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Evaluating the Effectiveness of Telegram Chatbots for Vocabulary Learning in ESL and EFL Contexts

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Abstract
Chatbots are a popular tool for language learning these days. This study evaluates LexiBot, a Telegram-based chatbot, for usability, engagement, and effectiveness on ESL and EFL learners. LexiBot was studied for vocabulary learning, specifically contextual clues at UiTM (Malaysia) and UD (Indonesia). According to a cross-sectional survey and interviews, ESL students used LexiBot autonomously. EFL students used it for scheduled tasks. Although usability was outstanding, low interest and repetitive exercise were criticized. The study underlines the need for adaptive chatbot features to increase long-term engagement and effectiveness. More research is needed on the customization of AI-powered language learning tools.

Keywords: Chatbot, vocabulary learning, ESL and EFL

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1.0 Introduction

The development of artificial intelligence technologies has notably changed educational technologies like chatbots, which strived for optimal interaction and engagement. They help offer learners real-time feedback. In the context of English as a Second Language (ESL) or English as a Foreign Language (EFL), where vocabulary learning is important for mastering the language, chatbots offer engaging solutions for rote memorization, which is often lacking context and autonomy (Shah et al., 2024). Mastery of vocabulary enables comprehension at different levels, crafting eloquent writings, engaging in meaningful dialogues, and communicating efficiently. Nonetheless, several learners in ESL and EFL programs simply lack exposure and ineffective teaching methodologies that severely hinder most learners' attempts to retain new vocabulary (Rosyada-As & Apoko, 2023). Approaches based on traditional methods often rely on textbook exercises, which do not foster high levels of motivation or provide relevant context. More so, AI chatbots can promote vocabulary learning through educational activities that are based on interaction, context, and real-world applications (Yusuf et al., 2020). This study focuses on determining the accuracy of vocabulary learning through context clues facilitated by a chatbot called LexiBot for

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ESL learners from Universiti Teknologi MARA (UiTM) in Malaysia and EFL learners from Universitas Dinamika (UD) in Indonesia. This research aims to determine the perceptions of ESL and EFL learners on the ease of use of LexiBot for vocabulary learning, analyze the extent to which LexiBot assists learners in comprehending contextual clues, and analyze the engagement level of the learners with LexiBot in vocabulary learning activities. This study adds to the existing literature on AI-integrated language learning systems by examining learner experiences across varying cultures and educational frameworks. It is hoped that the findings will contribute to the optimization and customization of chatbot applications for users of different proficiency levels and language backgrounds.

2.0 Literature Review

Teaching strategies that integrate memorization for vocabulary acquisition in ESL and EFL settings require the context in which words are used. The most important part of this process is contextual clues and their meaning, which involves learners using linguistic and situational understanding to make their best guess (İlter, 2021). This review synthesizes the literature on vocabulary learning through contextual clues, the role of chatbots as interactive tools, and comparative research in ESL/EFL contexts.

2.1 Vocabulary Acquisition and Contextual Clues

Learning a language entails understanding its vocabulary and mastering contextual clues. These aspects strengthen language proficiency as it enhances self-directed learning and retention (Zhou & Wu, 2024). Contextualization enables learners to extract meaning from text that surrounds a specific vocabulary and hence apply the vocabulary in practice (Devanti et al., 2022). Research has also focused on the effectiveness of teaching contextual clues instructing one to look for synonyms, antonyms, or grammatical matrices which helps in making inferences (Shafie et al., 2024). Nevertheless, traditional classroom approaches do not always provide possibilities for sufficient, consistent, individualized practice which creates a certain supply of pedagogical aids that foster genuine language production (Zammit, 2023).

2.2 Chatbots as Interactive Tools for Contextual Clues

Chatbots, especially those used within Telegram, provide contextual automatic learning by offering examples in the form of conversation (Shah et al., 2020). In contrast to these approaches, chatbots encourage active practice, instant response, and different ways of forming vocabulary (Goh et al., 2024). Embedding contextual clues in chatbots improved vocabulary acquisition, which was found helpful by 81.5% of respondents from Universitas Dinamika (UD) and 51.9% from Universiti Teknologi MARA (UiTM) (Shah et al., 2024). This indicates that contextual clue comprehension is better in chatbot-assisted learning than in traditional learning. Tai and Chen (2024) observed that the use of generative AI chatbots increased oral proficiency while also reducing speaking anxiety in elementary EFL learners. Interestingly, students who practiced in pairs showed higher motivation to engage and collaborate compared to those who practiced alone (Yusuf et al., 2020).

2.3 Comparative Effectiveness in ESL vs. EFL Contexts: The Role of Learner Autonomy

Vocabulary acquisition chatbots' effectiveness is affected by autonomy which is different in ESL and EFL contexts. The use of automation is influenced by the level of autonomy a learner possesses (Manuel et al., 2023). ESL learners, who are already in English-speaking countries, are more autonomous because they use chatbots for vocabulary practice without supervision (Annamalai et al., 2023). This is typical of self-regulated learning theories where learners establish objectives and evaluate their accomplishments. Conversely, EFL learners such as those in Indonesia are more passive and need step-by-step instructions due to a lack of knowledge about the language (Jon et al., 2021). They prefer chatbot activities integrated into formal curricula, as they provide a sense of direction and accountability (Apriani et al., 2024). They also participate more actively when the objectives of the chatbot activities are aligned with what is taught in class (Saifullah et al., 2024), suggesting the need to integrate autonomy with some form of guidance.

The gaps in autonomy considerably distinguish ESL learners from EFL learners and this calls for refined chatbot designs. ESL learners enjoy open-ended, exploratory features while EFL learners need goal-focused tasks with detailed procedures (Tahir et al., 2020). Enhancing vocabulary learning achievement is possible by meeting these needs through the design of the chatbots. Chatbot practices are beneficial for vocabulary learning because ESL learners surrounded by English-speaking communities often possess contextual clues. (Harisha et al., 2024). However, EFL learners depend on highly guided instruction and require the skill of contextual modeling (Guo & Li, 2024).

2.4 Usability and Technical Barriers

The use of chatbots, such as LexiBot, provides significant support to students. However, their effectiveness still depends on usability and integration into learning practices. Studies highlight that simple designs improve the use of the system (Lei & Dickson-Deane, 2024). Easy design and simple tasks improve learner attitudes toward participation (Lee & Maeng, 2023). However, learning will stagnate due to technical problems like lack of connection, standardization, inflexible responses, and poor adaptability to different languages (Shah et al., 2024).

Integrating chatbots into any service is difficult, especially when regions have underdeveloped digital infrastructure. Students from low-internet areas with older devices tend to have more problems while trying to utilize chatbot platforms. Other problems are slow response latency, issues with accessing rich media parts, and the use of older devices (Belda-Medina & Kokošková, 2023). Furthermore,

most chatbots use known answer-eliciting techniques that do not support complicated language processes or offer sufficient feedback (Jeon, 2021). These issues emphasize the necessity of flexible AI-based chatbot models capable of personal interactions and meaningfully blending in with the context. Therefore, while interest in chatbot-assisted learning continues to increase, particularly in vocabulary acquisition, there are some gaps that it fails to address. First, there is an insufficient understanding of how chatbot platforms contextualize vocabulary contextual clues as learners are guided through various levels of learning. Second, even though learner autonomy is discussed within the context of ESL and EFL environments, very few examine the differences in engagement and the efficacy of LexiBot as a chatbot tool designed to aid learning in these different settings. Coverage of these issues would have required extensive gap analysis that recommends further study focusing on the comparative evaluation of usability on learning outcome achievement toward predefined goals. In this regard, the gaps analyzed are: (1) evaluating usability across both groups, (2) assessing comprehension of contextual clues, and (3) understanding learners' interaction patterns. Engaging these gaps enables this study to document the comparative effectiveness of chatbots in learning vocabulary while assisting in the development of adaptive AI technologies designed for specific use in class context details specific to ESL and EFL classrooms.

3.0 Research Methodology

This study used a cross-sectional mixed-methods approach. This combination of survey and interview methods served a specific purpose; surveys made it possible to analyze groups in a standardized manner, while interviews offered additional perspectives on autonomy, engagement, technological experience, and other factors that were not easily measurable through quantitative methods. The study was conducted with a total of 49 students, 22 from UiTM and 27 from UD. These learners were enrolled in courses where LexiBot was integrated into vocabulary instruction. The sample was small, but it was still adequate for exploratory research with qualitatively driven insights (Dawadi et al., 2021). Participants completed surveys that measured usability, engagement, and perceived impact of the integration using a 5-point Likert scale. In addition, ten semi-structured interviews (5 from each site) were conducted with participants to understand their usage of LexiBot, their motivations, and the challenges they encountered. This approach was adopted to obtain comprehensive and valid explanations from the data collected. For the quantitative data, only descriptive statistics and inferential statistics were used. From the ESL and EFL learners, independent samples t-tests were conducted to analyze their differences, and one-way ANOVA was used to analyze other demographic factors like academic year and AI tool usage before the study. The interview transcripts were analyzed using Braun and Clarke's thematic analysis framework, specifically their six-phase approach. Codes were created inductively, and themes focused on barriers to usability, engagement, and learning were formed. This approach helped provide an organized, yet interpretable, understanding of learner experiences with chatbot-assisted vocabulary learning.

3.1 Limitations

More participants from different backgrounds are needed to draw wider conclusions. Second, the use of self-reports introduces potential response bias that affects the accuracy of the evaluations of usability, engagement, and efficacy. Several participants also dealt with minor technical problems, including some connectivity problems, which, for a short period, interfered with engagement. Despite these limitations, the study highlights the necessity to adapt such instruments to educational settings and learner requirements, thus enabling further research to fill in these gaps and analyze the role of chatbots in language education.

4.0 Findings

This section presents the findings from the study, highlighting key differences in usability, engagement, and effectiveness of LexiBot among ESL learners at UiTM and EFL learners at UD. The results are summarized in the table below and further elaborated in the subsections.

4.1 Demographic profile of respondents

In this research, 49 students completed the questionnaire, and their demographic information is shown in Table 1 below.

Table 1. Demographic profile of respondents (n=49)

Item	Number	Percentage
UiTM	22	44.90
UD	27	55.10
Total	49	100
Current year of study		
First year		
UiTM	16	32.65
UD	20	40.85
Second year		
UiTM	6	12.24
UD	3	6.12
Third year		
UiTM	0	0
UD	4	8.16
Prior Use of AI-Based Tools		

Yes		
UiTM	19	38.78
UD	7	14.29
No		
UiTM	3	6.12
UD	20	40.82

Out of 49 respondents, 22 were from UiTM and 27 from UD. Most (73.50%) were first-year students (16 from UiTM, 20 from UD), while 18.36% were second year (6 from UiTM, 3 from UD). Only 4 UD students (8.16%) were in their third year. Regarding AI-based tool usage, 26 respondents (53.06%) had prior experience (19 from UiTM, 7 from UD), while 23 (46.94%) had none, with the majority (20) from UD and 3 from UiTM.

4.2 Usability of LexiBot

In this study, the first research question aimed to evaluate the usability of LexiBot among ESL and EFL learners. Section B of the questionnaire focused on two key aspects: ease of use and technical issues encountered while using the chatbot. The participants shared their experiences regarding the LexiBot interface by reporting their ease or difficulty in circumventing it and connectivity problems confronted while using LexiBot.. To quantify the responses, the questionnaire employed a percentage-based analysis, where higher percentages indicated greater ease of use and lower percentages reflected technical difficulties. The findings are presented in Table 2 below.

Table 2. Usability of LexiBot

Item	Number	Percentage
Ease of use		
UiTM (Easy or Very Easy)	21	95
UD (Easy or Very Easy)	25	91
Technical Issue		
UiTM	4	18
UD	6	22

As shown in Table 2, 95% of UiTM students and 91% of UD students rated LexiBot as easy or very easy to use. Despite its overall user-friendliness, some technical difficulties were reported, with 18% of UiTM respondents and 22% of UD respondents mentioning connectivity issues.

4.3 Effectiveness in Understanding Contextual Clues

The second research question aimed to assess the effectiveness of LexiBot in assisting learners with understanding contextual clues. Section C of the questionnaire focused on evaluating how well LexiBot supported vocabulary comprehension by providing contextual hints. Respondents rated their experiences based on how helpful they found chatbot in improving their ability to understand words within different contexts. A percentage-based approach was used to analyze the responses, with higher percentages reflecting a greater perceived effectiveness. The findings are summarized in Table 3 below.

Table 3. Effectiveness of LexiBot

Item	Number	Percentage
UiTM (Helpful)	9	40
UiTM (Very Helpful)	13	59.1
UD (Helpful)	22	81.5
UD (Very Helpful)	5	18.5

From the data shown in Table 3, 81.5% of UD learners regarded LexiBot to be helpful, whereas 18.5% found it very helpful. Among UiTM learners, 40% found it helpful, while 59.1% found it very helpful.

4.4 Engagement with LexiBot

The third research question aimed to explore the engagement levels of ESL and EFL learners when using LexiBot. This section is based on interviews conducted with five students from UiTM and UD. The interviews focused on learners' frequency of use, motivation, and the extent to which LexiBot influenced their vocabulary learning habits. Most UiTM students reported using LexiBot independently and integrating it into their study routines. They highlighted the chatbot's convenience in providing structured vocabulary exercises and interactive learning experiences. Respondent 1 mentioned, *"LexiBot helps me review words at my own pace, but I still need additional resources to fully understand new words."* Additionally, students noted that LexiBot serves as a tool for teaching contextual clues that provide relevant types and examples that reinforce vocabulary comprehension. Respondent 2 explained that while "LexiBot provides useful information, somehow it lacked interactive elements that could have made learning more engaging". UD students incorporated LexiBot as an optional resource in their classes. The chatbot was first used with specific guidelines, so students only used it under the supervision of a teacher. As Respondent 3, a UD student noted, "LexiBot was useful for practicing vocabulary, but mostly used it when I was doing classwork." This suggests that LexiBot was used by UD learners primarily because it was required, rather than out of personal inclination. Some respondents from both groups pointed out problems they identified with the chatbot. A comment by

Respondent 4 from UiTM illustrates this, “LexiBot is useful, but sometimes it does not tell me why an answer is wrong.” This was echoed by Respondent 5 from UD who noted that the chatbot became boring after some time, which reduced their level of motivation to use it.

5.0 Discussion

The results of this research validate the effectiveness of lexical acquisition through chatbots in ESL and EFL contexts, but they also highlight subtleties that warrant deeper analysis. As previously stated, both UiTM and UD learners’ high usability ratings suggest that LexiBot, indeed, fulfilled at least some fundamental criteria for usability, but the conversations must go beyond the indisputable achievements, in this case, toward deeper educational considerations. Striking differences in participation levels and learning autonomy, in which ESL learners interacted with the chatbot independently, but EFL learners were instructed to use the chatbot, have echoed debates in the literature on AI in education regarding autonomy and dependency on context (Annamalai et al., 2023; Lo et al., 2024).

This difference brings attention to the need for an educational AI to reconsider AI's adaptability framework, incorporating sociocultural dimensions. Even when LexiBot style chatbots are scalable, their preparation toward pedagogy must address differences in language immersion and autonomy. This gap of self-directed learning in ESL to heavily guided EFL teacher scaffolding parallels the evidence provided by Jeon (2021), stating that AI devices need to facilitate both inquiry-driven and more structured pathways to learning. Still, LexiBot's efficacy needs to be assessed in the context of the learners’ sociocultural and instructional milieus. Subsequent versions should include features that adjust the level of interaction, detail of feedback, and guidance offered to learners in alignment with their needs, which is in step with the shift toward personalized AI in education (Belda-Medina & Kokošková, 2023).

Furthermore, even if this study analyzed only two specific institutional contexts, chatbot technologies could be reasonably applied to other educational settings if there is sufficient infrastructural and curricular support.. The findings illustrate that the utility of chatbots is not defined purely by information provision but by content integration within the operational teaching frameworks and the level of digitization preparedness educational institutions possess. For instance, students residing in areas with poorly developed internet infrastructure may be unable to actively participate in engaging with chatbot functionalities, as some respondents indicated. These challenges highlight the need for contextual flexibility not just in the design but also in systems, which are intended to function in bandwidth-constrained settings, in addition to the user interface design.

In reflecting critically on the impact of AI chatbots in teaching and learning, their merits are not found in the substitution of teaching instruction, but in teaching enhancement, for instance, through providing immediate feedback, learner modelling, and emotional involvement. Nonetheless, to effectuate the desired outcomes, rigorous teaching and guiding through empirical evidence is necessary. In this regard, the case of LexiBot’s implementation in this study showcases the potential of such technologies but graciously indicates that purposeful design, ongoing assessment, and policy support are paramount to unlocking educational innovation across diverse ecosystems.

6.0 Conclusion and Recommendations

This study demonstrates that AI chatbots, LexiBot, can be effective vocabulary-learning tool in both ESL and EFL contexts. Both learner groups ' high ratings for chatbot usability indicate potential for effortless integration into blended learning contexts. However, differences in learner autonomy and instructional support illustrate the need to adapt chatbot design to suit various contexts. ESL learners thrived during self-paced engagement, while EFL learners benefited from structured classroom incorporation, underscoring the necessity for responsive chatbot design. In optimizing effectiveness and enhancing learner engagement, several targeted strategies are recommended. First, responsive adaptive learning technologies should be implemented that allow the chatbot to tailor responses based on the learner’s language proficiency, interaction frequency, and level of autonomy. As an illustration, ESL learners may require open-ended tasks and exploratory dialogue, whereas EFL learners may need guided prompts and structured progress tracking aligned with the course curriculum. Second, to handle user disengagement, stimulating elements such as achievement badges and interactive storytelling embedded into time-bound challenges could enhance motivation. Third, enhanced metacognitive awareness and retention should be targeted by explaining correct and incorrect responses in depth through adaptive scenario-based tasks coupled with contextual feedback. Educators should look at incorporating chatbot use into lesson plans via blended models. This could include designating chatbot-based activities as pre-class or post-class reinforcement activities, or incorporating chatbots as co-leaders during classroom discussions, particularly in large group or asynchronous class settings. Further research should focus on other language competences such as grammar, writing, or speaking fluency, alongside the previously explored vocabulary acquisition for which AI chatbots provide guidance. Moreover, encompassing studies from different education systems and cultural settings would refine the principles for chatbot design directed towards broader adaptability. It would be beneficial to study the sustained motivational and linguistic impacts of chatbot interaction on learners’ language skills mid-term or longer.

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Paper Contribution to Related Field of Study

This study contributes to the field of chatbot-assisted learning by providing empirical insights into the effectiveness of LexiBot in facilitating vocabulary acquisition amongst learners of English. By examining learner engagement and usability across two countries, our project expands the know-how on chatbot integration in educational environments. Additionally, it reinforces the roles of AI chatbots as scalable and accessible tools that enhance autonomous learning and instructor-led teaching.

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