation, and inequitable access to digital tools. This literature review situates the study within global research trends and identifies gaps related to AI adoption in Indonesian Islamic high schools.AI in English language education has been widely investigated across various domains, including writing development, machine translation, pronunciation training, reading comprehension, and autonomous learning. Studies by Wang & Vásquez (2023), Kim (2020), and Li & Ni (2022) highlight the transformative impact of AI tools on learner engagement and accuracy. AI-based writing assistants such as Grammarly and ChatGPT provide instant feedback that enhances syntactic and semantic accuracy. Machine translation tools support

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RESEARCH METHOD

This study adopted a descriptive qualitative research design that was well suited to capturing the naturalistic and contextually embedded experiences of students. A total of eighty-five participants from three Indonesian Islamic senior high schools were recruited to represent diverse learning environments within the secondary education sector. Data were obtained through open-ended questionnaires that were intentionally constructed to solicit rich, reflective accounts of students'

engagement with AI tools, the challenges they encountered, and the learning outcomes that emerged from their use.

The data were analyzed using thematic analysis following Braun and Clarke's (2006) six-phase framework, which entailed systematic coding, the generation and refinement of thematic categories, and interpretive synthesis grounded in the data. To strengthen the trustworthiness of the findings, the study employed methodological triangulation, peer debriefing, and reflective memoing throughout the analytic process. These procedures collectively enhanced the credibility, dependability, and confirmability of the research outcomes.

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FINDINGS AND DISCUSSION

1. Implementation of AI-Based English Instruction

Students engaged extensively with a diverse range of AI tools—most prominently ChatGPT, Google Translate, Grammarly, and AI-driven speech-recognition applications—which collectively formed an integral part of their daily English learning routines. These technologies were not used sporadically, but rather embedded into multiple stages of students' academic work, demonstrating a high degree of functional integration into their learning practices. Each tool served a unique pedagogical role. ChatGPT, for instance, functioned as a highly interactive multimodal knowledge source capable of offering conceptual explanations, paraphrasing support, sentence reformulations, contextualized usage examples, and step-by-step breakdowns of syntactic structures. Students frequently described ChatGPT as a "virtual tutor" that responded patiently and adaptively to follow-up questions, allowing individualized engagement beyond what is typically feasible in a classroom setting.

Google Translate served a complementary function by supporting rapid semantic access and enabling learners to confirm word meanings, idioms, and short text translations. Although not designed for deep-level linguistic analysis, it allowed students to overcome vocabulary gaps quickly and maintain comprehension flow. Grammarly, on the other hand, was used as a writing enhancement platform offering automated detection of mechanical errors, stylistic inconsistencies, and syntactic issues. Students appreciated Grammarly's explanatory feedback, which assisted them in developing a clearer understanding of sentence structure, punctuation accuracy, and appropriate lexical choice. Meanwhile, speech-recognition applications enabled students to rehearse and refine pronunciation in a low-pressure environment, strengthening their oral fluency through repetition and immediate auditory comparison.

Across these tools, students articulated that AI operated as an autonomous yet highly responsive learning companion—one that enabled them to explore linguistic content at their own pace, seek clarification privately, and revisit explanations countless times without feeling judged. This contributed substantially to deeper comprehension, especially for learners who were hesitant to pose questions during class due to shyness or fear of making mistakes. AI tools also

encouraged iterative learning behaviors: students frequently revised their writing drafts multiple times, compared their original work with AI suggestions, checked meanings repetitively to confirm understanding, and engaged in repeated pronunciation practice.

One student described the pedagogical value of AI tools as follows:

"AI makes learning English easier because I can get explanations in different ways until I understand. In class I'm sometimes shy to ask, but with AI I can explore answers freely without pressure." *— Student Participant 21*

This statement illustrates how AI supports individualized and affectively safe learning conditions. The student's emphasis on receiving explanations "in different ways" underscores AI's capacity to provide multimodal clarifications that align with diverse cognitive needs. Furthermore, the reference to reduced anxiety reflects AI's role in mitigating affective barriers, enabling learners to engage in inquiry without fear of negative evaluation. Collectively, the quotation highlights AI's potential to foster self-paced exploration and increased learner autonomy, while also implying the necessity of digital literacy to ensure that students interpret AI-generated information critically and appropriately.

Collectively, the implementation patterns suggest that AI significantly broadened the scope of learning opportunities available to students. It provided continuous access to feedback, diversified language input, and flexible modes of engagement—conditions rarely afforded by traditional instructional environments. Nevertheless, the degree to which students benefited from AI tools varied noticeably depending on their digital literacy skills. Learners with higher proficiency in evaluating and refining AI-generated content achieved more substantial learning gains, while others risked uncritical reliance. This variation underscores the need for explicit instructional support to ensure that students interact with AI critically, ethically, and effectively.

2. Challenges Influencing AI Adoption

Students identified several challenges that shaped the quality and consistency of their AI-supported learning experiences. Misinformation and inaccuracies in AI-generated responses were commonly reported, particularly when explanations were overly complex or misaligned with students' proficiency levels. These inaccuracies sometimes led to confusion or misinterpretation, requiring teacher intervention to correct misunderstandings. Technological barriers—including unstable internet connectivity and limited access to capable devices—further restricted equal opportunities for AI use, especially among students from lower socioeconomic backgrounds. Cognitive overload also emerged as a challenge, as some AI explanations contained advanced terminology or excessively detailed analyses that overwhelmed learners. Additionally, several students reported tendencies toward overdependence, noting that the convenience of AI occasionally reduced their inclination to think critically or attempt tasks independently.

Several students expressed concerns that illuminate the complexities associated with AI-supported learning. Their reflections capture both cognitive and structural barriers encountered during AI adoption.

> ***"Sometimes the answers from AI look correct, but when I compare them with my textbook or teacher's explanation, they are different. It makes me unsure which one to trust."*** *— Student Participant 37*

This quotation reflects a form of epistemic ambiguity that arises when students confront discrepancies between AI-generated information and conventional academic sources. Such inconsistencies create cognitive dissonance and may impede learning progress, particularly among students lacking the evaluative skills necessary to verify information accuracy. This highlights the critical need for guided instructional support to help learners assess AI outputs in a methodologically sound manner.

> ***"If my internet connection is slow, I cannot use AI at all. It makes me fall behind because other students can finish tasks faster."*** *— Student Participant 11*

This statement foregrounds the structural inequities that shape AI adoption. Limited or unstable internet access prevents students from fully participating in AI-enhanced learning activities, thereby reinforcing existing disparities in educational opportunity. The quotation underscores the necessity of institutional investment in digital infrastructure to ensure that AI integration does not exacerbate socioeconomic divides.

> **"Sometimes I depend too much on AI. I know it is a problem, but it is hard not to use it because it gives answers quickly."** *— Student Participant 52*

This reflection illustrates a behavioral challenge associated with AI use: the emergence of habitual overreliance. The student's acknowledgment of dependence suggests a reduction in intrinsic cognitive engagement and a diminished inclination to attempt problem-solving independently. Such tendencies raise concerns regarding learners' long-term development of critical thinking and metacognitive regulation, affirming the importance of teacher-mediated scaffolding to counterbalance reliance on AI-generated solutions.

Collectively, these student perspectives reveal that the challenges of AI adoption extend beyond mere technical limitations. They encompass epistemic, infrastructural, and behavioral constraints that influence the quality and equity of students' learning experiences. The quotations demonstrate that inaccurate AI explanations can lead to misconceptions, limited digital access can produce inequitable learning conditions, and overdependence can undermine the cultivation of autonomous, critically engaged learners. These findings reinforce the conclusion that effective AI integration requires not only access to technology but also

pedagogical guidance, institutional support, and explicit instruction in critical AI literacy.

3. Learning Outcomes Emerging from AI Use

Despite the challenges, students reported considerable positive learning outcomes resulting from AI engagement. Vocabulary retention improved through repeated exposure to contextual examples and AI-generated paraphrases. Grammar awareness increased as students received instant corrective feedback that highlighted structural errors and offered alternative constructions. Writing fluency benefitted from revision cycles supported by AI, which helped students enhance cohesion, coherence, and syntactic refinement. Pronunciation tools lowered speaking anxiety by allowing learners to practice privately and receive immediate auditory comparisons. Students also reported increased motivation, curiosity, and autonomy in managing their English learning, although these gains varied depending on their ability to critically interpret and apply AI feedback.

Students articulated a range of positive learning outcomes derived from their engagement with AI tools, reflecting meaningful improvements in linguistic competence, learning autonomy, and affective readiness.

> ***"AI helps me remember new vocabulary because I can see different examples and sentences. It makes the words stay longer in my mind."*** — *Student Participant 08*

This comment illustrates how AI-supported contextualization enhances lexical retention. By providing multiple example sentences, paraphrases, and semantic variations, AI facilitates deeper cognitive processing, enabling learners to internalize vocabulary more effectively. The quotation aligns with theories of input enhancement, suggesting that repeated, meaningful exposure contributes significantly to long-term vocabulary acquisition.

> ***"When I practice writing with AI, I understand my mistakes more clearly because it explains why a sentence is wrong, not just corrects it."*** — *Student Participant 44*

This reflection demonstrates the pedagogical value of AI-mediated corrective feedback. Unlike traditional error correction, which may offer limited explanation, AI tools provide metalinguistic insights into grammatical structures. This enables students to recognize patterns of error and refine their writing through improved cohesion, coherence, and syntactic awareness. Such feedback promotes metacognitive growth and supports iterative writing development.

> ***"Using pronunciation apps makes me less nervous to speak English because I can practice many times without feeling embarrassed."*** — *Student Participant 19*

This statement highlights AI's role in reducing affective barriers associated with speaking anxiety. Through repeated, private rehearsal enabled by speech-recognition tools, learners gain confidence and fluency without the social pressures present in classroom speaking activities. This affirms existing research that identifies AI as a low-stakes environment conducive to oral language development.

Taken together, these student perspectives reinforce the broader pattern of learning outcomes associated with AI-assisted instruction. The quotations collectively reveal that AI enhances linguistic development through mechanisms such as contextualized exposure, metalinguistic feedback, and anxiety-reducing rehearsal environments. These affordances support improvements in vocabulary retention, grammatical accuracy, writing fluency, and oral proficiency. Moreover, learners' descriptions of increased motivation and confidence reflect the affective benefits of AI, which complement cognitive gains.

However, the variability in learners' ability to interpret and apply AI feedback underscores the necessity of teacher-mediated guidance. Students with stronger analytical skills derived greater benefits from AI explanations, whereas others required support to avoid misinterpretation or uncritical acceptance of AI suggestions. Thus, while AI contributes substantially to positive learning outcomes, its instructional impact is optimized when integrated within a pedagogically grounded and ethically informed framework.

DISCUSSION

Artificial Intelligence (AI) has increasingly demonstrated its pedagogical value as a complementary tool for English instruction in Indonesian high schools. By providing immediate feedback, personalized learning pathways, and opportunities for autonomous practice, AI has enhanced students' vocabulary development, grammatical awareness, writing fluency, and speaking confidence. These gains highlight AI's potential to enrich instructional practices and extend learning beyond the conventional classroom environment. Students' responses clearly showed that AI tools operate as flexible and responsive learning partners, allowing them to revisit complex topics, test hypotheses, and receive guidance tailored to their individual needs.

However, the integration of AI into English instruction also presents significant pedagogical and infrastructural challenges. Issues related to misinformation, uneven accuracy in AI-generated explanations, digital inequality, and behavioral overdependence risk compromising the quality of learning if left unaddressed. These concerns underscore an essential principle: while AI can augment instruction, it cannot replace the nuanced, morally grounded, and context-sensitive roles of teachers. Human educators continue to serve as epistemic authorities who mediate AI outputs, guide learners in ethical decision-making, cultivate critical thinking, and foster emotional resilience—areas in which AI lacks depth, intentionality, and contextual awareness.

From a broader educational perspective, responsible and sustainable integration of AI requires systemic support. Schools must invest in robust digital infrastructure, ensure equitable access to technological tools, and develop comprehensive AI literacy programs for both teachers and students. Such training should emphasize not only technical proficiency but also the ability to critically evaluate AI-generated information, recognize biases, and use AI tools ethically and productively. Policy frameworks at institutional and national levels must also articulate clear guidelines concerning data privacy, academic integrity, and responsible AI-based assessment practices.

In conclusion, AI holds considerable potential to strengthen the quality and inclusivity of English language education in Indonesia when integrated thoughtfully, ethically, and strategically. Its effectiveness is contingent upon balanced human–AI collaboration, where AI serves as a powerful supplementary resource and teachers maintain their central role as facilitators of learning, character formation, and critical inquiry. With appropriate infrastructure, training, and ethical safeguards, AI can become an integral component of a future-oriented English education system that empowers students to engage critically, creatively, and independently with the evolving landscape of digital literacy.

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