Exploring Tertiary Vietnamese EFL Students' Engagement in Vocabulary Learning through the Use of an AI Tool

Pham Thi Thu[1], Nguyen Lam Anh Duong[1], Dang Hoang Mai[1], Le Thi Thien Phuoc[1*]

[1] Faculty of Foreign Languages, Industrial University of Ho Chi Minh City, Vietnam
*Corresponding author's email: lethithienphuoc@iuh.edu.vn
* https://orcid.org/0000-0001-6168-1127
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ABSTRACT

The utilization of AI tools in language teaching is increasingly popular worldwide. Existing literature suggests that educators have integrated AI tools into their teaching methodologies to enhance student learning. Among the tools, POE is currently being used by several Vietnamese ESL teachers. Nonetheless, students' engagement in and their perception of the effectiveness of the tool still needs to be explored. Hence, this research was carried out to assess student engagement in utilizing this AI chatbot for students' vocabulary learning and their perceived usefulness and benefits. With a mixed-method approach, the study was conducted at a public university in Vietnam with a sample of 31 English-majored students. Data were collected through questionnaires and interviews. The quantitative data were analyzed with the use of repeated-measures ANOVA (RMA), while the qualitative data were analyzed following thematic analysis guidelines. The findings revealed that most of the participants found the tool useful, and they were actively engaged in learning vocabulary using this tool. The research outcomes propose valuable insights for university EFL teachers regarding the integration of AI tools like POE into curricula to optimize students' learning experiences with innovative language instruction.

Introduction

As technology continues to shape our society, students must be prepared for the digital world. Language teachers, therefore, need to get updated with technologies to equip their students with the digital skills and competence necessary to thrive in a technology-driven society. Several studies have been conducted to explore various approaches to language learning innovations and to investigate how participation in digital space transforms student learning experiences. Numerous studies have explored how involvement in digital spaces can reshape personalized language instruction and enhance students' learning journey. Additionally, these studies have sought sustainable approaches for language learning innovations as well as promoting the integration of technology and AI tools into language teaching.

With the advancement of Artificial Intelligence (AI) technology, several AI tools and chatbots have been launched and employed by language teachers, including Chat GPT and POE. Each stakeholder has their own perspectives about the advancement of these AI tools. Some are so excited about its existence, while some hold concerns about the usefulness and applications of the tool as well as the academic integrity practice among student users.

In recent years, there has been a growing concern about how AI chatbots are utilized in language education. The use of AI chatbots in language teaching offers several benefits, as supported by various studies. One of the advantages is that they provide tailored feedback and targeted language practice based on the learner's proficiency level and learning goals (Taylor et al., 2019). They can also improve learners 'writing performance since AI chatbots can stimulate conversations and provide writing prompts, allowing learners to practice their writing skills in a non-intimidating environment (Liu et al., 2019). Liu also stated that providing instant feedback, correcting errors, and offering suggestions can help learners improve their language production skills. Similarly, AI chatbots can identify grammatical errors and vocabulary misuse, enabling learners to self-correct and enhance their vocabulary, comprehension, and conversation skills (Divekar et al., 2021).

Other benefits include providing various types of information and knowledge through interactive methods and easy-to-operate interfaces (Muniasamy & Alasiry, 2020) and enabling learning to take place anytime and anywhere (Zhou et al., 2020), providing interactional, technological, and social affordances, which enhance L2 students' motivation to learn a target language (Jeon, 2022). More importantly, AI chatbots could create a positive experience to sustain students' engagement and interest in learning (Liu et al., 2022). In the Vietnamese ESL context, due to the possible benefits of AI tools, including chatbots, in improving English teaching and learning at the university level, teachers have begun to consider their broader applications in language education, particularly focusing on their use of personalized language instruction (Nguyen, 2023).

Literature review

What is engagement?

Engagement is a construct that has been widely used and intuitively understood among educational practitioners. Regardless of that, there is still a general agreement among researchers that "engagement is dynamic, malleable, and comprises at least three components of behavioral, cognitive, and affective engagement" (Christenson et al., 2012; Mercer & Dornyei, 2020; Hiver et al., 2021). In a recent study, Hiver et al. (2021) define engagement as "the amount (quantity) and type (quality) of learners' active participation and involvement in a language learning task or activity". Generally, learner engagement refers to "active participation" in a variety of activities, both academic and non-academic, as well as a commitment to achieve the learning outcomes (Ginting, 2021). In L2 education, an increasing number of researchers have recognized engagement as a significant variable in the process of language learning (Dörnyei & Kormos, 2000; Hiver et al., 2021b; Mercer & Dörnyei, 2020; Philp & Duchesne, 2016). Thus, engagement, as reinforced by Hiver et al. (2021, p. 1), is "a dynamic, multidimensional construct comprising situated notions of cognition, affect and behaviors".

Dimensions of language engagement

Conceptually, there is some consensus that engagement is a "multidimensional construct" that consists of three dimensions: behavioral, cognitive, and emotional. All of the three dimensions overlap and interrelate with one another (Christenson et al., 2012; Philp & Duchesne, 2016). While the definitions of engagement might show some differences among the perspectives, scholars have relatively widespread agreement on the key characteristics of learner engagement.

Due to the nature of being a multidimensional construct, engagement encompasses various aspects of learner involvement and participation. Global scholars have identified different dimensions of engagement and propose at least three or more fundamental dimensions. A significant body of research indicates that learner engagement is obvious in observable behaviors and also evident in cognitive and social magnitude. Additionally, learners' emotions towards their learning tasks and their interactions with their classmates or group mates do contribute to their engagement, as revealed through the studies by Lambert et al. (2017). Some scholars mention agentic engagement, which refers to learners' sense of ownership, autonomy, and self-regulation. This refers to the student's capability to establish learning objectives, evaluate, and be accountable for their own learning paths (Oga-Baldwin, 2019).

Behavioral engagement relates to the quantity and quality of how actively learners take part in learning. In the early stages of L2 research, researchers gauged behavioral engagement by counting words and turns, as seen in the work of Dörnyei and Kormos (2000). Behavioral engagement, within the realm of L2 learning, includes learners' willingness to be involved in interactional activities, time on task, speaking, or generating meaningful content during the performance of task assignments. In addition, behavioral engagement relates to the persistence of tasks, which is the ability to persevere on tasks without the required assistance or guidance (Philp & Duchesne, 2016). Having the same viewpoint, Hiver et al. (2021) and Fredricks et al. (2019) reinforce that this dimension of engagement refers to the involvement that the learners put in their own learning process and classroom activities. It can be measured based on learners' participation, persistence, effort, attention, and absence of disruptive behaviors.

When it comes to **emotional engagement**, the dimension is often reflected in students' personal affective reactions while they take part in meaningful language learning tasks or activities. Emotional engagement occurs when learners experience a strong interest, connection, and excitement toward a task. An emotionally engaged student finds pleasure in the learning experience and feels that the topic is valuable, meaningful, and inherently interesting. Teaching materials that allow learners to discover, explore, and make choices based on their own interests provide the autonomy necessary to establish emotional engagement (Lambert et al., 2016). Emotional engagement can refer to learners' positive and negative reactions to the topic, to their teammates and teachers, as well as their valuing of and interest in the subject (Fredricks et al., 2016). According to Svalberg (2009, p. 247), emotionally engaged learners are described as having a positive attitude, purposeful learning, and willingness to learn towards their language process. Positive feelings include enjoyment and enthusiasm. Negative emotions, on the contrary, consist of such things as frustration, anger, anxiety, or boredom. This might be referred to as "emotional disconnection" or "lack of interest" (Mercer, 2019). Emotional involvement significantly affects other aspects of engagement (Dao, 2019; Henry & Thorsen, 2020). It is worth noting that emotional engagement is tied to learners' feelings about learning environments, the people involved, the tasks, and their own involvement in those situations (Skinner et al., 2009; Reeve, 2012).

Cognitive engagement is defined as psychological investment by trying to understand complex ideas, self-regulating, exerting efforts to solve challenging tasks, and using deep learning strategies (Fredricks et al., 2016; Sinatra et al., 2015). This type of engagement occurs when students make connections, justify arguments, reason, exchange ideas, answer questions, and solve problems. Indicators of cognitive engagement are the use of questions, connectors, or phrases that express personal opinions (Philp & Duchesne, 2016) or when they have thoughtful reflection (Svalberg, 2009). In other words, students are engaged cognitively when they think about what they want to say, commit target words to memory, and connect language patterns to previous learning.

Engagement in contemporary teaching methods

Recent years have witnessed a shift from teacher-centered approaches using traditional teaching methods to student-centered skills-focused learning activities (Camilleri & Camilleri, 2019). Christenson et al. (2012) defined engagement in classroom activities as a degree to which students are involved in the learning process. Active participation from learners during classroom activities could stem from students' attention, excitement, and relevance to the given topics (Coleman & Money, 2020; Brewster & Fager, 2000).

Several elements might lead to increased levels of motivation and engagement of students, according to an array of studies. Firstly, Reeve (2012) concluded that positive learning outcomes could be linked to students' involvement in instructional activities. He also maintained that collaboration tasks in class would greatly help stimulate students' mental processes and engage learners to great extents in a limited amount of participation time with the view to improving their academic scores, which was deduced from a lot of meta-analysis studies.

Technological aids employed to boost learning engagement levels

Learning experiences have reportedly been enhanced thanks to the advent of digital advances via smartphones and technological platforms during recent eras (Carroll et al., 2019). A study by Camilleri & Camilleri (2009) suggests that mobile phones could be utilized in class to obtain students' immediate feedback and interactive activities, which has a pivotal role to play in the adoption of gamification in formal settings. Fishman et al. (2004) also demonstrate that digitized activities, which were recognized for their enhancement of reasoning abilities and thought-provoking mental processes for learners, ought to be utilized as a factor contributing to the relationship between teaching and learning tasks as they helped teachers in scaffolding knowledge that could be rendered as challenging for students. While "Clickers" is an application that was claimed to foster mutual interactions and provide direct feedback for peers, it could, by the same token, encourage spoken response during collaboration on digital devices (Mazur, 1997).

Some common technological applications used to support engagement

A thesis done by Gutiérrez Salvatierra (2014) depicted students' levels of perception towards the use of technology in improving their English. With the use of the tools and websites regarding YouTube, Google, Facebook, SMART speaking, Story corps, Tongue Twisters, Duolingo, Hello-Hello, Word Power, and the like, most students assumed that most areas of English, such as grammar, pronunciation and language skills could be greatly improved in the process of acquisition. Moreover, tutorial YouTube videos could generate hands-on learning sources for students in terms of contexts, language use, cultural knowledge, and self-study (South et al., 2008). Awuah (2015) acclaimed the effectiveness of Google apps by pointing out that these aids could promote online collaboration learning via delivering presentations,

establishing projects, and processing materials. According to a study by Chiablaem (2021), WhatsApp was the most chosen and effective application among Thai students, considering its consistent and user-friendly functions. Several studies have also advocated the benefits of learning apps combining visual and audio aids via videos and text chat for students' interactions. Authentic conversations and language skills through classroom activities might be reinforced by video conferencing with the effects of sounds and real-time (Lee, 2007). A study by Tran & Tran (2023) indicated that Chat GPT played a crucial role in enhancing learners' critical thinking ability and critical literacies. Likewise, Phan (2023) pointed to the positive emotions of students when being engaged in writing classes with the use of AI in grammar and vocabulary exercises as well as feedback during the tasks. Chatbot CLT was also recognized as a friendly user tool which might increase students' motivation in learning vocabulary (Dinh et al., 2022)

The application of AI tools in promoting learner engagement in classroom practices

Sumakul (2019) introduced AI as a revolutionary invention amidst the rise of computer-assisted language learning (CALL) during the 1960s. Technological advances have made learning more accessible for students with more specialized needs (Yildiz, 2021); therefore, chatbots or digitalized learning aids would offset the lack of student-teacher contact and provide regular feedback for students (Demirci & Yavuz, 2009). The introduction of chatbots has promoted learner engagement, increased their linguistic competence, and maintained their interests (Kohnke, 2023; Smutny & Schreiberova, 2020). Chatbots have also brought the benefit of reducing language learners' social anxiety (Fryer & Carpenter, 2006) and enhancing the acquisition of incidental vocabulary, according to Laufer and Hill's research in 2000. Besides serving as a resource for dialogue learning, chatbot agents have been shown to have beneficial effects on vocabulary learning (Legault et al., 2019), cultural learning (Cheng et al., 2017), and boosting students' readiness for interactions (Ayedoun et al., 2015). Moreover, these tools have been known to promote self-studying vocabulary and exposure to new linguistic features (Gallacher et al., 2018). According to Hassani et al. (2016), they were able to enhance students' motivation by giving them insights into real-world resources for learning and opportunities for experiential learning. A speech-activated multimedia system (Conversim) was developed by Harless et al. (1999) to allow students to engage in lengthy conversations with virtual native Arabic speakers. The results suggested that students would be motivated to learn more based on the utility: native-like conversations with immediate feedback from the machines.

Developed by Jia in 2004, the Computer Simulator in Educational Communication (CSIEC) system was directed at serving as a conversational partner for people learning foreign languages. Grammar and syntax intelligence are both presented in the system as they create learning instances for students to approach a wide range of phrases and sentences. Furthermore, Jia also studied the CSIEC system in 2008 after adding new features like assessment and fill-in-the-blank grammar exercises, which were then integrated into an English course in a middle school in China. Students' pre-test and post-test scores and engagement levels during the surveyed period illustrated a gradual rise. Fryer and Carpenter (2006) polled 211 students who were instructed to utilize well-known chatterbots like Alice and Jabberwocky in class. According to the survey results, pupils felt more at ease speaking with bots than with their teachers or partners, but these tools might benefit advanced learners more than lower-level learners. In a study by Coniam in 2008, the efficacy of a chatterbot for ESL learners was investigated based on algorithms and their function as a learning aid in the classrooms, which could be rendered successful for language learning. In 2017, Huang et al. measured the impact of a voice-based chatbot on EFLs' meaning negotiation and speech acts regarding the account of confirmation checks, clarification requests, and re-organization of ideas on 123 Korean English students. As a result, a substantial improvement was recorded between the first and

final talk, demonstrating that the chatbot facilitated the learners over the course of the 16-week research period. The effect of utilizing a mobile-based AI agent on the writing performance and attitude of EFL learners was recently researched by Kim et al. (2020), reporting noticeable increases in their writing abilities, particularly in terms of syntax and vocabulary, as well as confidence levels and positive perception for the role of AI during study. Meanwhile, their anxiety was seen to decrease. According to the study by Alm and Nkomo in 2022, it is witnessed that students were more eager to engage in friendly discussions with AI bots (such as Reddit, the Memrise community, and Duolingo apps) to practice using English outside classrooms.

In summary, Kim et al. (2020) proved that students' engagement in learning vocabulary for writing skills before and after using chatbots could be improved significantly. Another experimental study carried out by Mahmoud (2022) and De Vivo (2022) showed that POE brought certain effects in enhancing students' engagement in learning activities, especially in an educational context. Meanwhile, studies conducted by Cheng et al. (2017), Gallacher, Thompson, and Howarth (2018), Coniam (2008), and Huang et al. (2017) have investigated the impact of chatbots on cognitive engagement in language learning, which enhanced student participation and self-directed learning. In addition, research by Kohnke (2023), Smutny & Schreiberova (2020), Ayedoun et al. (2015), and Demirci & Yavuz (2009) highlighted the benefits of using technology-based tools in language learning that facilitated teacher-student feedback, prolonged participation, and learner interaction outside of class time. Besides, several investigations, including those by Fryer and Carpenter (2006), Hassani et al. (2016), Kim et al. (2020), and Alm and Nkomo (2022), have explored the influence of chatbots on emotional engagement in language learning. Their findings suggest that chatbots can effectively reduce anxiety, increase enjoyment and motivation, and foster a stronger sense of accomplishment among learners.

The introduction of POE into language learning

POE (Platform for Open Exploration) is a technological tool developed by Open AI and Anthropic (Gülen, 2023). This is a well-known chatbot web application with AI technology that could provide prompt responses to users' questions. Poe AI has deep-learning algorithms that were programmed to analyze immense amounts of data to support learning. This is an AI bot with cutting-edge language models as it introduces learners to Natural Language Processing (NLP) models such as ChatGPT-4. There are a variety of functions that POE can offer to learners, ranging from multilingual support (Sage, ChatGPT), excellent writing samples (Claude or Claude+), instant answering feedback (Dragonfly), and creative and problem-solving actions (GPT-4).

Determining student engagement and perceptions of this available AI tool could provide useful insights for developing more targeted approaches. Researchers should conduct a study exploring the levels and nature of student engagement when using various AI vocabulary applications as part of their regular language acquisition process. This research would help address current gaps in understanding how AI can best complement independent vocabulary study at the university level. It would guide how to design AI tools that maximize learner engagement for optimal language growth. The results have the potential to not only improve individual learning but also help educators integrate new technologies effectively into their curriculum.

According to the lack of studies into the use of POE in vocabulary learning, there is a growing interest in using artificial intelligence tools to support language learning, but more research is needed to understand how students engage with and perceive these tools behaviorally, cognitively, and emotionally. As universities aim to support independent vocabulary study

better, it is important to investigate new technologies and their effectiveness. However, more is needed to know about how university students use and experience AI-assisted vocabulary tools integrated into their curriculum.

Research questions

This study aims to answer the two following research questions:

(1) How do students' levels of behavioral, cognitive, and emotional engagement change throughout a four-week vocabulary learning project involving the use of one AI chatbot named POE?

(2) What are the students' perceptions of the utility and challenges associated with the use of the chatbot POE for vocabulary learning?

Methods

Pedagogical Setting & Participants

The study was conducted at a public university in Ho Chi Minh City - Vietnam. The participants consisted of 31 English-majored students who were mainly in their third and final years in university. The students' IT level ranges from beginner to advanced, with almost two-thirds of them claiming to be intermediate or advanced. The majority of them (88%) also find applying technological tools in learning English easy or neutral. Only about one in ten stated that they find it challenging.

At the time the research was conducted, the students were taking the Interpretation Course, in which they were expected to achieve several learning outcomes. One of which is that students can demonstrate their continuous learning outside the class. Besides, the students are expected to demonstrate their understanding of vocabulary related to different topics in the course.

Considering all the characteristics mentioned above, the participants were chosen for the research and were asked to participate in a project that can help students learn vocabulary related to the lessons by themselves with the use of POE. The following table describes the participants' demographic features and their perception of the integration of technology into their learning process.

Table 1. The participants' background.

Years in university	Percentage
Junior	71%
Sophomore	4%
Senior	25%
Students' IT level	**Percentage**
Beginner	39%
Intermediate	56%
Advanced	5%
Students' perception of the integration of technology into the learning process	**Percentage**
Easy	31%
Neutral	57%
Difficult	10%
Extremely difficult	2%

Design of the Study

A mixed method was employed for this study, with data being collected through questionnaires and interviews. The approach allows both quantitative as well as qualitative data collection and analysis and it provides a better understanding of the research problem (Creswell et al., 2006).

Firstly, a four-week vocabulary project was designed to incorporate the use of POE in learning vocabulary. To complete the project, students were required to use POE at least twice a week. During four weeks, the students had to complete a weekly vocabulary portfolio. Each week, the students asked POE any questions related to the topics they learned in the course and recorded the usage, form, and meaning of the new words they learned from their conversations with POE. In the final week, students submitted a final video recording in which they gave a presentation about the most useful words that they learned during the month.

In order to collect data about the changes in student engagement in utilizing POE, the questionnaire was sent to all students by the end of each week. The weekly questionnaires have the same questions exploring the three dimensions of student engagement. Only the questionnaire for the first week contains an extra part, which collects the participants' biographical information to help the researchers have a better understanding of the participants.

Interviews were also conducted by the end of the course with 12 students to gather further information about their perception of the usefulness and limitations of the tools as well as their future intention in using the chatbot.

Since the students' participation and engagement were measured repeatedly in four weeks, the quantitative data collected from the questionnaire was analyzed using RMA, and qualitative data was analyzed following thematic analysis guidelines.

Data collection & analysis

Questionnaires

The questionnaire, which was in the form of a weekly reflection form, was sent to the participants by the end of every week. The student participants answered multiple-choice and short-answered questions on Google Forms. The questionnaire was divided into two main parts:

Part 1 aimed to collect the participants' biographical information, including their names, native language years, years in university, and IT levels. This part would help the researchers better understand the students' background and ensure the participants were suitable for the research.

Part 2 aimed to explore different aspects of students' emotions, participation, and cognition. Questions 1 and 2 were used to find out the frequency and the amount of time the students spent on using the app for learning vocabulary, which was one of the indicators of behavioral engagement. Question 3 consists of 15 items, which were used to explore students' behavioral, emotional, and cognitive engagement in vocabulary learning using POE.

Interviews

After the collection of quantitative data, the researchers conducted semi-structured interviews with 12 students. These students were chosen randomly among those participating in the four-week vocabulary learning project. There are six interview questions, with questions 1 and 2 aiming to further explore students' behavioral and emotional engagement in the AI tool and questions 3 and 4 exploring students' perceptions of the advantages and limitations of using the app. The last two questions are to find out their future intention of using the app.

Data analysis

The data about students' participation collected in the first part of the questionnaire was analyzed descriptively using Excel, and charts were employed to present the results about students' frequency and amount of time spent on using the app, while the students' engagement in part 2 of the questionnaire was analyzed using one way RMA.

The answers collected from the interview were first summarized and then coded following the thematic analysis guidelines. The results from the qualitative data were compared with the quantitative data to elaborate and validate the result (Cress-well & Plano Clark, 2011)

Results/Findings and discussion

Behavioral engagement

Student's participation

Students' participation in one learning activity is one of the indicators of students' behavioral engagement. The study asked the participants to record the time they devoted to the vocabulary-learning activity. The following figures indicate the amount of time that the student participants invested in vocabulary learning using POE.

Figure 1. The weekly frequency that the students spent on POE to learn vocabulary over a four-week period:
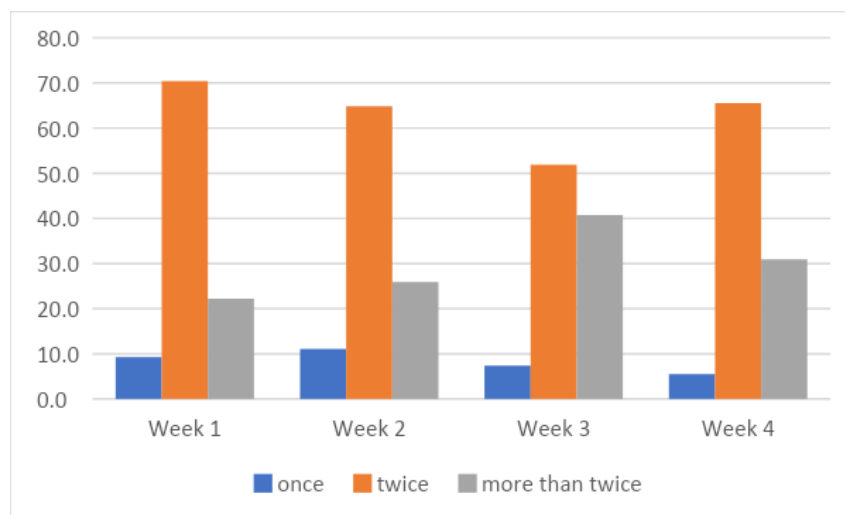

Generally, students' frequency of using POE to learn vocabulary increased over the four weeks under the survey.

More specifically, almost two-thirds of the students reported using POE twice a week to learn vocabulary, except for week 3, when the figure fell to above 50 %. However, in the same week, the percentage of those using the app more than twice peaked at 40 %. The biggest percentage of students using the app twice a week was in week 1 (70%).

Similarly, the percentage of students using the app more than twice also grew from 20% in week 1 to 30% in week 4. On the other hand, the percentage of those using the app only once a week was the lowest (less than 10%).

Figure 2. The amount of time the students spent on learning vocabulary using POE in 4 weeks.
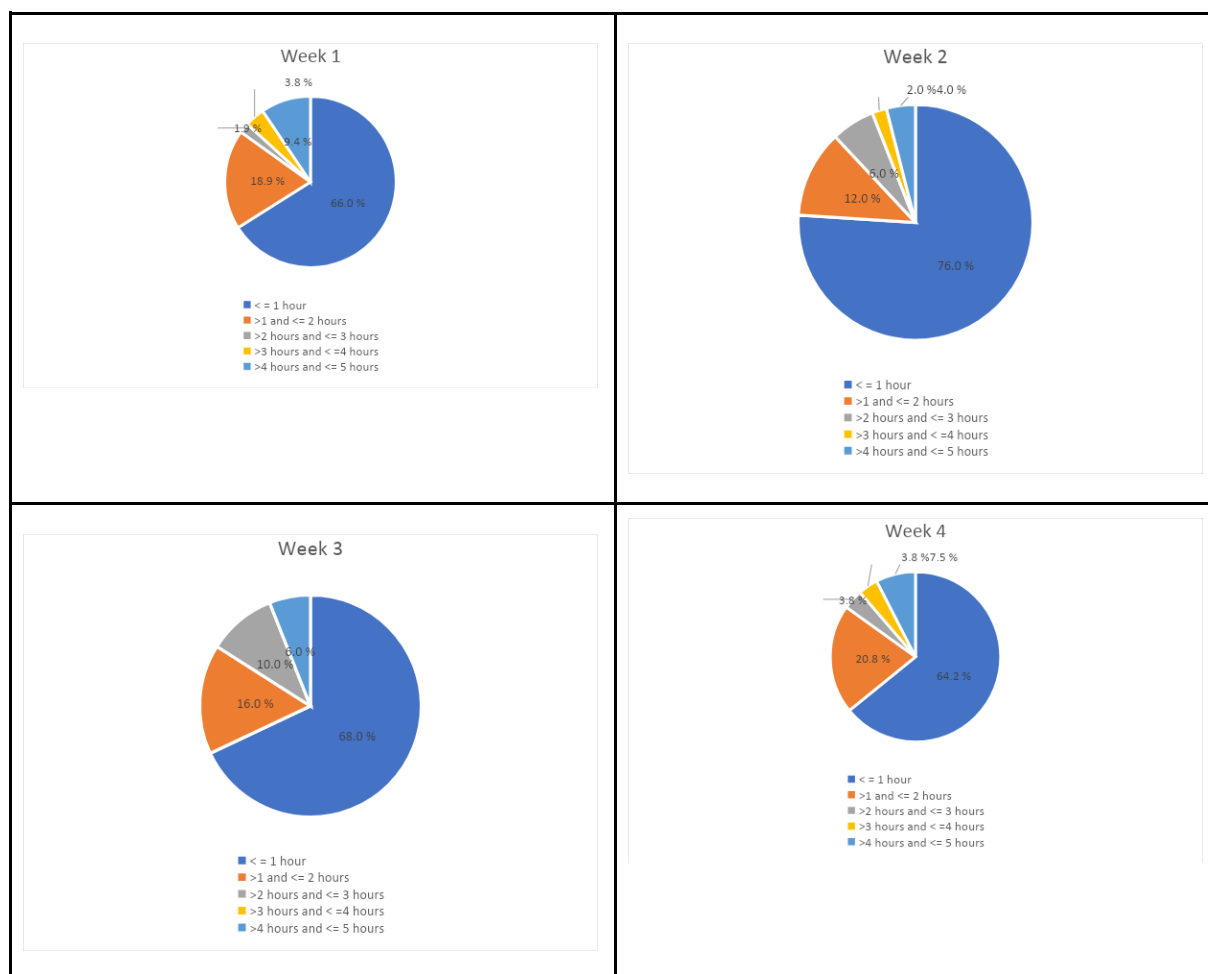
Generally, the students spent more time learning vocabulary using POE in weeks 1 and 4 than in weeks 2 and 3, with more than two-thirds of them spending less than an hour using the app per week. More specifically, 66 % of the students spent less than an hour using the app in week 1. Then there was a slight increase of 10 % to peak at 76% in week 2, followed by slight decreases to 68% and 64 % in the last two weeks.

The second highest percentage was that of those spending from 1 to 2 hours per week. In week 1, around 19% of the students spent 1 to 2 hours. Despite a mild drop to 12% in week 2, the figure recovered and continued to increase to 20,8% by the end of the period.

Starting from 9,4% in week 1, the percentage of those spending more than 4 hours halved in week 2, then increased gradually to 7.5 % in week 4.

The percentage of those spending around 2 to 3 hours grew significantly from under 2% in week 1 to 10% in week 3, then dropped sharply to under 4 % by the end of week 4.

Besides the amount of time and frequency of software usage, data on efforts and persistence levels are two other indicators of behavioral engagement. The data on the efforts and persistence levels of students were analyzed using one-way RMA. The results are presented below:

Table 2. Mean and SD values of the three variables indicating levels of the three dimensions of engagement over the course of four weeks.

Variables	Week 1		Week 2		Week 3		Week 4	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Behavioral engagement	3.848	.3949	4.026	.6011	4.142	.5130	4.348	.4226
Emotional engagement	3.074	.7151	3.216	.7367	3.987	.4185	4.361	.3353
Cognitive engagement	2.848	.5501	3.729	.4584	4.029	.3339	4.426	.3235

Table 3. Descriptive analysis of behavioral engagement during the four-week period

Week 1	31	3.848	.3949
Week 2	31	4.026	.6011
Week 3	31	4.142	.5130
Week 4	31	4.348	.4226

Post hoc test analyses indicated that the average level of how students changed their attitudes in week 4 (M = 4.348, SD = .4226) was significantly higher than that of week 1 (M = 3.848, SD = .3949).

Table 4. The significance level of changes in students' behaviors:

Behavioral Engagement	.038	.000

The main effect of using POE in improving vocabulary learning engagement yielded a significant score of p=.038 in Mauchly's test of sphericity and p = .000 for Greenhouse-Geisser, indicating a great improvement in the behavioral perception level of learners.

Emotional engagement

The table below details the levels of emotional engagement (regarding the presence of enjoyment and absence of frustration and boredom)

Table 5. Descriptive analysis of emotional engagement during the period.

Week 1	31	3.074	.7151
Week 2	31	3.216	.7367
Week 3	31	3.987	.4185
Week 4	31	4.361	.3353

Post hoc analyses indicated that the average level of how students changed their attitudes in week 4 (M = 4.361, SD = .3353) was significantly higher than that of week 1 (M = 3.074, SD = .7151)

Table 6. The significance level of changes in students' behaviors:

Emotional Engagement	.000	.000

The main effect of using POE in improving vocabulary learning engagement saw a significant score of p=.000 in Mauchly's test of sphericity and p = .000 for Greenhouse-Geisser, indicating an immense improvement.

Cognitive engagement

In terms of the cognitive development of learners, factors with regard to cautiousness, connection with previous knowledge, challenges using AI, and sufficient efforts to get by are measured in the following table:

Table 7. Descriptive analysis of cognitive engagement during the four-week period

| Week 1	31	2.848	.5501
Week 2	31	3.729	.4584
Week 3	31	4.029	.3339
Week 4	31	4.426	.3235

Post hoc analyses indicated that the average level of how students changed their attitudes in week 4 (M = 4.426, SD = .3235) was significantly higher than that of week 1 (M = 2.848, SD = .5501)

Table 8. The significance level of changes in students' behaviors

Cognitive Engagement	.001	.000

The main effect of using POE in improving vocabulary learning engagement yielded a significant score of p=.001 in Mauchly's test of sphericity and p = .000 for Greenhouse-Geisser, indicating a sharp development in the cognitive perception level of learners.

Figure 3. The profile plots of 3 dimensions of engagement.
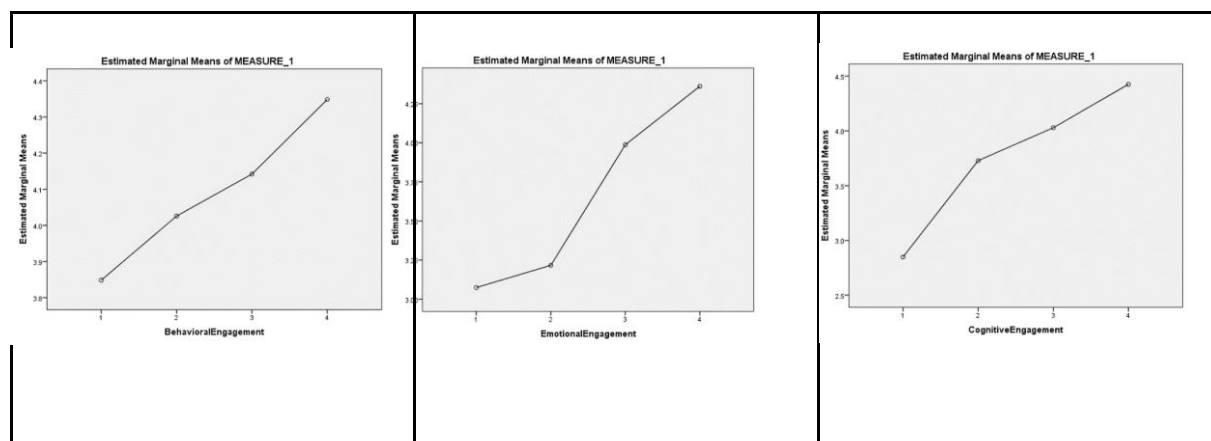
In summary, all three kinds of engagement witnessed gradual improvements, with the most noticeable rise observed in cognitive engagement levels, whilst the first week might undergo a slight hesitation in emotional engagement in which learners did not recognize the entertainment elements of using POE in studying their vocabulary range (M < 3.25).

Students' perception of the utility and challenges associated with the use of the chatbot POE for vocabulary learning

To enrich the data, interviews were carried out with twelve participants. Those twelve participants who filled out the questionnaire were in the same group. First and foremost, the participants were asked to confirm their experience with the use of POE for vocabulary learning in the four-week project.

Most of the interviewees used POE at a certain level. They all emphasized that they used POE regularly to support their vocabulary learning process. Some students even used POE every day or six times a week. Most of the students used POE 3 times a week, but two interviewed students said they used the app less frequently than their peers. However, they tried to continue using it at least twice a week. All of the interviewees found it useful to learn vocabulary using POE.

Specifically, most students expressed interest in using this AI tool. They thought that POE made the process of learning vocabulary more interesting and engaging. Just as participants 3, 4, and 5 mentioned, POE was "*quite interesting*." One of them explained that they just sat down and searched for any vocabulary needed, and POE's answers were very specific, clear, and relevant. Another reason why they found POE interesting was that POE could be used for brainstorming ideas. The participants specifically liked this feature. For example, one participant revealed, "*When I have a question, I ask POE, and it provides me with many useful ideas and suggestions*". Some students thought that interacting with the AI tool was like having a conversation with a friend. The AI tool also helped students memorize vocabulary more easily, as asserted by most of the participants interviewed.

The benefits of using POE were the reason why the participants kept using POE. Among them, the flexibility of POE was the thing students appreciated the most. They could access the tool anytime and anywhere they wanted. Furthermore, the students were surprised at the response speed of POE, which was quick and quite accurate. This helped students save a lot of time and effort when learning vocabulary. When being asked, participants 6 and 8 both agreed that "*POE was convenient, had quick answers, and gave accurate information*." In addition, the AI tool also provided exercises that helped students remember vocabulary longer. Besides, the responses from POE were very useful and relevant to reality, helping students memorize vocabulary more easily. Additionally, answers from POE provided students with different contexts, illustrations, and sounds to help students understand the vocabulary needed more clearly. Interviewee number 12 thought that the AI tool helped them expand their vocabulary, ideas, and grammar, thereby improving their communication skills. In addition to learning vocabulary, many students who participated in the interview answered that they used POE to learn about issues in life, find the content of literary works, etc. It can be said that POE's functions were very diverse and could meet most of the student's needs, especially in terms of vocabulary learning.

However, some students still encountered some problems related to POE's responses. Firstly, POE's answers were "*too general, not in-depth enough, and not as diverse as Google*", according to participant number 1. Sometimes, in the answers that POE provided, there were

too many new words, which made them have to look up more words than their initial needs. Some students could not even find the answer because POE did not understand the command they gave. However, in general, most of them did not encounter many difficulties, and the things they experienced were just minor problems and could be easily solved when they asked a similar question but more clearly to POE.

Surprisingly, all of the interviewees stated that they would continue to use POE in the future and would highly recommend other people to use POE. This is fully in line with their frequent use schedule, as presented in the question above about students' frequent use of POE. The biggest reason for students to keep using POE was that POE helped them solve the difficulties related to their major in the present and the future. POE could serve their learning needs, such as "*answering the teacher's questions, doing homework, and searching for data*," just as participants 2, 4, and 5 mentioned. Therefore, they find POE convenient and necessary and want to stay with it for a long time. They believed this tool could help people "*learn vocabulary faster*" and effectively improve their communication skills. Another participant explained that they were willing to recommend POE to their friends because "*POE could be used for a variety of purposes, could serve the learning of students whether the same or different majors*". In short, convenience, ease of use, and time-saving are the biggest reasons why they are willing to recommend it to friends.

Discussion of results

Overall, students' perception of using POE as a learning aid in the classroom saw general increases based on the findings of regular surveys on a weekly basis. Firstly, results indicated growth in students' participation in learning vocabulary using POE. Surprisingly, there was an increase in the number of students who spent more than 4 hours learning vocabulary using POE, though the majority of the participants spent less than an hour using it. The increases in both the frequency and the amount of time the participants spent proved students' increased behavioral engagement through their active participation and involvement in the learning task, as defined by Philp & Duchesne (2016), Fredricks et al. (2019), Dörnyei & Kormos (2000), Hiver et al. (2021). Though over a shorter period of 4 weeks, POE also brought similar effects in enhancing students' engagement in learning activities. This means that POE can be used like other chatbots to boost students' engagement in an educational context. However, the slight drop in the amount of time they spent on learning vocabulary in weeks 2 and 4 was probably due to the fact that they had to prepare for their midterm test and their group presentation during these two weeks.

Results also showed improved intrinsic motivation and interest in learning new words through natural dialogues. These findings align with research by Kim et al. (2020), who surveyed a number of Korean ESL students' engagement before and after practicing vocabulary for writing skills with a chatbot. Using a 5-point Likert scale, this project found that participants reported higher levels of enjoyment and motivation interacting with the chatbot compared to traditional flashcards.

Other studies have explored chatbots' impact on cognitive engagement. Cheng et al. (2017), Gallacher, Thompson, and Howarth (2018), Coniam (2008), Huang et al. (2017) researched the enhancement of learners' participation in using artificial intelligence applications in studying English vocabulary and concluded that factors of students' learning showed positive improvements regarding their autonomy for self-study outside the classrooms and individual recognition for the usefulness of the apps. The results indicating the cognitive development of the participants of this study also reflected a similar tendency when a doubling of interest levels

was reported from nearly 2.8 to around 4.5 during 4 weeks, claiming the effectiveness and usefulness of learning vocabulary with the support of POE.

Research also indicates chatbots may foster behavioral engagement through extended practice. Kohnke (2023), Smutny & Schreiberova (2020), Ayedoun et al. (2015), and Demirci & Yavuz (2009) emphasized the importance of using technology-based approaches in language learning environments as they could promote teacher-student feedback, sustaining participation periods, and out-class interactions of learners after the research time. These results underwent gradual increases and changes in students' behaviors, with 0.5 higher than that of the beginning phase of the project, and this was suitable to Hiver et al. (2021) and Fredricks et al. (2019) perceptions of behavioral engagement.

Investigations further uncover chatbots' ability to boost emotional engagement factors. Fryer and Carpenter (2006), Hassani et al. (2016), Kim et al. (2020), and Alm and Nkomo (2022) detected reduced anxiety rates, increased levels of enjoyment and motivation, and greater feelings of accomplishment dialoguing with bots across engagement surveys administered to English learners pre- and post- chatbot usage. Similarly, positive attitudes, interest, and language learning values after using POE were recorded in this study (from 3.0 to nearly 4.5), finding higher post-scores.

De Vivo (2022) stated the importance of POE. By working on real-world projects, students could apply what they had learned in the classroom and see how it is relevant to the world around them. The results from interviewees showed that students used POE to learn about issues in life, find the content of literary works, and answer questions related to their major. This suggests that POE has the potential to be a versatile tool for learning and development.

Brewster and Fager (2000) found that real-life activities lead to high engagement and motivation, which could lead to higher achievement. The interview with students suggested that the chatbot POE was a useful tool for vocabulary learning, and they appreciated the flexibility, speed, and accuracy of POE's responses. They also found POE's answers to be relevant and helpful, and the AI tool's ability to provide exercises and context to support vocabulary learning was particularly valuable. One of the most interesting findings of this study is that students report using POE for a variety of purposes beyond simply learning vocabulary. Therefore, they gradually used POE to learn vocabulary more than their needs, which affected and raised their motivation toward vocabulary learning.

Conclusion

Over the past few years, education has witnessed so many changes in technology that both teachers and students can benefit from. The findings of this study gave valuable insights into students' engagement, attitudes, and perception of vocabulary learning via an AI tool known as POE. In terms of engagement, the RMA analysis revealed that the students did engage in the use of the AI tool for their vocabulary learning. All of the three dimensions varied positively from the first week of trying the tool until the last week of the four-week project. Specifically, the figures showed that the participants had a tendency to spend more time exploring the app as time went by. The interview data indicated that the participants used this tool for vocabulary learning, brainstorming ideas, and finding information. After using the tool for one month, most of the participants expressed a positive perception of its usefulness, with all of them intending to use it in the future and recommend it to others. The findings provided positive feedback for all teachers who have the intention to integrate technology and such AI tools as POE into teaching in general, and in teaching vocabulary in particular.

Nevertheless, teachers should take some considerations when considering employing this tool into language teaching. Some students found issues with POE's responses, including the problem that the answers provided by this tool needed to be more specific and more diverse than Google's. Some participants said they had difficulties with unfamiliar words, or too uncommon words, and thus they faced occasional misunderstandings. How to write a good prompt in either Vietnamese or English was another issue faced by the participants. Addressing these minor issues greatly enhances the tool's long-term effectiveness as a student support service, resulting in more significant benefits for learners.

The results of the study brought back several insights for practitioners, teachers, curriculum developers and even the program developers. In this study, however, there were some limitations that the authors did acknowledge. Firstly, the research relied on a small sample size for the quantitative data, which limits its generalizability. Conducting a larger-scale investigation in future research would be necessary to address this constraint. Secondly, the research only spanned a four-week period, potentially resulting in an incomplete representation of the various dimensions of engagement related to the construct. To gain a more comprehensive understanding of student engagement in vocabulary learning using this AI tool, it is recommended that a longitudinal study be conducted. This approach would provide a holistic picture of the topic over an extended period of time. Furthermore, in relation to the dimensions of the engagement construct, there is another dimension known as agency engagement which should be further examined in the future studies.

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Biodata

Thu-Thi Pham is currently working as a lecturer at the Faculty of Foreign Languages, Industrial University of Ho Chi Minh City. She has also taught part-time at other universities and English centers for almost ten years. Her research direction involves language teaching, language assessment, task-based language teaching, and technology-enhanced language teaching and learning.

Thien-Phuoc Le is an English lecturer at the Faculty of Foreign Languages at the Industrial University of Ho Chi Minh City, Vietnam. She has more than fifteen years of teaching experience in linguistics and language skills. Her research interests include lifelong learning, student engagement, project-based learning, and technology for sustainable learning.

Hoang-Mai Dang is currently working as a lecturer in the Faculty of Foreign Languages at the Industrial University of Ho Chi Minh City, Vietnam. She has been teaching English since 2013. Her research interests are teaching methodology and applying information technology in teaching.

Anh-Duong Nguyen has obtained ten years of teaching the language to a diverse population of learners in a number of academic contexts (universities, businesses, and language centers). Her research interests are using technologies in teaching English, curriculum designs, and methods in teaching English skills.