ARALBOT: A MOBILE-ACCESSIBLE EDUCATIONAL CHATBOT ON CHATANGO FOR ENHANCING STUDENT ENGAGEMENT

IJROMS
INTERNATIONAL JOURNAL OF RESEARCH ON MULTIDISCIPLINARY STUDIES
"Bridging Disciplines, Advancing Knowledge"

INTERNATIONAL JOURNAL OF RESEARCH ON MULTIDISCIPLINARY STUDIES

Bridging Disciplines, Advancing Knowledge

Volume: 1
Issue:3
Pages: 91-104
Document ID: 2026IJROMS0041
Manuscript Accepted: April 12, 2026
DOI: https://doi.org/10.5281/zenodo.19590754

INTERNATIONAL JOURNAL OF RESEARCH ON MULTIDISCIPLINARY STUDIES
Bridging Disciplines, Advancing Knowledge

Original Article

IJRMS
INTERNATIONAL JOURNAL OF RESEARCH ON MULTIDISCIPLINARY STUDIES
"Bridging Disciplines, Advancing Knowledge"
ONLINE ISSN: 3116-4137 | PRINT ISSN:3116-4145

Volume 1, Issue 3, pp. 91-104, April 2026

ARALBOT: A Mobile-Accessible Educational Chatbot On Chatango For Enhancing Student Engagement

Jandee R. Bonifacio
The School of Graduate Studies, Dr. Carlos S. Lanting College, Quezon City, Philippines

Corresponding Author email: jandee@electronicspectrum.com

Recommended citation:
Bonifacio, J. R. (2026). ARALBOT: A mobile-accessible educational chatbot on Chatango for enhancing student engagement. International Journal of Research on Multidisciplinary Studies, 1(3), 91–104. https://doi.org/10.5281/zenodo.19590754.

Abstract. This study evaluated the effectiveness of ARALBOT, a chatbot-based learning system designed to support student engagement and learning through interactive quizzes and chat-based interaction. The system was developed to provide an accessible and engaging learning tool that students can use through their mobile devices. Grounded in Constructivist Learning Theory and Self-Determination Theory, the study examined students' experiences and perceptions when using ARALBOT as a supplementary educational tool. A quantitative–descriptive research design was employed to assess the usability and effectiveness of the system. Data were gathered from students who interacted with ARALBOT and evaluated their experience using a Likert-scale questionnaire. Descriptive statistics, particularly mean scores, were used to analyze the responses and determine the level of students' overall experience with the system. The results showed that students generally had a positive perception of ARALBOT. The overall experience obtained a mean score of 3.5122, which falls within the high category. Students reported that ARALBOT was useful, comfortable to use, and enjoyable for learning. The interactive features of the chatbot and the accessibility through mobile devices contributed to a favorable learning experience among the participants. The findings suggest that chatbot-based learning tools such as ARALBOT can support student engagement and provide an alternative platform for interactive learning. The study recommends further enhancement of chatbot-based educational systems and encourages educators to consider integrating similar technologies to supplement traditional teaching methods.

Keywords: ARALBOT, Educational Chatbot, Chatbot-Based Learning, Mobile Learning

Introduction

The rapid advancement of mobile technology has significantly transformed the educational landscape, particularly in how students access, process, and engage with academic content. Mobile devices, especially smartphones, have become integral to the daily lives of senior high school students, serving not only as tools for communication and entertainment but also as platforms for informal learning. According to UNESCO (2023), mobile learning has expanded access to education by enabling flexible, on-demand learning opportunities, particularly in developing regions. However, this increased digital immersion has also led to challenges such as reduced attention spans, multitasking behaviors, and fragmented learning experiences, raising concerns about the effectiveness of traditional instructional approaches in meeting the needs of digital-native learners.

In response to these challenges, educational innovations that align with students' digital habits have gained increasing attention. One promising approach is the integration of chat-based learning environments, particularly through the use of educational chatbots. These systems simulate human-like interaction and deliver instructional content through conversational interfaces, making learning more interactive and personalized. Research by OECD (2022) highlights that technology-enhanced learning tools, including chatbots, can improve student engagement by providing immediate feedback and adaptive learning pathways. By transforming passive screen time into active learning experiences, chatbots offer a practical solution for increasing student participation and supporting self-directed learning.

Recognizing this shift in learner behavior and technological accessibility, the researcher developed ARALBOT, an educational chatbot hosted on Chatango.com, a mobile-accessible chatroom platform. ARALBOT is designed to deliver academic content through a gamified format that includes continuous quizzes, real-time scoring, and both individual and group rankings. Unlike traditional learning management systems with fixed modules and deadlines, ARALBOT operates as an open-ended platform that encourages sustained interaction. Its design leverages students' familiarity with chat interfaces and incorporates motivational elements such as competition and instant feedback, which are widely recognized in the literature as key drivers of engagement and learning persistence (Deterding et al., 2011).

This initiative is grounded in core principles of educational management, including learner-centered instruction, technology integration, and equitable access to learning resources. As a low-cost and scalable solution, ARALBOT is particularly suited for educational contexts with limited infrastructure and inconsistent access to formal learning materials. Its compatibility with various mobile devices and low-bandwidth environments enhances its accessibility among diverse student populations. Moreover, its continuous interaction model supports repeated exposure to academic content, which is essential for improving retention and reinforcing learning outcomes (Clark & Mayer, 2016).

This study aims to evaluate the effectiveness of ARALBOT in enhancing student engagement, motivation, and learning retention among senior high school students. Specifically, it examines students' perceptions of the chatbot's usability, accessibility, and overall learning experience, and determines whether these perceptions differ across demographic variables such as gender, school type, device usage, and internet accessibility. Furthermore, the study investigates the relationship between students' levels of engagement and motivation and their perceived learning effectiveness. The findings are expected to contribute to the growing body of research on chatbot-assisted learning and inform the development of inclusive, mobile-based educational technologies that address the evolving needs of learners in the Philippines and similar contexts.

Research Questions

This study, entitled "ARALBOT: A Mobile-Accessible Educational Chatbot on Chatango for Enhancing Student Engagement," aimed to evaluate the chatbot's effectiveness in promoting student engagement, enhancing motivation, and improving retention of academic content within a mobile-based learning environment, Specifically, it sought to answer the following research questions:

1. What is the demographic profile of the respondents in terms of:
   1.1 Age
   1.2 Gender
   1.3 Mobile Device
   1.4 Internet Access
2. What is the respondents' level of engagement while using ARALBOT?
3. What is the respondents' level of motivation while using ARALBOT?
4. How do the respondents evaluate ARALBOT in terms of:
   4.1 Accessibility
   4.2 Usability
   4.3 Effectiveness
   4.4 Satisfaction
   4.5 Overall Experience

Scope and Delimitation of the Study

This study focused on the development and evaluation of ARALBOT, an educational chatbot deployed on the Chatango.com platform and primarily designed for mobile use to reflect students' preference for smartphones, although it was also accessible via desktop and tablet devices. It examined the chatbot's effectiveness in supporting student engagement, motivation, and interaction through its core features, including formative assessment modules, feedback mechanisms, and supplementary learning tools, among senior high school students in Quezon City, Metro Manila. The research was exploratory and descriptive in nature and did not employ inferential statistical analysis or aim for broad statistical generalizability. Its scope was limited to evaluating ARALBOT as a low-cost, flexible, and supplementary learning tool, without incorporating advanced artificial intelligence systems or formal learning management platforms. As a result, the study was subject to limitations such as variability in user engagement, reliance on self-reported data, and the inability to measure long-term learning outcomes beyond the intervention period, while variables outside the defined scope were not analyzed and are recommended for future research.

Literature Review

Mobile Learning: Transforming the Delivery of Education and Training

Mobile learning allows students to access educational content anytime and anywhere using portable devices, making learning more flexible and student-centered. As explained by Mohamed Ally (2009), it

supports personalized and real-life learning by letting students study at their own pace and apply knowledge in practical situations, improving understanding and retention. His FRAME model shows that effective learning happens when technology, learner readiness, and social interaction work together, with mobile devices enabling communication and collaboration. Research also shows that mobile learning increases motivation, confidence, and participation, even in low-resource settings, while helping connect formal and informal learning through online platforms. However, challenges such as limited teacher training and technological barriers remain. In the Philippine context, Caraig et al. (2020) emphasized that user-friendly and accessible mobile platforms are essential to support independent learning, especially where technical support is limited.

Learning in a Mobile Age

Mobile learning has become a distinct educational approach that reflects social, cultural, and technological changes in modern education. According to John Traxler (2010), it goes beyond using handheld devices, offering flexible, personalized, and context-aware learning that surpasses traditional e-learning. While early definitions focused on devices and connectivity, mobile learning now emphasizes portability, immediacy, and learner autonomy. Traxler notes challenges such as scalability, inclusion, and equity, and suggests frameworks like Activity Theory and connectivism to understand learning through networks and social interaction. Although mobile technologies provide "anytime, anywhere" access and democratize knowledge, they can also create fragmented learning without careful design. Complementing this, Al-Adwan et al. (2023) highlight that accessibility and technical infrastructure strongly influence student engagement, with easy-to-use platforms encouraging adoption. Data from Statista (2021) and Pew Research Center (Silver, 2019) show the widespread use of affordable Android devices, especially in emerging markets, emphasizing the need for mobile learning tools that are accessible across devices. Overall, mobile learning's effectiveness depends on pedagogical quality, usability, and alignment with learners' technological realities, supporting sustained engagement and integration into daily learning.

Factors Influencing Technology Adoption

Gender plays an important role in how students perceive and interact with educational technology. According to Viswanath Venkatesh et al. (2003) in the UTAUT model, while both genders recognize technology's usefulness, female students tend to focus more on ease of use and navigation. Supporting this, Bo He and Lindsey Freeman (2020) found that female students report higher satisfaction with educational chatbots that offer clear, structured, and empathetic feedback, showing that gender can influence evaluations of usability. At the same time, mobile learning (m-learning) provides flexible, learner-centered access to educational content through smartphones and tablets. Research by Mohamed Ally (2009) and John Traxler (2010) highlights that mobile platforms increase engagement by delivering personalized, on-demand content and promoting autonomy, self-directed learning, and continuous involvement. ARALBOT, a mobile-accessible chatbot, embodies this approach by integrating instructional content into interactive, conversational formats with quizzes, feedback, and gamified elements to maintain motivation. However, sustaining long-term engagement remains a challenge due to the "novelty effect," where initial interest can decline without adaptive and personalized features (Luke K. Fryer et al., 2019). Overall, the effectiveness of mobile and chatbot-based learning depends not only on accessibility and usability but also on the ability to maintain evolving and meaningful learner engagement.

Chatbots in Education

Educational chatbots have become powerful tools in modern learning by providing interactive, AI-driven support for content delivery, assessment, and engagement. They simulate human-like dialogue, allowing students to ask questions, receive explanations, and navigate materials in a personalized way, meeting digital-native learners' needs for immediacy, autonomy, and self-directed learning. Research shows that chatbots can reduce cognitive load and support metacognitive development through adaptive feedback and scaffolded guidance, improving satisfaction and retention (Fadhil Fadhil & Alessio Villafiorita, 2018). Platforms like Duolingo and Replika demonstrate chatbots' versatility in language learning and emotional support, fostering cognitive and affective engagement. In this study, ARALBOT applies these principles to General Physics via mobile-accessible, gamified quiz modules with instant feedback, progress tracking, and playful branding to motivate learners. Unlike Duolingo or Replika, ARALBOT emphasizes academic engagement through command-based interactions, AI-driven guidance, and social features like group rankings, while remaining lightweight and suitable for low-bandwidth environments. By combining gamification, scaffolding, and motivational prompts, it bridges instructional gaps and sustains engagement. As Kuhail Kuhail et al. (2023) note, a seamless, interactive user experience is key to converting students into long-term users. Overall, ARALBOT showcases how educational chatbots can deliver scalable, inclusive, and engaging learning that addresses both cognitive and affective needs, standing out through its academic focus, accessibility, and interactive design.

Mobile Learning and Student Behavior

The widespread use of mobile devices has transformed how students access and engage with learning. Mobile learning, or m-learning, uses smartphones and tablets to support flexible, personalized, and accessible education anytime and anywhere (John Crompton & Dylan Burke, 2018). Senior high school students, who frequently use devices for communication, entertainment, and informal learning, often experience a disconnect between their digital habits and traditional classroom methods. Marc Prensky's (2001) concept of the "digital native" describes students fluent in technology who thrive in fast-paced, interactive learning environments. In the Philippines, senior high students aged 16 to 18 (DepEd, 2020) exemplify this digital-native profile, making mobile-based educational chatbots like ARALBOT well-suited to their learning preferences, technical habits, and needs, effectively bridging informal digital engagement with formal academic instruction.

Educational Chatbots as Instructional Tools

Educational chatbots are AI-powered systems that simulate human conversation and deliver instructional content through messaging interfaces, providing immediate feedback, answering questions, and guiding learners through structured activities. Research by Kuhail Kuhail et al. (2023) highlights that chatbots can function as virtual teaching assistants, enhancing learner engagement while supporting teachers in managing repetitive instructional tasks. In mobile contexts, chatbots leverage familiar and intuitive chat-based interfaces, making them particularly suitable for students accustomed to digital communication and enabling asynchronous, self-paced learning within flexible educational models. Kuhail et al. also emphasized the instructional value of chatbots in facilitating scaffolded learning, whereby interactive dialogues and quizzes guide students toward correct solutions, promoting active engagement and deeper comprehension compared with passive reading methods. Complementing this, a systematic review by Huang Huang, Dan Hew, and Luke K. Fryer (2022) identified that technical affordances—particularly ease of use and clear navigation—are critical drivers of student engagement. Their findings suggest that when educational chatbots provide low-barrier, user-friendly interfaces, learners can concentrate on content mastery rather than tool mechanics, thereby reducing cognitive load and enhancing overall learning effectiveness.

Gamification in Education

Gamification involves applying game elements—like points, badges, leaderboards, and challenges—to non-game contexts to boost motivation, engagement, and behavior. According to Sebastian Deterding, Dan Dixon, Rilla Khaled, and Lennart Nacke (2011), gamification uses "gamefulness" to enrich experiences without turning education into a game, applying motivational design principles to make learning more compelling. In education, gamified features can increase persistence, enjoyment, and performance; Hsin-Yi Hwang and Chiou-Lian Chang (2021) found that gamification reduces procrastination and fosters a sense of achievement. When used in educational chatbots, gamification enhances interactivity and engagement, with tools like real-time scoring and progress tracking helping students visualize accomplishments and stay motivated. Hamari, Koivisto, and Sarsa (2014) note that gamification's effectiveness depends on context: points and leaderboards work best when paired with clear goals, consistent feedback, and progressively challenging tasks, while static or repetitive systems can reduce engagement over time.

Chatbot-Based Gamified Learning

Combining chatbots with gamification creates an instructional model that effectively aligns with students' digital behaviors and learning preferences. Labadze Labadze et al. (2023) observed that chatbot-based learning environments can simulate peer-like interactions, making learning more social, approachable, and engaging, while delivering quizzes, hints, and real-time performance tracking within a conversational interface. For mobile learners, this integration transforms passive screen time into active, self-directed learning. In practice, platforms such as ARALBOT employ a chatroom-based interface to deliver academic content in a gamified format, featuring continuous quizzes, motivational feedback, and group rankings designed to sustain engagement and reinforce learning. Supporting this approach, Zainuddin Zainuddin et al. (2020) conducted a systematic review of gamified digital tools and found that immediate feedback and reward systems significantly enhance student motivation and achievement by satisfying learners' needs for competence and autonomy. However, they cautioned that long-term motivation depends on maintaining user-friendly interfaces and ensuring that content remains relevant to students' learning goals, highlighting the importance of careful instructional design in sustaining engagement over time.

Educational Management and Technology Integration

From an educational management perspective, tools like ARALBOT support key principles such as learner-centered instruction, accessibility, and technology integration. Mobile-accessible chatbots can supplement classroom teaching by providing additional practice, especially for students who need flexible learning schedules. As a low-cost and scalable solution, ARALBOT aligns with the goals of inclusive education and digital transformation. However, effective implementation requires thoughtful instructional design and ongoing evaluation to ensure that such tools genuinely enhance learning outcomes.

The Philippine Digital Landscape

The Department of Information and Communications Technology (DICT, 2021) reported that internet access in the Philippines has seen significant growth, especially among the youth who rely on digital platforms for education. Their national survey highlighted that while more households are becoming "connected," there is still a noticeable variation in the stability and speed of connections across different regions. For mobile-based educational tools like chatbots, this data implies that accessibility is no longer just about owning a device, but also about the availability of reliable data services to sustain interactive learning sessions.

Gamification and Chatbots in Education: A Study on the Impact on Student Interaction and Engagement

Rufino et al. (2025) explored how combining gamification with chatbot technology can improve student motivation and interaction, noting that traditional static teaching methods often fail to engage learners accustomed to dynamic, technology-driven experiences. Their study found that embedding gamified elements into chatbots—such as scoring, challenge prompts, and immediate feedback—significantly increased learner responsiveness, with some interaction metrics improving by up to 66.7%. Qualitative feedback also showed heightened attentiveness and interest during gamified activities. While the study did not directly link chatbot use to long-term retention, it highlighted their potential in subjects like mathematics and science, where repeated practice and immediate feedback are essential. These findings inform the design of ARALBOT, which applies gamified quizzes, motivational prompts, and real-time feedback within a mobile-first, command-based interface, demonstrating how gamified chatbots can effectively boost engagement, motivation, and academic interaction in mobile learning environments.

Engaging Minds: How Gamified Chatbots Can Support and Motivate Learners in Digital Education

Benner et al. (2024) examined how gamified chatbots can boost learner motivation and engagement, focusing on visual elements like badges, progress bars, and achievement indicators. Their study found that these features improved focus and reduced procrastination, especially in self-paced and blended learning, by supporting self-regulated learning. Visual cues helped students manage their pace, goals, and progress, with progress bars fostering accomplishment and badges serving as motivational rewards that increase persistence and attentiveness. The researchers also provided design guidance, emphasizing that gamification should be visually engaging, pedagogically meaningful, and include clear feedback, adaptive prompts, and personalized goals without distracting from learning. These principles are reflected in ARALBOT, which uses real-time scoring, ranking systems, and motivational prompts within a command-based interface, enabling students to track progress, receive feedback, and engage with General Physics content in a gamified, low-pressure environment. By applying these insights, ARALBOT demonstrates how chatbots can sustain motivation, reduce cognitive fatigue, and promote continued engagement in mobile learning.

Comparative Analysis of ARALBOT and CiboPoliBot

Fadhil and Villafiorita (2017) introduced CiboPoliBot as an adaptive learning chatbot that integrates gamification and conversational user interfaces to enhance student engagement. Designed primarily for children, CiboPoliBot aimed to deliver educational content in a playful and interactive format, using challenges and rewards to sustain interest. Similarly, ARALBOT was developed to support academic engagement through mobile-accessible, chat-based learning, with a particular emphasis on General Physics quizzes. While both tools leverage conversational design and gamified elements, ARALBOT distinguishes itself through its structured command system, formative assessment logic, and integration into a research-driven educational framework.

Gamification and Learner Engagement

CiboPoliBot uses game mechanics such as quizzes, challenges, and reward systems to motivate learners, demonstrating how gamification can improve retention and participation. Its playful interface encourages exploration and curiosity, especially among younger users. ARALBOT adopts a similar strategy but applies it to academic reinforcement, embedding riddles, vocabulary puzzles, and math problem sets into its chat flow. These elements are designed not only to entertain but also to reinforce foundational skills in a format aligned with students' mobile habits. ARALBOT transforms passive chat into microlearning opportunities, using real-time scoring, group rankings, and motivational prompts to sustain engagement and encourage repeated interaction.

Conversational Interfaces and Personalization

CiboPoliBot's conversational interface enables adaptive, natural interactions tailored to young learners. It simulates human-like dialogue to create a sense of companionship and responsiveness. ARALBOT builds on this model by offering multi-topic dialogue paths across mathematics, science, English, and translation, with content refined through iterative user experience surveys. While both systems simulate tutoring behavior, ARALBOT emphasizes formative feedback and content scaffolding, allowing learners to

progress at their own pace. By embedding academic content into a familiar chat interface, ARALBOT lowers barriers to access and promotes personalized, learner-driven exploration—especially for mobile-first users in informal learning contexts.

Adaptive Learning and Content Flexibility

In terms of adaptability, CiboPoliBot provides basic personalization, adjusting its responses based on user input to maintain engagement. ARALBOT, however, employs modular content blocks that dynamically respond to learner performance and command triggers. This supports differentiated instruction and allows the chatbot to tailor its delivery without relying on formal classroom structures. ARALBOT's mobile-first design and multilingual content reflect a commitment to inclusive learning, particularly for students in underserved or low-bandwidth environments. Its flexibility enables learners to engage with content anytime and anywhere, aligning with principles of just-in-time learning and self-paced study.

Evaluation and Research Integration

CiboPoliBot's evaluation relied primarily on anecdotal feedback from children, providing informal insights into user engagement and enjoyment. While valuable for early-stage prototyping, this approach lacks the methodological rigor required for broader educational application and long-term impact assessment. In contrast, ARALBOT is embedded within a graduate-level research framework that incorporates structured user experience surveys, formative assessment tracking, and clearly documented AI-assisted development processes throughout its Python-based implementation. This positions ARALBOT not only as a functional instructional tool but also as a research-informed educational intervention. Its integration of analytics, feedback loops, and pedagogical theory contributes meaningfully to the evolving field of chatbot-based education, offering a scalable and replicable model for future deployments in mobile learning environments.

Chatroom-Based Learning and Informal Educational Platforms

Recent research on chatroom-based learning highlights its potential as an informal, real-time alternative to traditional educational technologies. Unlike formal systems like learning management platforms, chatrooms offer lightweight, mobile-accessible, low-bandwidth spaces that align with digital-native learners' conversational habits. Platforms such as Chatango.com demonstrate this potential by supporting synchronous and asynchronous interaction, enabling microlearning, peer tutoring, and formative discussions without complex setup. Chatango's real-time messaging facilitates activities like vocabulary drills, math challenges, and Q&A sessions in a conversational format, reflecting ARALBOT's command-based interface, which turns casual chat into structured academic engagement. Pedagogically, chatroom learning fosters social interaction and cognitive scaffolding through peer dialogue and immediate feedback. When combined with gamification or chatbot integration, these environments become dynamic learning hubs that reinforce foundational skills. ARALBOT applies this approach by embedding academic content into a structured yet conversational interface, offering real-time scoring, adaptive prompts, and multi-topic dialogue paths. Its Python-based system also includes AI-assisted content generation, user experience surveys, and analytics tracking, making ARALBOT a scalable, research-informed tool that merges the spontaneity of chatrooms with the rigor of chatbot pedagogy, advancing mobile learning and digital engagement strategies.

Synthesis of the Reviewed Literature and Studies

The reviewed literature highlights the growing importance of mobile-accessible, learner-centered tools in modern education, emphasizing their ability to provide just-in-time instruction, personalization, and accessibility for digital-native students who frequently use smartphones and chat-based platforms. Scholars such as Ally (2009), Traxler (2010), and Crompton and Burke (2018) note that mobile learning allows learners to access content anytime and anywhere, reshaping instruction to meet evolving needs. In the Philippine context, senior high students aged 16 to 18 (DepEd, 2020) demonstrate high digital literacy, aligning with Prensky's (2001) concept of digital natives who thrive in fast-paced, interactive environments, suggesting that mobile-based chatbots like ARALBOT suit their cognitive styles and technical habits. Gender also influences technology adoption, with Venkatesh et al. (2003) showing that female users value ease of navigation, and He and Freeman (2020) reporting higher satisfaction when chatbots provide structured, empathetic feedback. Platform choice affects accessibility, as Android dominates global and Southeast Asian markets (Statista, 2021; Silver, 2019), while uneven internet access in the Philippines (DICT, 2021) highlights the need for reliable connectivity. Educational chatbots have been shown to enhance learner autonomy, satisfaction, and engagement by simulating human dialogue, reducing cognitive load, and providing personalized support, especially when gamified with scoring, badges, and challenge prompts (Fadhil & Villafiorita, 2018; Rufino et al., 2025; Benner et al., 2024; Huang, Hew, & Fryer, 2022; Kuhail et al., 2023). Gamification improves motivation, persistence, and attentiveness, though effectiveness depends on context (Hamari, Koivisto, & Sarsa, 2014), with user-friendly design, relevant content, and progress indicators fostering achievement (Deterding et al., 2011; Zainuddin et al., 2020; Hwang & Chang, 2021). ARALBOT applies these principles through a mobile-first, chat-based interface featuring real-time scoring, performance tracking, motivational prompts, modular content, and multilingual optimization, making it

inclusive for low-bandwidth or underserved students and academically grounded compared with informal platforms like CiboPoliBot. Despite global evidence supporting educational chatbots, localized studies in formal Philippine settings are limited, and this study addresses that gap by evaluating ARALBOT's effectiveness, contributing to research on educational technology, informal learning, and digital transformation.

Methodology

Research Design

This study used a quantitative–descriptive design to evaluate both the development and educational impact of ARALBOT. In the first phase, ARALBOT was created using Python and deployed on Chatango.com, a lightweight, mobile-friendly chatroom that supports real-time interaction. The chatbot's interface allowed students to take quizzes, skip or repeat questions, request clues, and see correct answers, while tracking individual and group performance through scores, accuracy, attempts, and rankings. It also included motivational and cultural content, study tips, health reminders, trivia, and AI-powered responses for open-ended questions, along with playful features to keep learners engaged. In the second phase, ARALBOT's effectiveness was tested through structured student interactions, surveys, usage logs, and quiz results, measuring motivation, usability, learning outcomes, and retention. By combining development with evaluation, the study showed that ARALBOT can transform informal chat platforms into engaging, interactive learning tools that support mobile, student-centered education.

Sampling Design

This study employed a purposive sampling technique to select participants who met specific criteria aligned with the research objectives, resulting in a sample of forty-one (41) senior high school students from Quezon City, Metro Manila. Purposive sampling was used to ensure that respondents had access to mobile devices and familiarity with online chat platforms, which were essential for interacting with ARALBOT. This approach allowed the researcher to intentionally select individuals who possessed the characteristics necessary for meaningful participation, including mobile device access, experience with chat-based platforms, and willingness to engage with ARALBOT in a controlled chatroom environment. The selected participants interacted with ARALBOT through Chatango.com, responding to academic prompts, receiving automated feedback, and utilizing progress tracking features, providing data to assess the chatbot's usability, instructional value, and impact on learner motivation, retention, and informal learning. By focusing on digitally literate senior high school students, the sampling design supported the study's goal of evaluating ARALBOT in realistic, mobile-first educational contexts.

Research Locale

The study was conducted within a controlled chatroom environment hosted on Chatango.com, a lightweight and mobile-accessible platform chosen for its compatibility with informal learning contexts. Chatango's real-time messaging features and minimal infrastructure requirements made it suitable for deploying ARALBOT and observing user interactions in a setting that reflected students' everyday digital behavior, while its accessibility across smartphones, tablets, and desktop devices supported the study's focus on mobile-first learning and flexible engagement. Student participants were purposively selected from senior high schools in Quezon City, Metro Manila, which enrolled learners who regularly used mobile devices and chat-based platforms, making them ideal for evaluating the chatbot's usability, relevance, and instructional value. The combination of Chatango.com as the virtual learning space and Quezon City-based schools as the participant source ensured that the study was anchored in both technological and contextual realities, supporting the research goal of assessing ARALBOT's effectiveness in informal, mobile-accessible environments while capturing insights from digitally literate senior high school students.

Research Participants

The population of this study consisted of forty-one (41) senior high school students who had access to mobile devices and were familiar with online chat platforms, purposively selected from senior high schools in Quezon City, Metro Manila. Purposive sampling was employed to ensure that all participants met the criteria necessary for meaningful engagement with ARALBOT, including regular use of mobile devices, familiarity with chat-based communication, and willingness to participate in a chatbot-mediated learning experience. The selected students interacted with ARALBOT within a controlled chatroom environment, enabling the researcher to observe usage patterns, collect performance data, and gather feedback on the chatbot's usability and instructional value. This targeted sampling approach supported the study's goal of evaluating ARALBOT in realistic, mobile-first learning contexts while capturing insights from digitally literate senior high school learners, allowing the assessment of the chatbot's relevance, accessibility, and potential impact on engagement and retention in informal educational settings.

Research Instrument

This study utilized quantitative research instruments to evaluate the instructional effectiveness and user engagement associated with ARALBOT, employing a structured survey questionnaire as the primary tool to collect numerical data on participants' experiences and perceptions following a one-week interaction with the chatbot in a controlled chatroom environment. The survey was administered via Google Forms, enabling respondents to provide measurable feedback in a secure and accessible format. The questionnaire consisted of Likert-scale items assessing variables such as usability, motivation, satisfaction, and perceived learning effectiveness, which were adapted from validated instruments in mobile learning and educational technology research to ensure reliability and contextual relevance. Each participant completed the survey individually after the chatbot exploration period, providing data for the quantitative evaluation of ARALBOT's instructional impact.

Data Gathering Procedure

The data collection process for this study was implemented through a systematic sequence of activities designed to evaluate ARALBOT's instructional effectiveness and user engagement. ARALBOT was first deployed on the Chatango.com platform and made accessible to participants via mobile devices, ensuring interaction in a familiar, mobile-friendly environment reflective of their typical digital behavior. Prior to the interaction period, participants received a structured orientation on accessing ARALBOT and using its interactive features, including initiating quizzes, requesting clues, tracking progress, and viewing rankings through the command-based interface, which ensured that all respondents were adequately prepared to engage with the system. Participants then interacted with ARALBOT over the course of one week, engaging with quiz-based content and educational tools, responding to academic prompts, and receiving automated feedback, while the chatbot logged user activity in real time, capturing data such as quiz scores, accuracy rates, total attempts, mistakes, skips, clues requested, and ranking information. Upon completion, participants individually completed a structured survey questionnaire via Google Forms, designed to assess engagement, satisfaction, and perceived learning outcomes. This procedure ensured that both behavioral data and self-reported feedback were collected consistently and securely, supporting the study's aim of evaluating ARALBOT's pedagogical value in informal, mobile-accessible learning environments.

Results and Discussions

Problem 1: **What is the demographic profile of the respondents in terms of Age, Gender, Mobile Device, and Internet Access?**

Table 1: Demographic profile of the participants in terms of Age

Age of the Participants	Frequency	Percentage
16	21	51.22%
17	14	34.15%
18	5	12.20%
25	1	2.54%
Total	**41**	**100%**

Table 1 shows the age distribution of the participants. Out of 41 respondents, the majority were 16 years old (n = 21, 51.22%), followed by 17-year-olds (n = 14, 34.15%), and 18-year-olds (n = 5, 12.20%). Only one participant was 25 years old (n = 1, 2.44%). The results indicate that most participants belong to the 16–17 age range, which corresponds to the typical age bracket of senior high school learners in the Philippines. This suggests that the sample appropriately represents the intended population of the study. The age profile aligns with the K–12 educational structure implemented by the Department of Education (DepEd, 2020), where learners in senior high school are generally within the 16–18 age range. Moreover, students in this cohort are often described as digital natives who have grown up in a technology-rich environment (Prensky, 2001), which may influence their engagement with digital or technology-assisted learning tools used in the study.

Table 2: Demographic profile of the participants in terms of Gender

Gender of the Participants	Frequency	Percentage
Male	11	26.83%
Female	30	73.17%
Total	**41**	**100%S**

Table 2 shows that out of the 41 respondents, 11 (26.83%) were male, while 30 (73.17%) were female, indicating a predominance of female participants. This distribution aligns with the strengths (SPOs) of the study, as prior research suggests that female students often exhibit higher engagement, motivation, and

responsiveness to technology-assisted learning, particularly in chatbot-mediated environments (He & Freeman, 2020). Their sensitivity to ease of use, supportive feedback, and motivational features may have contributed positively to ARALBOT's usability and perceived effectiveness. However, the imbalance also reflects a potential weakness (WOs), as the lower representation of male participants may limit the generalizability of findings across genders, given that male learners might interact differently with mobile chatbots and perceive engagement, motivation, and user experience differently (Venkatesh et al., 2003). Table 2 presents the demographic profile of respondents by gender, with 11 males (26.83%) and 30 females (73.17%) out of the total 41 participants.

Table 3: **Demographic profile of the participants in terms of Mobile Device**

Mobile Device of the Participants	Frequency	Percentage
Android	34	82.93%
IOS	7	17.07%
Total	**41**	**100%**

Table 3 shows that out of the 41 respondents, 34 (82.93%) used Android devices, while 7 (17.07%) used iOS devices, indicating a clear predominance of Android users. This distribution aligns with the strengths (SPOs) of the study, as the widespread use of Android in the Philippine context ensured that ARALBOT's mobile-first design was accessible and relevant to the majority of participants, supporting ease of use, engagement, and uninterrupted interaction. However, a potential weakness (WOs) arises from the smaller proportion of iOS users, as their experiences may differ due to operating system variations, possibly limiting the generalizability of findings across all mobile platforms. Table 3 presents the distribution of participants according to their mobile device, with 34 respondents using Android (82.93%) and 7 using iOS (17.07%).

Table 4: **Demographic profile of the participants in terms of Internet Access**

Internet Access of the Participants	Frequency	Percentage
Rarely Available	1	2.44%
Sometimes Available	14	34.15%
Always Available	26	63.41%
Total	**41**	**100%**

Table 4 shows that out of the 41 respondents, 26 (63.41%) reported that internet access was always available, 14 (34.15%) indicated it was sometimes available, and 1 (2.44%) stated it was rarely available, indicating that most participants had consistent connectivity essential for engaging with ARALBOT. This distribution reflects a strength (SPO) of the study, as the majority of students could fully utilize the mobile-based chatbot, ensuring reliable interaction, feedback, and performance tracking. A corresponding weakness (WO) is observed in participants with intermittent or limited access, as connectivity issues could hinder engagement, motivation, and the overall learning experience, highlighting a potential barrier for broader implementation. Table 4 presents the distribution of participants according to their internet access, with 26 respondents reporting always available (63.41%), 14 sometimes available (34.15%), and 1 rarely available (2.44%).

Problem 2: What is the respondents' level of engagement while using ARALBOT?

Table 5: Level of Engagement of the Participants when using ARALBOT

	Level of Engagement of the Participants when using ARALBOT	Mean	Standard Deviation	Verbal Interpretation
1.	I actively participated in the quizzes and activities provided by ARALBOT.	3.1707	0.97217	Neutral
2.	I enjoyed using ARALBOT as part of my learning experience.	3.3659	0.96840	Neutral
3.	I looked forward to engaging with ARALBOT each time I used it.	3.4390	1.00122	Agree
	Mean	**3.3252**	**0.92643**	**Neutral**

Table 5 shows that the level of engagement of the 41 participants when using ARALBOT had an overall mean score of 3.3252 with a standard deviation of 0.92643, corresponding to a Neutral verbal interpretation. Among the indicators, the highest mean was recorded for "I looked forward to engaging with

ARALBOT each time I used it" (M = 3.4390, SD = 1.00122), while the lowest mean was for "I actively participated in the quizzes and activities provided by ARALBOT" (M = 3.1707, SD = 0.97217), suggesting that students experienced moderate anticipation and enjoyment but neutral actual participation in activities. From a strengths perspective (SPO), ARALBOT successfully captured student interest and maintained consistent attention, reflecting its ability to generate curiosity and positive initial interaction. Conversely, a weakness (WO) is evident in the relatively lower active participation, indicating that engagement mechanisms such as personalized feedback or more adaptive challenges may require enhancement to promote stronger involvement. Table 5 presents the mean, standard deviation, verbal interpretation, and ranks of the participants' responses on their level of engagement when using ARALBOT.

Problem 3: What is the respondents' level of motivation while using ARALBOT?

Table 6: Level of Motivation of the Participants when using ARALBOT

	Level of Motivation of the Participants when using ARALBOT	Mean	Standard Deviation	Verbal Interpretation
1.	ARALBOT encouraged me to continue learning even outside the classroom,	3.3902	0.99695	Neutral
2.	I felt a sense of accomplishment after interacting with ARALBOT.	3.3415	0.93834	Neutral
3.	I felt motivated to continue engaging with ARALBOT's ongoing quiz questions.	3.3902	0.97155	Neutral
	Mean	**3.3740**	**0.91650**	**Neutral**

Table 6 shows that the level of motivation of the 41 participants when using ARALBOT had an overall mean score of 3.3740 with a standard deviation of 0.9165, corresponding to a Neutral verbal interpretation. Among the indicators, the highest mean was recorded for "I felt motivated to continue engaging with ARALBOT's ongoing quiz questions" (M = 3.3902, SD = 0.97155), followed closely by "ARALBOT encouraged me to continue learning even outside the classroom" (M = 3.3902, SD = 0.99695), while the lowest mean was for "I felt a sense of accomplishment after interacting with ARALBOT" (M = 3.3415, SD = 0.93834), suggesting that ARALBOT moderately supported motivation but did not strongly elicit a sense of achievement. From a strengths perspective (SPO), ARALBOT successfully maintained students' interest and encouraged ongoing engagement, reflecting its capacity to provide consistent reinforcement and external stimuli. However, a weakness (WO) is evident in the relatively lower sense of accomplishment, indicating that the platform may benefit from enhanced goal-setting, adaptive challenges, or personalized rewards to increase intrinsic motivation and persistence. Table 6 presents the mean, standard deviation, verbal interpretation, and ranks of the participants' responses on their level of motivation when using ARALBOT.

Problem 4: How do the respondents evaluate ARALBOT in terms of Accessibility, Usability, Effectiveness, Satisfaction, and Overall Experience?

Table 7: Level of Evaluation of the Participants when using ARALBOT in terms of Accessibility

	Level of Evaluation of the Participants when using ARALBOT - Accessibility	Mean	Standard Deviation	Verbal Interpretation
1.	ARALBOT was easy to access using my mobile device.	3.5610	1.04997	Agree
2.	I was able to connect to ARALBOT without technical difficulties.	3.4634	0.97718	Agree
3.	The platform (Chatango.com) provided a convenient environment for Interaction.	3.4878	0.84030	Agree
	Mean	**3.5041**	**0.83374**	**Agree**

Table 7 shows that the level of evaluation of the 41 participants when using ARALBOT in terms of accessibility had an overall mean score of 3.5041 with a standard deviation of 0.83374, corresponding to an Agree verbal interpretation. Among the indicators, the highest mean was recorded for "ARALBOT was easy to access using my mobile device" (M = 3.5610, SD = 1.04997), followed by "The platform (Chatango.com) provided a convenient environment for interaction" (M = 3.4878, SD = 0.84030), while the lowest mean was for "I was able to connect to ARALBOT without technical difficulties" (M = 3.4634, SD = 0.97718), suggesting that participants generally agreed that ARALBOT was accessible and compatible with mobile devices. From a strengths perspective (SPO), the study highlighted ARALBOT's user-friendly mobile interface and convenience, which facilitated flexible, barrier-free engagement. On the other hand, a weakness (WO) was

observed in occasional technical difficulties, indicating the need for system optimization to ensure consistent connectivity and smooth interaction across all devices. Table 7 presents the mean, standard deviation, verbal interpretation, and ranks of the participants' responses on their evaluation of ARALBOT in terms of accessibility.

Table 8: Level of Evaluation of the Participants when using ARALBOT in terms of Usability

Level of Evaluation of the Participants when using ARALBOT - Usability	Mean	Standard Deviation	Verbal Interpretation
1. ARALBOT's commands and features were easy to understand.	3.4878	0.81000	Agree
2. Navigating the chatbot was simple and straightforward.	3.5610	0.83812	Agree
3. I was able to use ARALBOT without requiring additional assistance.	3.5122	0.86954	Agree
Mean	**3.5203**	**0.77477**	**Agree**

Table 8 shows that the level of evaluation of the 41 participants when using ARALBOT in terms of usability had an overall mean score of 3.5203 with a standard deviation of 0.77477, corresponding to an Agree verbal interpretation. Among the indicators, the highest mean was recorded for "Navigating the chatbot was simple and straightforward" (M = 3.5610, SD = 0.83812), followed by "I was able to use ARALBOT without requiring additional assistance" (M = 3.5122, SD = 0.86954), while the lowest mean was for "ARALBOT's commands and features were easy to understand" (M = 3.4878, SD = 0.81), suggesting that participants generally agreed that ARALBOT was usable, with intuitive navigation and ease of independent use. From a strengths perspective (SPO), ARALBOT's clear command structure and minimal need for external guidance enhanced user confidence and engagement, while a weakness (WO) identified was the slight variation in understanding some commands, indicating opportunities for refining instructions and interface cues. Table 8 presents the mean, standard deviation, verbal interpretation, and ranks of the participants' responses on their evaluation of ARALBOT in terms of usability.

Table 9: Level of Evaluation of the Participants when using ARALBOT in terms of Effectiveness

Level of Evaluation of the Participants when using ARALBOT - Effectiveness	Mean	Standard Deviation	Verbal Interpretation
1. ARALBOT helped me engage more actively with academic content.	3.4146	0.83593	Agree
2. The quizzes and prompts improved my understanding of the topics.	3.4634	0.92460	Agree
3. Using ARALBOT contributed positively to my motivation and retention	3.3659	0.92460	Neutral
Mean	**3.4146**	**0.80891**	**Agree**

Table 9 shows the mean, standard deviation, verbal interpretation, and rank distribution of participants' evaluation of ARALBOT in terms of effectiveness, with an overall mean score of 3.4146 (SD = 0.80891) interpreted as Agree, indicating that respondents generally perceived the system as effective in supporting their learning. The highest mean was recorded for the statement "The quizzes and prompts improved my understanding of the topics" (M = 3.4634, SD = 0.9246), followed by "ARALBOT helped me engage more actively with academic content" (M = 3.4146, SD = 0.83593), both reflecting positive perceptions of ARALBOT's role in enhancing comprehension and engagement. In contrast, the lowest mean was obtained by "Using ARALBOT contributed positively to my motivation and retention" (M = 3.3659, SD = 0.9246), which was interpreted as Neutral, suggesting that its effect on sustaining motivation and long-term retention was less pronounced. Overall, the findings indicate that ARALBOT was effective in improving understanding and promoting active learning, although its impact on motivation and retention may require further enhancement. These results are consistent with Kuhail et al. (2023), who found that educational chatbots enhance comprehension and engagement through interactive prompts and immediate feedback, and with Winkler and Söllner (2018), who reported that while chatbots support active learning, their influence on motivation and retention may be limited without additional instructional design strategies.

Table 10: Level of Evaluation of the Participants when using ARALBOT in terms of Satisfaction

Level of Evaluation of the Participants when using ARALBOT - Satisfaction	Mean	Standard Deviation	Verbal Interpretation
1. I am satisfied with my overall experience using ARALBOT	3.4390	0.94977	Agree
2. I would recommend ARALBOT to other students.	3.5854	0.94804	Agree
3. I would be willing to use ARALBOT again in future learning activities.	3.5366	0.92460	Agree
Mean	**3.5203**	**0.89147**	**Agree**

Table 10 shows the mean, standard deviation, verbal interpretation, and rank distribution of participants' evaluation of ARALBOT in terms of satisfaction, with an overall mean score of 3.5203 (SD = 0.89147) interpreted as Agree, indicating that respondents were generally satisfied with their experience using the system. The highest mean was recorded for the statement "I would recommend ARALBOT to other students" (M = 3.5854, SD = 0.94804), followed by "I would be willing to use ARALBOT again in future learning activities" (M = 3.5366, SD = 0.9246), both reflecting strong user acceptance and intention for continued use. Meanwhile, the lowest mean was obtained by "I am satisfied with my overall experience using ARALBOT" (M = 3.4390, SD = 0.94997), although it still falls within the Agree interpretation, suggesting a generally positive but slightly less pronounced level of overall satisfaction. These findings indicate that ARALBOT provided a satisfactory learning experience and demonstrates strong potential for recommendation and sustained use among students. This result aligns with Kuhail et al. (2023), who emphasized that user satisfaction is a key factor influencing the continued use and recommendation of educational chatbots, and with Al-Adwan et al. (2023), who found that satisfaction in mobile learning environments is closely associated with usability and accessibility, ultimately affecting learners' willingness to adopt such technologies in their academic activities.

Table 11: Level of Evaluation of the Participants when using ARALBOT in terms of Overall Experience

Level of Evaluation of the Participants when using ARALBOT – Overall Experience	Mean	Standard Deviation	Verbal Interpretation
1. I am satisfied with my experience using ARALBOT.	3.5122	0.92526	Agree
2. I felt comfortable using ARALBOT for educational purposes.	3.5122	0.92526	Agree
3. I found ARALBOT to be a useful and enjoyable educational tool.	3.5122	1.02767	Agree
Mean	3.5122	0.91012	Agree

Table 11 shows the mean, standard deviation, verbal interpretation, and rank distribution of participants' overall experience when using ARALBOT, with an overall standard deviation of 0.91 corresponding to an Agree verbal interpretation, indicating that respondents generally had a positive experience with the system. The highest mean was recorded for the statements "I am satisfied with my experience using ARALBOT" (M = 3.51, SD = 0.93) and "I felt comfortable using ARALBOT for educational purposes" (M = 3.51, SD = 0.93), suggesting that students perceived the plaStform as both satisfactory and user-friendly. In contrast, the lowest mean was obtained by "I found ARALBOT to be a useful and enjoyable educational tool" (M = 3.51, SD = 1.03), although it still falls within the Agree interpretation, indicating a generally positive but slightly less consistent perception in terms of enjoyment and utility. Overall, the findings suggest that ARALBOT provided a satisfactory and comfortable learning experience, reinforcing its potential as a supportive educational tool. These results are consistent with Kuhail et al. (2023), who emphasized that user satisfaction and comfort significantly influence the continued use of educational chatbots, and with Al-Adwan et al. (2023), who found that usability, accessibility, and instructional effectiveness in mobile learning platforms contribute to higher levels of satisfaction and positive overall learning experiences.

Ethical Considerations

This study adhered to established ethical standards in educational research to ensure the protection of the rights, welfare, and privacy of all participants. Approval to conduct the research was obtained from the institutional authorities of Dr. Carlos S. Lanting College prior to implementation, ensuring compliance with academic and research protocols. Participants, who were senior high school students, were fully informed

about the purpose of the study, the procedures involved, and their rights as respondents. Informed consent was secured from each participant, emphasizing that their participation was entirely voluntary and that they could withdraw from the study at any time without any form of penalty. Confidentiality and anonymity were strictly maintained, with all personal information and responses anonymized in reports, presentations, and publications. Data collected through ARALBOT's usage logs and structured survey questionnaires were securely stored and used solely for research purposes, with appropriate data protection measures in place to safeguard participant information in accordance with the Data Privacy Act of 2012 (Republic Act No. 10173). Furthermore, as ARALBOT is a non-invasive digital learning tool implemented within a controlled chatroom environment, the study posed minimal risk to participants. Its design prioritized user safety, accessibility, and educational relevance, ensuring that all interactions occurred within a secure and supportive setting while upholding the principles of integrity, transparency, and ethical responsibility throughout the research process.

Conclusion

Based on the findings of this study, it can be concluded that ARALBOT is a generally effective and well-received mobile-based learning tool that aligns with the digital habits and accessibility needs of its target users, who are predominantly 16–17 years old, female, Android users with consistent internet access. The system achieved an overall Agree rating in terms of experience, indicating that students found it useful, comfortable, and enjoyable to use. Its strongest dimensions—usability, satisfaction, and accessibility—were also rated Agree, demonstrating that ARALBOT is user-friendly, convenient, and engaging, which are essential factors for adoption and continued use. In terms of instructional effectiveness, ARALBOT was found to enhance students' comprehension and engagement, although its influence on motivation and retention was less pronounced, suggesting the need for further improvement. While the chatbot successfully initiated interaction and provided moderate encouragement, the findings highlight the importance of integrating additional features such as gamification, adaptive challenges, and personalized feedback to sustain deeper engagement and long-term motivation. Overall, ARALBOT shows strong potential as a supportive educational tool, but further enhancements are necessary to maximize its instructional impact and learner motivation.

Reccomendations

In response to the study's findings and conclusions, it is recommended to implement a comprehensive enhancement and integration plan for ARALBOT to maximize its effectiveness, usability, and long-term impact on student learning. This plan should include expanding user orientation beyond basic functions through detailed training sessions and guides that emphasize advanced features such as gamification and interactive prompts, enabling students to fully utilize the system. Additionally, efforts should be made to encourage the active use of motivation tools by reinforcing awareness of personalized feedback, progress tracking, and motivational cues embedded within the platform. Integrating ARALBOT into classroom activities is also essential, with teachers embedding it into structured lessons and assignments to promote authentic and consistent use rather than superficial interaction. To support accessibility, institutions must ensure stable internet connectivity, as the platform relies on online access for optimal functionality. Furthermore, future research is recommended to explore strategies that guide students in maximizing ARALBOT's full range of features, investigate effective methods for embedding the chatbot into formal instructional settings to enhance engagement and motivation, and examine its long-term impact on academic performance, including comparisons with other digital learning tools. Collectively, these initiatives aim to strengthen ARALBOT's role as a sustainable and effective educational support system.

References

Al-Adwan, A. S., Al-Adwan, A., & Smedley, J. (2023). Acceptance of mobile learning technology by teachers: Influencing mobile self-efficacy and 21st-century skills-based training. *Sustainability*, 15(11), 8514. https://doi.org/10.3390/su15118514

Ally, M. (Ed.). (2009). *Mobile learning: Transforming the delivery of education and training*. Athabasca University Press.

Benner, D., Schöbel, S., Janson, A., & Leimeister, J. M. (2024). Engaging minds—How gamified chatbots can support and motivate learners in digital education. In *Proceedings of the 57th Hawaii International Conference on System Sciences*.

Caraig, R., et al. (2020). Mobile learning adoption in the Philippines: Challenges and opportunities. *International Journal of Advanced Trends in Computer Science and Engineering*, 9(3), 3500–3505.

Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). Wiley.

Crompton, H., & Burke, D. (2018). The use of mobile learning in K–12 education: A systematic review. *Computers & Education*, 123, 53–64. https://doi.org/10.1016/j.compedu.2018.04.007

Department of Education. (2020). *Basic education statistics: School year 2020–2021*. https://www.deped.gov.ph

Department of Information and Communications Technology. (2021). *National ICT household survey 2019–2021*. https://dict.gov.ph

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining gamification. In *Proceedings of the 15th International Academic MindTrek Conference* (pp. 9–15). https://doi.org/10.1145/2181037.2181040

Fadhil, A., & Villafiorita, A. (2017). An adaptive learning with gamification & conversational UIs: The rise of CiboPoliBot. In *Proceedings of the 25th Conference on User Modeling, Adaptation and Personalization* (pp. 408–412). https://doi.org/10.1145/3099023.3099112

Fadhil, A., & Villafiorita, A. (2018). An adaptive chatbot for personalized learning. *Educational Technology & Society*, 21(4), 250–262.

Fryer, L. K., Nakao, K., & Thompson, A. (2019). Chatbot learning partners: Connecting learning gains, interest and beliefs. *Journal of Computer Assisted Learning*, 35(2), 161–169. https://doi.org/10.1111/jcal.12325

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. In *Proceedings of the 47th Hawaii International Conference on System Sciences* (pp. 3025–3034). https://doi.org/10.1109/HICSS.2014.377

He, X., & Freeman, S. X. (2020). Are chatbots ready for prime time? A study on students' acceptance of chatbots in higher education. *Journal of Information Systems Education*, 31(2), 129–139.

Huang, W., Hew, K. F., & Fryer, L. K. (2022). Chatbots for language learning—Are they really useful? A systematic review. *Journal of Computer Assisted Learning*, 38(1), 237–257. https://doi.org/10.1111/jcal.12610

Hwang, G.-J., & Chang, C.-Y. (2021). A review of opportunities and challenges of chatbots in education. *Interactive Learning Environments*. https://doi.org/10.1080/10494820.2021.1952615

Kuhail, M. A., Alturki, N., Alramlawi, S., & Alhejori, K. (2023). Interacting with educational chatbots: A systematic review. *Education and Information Technologies*, 28, 973–1018. https://doi.org/10.1007/s10639-022-11177-3

Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: Systematic literature review. *International Journal of Educational Technology in Higher Education*, 20, 56. https://doi.org/10.1186/s41239-023-00426-1

OECD. (2022). *Digital education outlook 2022: Pushing the frontiers with AI, blockchain and robots*. OECD Publishing.

Prensky, M. (2001). Digital natives, digital immigrants part 1. *On the Horizon*, 9(5), 1–6. https://doi.org/10.1108/10748120110424816

Rufino, L. J. G. C., Benevides, M. P., Benevides, K. D. G., dos Santos Goussain, B. G. C., & de Moura, R. A. (2025). Gamification and chatbots in education: A study on the impact on student interaction and engagement. *Journal of Information Systems Engineering and Management*, 10(27s). https://doi.org/10.52783/jisem.v10i27s.4525

Silver, L. (2019). Smartphone ownership is growing rapidly around the world, but not always equally. *Pew Research Center*. https://www.pewresearch.org

Statista. (2021). Mobile operating system market share worldwide 2009–2021. https://www.statista.com

Traxler, J. (2010). Learning in a mobile age. *International Journal of Mobile and Blended Learning*, 1(1), 1–12. https://doi.org/10.4018/jmbl.2009010101

UNESCO. (2023). *Global education monitoring report: Technology in education*. UNESCO Publishing.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. https://doi.org/10.2307/30036540

Winkler, R., & Söllner, M. (2018). Unleashing the potential of chatbots in education: A state-of-the-art analysis. *Academy of Management Proceedings*, 2018(1), 15903.

Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review*, 30, 100326. https://doi.org/10.1016/j.edurev.2020.100326