The Interplay between L2 Motivation and Artificial Intelligence: What and How

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ABSTRACT

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This study aims to investigate the factors affecting EFL learners' L2 motivation when learning with artificial intelligence (AI) and how those factors could affect L2 motivation. Equipped with Self Determination Theory (SDT), this study looked at two EFL classrooms in a university in Indonesia where AI apps were utilized. Two teachers and 21 learners participated, and the data were collected qualitatively using app evaluation, interviews, and FGDs. This study found that localization, valuableness, and engagingness were three factors of AI-injected language learning that greatly influenced the learners' L2 motivation. This study also found that localization could be approached using pedagogical views, while valuableness and engagingness could be viewed from psychological perspectives. This study offers a new construct in L2 motivation studies called the L-VE framework. The results of this study could contribute new insights into the discussion of L2 motivation and technology, particularly in the field of Computer-Assisted Language Learning (CALL).

Introduction

Motivation is one of the important elements in language learning, including English as a Foreign Language (EFL) classrooms. In language learning contexts, the term is known as language motivation or L2 motivation, following the work of Gardner and Lambert (1959) in the 1950s. Despite its crucial function, motivation is considered a complex subject. For L2 motivation, for instance, numerous theories have been proposed to understand the concept, and several influencing factors have also been found. For example, studies found that L2 motivation could be affected by learners' attitudes (Gardner, 1985), intrinsic motivation (Brown, 1994), social contexts (McGroarty, 2001), ideal L2 self (Dörnyei, 2005), and technology (Egbert, 2003).

Integrating technology in EFL classrooms has shown significant developments. Since the introduction of technology in language laboratories in the 1960s, computer application in the

1970s-1980s, the early internet in the 1980s, and web 2.0 and mobile technology at the beginning of the 21ˢᵗ century (Bax, 2003; Davies et al., 2011; Healey, 2016; Kelly, 2012; Warschauer, 2000), we are now in the dawn of a new era with artificial intelligence (AI). Adapting from Montebello's (2018) terminology, the integration of AI in language learning could be labeled as AI-injected language learning. However, only a few studies have looked at technology and L2 motivation (Al-Hoorie, 2017; Henry, 2019), and there are even fewer studies with AI. AI needs to have special treatment in L2 studies since AI is currently mushrooming, and current trends indicate that it will continue to develop in the future. The automation features carried by AI might have significant impacts on L2 motivation, as they have been found to offer both advantages (e.g., Aldosari, 2024; Ha, 2024; Sumakul et al., 2022) and disadvantages (e.g., Gallacher et al., 2018; Sumakul & Hamied, 2023; Suminar et al., 2025) to language learning. These opposite ideas might affect learners' motivational levels.

Accordingly, using the frameworks in Self Determination Theory (SDT) (Deci & Ryan, 1985), this study focused more on the interplay between AI and L2 motivation. To fulfill the purpose of this study, the data collected were used to provide the answers to the following research questions: 1) What factors of AI-injected language learning influence L2 motivation? 2) How do these factors affect L2 motivation? It is expected that the findings of this study could fill the gaps in technology and L2 motivation studies. Moreover, this study could provide insights to EFL teachers, learners, and software developers regarding the use of AI technology in EFL classrooms.

Literature review

L2 Motivation and Self-Determination Theory

Motivation is a key concept in general psychology. In general terms, it is about why a certain activity is performed, or a person performs an action. Motivation is the force that drives that action. However, this force could originate from various sources, both internal and external to the person. There is no single cause of action, and it might include social, psychological, biological, and cognitive elements. Those elements indicate that motivation is a complex subject.

As a complex subject, there is no single agreed-upon definition of motivation. There is little agreement regarding the definition of motivation (Dörnyei,1998), and coming to a simple definition will be impossible (Gardner, 2010). Different authors have different ways to describe and explain motivation. These could date back to the era of the Greek philosophers (Cooper, 1984; Reshotko, 1992). In the 20ᵗʰ century, one of the attempts to understand motivation was made by Deci and Ryan (1985) through a new construct in motivation studies known as Self-Determination Theory. Self Determination Theory is often abbreviated as SDT.

SDT refers to the energy and direction of behavior. Deci and Ryan (1985) state that SDT is "… the capacity to choose and to have those choices… be the determinants of one's actions" (p. 38). The choice mentioned here concerns the self-determination self-determination levels one has when performing an action. In regard to the levels, in that same book, they discuss three major types of motivational orientations in SDT: intrinsic, extrinsic, and amotivation. Moreover, SDT

also suggests that one can be self-determined in conditions where they have satisfied their basic psychological needs. These needs are competence, relatedness, and autonomy (Ryan & Deci, 2017). Motivational orientations and basic psychological needs are the core of SDT.

Regarding motivational orientations, intrinsic motivation is related to the internal stimuli one has when performing a behavior. Extrinsic motivation is related to external stimuli, while motivation occurs when one is not willing to perform the behavior. In other words, intrinsic motivation is the most self-determined form of motivation. Amotivation is the least self-determined form, while extrinsic motivation is positioned somewhere in between. This self-determined range is also known as the controlled-autonomous continuum.

The basic psychological needs, however, are not described in a continuum state. They are the most important concepts in SDT applications (Ryan & Deci, 2000). When they are fulfilled, the impact on motivation will be positive. Competence is the sense of mastery. When it is satisfied, one will have the feeling that they have the ability to perform the activity. Relatedness is about the connections to other people. This is satisfied when one has the feeling of being socially connected. Relatedness is experienced when one is meaningfully connected to other people. The last one is autonomy, the feeling of ownership. It happens when one performs an activity because they like doing it, not because of external reasons. Autonomy lies at the heart of SDT (Noels et al., 2019, p. 97). Without autonomy, competence, and relatedness, they are irrelevant.

Some studies on L2 motivation in EFL contexts have used SDT frameworks. For example, Brown (1994) concluded that intrinsic motivation is important in language learning. In another study, with explanations from the three basic psychological needs, Wu (2003) found several variables related to perceived autonomy in language classrooms. Furthermore, Noels et al. (2019) provided some examples of how motivational orientations could occur in EFL learning. They could serve as positive indicators for intrinsic motivation. A study by Henry and Lamb (2019) proposed three motivational constructs, namely vision, verisimilitude, and validation, that are closely related to SDT's basic psychological needs. Interestingly, that study is on L2 motivation and technology, which is the context of this paper. The study also suggested that SDT would serve as a suitable framework to use in the context of language learning and technology.

Artificial Intelligence in Language Learning

Artificial intelligence (AI) in language learning is part of technology integration into language classrooms and is under the field of Computer-Assisted Language Learning (CALL). Technology applications in language learning started in the 1960s (Warschauer & Healey, 1998), but the term CALL was first coined by Davies and Higgins (1982). In his analysis of CALL, Bax (2003) explains that the application of technology in language learning could be categorized into three stages: restricted CALL, Open CALL, and Integrated CALL. He suggests that integrated CALL is the normalization stage when technology application in language classrooms would be a common phenomenon. Technology would become invisible, meaning that technology would be taken for granted in daily use and hardly even recognized as a technology. With AI's current conditions and applications, this normalization might have started to happen.

AI offers automation. It is a prominent feature of AI. Nilsson (2010) states that AI projects are about the creation of intelligent machines, and this is about human intelligence (Stone et al., 2016). Synthesizing from various other definitions, Russel and Norvig (2016) suggest that AI could be defined as machines that can think and act humanly and rationally (pp. 2-5). As AI is created to mimic human intelligence, AI would think and act like a human language teacher in language teaching and learning contexts. Bailin (1987) suggests that AI would perform the role of a language teacher in a language classroom. Correspondingly, the development of AI for language learning should be based on what a teacher would normally do in a real language classroom.

In language education contexts, AI now has the ability to analyze, comprehend, and produce human language (Lu, 2018). With this ability, today's AI apps can talk to learners and understand learners. Many AI apps can also provide feedback on learners' speaking and grade their writing assignments. AI is beginning to do work like human teachers.

However, These remarkable achievements have triggered debates among researchers in language education. First, some studies have found that AI could bring benefits to language learners. For instance, AI apps have been found to have the ability to check learners' grammar, provide feedback (Bailin, 1987), and process language input (Holland et al., 1993). AI apps could also help learners improve their language skills. AI apps have been found to be able to help learners with their speaking (e.g., El Shazly, 2021; Madhavi et al., 2023), listening (e.g., Ghoneim & Elghotemy, 2021; Suryana et al., 2020), writing (e.g., Al Mahmud, 2023; Song & Song, 2023), and reading (e.g., Fitria, 2024; Lestari et al., 2021). Some studies have also found that AI could bring benefits to learners in terms of fostering soft skills (e.g., Borkovska et al., 2024; Sumakul et al., 2022) and help increase motivation (e.g., Alsager, 2024; Wei, 2023). The examples show that AI technology was mostly related to grammar in its early development. More recent studies indicate that AI has now expanded its ability to language skills and other aspects of language learning.

However, some other studies reported opposite findings. In its early development, the praises of AI were thought to be misunderstood (Last, 1989). O'Brien (1993) also viewed them as exaggerating. They are even doubted to have benefits for language learning (Salaberry, 1996). More recent studies suggest similar findings. The language produced is decontextualized (Wilson et al., 2021) and non-natural (Pace Sigge & Sumakul, 2022). Gallacher et al. (2018) conclude that AI apps cannot be used as legitimate learning tools. The more recent discussions on AI hallucinations (e.g., Maleki et al., 2024; Tilli & Burgos, 2025) put the cherry on top of the issues with AI.

These contradicting views complicate the debates on the benefits of AI in language classrooms. Such debates, however, could enrich the understanding of how to use AI apps properly. Pham and Cao (2025), for example, provide a thorough discussion on the use of AI in language classrooms from those two perspectives and offer some ideas that could minimize the issues. Rieland (2017) also mediates this discussion, stating that the core issue may lie in the design of the technology. Zawacki-Richter et al. (2019) state that the problems are in the pedagogical design of those apps. Sumakul (2019) adds another dimension to the discussion, explaining that the issue might also come from teachers' poor pedagogical knowledge.

Despite the debates, AI will continue to develop, and it is at an exponential speed. The integration of AI in language classrooms is inevitable. The automation features of AI offer the idea of more personalized learning. AI can potentially contribute significantly to language classroom development (Kannan & Munday, 2018). The potentials might still seem small in their current state, but they are on the horizon. Montebello (2018) states that AI is the future of education, and this includes language education. This idea suggests that numerous aspects of AI in education are yet to be explored. One of them is L2 motivation.

L2 Motivation and Technology

As discussed earlier, AI in language learning is part of the discussion of CALL (Computer Assisted Language Learning). In CALL studies, the pervasive use of digital technologies has intrigued researchers to examine how these technologies could impact L2 motivation. Although there are only a few of them (Al-Hoorie, 2017), some studies look at L2 motivation and digital technologies, including AI technology.

For example, Adolphs et al. (2018) investigated the use of digital technology in creating representations of language learners' ideal L2 selves. Mental visualization of ideal L2 selves has been claimed to positively impact L2 motivation. Nine EFL learners participated, and the data was collected through semi-structured interview sessions. During the interviews, the participants were shown three versions of their ideal L2 selves: 2D and 3D animations, facial masks, and facial overlay. The findings suggest that 3D animation presented the best impact on motivation, and facial overlay with improvements might have the potential to L2 motivation.

Another example is a study by An et al. (2023), and this is one study that looked specifically at AI technology. The study investigated EFL learners' use of AI technologies in their learning. One of the elements they examined was the motivational factors. Participated by 524 learners, this study used an eight-factor survey using a 5-point Likert scale. One of the findings showed that technological factors and social factors were relevant to L2 motivation. The technological factors included useful and usable AI tools, technological support, and an internet-supported learning environment. Meanwhile, the social factors were a social influence, organizational support, and cultural interest.

Regarding L2 motivation and technology in general, one study worth considering is a comprehensive discussion offered by Henry and Lamb (2019). In the article, based on SDT frameworks, they introduced three new constructs in L2 motivation and technology. These three constructs are vision, verisimilitude, and validation seeking. Vision is about using digital media as the current online environment provides numerous tools and resources for creating L2 learner's identities. Next is verisimilitude. It is about the interactions of digital entities in online environments. It is also about the perceived realness by learners regarding those digital entities and their interactions. The last one is validation seeking, the desire to be recognized in online social contexts, such as social media.

The technological tools that can be applied in the language classroom are developing rapidly. These technological developments have changed how learners learn and how teachers teach. AI technologies, in particular, are growing exponentially and invading language classrooms. AI could be the new 'new normal' in language education. However, research on motivation and

technology is still a part of these technological developments. Therefore, this is a very promising research area that could contribute beneficial ideas to studies in language learning.

Methods

Pedagogic Setting & Participants

This study was conducted at an English Language Education Programme at a university in Indonesia, where the use of digital technologies was already common. This study employed a purposive sampling method where the participants were selected based on the characteristics relevant to the research questions (Creswell & Plano Clark, 2018). Two teachers and 21 learners were involved as the participants of this study. 13 learners were first-year students who utilized Elsa Speak (mobile app, https://id.elsaspeak.com/) in their speaking classes, while eight learners were second-year students who used Plot Generator (web app, https://www.plot-generator.org.uk/) in their writing classes. One teacher taught one of the speaking classes, while the other taught one of the writing classes.

Design of the Study

This study used a qualitative approach to get an in-depth understanding of the topic of the study. Creswell (2014) explains that qualitative design could develop a comprehensive understanding of the topic and find new and specific ideas and a deeper understanding of the subject. To answer the research questions, this study employed software evaluation, interviews, and Focus Group Discussions (FGDs) as the instruments for data collection. In CALL studies, one of the elements to examine is the technology being used, and it is known as software evaluation (Chapelle, 2001). The purpose of the software evaluation was to explore features of the apps that were relevant to the purpose of the research. A third party, an expert in CALL studies, verified the results of the software evaluation. Meanwhile, the interviews were semi-structured. The questions concerned the learners' use of the apps, such as their experience in using each app, what they liked about the app, problems, duration, and how the app helped them learn. The interviews were also conducted via WhatsApp. This practice is called Mobile Instant Messaging Interview (MIMI). Kaufmann and Peil (2020) suggest that MIMI offers some benefits over direct oral interviews in terms of flexibility, efficiency, and richer data. Moreover, The FGDs were intended to confirm the interview data and reveal more data regarding group norms (Creswell & Plano Clark, 2018).

Data collection & analysis

Software evaluation was conducted at the initial phase of the research, and it contributed to the development of questions used in the interview and FGD sessions. The interviews were done first with the teachers and then with the learners. The interviews were conducted via WhatsApp, and the sessions lasted for about a week as they were done asynchronously. The FGD sessions were conducted face-to-face with the learners. They were the final phase of the data collection process. Moreover, they were conducted separately for each group and lasted about one hour. The conversations during the FGD sessions were transcribed for analysis.

The software evaluation data were analyzed to look at the apps' functions, features, intelligence,

how the apps work, and their language learning potentials. Within the context of this study, the apps were specifically examined on how learning with these apps could affect L2 motivation. Meanwhile, the analysis for the interview and FGD data looked at topics relevant to the answers to the research questions. They were analyzed using thematic approaches. The themes were based on SDT's frameworks (Deci & Ryan, 1985). New emerging themes were also categorized based on the data collected. Following Maguire and Delahunt (2017), the thematic analysis was conducted in several step-by-step activities: reading, coding, theming, and reviewing themes. Reading was done to familiarize myself with the data. After reading was coding, where labels were put to data. Once coding was settled, theming was performed to find more general words to represent the codes with the same or similar activities. Finally, the themes were reviewed, examining whether they made sense. Adjustments were made where necessary.

Results/Findings

Factors Affecting L2 Motivation

This study found that three factors of AI-injected language learning could affect L2 motivation. They were localization, valuableness, and engagingness. These three factors were found based on the data from software evaluation, interview sessions, and FGD sessions.

Localization

In general, localization is about adaptation. In the business field, Vavare (2019) explains that localization could mean the adaptation of a business product or service to suit the characteristics of a specific market. It is about recreating users' experiences and values of a product or service to the new targeted market (Matović, 2018). Borrowing the concept from this business field, in the context of this research, localization could be translated as how teachers use an AI app in their classrooms. It is about how teachers localize the power offered by an AI app in their teaching practices to facilitate their learners. Sumakul (2019) points out that successfully integrating technology into education is not only about teachers' technological competence but also their pedagogical competence. This study found that how the two teachers localized the AI apps might affect L2 motivation. Based on the interview data with the teachers, there were three sub-factors of this localization factor: language skills, soft skills, and classroom utilization.

- Language skills

When a teacher plans to use technology in a language classroom, the first thing to consider is its language learning potential. It concerns how the technology would help the learners learn the language. Based on the interview data, the teachers participating in this study also had the same idea. For example, Teacher 01 said she decided to use Elsa Speak because she thought the app could help her students with pronunciation. Teacher 02 also explained, "I decided to use Plot Generator because it was suitable for the course and allowed the teacher to use it as a teaching tool". These excerpts clarify that the teachers understood the language learning potential of each AI app.

- Soft skills

These AI apps could also foster soft skills when used properly, not only for language skills. The

teachers participating in this study understood the benefits offered by the AI apps regarding soft skills. Teacher 01, for example, was aware that Elsa Speak could promote learning autonomy in addition to pronunciation skills. Teacher 02 had a similar idea regarding Plot Generator, stating that the app had the potential to promote critical thinking and creativity. Both teachers use the AI apps with such an understanding that the apps could further be used to help learners acquire both language and soft skills.

- Classroom utilization

Classroom utilization relates to how teachers integrate AI apps into classroom practices and the design of learning activities. When the teacher already recognizes the learning potential of the app, both language skills and soft skills, the next stage is to design the learning activities with the app to be implemented in the classroom. Based on the interview data, this study found that there were several things to consider when utilizing AI apps in language classrooms. They were whether the app would be used inside or outside the classroom, how long it would be used, in what learning activities, and how it would be used, individual or group work. These considerations and practices might also have implications on L2 motivation.

Valuableness

This study found that valuableness was another AI-injected language learning factor that could affect L2 motivation. Valuableness is about the values or benefits learners think they will get when learning with an AI app. That is the difference between localization and valuableness. Localization is related to the teacher's design of the learning activities, while valuableness is what the learners perceive about the learning activities. When learners find the activities with an app useful, it could be the reason to continue using it. In SDT, this is closely related to identified regulation, one self-determined type of extrinsic motivation. One strong piece of evidence from this study was a comment from a learner during the interview. As Student II-06 said, "I didn't use it again, not because it's not interesting. But, for what?" This excerpt highlights that the motivation to use the app was about the benefits. Another example was from Student I-03, who said, "… for practising my pronunciation." when asked about why she used Elsa Speak. From the interview and FGD sessions, many learners confirmed that Elsa's speaking helped their pronunciation and Plot Generator helped their writing. These are the core values that the learners perceived from using the apps. This study also found that there is more to this valuableness factor. It may be broken down into several sub-factors: primary skills, secondary skills, and learning fit.

- Primary skills

Primary skills are the abilities identified by the learners that they would mainly learn when using the app. In this study, the first-year students identified that pronunciation skills were the primary skills offered by Elsa Speak, while the second-year learners thought writing skills were the primary skills of Plot Generator. In addition to pronunciation and writing skills, some other concepts that can be categorized as primary skills were also found. Some second-year students, for example, mentioned that the Plot Generator app also helped them understand some theoretical concepts relevant to their writing skills, such as the elements of short stories, genres, themes, writing styles, paragraph hooks, and plot twists. These were revealed in the interview

and FGD data.

- Secondary skills

Secondary skills are the abilities identified by the learners in addition to the primary skills. For example, some first-year students found that they could learn other things from Elsa Speak, such as grammar and vocabulary. Similarly, some second-year students discussed that they also learned grammar and vocabulary while working with Plot Generator. Moreover, besides grammar and vocabulary, the students also mentioned that the app helped them develop soft skills and knowledge of the target language's culture.

- Learning fit

Learning fit literally means that the AI app suits their learning contexts. In a more detailed explanation, learning fit is a condition where students are able to directly apply the skills they learned while using an AI app in their own learning contexts. This is another value the learners got from the AI app. This learning fit idea came during the interview sessions with the first-year students. Many learners mentioned another AI app called Rivet. The app offered some texts for the learners to read aloud. While they read the text, Rivet could recognize their pronunciation errors and suggested the correct versions. With Elsa Speak, the learners did some exercises focussing on individual sounds. The idea that on Rivet, the learners could do reading activities while practicing their pronunciation skills highlights the values of learning fit.

Engagingness

Similar to valuableness, the engagingness factor is attached to an AI app, not to the teacher as in localization. Engagingness occurs when learning is considered pleasant or enjoyable. This quality of being pleasant or enjoyable is related to intrinsic motivation. Inherent satisfaction and enjoyment are two characteristics that are usually attributed to intrinsic motivation (Ryan & Deci, 2017). When a learner is engaged in a learning activity, it might imply that the learner found the activity pleasant or enjoyable. The interviews revealed that many first-year students liked or enjoyed working with Elsa Speak. Moreover, some students also said they still liked using the app, although the term had been over. For example, Student I-03 said, "I used it every day last semester … I am still using it although the semester has ended". When asked why they were still using it, Student I-12 replied, "I just like using it." The second-year students reported similar data. In the interviews, many learners mentioned that they enjoyed working with Plot Generator. The word "enjoyable" appeared several times during the interviews. These answers were also confirmed during the FGD session. Many students agreed they liked learning with the AI apps, and some used the app again even if it was not part of their class lessons anymore. In short, the learning activities with those AI apps were engaging. Further analysis of the interview and FGD data revealed several sub-factors of the engagingness factor. They were all related to the features of the apps: intelligence, usability, pedagogical functions, and entertainment functions.

- Intelligence

As AI-powered apps, the intelligent levels of Elsa Speak and Plot Generator played a crucial role in L2 motivation. Based on the software evaluation data, Elsa Speak could recognize

learners' pronunciation errors and provide feedback. The app could also develop a syllabus personalized to each learner. For Plot Generator, the app could create short stories based on the prompts provided by the learners. The learners also mentioned the amazing work done by these apps during the interview sessions, which was confirmed in the FGD sessions. Software evaluation confirmed this. The same case occurred with the Plot Generator. Some learners reported that sometimes, the stories created by the app did not make any sense. The learners need to spend some minutes editing the stories before submitting them to the teacher. These unintelligent phenomena might deteriorate the EFL learners' motivation while working with the apps.

- Usability

Usability is about the ease of using the apps. An app with good usability could be simply described as user-friendly. Another sub-factor found in this study could affect L2 motivation. Usability was evident in software evaluation, interviews, and FGD data. Software evaluation data suggested that the mobile app's user interface was relatively simple. Moreover, many learners reported that both apps were easy to use. Many second-year students also reported similar things with Plot Generator. However, this app did not work well on mobile phones. It was better accessed through laptops or desktop computers. The ease of use of those apps would affect L2 motivation positively, but the unavailability of the mobile version of Plot Generator could have negative impacts on learners' motivation. One advantage of mobile phones compared to traditional computers is their high portability (Stockwell, 2016). An app is engagement level might also increase when it is easy to use.

- Pedagogical elements

When an app is intended to be used for language learning, the design of the app should support language learning. This is known as the pedagogical design of an app. This might be related to the primary skills in the valuableness factor described earlier, but this was not always true. The pedagogical functions here were part of the app design, while the ones in primary skills were the ones perceived by the learners. This study found that pedagogical functions could also affect the level of engagement. This was found in the software evaluation data. For example, Elsa Speak was designed to improve pronunciation skills. The software evaluation data suggested that the app had a good pedagogical design since it contained pre-and post-tests, a targeted learning objective, and a comprehensive syllabus. On the other hand, Plot Generator did not have all those elements. This could be why the learners spent more time on Elsa Speak than Plot Generator.

- Entertaining elements

Another sub-factor of engagingness is the entertaining elements. This study found that there were several factors that play a role in this entertaining subject, such as looks, comedic aspects, and gamification features. However, the interview data showed that there were contradicting opinions regarding the entertainment functions. For example, Student I-08 praised how Elsa Speak looked, as it is interesting and beautiful, while Student I-12 mentioned that the app's look was too monotonous. This suggests that looks could be subjective. Student II-01 said that Plot Generator was entertaining because the results were so funny. Student I-10 added another thing

about Elsa Speak: "For me, the app is not only very educative, but it also has entertaining elements." When asked about it, she mentioned that she liked the gamification feature in the app. In the FGD sessions, she further explained that with gamification, learners would be more encouraged to use the app for learning. These examples show that entertaining functions could play some roles in the engagingness level of AI apps.

How the Factors Affecting L2 Motivation.

Localization, valuableness, and engagingness have been found to be factors of AI-injected language learning that could affect L2 motivation. To have a deeper understanding of the roles of AI technology in L2 motivation, it was also necessary to find out how those factors affect the motivation of EFL learners. Based on some existing theories relevant to L2 motivation and CALL studies, this research found that how the factors of AI-injected language affected L2 motivation could be viewed from two different perspectives: pedagogical and psychological approaches.

Pedagogical Approach

From a pedagogical perspective, this study found that localization, valuableness, and engagingness affected L2 motivation. This could be explained by two terms: lesson design and app design. Table 1 shows the matrix of this pedagogical approach. The matrix shows how the two variables, *factors affecting L2 motivation* and *design types*, are interrelated. The shaded

Table 1.

Matrix of Pedagogical Perspective

	Design Types	
Factors Affecting L2 Motivation	**Lesson Design**	**App Design**
Localization	▨	
Valuableness		▨
Engagingness		▨

areas show where the two variables are interconnected. Localization could be affected by the design of the lesson, while valuableness and engagingness might be influenced by the design of the AI app. Teachers did the former, while the latter was part of the work of the app developers.

Localization is part of the teacher's efforts in adapting the app's features to the learning activities. In other words, the teacher is the one who localizes the AI app to be used in the language classrooms. This is part of the lesson design, and the app should not be the only classroom activity resource. There are so many things that the teacher needs to consider when integrating the app. Localization may only be applicable when the teacher has a plan to use technology, AI in particular. When localizing the AI app, as discussed earlier, the teacher needs to first recognize the benefits of the app in terms of language learning. Moreover, the teacher also needs to identify what soft skills could be included in the activities with the app. As

Halvorsen (2018) explains, a language classroom is an ideal place for the development of soft skills. Finally, the teacher can start creating classroom activities based on these language and soft skills. All these efforts would contribute to L2 motivation. For example, incorrect recognition of the language skills and soft skills potential with the app might decrease the learners' willingness to use the app in their learning. Similarly, inappropriate development of the classroom activities with the app could also affect L2 motivation. This explanation might better explain why lesson design is related to localization.

App design also plays a role in L2 motivation. As discussed earlier, this study found that the valuableness and engagingness factors also affected the learners' motivation. Valuableness is about the values relevant to their learning that the learners found in an AI app, while engagingness is related to the features of the app that make the activities while using the app enjoyable. Unlike Localisation, valuableness and engagingness are beyond the teacher's control. They are part of the app design and are programmed by the app developers.

Psychological Approach

This is another angle to see how AI-injected learning factors might affect L2 motivation. From a psychological perspective, this study found that localization, valuableness, and engagingness might also be associated with the basic psychological needs in SDT (Deci & Ryan, 1985). Table 2 offers a visual representation of this relationship. The matrix shows that localization can be explained by relatedness. Meanwhile, valuableness is connected to competence, and engagingness has something to do with autonomy. The relationship between the elements of these two variables, factors affecting L2 motivation and basic psychological needs, adds another dimension to the explanation of how these factors could affect L2 motivation.

Table 2.

Matrix of Psychological Perspective

	Basic Psychological Needs		
	Relatedness	**Competence**	**Autonomy**
Localization	▓		
Valuableness		▓	
Engagingness			▓

Relatedness is the basic psychological need concerning social practices. In other words, it is the socio-psychological need in SDT. It is about the feeling of connection between the performer of the action and the other people (Ryan & Deci, 2020). This need can be satisfied when one needs others and while one is being needed by others (Ryan & Deci, 2017). It can be satisfied in a two-way social direction. As the teacher does localization, the teacher is responsible for satisfying this need. This can be seen in this study's activities with the plot generator. The teacher did the activity in group work so each learner could contribute ideas to their classmates in their group. Moreover, when learners participates in their group and need ideas from their friends in their group, their relatedness needs are satisfied. Therefore, relatedness can be

satisfied when a learner is contributing to others and when a learner is given contributions by others.

Competence is about the feeling of mastery (Ryan & Deci, 2020). When one owns this feeling, it is an indication that they have the ability to do the activity that they are doing. This is associated with the valuableness factor found in this study. The benefits the learners gained from the AI apps help satisfy their competence needs. In this study, as discussed in the previous section, primary skills, secondary skills, and learning fit were the benefits that the learners perceived they got from learning with the AI apps. These benefits could help the learners feel that their competence needs were fulfilled.

Autonomy is a condition when people do an activity because they like doing it. The same reason was found in this study in the engagingness factor. Many learners said they did the learning activities with the AI apps because they liked them. When they do the activity, they perform it with the feeling of ownership (Ryan & Deci, 2020). In the same case in this study, when the learners enjoyed their learning, they developed a feeling of ownership of their activities with the AI apps. Autonomy is the most important psychological need in SDT, without which relatedness and competence would not be enough to motivate (Ryan & Deci, 2017; Noels et al., 2019). Therefore, autonomy can be labeled as the heart of SDT.

Discussion

Up to this point, the answers to the two research questions have been answered. The factors affecting L2 motivation in AI-injected learning contexts are localization, valuableness, and engagingness. Furthermore, how these factors could affect L2 motivation can also be explained by using two perspectives: pedagogical and psychological. These findings add new dimensions to the factors affecting L2 motivation and technology found in other previous studies. These factors could be in the forms of learning, empowerment, and communication (Warshcauer, 1996); learners' external and internal factors (Raby, 2007); technical infrastructure, teaching-learning process, and evaluation (Selvi, 2010); visions to learners' future selves (Adolphs et al., 2018); entertaining and educational elements (Lamb & Arisandy, 2019); vision, verisimilitude, and validation seeking (Henry & Lamb, 2019); and technological and social factors (An et al., 2023).

Not only do the findings of this study provide new ideas on L2 motivation and technology, but in many cases, they could also confirm the findings of some previous studies. For example, the valuableness factor might be similar to the empowerment factor found in Warschauer (1996) and the useful AI tools factor found in An et al. (2023, while the engagingness factor might be related to the technical infrastructure factor in Selvi's (2010). The localization factor could also intersect with the teaching-learning process factor in Selvi (2010). The confirmation could also go deeper with the sub-factors. For instance, this study found that under the localization factor, teachers needed to identify soft skills before utilizing an AI app in the classroom. In addition to language skills, Brown (2004) has claimed that soft skills are essential for language learners, and language classrooms have the potential to develop soft skills (Halvorsen, 2018; Sumakul, 2021).

Furthermore, gamification, as part of the valuableness factor, has also been found beneficial to L2 motivation (Dehghanzadeh et al., 2021). Similar findings of the intelligence sub-factor were also previously reported by Pace Sigge and Sumakul (2022) and Wilson et al. (2021). Another example, the pedagogical and entertaining elements under the engagingness factor, are also related to Lamb and Arisandy (2019), who found that these elements were also important in technology-supported learning environments. Especially pedagogical elements, the idea discussed by Rieland (2017) maintains that one of the big issues of educational technology is the pedagogical design of the technology being used. In relation to that, Pace-Sigge (2017) suggests that linguists should also be involved during software development. The learning fit sub-factor might have an intersected conceptual explanation with Henry and Lamb's (2019) verisimilitude when it is related to perceived realness.

Moreover, the discussions on the findings in this study have also led to the development of a new construct relevant to L2 motivation and technology contexts, called the L-VE framework. Figure 1 shows how the L-VE framework is depicted in a visual representation. From the diagram, it can be seen that the three main elements of the framework are represented by three big capital letters. L is the abbreviation of Localisation, V represents valuableness, and E represents engagingness. Each of these letters is contained in a different box consisting of the sub-factors. The L box has language skills, soft skills, and utilization, and the V box consists of primary skills, secondary skills, and learning fit. Meanwhile, the E box has four sub-factors: intelligence, usability, pedagogical elements, and entertaining elements. Moreover, there are two areas represented by two different colors, and a vertical dashed line separates them. Blue is for lesson design, while green is for app design. The use of the dash (-) symbol in the framework's name, L-VE, is also meant to separate these two areas.

Figure 1.
The L-VE Diagram
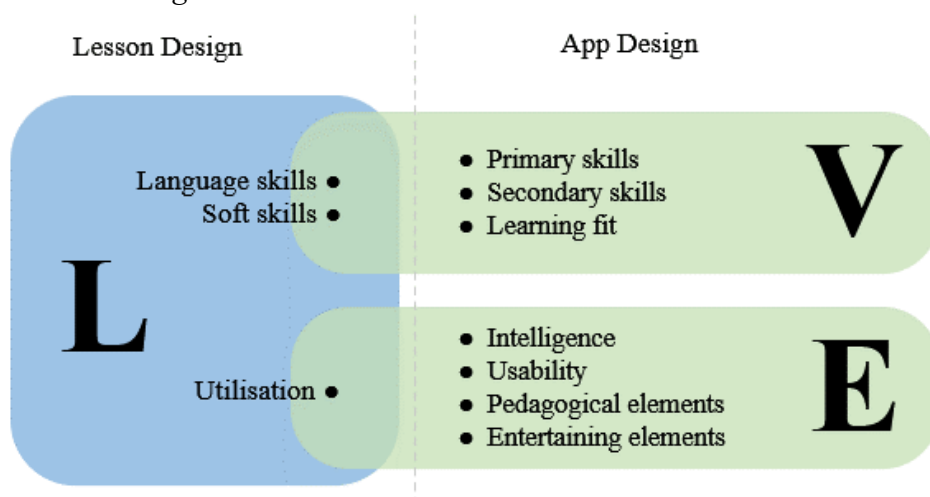
One interesting thing could be observed in the overlapping areas. There are sections where the localization cube intersects with valuableness and engagingness rectangles. The diagram shows that although language skills and soft skills are part of the localization area, they could also be part of the valuableness area. The same case happens with utilization. Although it is part of the Localisation blue cube, it is also located inside the engagingness green rectangle. This

overlapping phenomenon means that teachers in lesson design could localize parts of the app design. Teachers could localize the features of an AI app to be used in the teaching-learning process in the classroom.

Another thing that needs to be explained for the framework is the order of the letters. The L letter comes first, while the V and E letters follow afterward. Localization is positioned in the beginning since it is considered that pedagogy should be the starting point of the concept. Localization is associated with pedagogy since it is part of the lesson design. Valuableness and engagingness are associated with technology since they are part of the app design. The size of the boxes also resembles this idea. With the same logic, the blue cube is bigger than the green rectangles as, in this L-VE construct, pedagogy is regarded as a more significant concept than technology. In the context of this study, the most important factor for L2 motivation is pedagogy.

Moreover, although this new concept was born in an AI-injected learning context, it could also be applicable in other CALL contexts. For example, intelligence was found to be one of the sub-factors of valuableness. This might not be relevant in other non-AI types of technology, but valuableness should also be put into consideration when researching L2 motivation. What learners find valuable for their learning might appear in different forms. With the explanation above, this L-VE construct highlights the importance of teachers' pedagogical competence in technological contexts. Although this construct comes from an L2 motivation study, it could also be expanded in other language learning with technology contexts. Technology, AI in particular, might develop into a more sophisticated form, but teachers will always have the key roles when it comes to integrating technology into classroom practices.

Finally, the findings of this study narrowed down to recommendations for both educators and app developers. For teachers, the integration of AI technology in the teaching and learning process is quite recommended as it comes up with various benefits to the learners. Within the context of this study, when localized well, the use of AI could increase the learners' L2 motivation. However, for the localization to happen properly, teachers need to possess sufficient pedagogical competence. The app developers, especially for apps specifically designed for language learning purposes, need to consider two major things: valuableness and engagingness. Different learning contexts might have different needs, but the app developers might want to make sure that the technology they are developing would offer language learning values to the learners and promote engagement at the same time.

Conclusion

This study has found that three factors could affect L2 motivation in AI injected learning context. They are localization, valuableness, and engagingness. There are three sub-factors for the localization factor: language skills, soft skills, and classroom utilization. Meanwhile, for the valuableness factor, the sub-factors are primary skills, secondary skills, and learning fit. The engagingness factor consists of intelligence, usability, pedagogical elements, and entertaining elements. This study also found that how those factors affect L2 motivation could be viewed using two perspectives: pedagogical approach and psychological approach. The pedagogical

approach explains those factors using lesson design and app design. Localization is part of the lesson design since it is part of the teacher's efforts to localize the power of the AI apps into the teaching and learning activities. Meanwhile, the valuableness and engagingness factors belong to the app design. These two factors are beyond the control of the teacher, as the software programmers design them. Moreover, using the psychological approach, this study connects those three factors to the basic psychological needs in SDT (Deci & Ryan, 1985). Localization can be associated with relatedness, valuableness is related to competence, and engagingness to autonomy. From those findings, this study also proposed a new construct in L2 motivation and technology, called the L-VE framework, reiterating the importance of teachers' pedagogical competence in CALL practices. This L-VE framework can be considered an option for future studies in L2 motivation with various technological tools, not limited to AI-injected language learning environments.

The findings of this study also come with two pedagogical implications. First, this study suggests that AI technology could positively impact L2 motivation. This is in line with the findings of other similar studies (e.g., Alsager, 2024; Yin et al., 2021). Second, this study also highlights the importance of teachers' pedagogical competence when working with AI technology. This has been reiterated in other studies, such as Sumakul (2019), who proposes that ACE (analytical, creative, and evaluative) skills are key requirements when teachers are involved in AI in their teaching practices. Similarly, Ho (2024) strengthens that the role of teachers is irreplaceable even in the era of AI. With good pedagogical competence, teachers could design learning activities with AI apps that could provide optimum benefits to learners.

Finally, this study was conducted at a university where two teachers and 21 EFL learners used Elsa Speak and Plot Generator in their classrooms. The data was collected qualitatively through software evaluation, interviews, and FGD sessions, and the analyses were conducted mainly using SDT frameworks. The data from interviews and FGD sessions might also have potential biases due to subjective answers from the participants. Correspondingly, the variables involved, the data collected, and the analyses conducted might not be adequate to provide a comprehensive discussion on L2 motivation and technology, AI in particular. Therefore, for future studies, it is recommended that more participants be involved, more data collection tools be used, and more AI apps be explored. It is also possible that future studies could also employ other theoretical frameworks other than SDT. Quantitative data might also enrich the discussion on this topic.

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