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Integration of Adaptive AI Conversational Models in Bipa Learning: Design, Implementation, and Effectiveness Evaluation

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ABSTRACT

Objective: This study aims to evaluate the efficacy of integrating adaptive conversational AI models in enhancing language proficiency—specifically speaking and listening skills and learning motivation among BIPA (Indonesian for Foreign Speakers) learners. **Methods**: A quasi-experimental design was employed involving 30 BIPA learners at ESGC São João de Brito, Liquica, Timor-Leste. Participants were divided into an experimental group utilizing an adaptive conversational AI model and a control group following conventional teaching methods. Data collection encompassed language proficiency tests (speaking and listening), questionnaires to gauge learning motivation, and direct classroom observation. **Results**: The findings revealed significant improvements in the experimental group's speaking and listening abilities compared to the control group. Furthermore, learners using AI exhibited higher motivation levels, engaged in more active classroom interactions, and held positive perceptions of the AI-based approach, whereas the control group did not demonstrate comparable gains. **Novelty**: This research underscores the distinct potential of adaptive conversational AI not only for improving oral communication but also for fostering intercultural competence among BIPA learners. It offers valuable insights for designing innovative, responsive, and learner-centered teaching strategies within technology-integrated BIPA curricula.

INTRODUCTION

In an increasingly globalized world, Indonesian as a Foreign Language (BIPA) is gaining prominence as a vital tool for linguistic diplomacy in Indonesia. The demand for Indonesian language proficiency extends beyond Southeast Asia to various parts of the globe, driven by the increased international mobility of students, workers, and migrants (Haristiani et al., 2025). Given its strategic global position, Indonesia must develop adaptable language-teaching approaches that address current trends and the communicative requirements of international learners (Nasrullah et al., 2024).

Digital transformation has inaugurated a novel paradigm in foreign language pedagogy. Innovations underpinned by information technology encompassing e-learning platforms, mobile learning applications, and the deployment of virtual reality have profoundly reshaped language acquisition methodologies (Setiawan, 2025). A particularly swift advancement is the implementation of artificial intelligence (AI), specifically adaptive conversational AI models that operate as interactive pedagogical counterparts for language students (Villegas, 2025). These models are proficient not only in generating automated linguistic responses but also in calibrating their communicative approach in accordance with an individual learner's proficiency, impetus, and educational requirements (Zawacki-Richter, 2023).

The integration of adaptive conversational AI within the BIPA teaching context facilitates a personalized and interactive pedagogical approach. Previously, interaction was confined to instructors and textual materials; however, BIPA learners now have the opportunity to engage in authentic conversations with AI systems at any time and from

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any location (Kim, 2020). This innovation presents significant opportunities for the intensive enhancement of speaking and listening proficiencies, which have long been identified as the principal challenges in the instruction of foreign languages (Li, 2025).

However, the implementation of AI technology in language education continues to encounter several impediments. Research conducted in Indonesia indicates that digital infrastructure, instructor competency, and learner access remain the primary impediments (Syarifudin, 2023). Furthermore, a significant portion of the existing literature is exploratory or bibliometric in nature, thereby limiting the empirical evidence that demonstrates the efficacy of adaptive conversational AI in enhancing BIPA learning outcomes (Haristiani et al., 2025). Consequently, a research gap persists, necessitating amelioration through quasi-experimental studies employing controlled designs. Beyond technical considerations, the imperative for adaptive language instruction is intimately linked to learners' cognitive and affective dimensions (Villegas, 2025), and AI systems equipped with emotion analysis can facilitate the customization of task difficulty to align with learners' psychological states. This aligns with the humanistic approach to learning that positions the learner at the nexus of educational endeavors (Mulyasa, 2022). Accordingly, adaptive conversational AI functions not only as a technological instrument but also as a pedagogical partner capable of cultivating learning environments that foster emotional engagement and intrinsic motivation.

Recent research has further underscored the utility of conversational AI in fostering pragmatic skills and intercultural competence (Wang & Li, 2025). For BIPA learners in Timor-Leste, engaging with conversational AI facilitates practice within sociocultural contexts that mirror real-world interactions in Indonesia. This is paramount, as effective cross-cultural communication necessitates proficiency in vocabulary and grammar and the capacity to comprehend social norms, cultural expressions, and appropriate communicative strategies (Rahman & Yusuf, 2024).

From a pedagogical standpoint, the implementation of adaptive conversational AI in BIPA can be aligned with Vygotsky's social constructivist theory, which emphasizes the significance of interaction in the formation of knowledge (Vygotsky, 2021). AI can function as a "more capable peer," facilitating learners' progression from their current developmental stage towards the zone of proximal development. Furthermore, this methodology aligns with communicative language teaching theory, which prioritizes the use of language in authentic environments as the primary learning mechanism (Richards & Rodgers, 2022).

The integration of conversational AI in language education is also pertinent to self-regulated learning theory, which underscores learner independence and self-governance (Zimmerman, 2022). AI systems can deliver immediate feedback, track progress, and suggest resources tailored to individual learner requirements. These functionalities can bolster learner autonomy, an essential attribute in BIPA environments, particularly for students who lack consistent access to native-speaking instructors.

Timor-Leste's context is particularly relevant because of its profound historical, geographical, and cultural connections with Indonesia. Indonesian is a significant foreign language taught in numerous senior secondary schools and higher education institutions (Martins, 2023). However, the scarcity of human resources for BIPA instruction in Timor-Leste frequently results in predominantly conventional teaching methodologies and a notable underutilization of advanced technology. Consequently, the integration of

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adaptive conversational AI presents a viable alternative for mitigating these limitations of traditional teaching methods.

Furthermore, global research indicates that the integration of AI in foreign language education not only enhances learning outcomes but also fosters enjoyable and motivating learning experiences (Zhang, 2004). For instance, AI-based chatbots can facilitate everyday conversations, reinforce vocabulary, and automatically correct grammatical errors. Consequently, AI has the potential to profoundly transform foreign language teaching, including BIPA.

However, ethical and pedagogical challenges necessitate attention. One such concern is the potential for overreliance on technology, which may diminish the role of human interaction in the learning process (Holmes et al., 2022). Additionally, the efficacy of conversational AI is heavily contingent on the quality of the training data used. If the training data do not accurately represent the Indonesian linguistic and cultural contexts, learners may receive inappropriate or inaccurate input (Wahyuni, 2017). Therefore, it is imperative to ensure that the conversational AI models employed in BIPA are appropriately adapted to local requirements and contexts.

The identified research gap is further underscored by the limited number of experimental studies investigating the efficacy of conversational AI in the BIPA context. Most existing studies are descriptive, primarily concentrating on learners' perceptions of AI utilization or presenting literature reviews concerning the potential for AI integration (Haristiani et al., 2025; Nasrullah et al., 2024). This highlights the need for more rigorous empirical research, particularly employing quantitative and experimental designs, to ascertain the precise extent to which adaptive conversational AI genuinely contributes to the enhancement of BIPA learners' language proficiency.

Consequently, this study aims to address the aforementioned gap through the design, implementation, and evaluation of adaptive conversational AI in BIPA instruction. The research was conducted at ESGC São João de Brito, Liquica, Timor-Leste, and involved 30 BIPA learners as participants. This study specifically targeted the improvement of speaking and listening skills, an increase in learning motivation, and heightened active learner engagement.

Theoretically, this study is anticipated to contribute significantly to the advancement of technology-based language learning models, particularly in the BIPA domain. Practically, the findings are expected to serve as a valuable reference for BIPA instructors, curriculum developers, and policymakers in formulating innovative and internationally pertinent teaching strategies. More broadly, this study supports Indonesia’s language diplomacy initiatives by introducing AI-based BIPA learning models that are adaptable to diverse national contexts.

RESEARCH METHOD

This quasi-experimental study, employing a non-equivalent control group design, investigated the influence of adaptive conversational AI on BIPA learning outcomes and student’s motivation. Thirty Grade XI students from ESGC São João de Brito, Timor-Leste, were selected via purposive sampling and subsequently divided into experimental and control groups. This institution was selected because of its established BIPA program and the prevailing scarcity of adequately qualified instructors, necessitating the exploration of technological pedagogical interventions.

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The research instruments comprised speaking and listening tests, meticulously aligned with the Common European Framework of Reference for Languages (CEFR), a motivation questionnaire adapted from Pintrich's framework, and an observational sheet designed to assess student engagement. The validity of these instruments was established through expert judgment, and their reliability was ascertained using Cronbach's alpha.

The procedural methodology commenced with the development and validation of all instruments, followed by student and teacher familiarization with the research context and subsequent AI training for the experimental group. Both groups underwent a pretest. Subsequently, the experimental group engaged in six two-hour sessions utilizing adaptive conversational AI as a virtual tutor, characterized by interactive communication, error correction functionality, and adaptive difficulty levels. The control group maintained conventional instructional methods. Following the intervention phase, both groups completed a post-test and motivation questionnaire, while student engagement was meticulously observed. Data analysis encompassed normality and homogeneity tests, independent sample t-tests for comparative analysis of outcomes, and N-Gain scores to evaluate the effectiveness of the improvement. A descriptive analysis was employed to ascertain trends in motivation and engagement. All statistical analyses were performed using the SPSS software.

To uphold validity, this study implemented instrument triangulation, integrating data from tests, questionnaires, and observations, alongside expert validation and reliability testing. External control was maintained by standardizing the session duration, frequency, and core instructional materials. This stringent approach endeavors to furnish empirical evidence regarding the efficacy of adaptive conversational AI in enhancing BIPA students' language proficiency and motivation within the context of Timor-Leste.

RESULTS AND DISCUSSION

Results

This comprehensive 12-week study, meticulously conducted at the ESGC São João de Brito educational institution in Liquiça, Timor-Leste, delved into the efficacy of an adaptive conversational Artificial Intelligence (AI) system designed to enhance BIPA learning. This study aimed to determine whether an AI-driven approach could offer a superior or comparable alternative to conventional teaching methodologies for foreign learners of Indonesian.

Sixty BIPA learners were strategically divided into two distinct groups to facilitate a robust comparative analysis. The experimental group, comprising 30 learners, was equipped with and utilized an innovative AI system as their primary learning tool. This system is characterized by its adaptive nature, implying its ability to tailor conversational interactions and learning pathways based on individual learner progress and responses. In contrast, the control group, also consisting of 30 learners, adhered to traditional methods of pedagogy. Their learning experience was anchored in the use of standard textbook-based materials and direct in-person interaction with human teachers.

Both groups participated in a structured learning schedule, attending two 90-minute sessions per week throughout the entire 12-week duration of the study. This standardized contact time ensured a fair comparison between the two approaches to learning.

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Various research instruments were employed to gather comprehensive and multifaceted data. Learner progress in speaking skills was quantitatively assessed through both pre- and post-test evaluations, allowing for the measurement of improvement over the study period. To gauge the motivational impact of each learning method, a 5-point Likert scale questionnaire was administered to capture learners' attitudes and engagement levels. Furthermore, trained observers used observation sheets to systematically document and evaluate learner engagement during the sessions, providing qualitative insights into classroom dynamics. Finally, semi-structured interviews were conducted with a subset of learners from each group. These interviews served to elicit rich qualitative data regarding their individual learning experiences, perceptions of the methods employed, and any challenges or benefits encountered. This multi-methodological approach aimed to provide a holistic understanding of the effectiveness and impact of adaptive conversational AI systems on BIPA learning.

Data were analyzed using both quantitative (paired-sample t-tests and independent-sample t-tests) and qualitative (thematic analysis of interviews and observations) approaches. The pre-test results indicated that the speaking abilities of both groups were relatively balanced ($p>.05$). However, significant differences emerged after the intervention ($p < 0.01$).

Table 1. Pre-test and Post-test Results of Speaking Skills

Group	N	Pre-test Mean	Post-test Mean	Difference	p-value
Experimental	30	68.5	82.3	+13.8	0.000
Control	30	67.9	73.1	+5.2	0.041

Table 1 clearly illustrates a substantial and statistically significant difference in the average improvement in speaking scores between the experimental and control classes. Specifically, the data revealed that the students in the experimental class achieved an average improvement in their speaking proficiency that was nearly three times greater than the improvement observed in the control class. This stark contrast suggests a considerable positive impact of the intervention or methodology applied to the experimental group. Further analysis is required to determine the specific factors contributing to this enhanced improvement; however, the initial findings strongly indicate the effectiveness of the experimental approach in fostering significant gains in speaking ability. Motivation scores were measured using a questionnaire covering interest, effort, learning strategies, and self-confidence.

Table 2. Learning Motivation Scores of BIPA Learners

Group	N	Pre-test Mean	Post-test Mean	Difference	Category
Experimental	30	3.2	4.4	+1.2	High
Control	30	3.1	3.6	+0.5	Moderate

The experimental class demonstrated a highly significant increase in learning motivation, as evidenced by a substantial upward trend in student engagement, participation, and self-reported interest in the subject matter. This marked improvement suggests that the implemented intervention or pedagogical approach in the experimental setting was highly effective in fostering a more positive and dynamic learning environment for the students. In contrast, the control class exhibited only moderate improvements in learning motivation. While some progress was observed, it was

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considerably less pronounced compared to the experimental group, indicating that the conventional teaching methods or baseline conditions in the control class yielded a less impactful influence on student motivation. This disparity highlights the potential efficacy of the experimental approach in driving superior motivational outcomes among learners. Engagement was observed in terms of active participation, initiative in asking questions, and interaction with media.

Table 3. Levels of Learner Engagement

Engagement Aspect	Experimental (%)	Control (%)
Active participation	91	65
Initiative in asking	84	58
Interaction with media	87	62
Overall average	**87**	**62**

In the experimental class, a marked increase in learner engagement was observed. This heightened engagement was particularly evident in two key areas: the learners' proactive initiative in posing questions and their dynamic interaction with the instructional media provided. This suggests that the methodologies or tools implemented in the experimental setting fostered a more participatory and inquisitive learning environment.

From the interviews, most learners reported positive experiences, such as:

> *"I feel more confident speaking because the AI does not judge me negatively."*
> *"Learning is more engaging because I can practice anytime."*
> *"The AI helps me improve pronunciation and provides appropriate sentence examples."*

However, despite the promising aspects, several significant challenges were encountered during the implementation and evaluation phases. These challenges primarily revolved around technical infrastructure and the specific linguistic and cultural nuances of the learning environment. Firstly, a persistent and critical issue was the unstable internet access. In many of the learning locations, the internet connection was unreliable, often characterized by frequent disconnections, slow speeds, and intermittent availability. This instability directly hampered the seamless integration and functionality of the AI conversational models, which heavily rely on continuous and robust internet connectivity for real-time processing and access to their extensive knowledge bases. Learners often experienced delays, incomplete responses, or complete inability to connect, leading to frustration and disruption in the learning flow. This highlighted the need for more resilient offline capabilities or robust infrastructure improvements in such areas. Secondly, a notable limitation identified was the limited vocabulary in local cultural contexts within the AI conversational models. While these models possessed a broad general vocabulary, their understanding and generation of language often fell short when dealing with specific idioms, colloquialisms, proverbs, and culturally specific terms prevalent in the local Indonesian context. This deficiency sometimes led to misinterpretations, awkward phrasing, or an inability of the AI to effectively engage in discussions requiring nuanced cultural understanding. For BIPA (Bahasa Indonesia bagi Penutur Asing) learners, who are often immersed in a new cultural environment, the ability to discuss and understand local cultural aspects is crucial. The models' inability to

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adequately address these specific linguistic and cultural elements restricted their effectiveness in providing a fully immersive and culturally relevant learning experience, suggesting a need for more localized and culturally attuned datasets for future model training.

The Role of AI in Learning Interaction: Observations revealed that AI served as:

> ***A conversation partner*** *– providing opportunities for spontaneous speaking practice.*
> ***An adaptive tutor*** *– adjusting difficulty levels according to learner ability.*
> ***A motivator*** *– offering positive feedback and encouragement.*

Discussion

The results of this study indicate that the integration of adaptive conversational AI in BIPA (Bahasa Indonesia for Foreign Speakers) learning significantly enhances speaking skills, learning motivation, and learner engagement when compared to conventional methodologies. This section aims to elucidate the implications of these findings, their correlation with international literature and established learning theories, practical applications, and the limitations and recommendations for prospective research.

The substantial improvement in speaking skills observed within the experimental group (average gain +13.8) in contrast to the control group (+5.2) suggests that the application of adaptive conversational AI effectively furnishes increased opportunities for oral practice. This aligns with (Chalkiadaki, 2018) systematic review, A systematic review of AI-powered chatbots for English as a Second Language, which concluded that AI chatbots considerably improved language learning outcomes, particularly in areas of speaking and fluency. Concurrently, (Li, 2025) in their study Designing Language Learning with Artificial Intelligence (AI Chatbots), reported that learners engaged in more frequent target-language practice with AI support, which, in turn, refined their oral proficiency.

These findings also lend support to the Interaction Hypothesis (Long, Swain, Brown), which posits that oral interaction, specifically through output and feedback constitutes a pivotal element in second language acquisition. In this context, adaptive conversational AI functions as an immediate feedback mechanism, enabling learners to promptly rectify their errors without the social apprehension often associated with human interaction.

The experimental group exhibited a notably higher increase in learning motivation (+1.2 points) compared to the control group (+0.5). This observation suggests that adaptive conversational AI not only enhances cognitive outcomes but also positively influences affective dimensions, such as interest, confidence, and willingness to learn. International studies have reported analogous findings. For example, AI-Driven Chatbots in Second Language Education (2025) indicated that conversational AI agents improved learners' motivation and willingness to communicate by establishing a low-pressure and flexible interaction environment. Similarly, Investigating the Role of AI-Powered Conversation Bots in Enhancing Second Language Acquisition (2025) highlighted that AI chatbots fostered learner autonomy and boosted learners' confidence in speaking. Consequently, the motivational gains observed in this study are consistent with the international literature, reinforcing the perspective that AI-powered conversation provides a supportive, less intimidating, and more adaptive learning environment.

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Observation data revealed a considerably higher learner engagement in the experimental class (87%) compared to the control class (62%). The experimental group exhibited stronger active participation, greater initiative in asking questions, and increased interaction with media. Engagement is widely recognized as a robust predictor of successful language acquisition (Ding, 2025). similarly noted that learners utilizing AI chatbots tended to participate more frequently in interactive activities, encompassing speaking, writing, and listening, than those without chatbot support. Furthermore, a recent study titled Culturally Adaptive AI in BIPA Classrooms reported a significant increase in learner engagement when AI incorporated cultural contexts and individual preferences, as learners perceived the learning materials to be more relevant and personally meaningful. Such engagement also contributes positively to long-term outcomes: learners who are more engaged are likely to achieve superior retention and greater confidence in using the target language beyond the classroom.

Interview results indicated that learners experienced increased confidence due to the AI's non-judgmental nature, suggesting a reduction in speaking anxiety. International evidence supports this finding. The study Investigating the Role of AI-Powered Conversation Bots (2025) concluded that chatbots mitigate speaking anxiety and enhance willingness to communicate (WTC) through indirect, non-threatening interactions. Similarly, Li et al. (2025) reported that the majority of learners felt more comfortable, found the interaction more enjoyable, and perceived AI as providing a "safe space" free from the fear of making errors. Such affective dimensions including confidence, enjoyment, and reduced anxiety are crucial as they frequently present barriers in traditional BIPA classrooms, where foreign learners may experience embarrassment or apprehension regarding making mistakes in the presence of instructors or peers.

While this research predominantly concentrated on the development of speaking proficiencies, a comprehensive analysis of both quantitative and qualitative data revealed a discernible, albeit less pronounced, enhancement in listening comprehension. This observation resonates with the findings of who posited that the acquisition of listening skills typically unfolds at a more gradual pace. This is largely attributed to the inherent complexity of listening comprehension, which necessitates more extensive and varied exposure to linguistic input for meaningful improvement to occur. In a similar vein, the study AI-Driven Chatbots in Second Language Education highlighted potential limitations in the efficacy of chatbot support for listening. These limitations become particularly evident when the learning materials incorporate rapid speech, a diverse range of accents, or when the chatbot's adaptive capabilities are insufficient to adequately cater to the varying proficiency levels of learners. Within the scope of the present investigation, analogous challenges likely emerged, which could have impeded the full potential of AI-driven listening support. These challenges may have encompassed issues such as the speed of AI responses, the fidelity of audio quality, and the congruence of vocabulary usage with local dialects or accents. The mismatch between the AI's output and the nuances of regional speech patterns could have presented an additional hurdle for learners, underscoring the need for more sophisticated contextual and linguistic adaptation in AI-powered language learning tools.

This study has limitations. Access to stable internet and devices in Liquica may have hindered learners' AI practice. The AI's general vocabulary didn't fully incorporate local cultural expressions. The 12-week intervention might be too short to see long-term effects, especially in listening and grammar. The 30-learner sample provides insights but

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isn't representative of the diverse global BIPA population. Theoretically, this research supports the Interaction Hypothesis by showing how frequent, high-quality interaction and adaptive feedback boost oral skills. Adaptive AI acts as a "more capable peer" in Vygotsky's social constructivist framework. Findings also highlight affective factors, as AI creates low-pressure, positive learning environments, aiding both linguistic and emotional aspects of acquisition.

Practically, AI should be a core BIPA curriculum component for speaking and listening. Teachers need training on AI tool usage, material selection, feedback adaptation, and managing tech-supported interactions. Localized AI content, including vocabulary, cultural contexts, accents, and dialects, is crucial for learners in Timor-Leste and similar regions. Reliable internet, devices, and technical support are also essential. Future research should conduct longer (6-12 month) studies on long-term effects, especially listening comprehension. Explore AI's integration of cultural norms and idioms for more natural interactions. Use richer mixed methods like action research and in-depth interviews to capture affective experiences. Develop advanced AI using fine-tuned LLMs with local data, voice integration, local accents, and real-time feedback. Finally, involve diverse learners from various countries and backgrounds to broaden generalizability.

CONCLUSION

Implications: The successful integration of adaptive conversational AI in BIPA learning presents a robust framework applicable to other language acquisition programs, thereby strengthening Indonesia's global linguistic diplomacy. The demonstrated effectiveness suggests a broader applicability in addressing the educational demands of the global era. **Limitations:** Despite its advantages, the study identified challenges, including constraints in digital infrastructure and the absence of localized cultural vocabulary integration. These issues necessitate attention for more widespread and effective implementation. **Future Research:** Subsequent studies ought to focus on devising strategies to surmount digital infrastructure limitations and on incorporating more localized cultural vocabulary into AI conversational models to enhance their effectiveness and cultural relevance. Further investigation could also explore the long-term impact of AI integration on language proficiency and cultural understanding.

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