Indonesian university students' perspectives on integrating AIEd into English language learning

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Our research investigated the integration of artificial intelligence in education (AIEd), focusing on Indonesian university students' perspectives. A quantitative survey design was based on the *Technology Acceptance Model* (TAM), a framework focused on perceived usefulness, modified by adding items related to affective aspects: interest, needs, excitement, and enjoyment; and cognitive aspects: listening and speaking skills with vocabulary and pronunciation components; reading skills focused on vocabulary enrichment; and writing skills with features of translation, vocabulary buildings, grammar checkers, sentence paraphrasers, idea content generators, and citation management. The questionnaire comprised 13 items based on a 4-point Likert-style scale and one item about types of AIEd. The study encompassed a cohort of 285 university students from four islands in Indonesia: Sumatra, Java, Kalimantan and Nusa Tenggara. The findings recorded 39 types of AIEd used by students. Most of the respondents have positive perceptions of the integration of AIEd, with index scores ranging from 79.1 to 84.6, while only a few of them expressed negative perceptions. Future research can consider exploring the students' perceptions through qualitative research that uses interview data.

Introduction

In recent years, artificial intelligence in education (AIEd) has had a significant impact in the educational field. AIEd is accepted as a technological trend with continually advanced features to support students' English language learning process (Hwang et al., 2020). Now, the integration of AIEd into English language learning has become a phenomenon. It indicates that a transformational process is making profound changes that are evolving in the field of education. This paradigm shift in technology has various effects on students' learning experiences (Montenegro-Rueda et al., 2023).

There are four main reasons why students choose to interact with AIEd: communication, interaction, information, and academic (Smith & Short, 2022; Yang et al., 2022). The reasons are clearly justified since AIEd is beneficial to learning academic language for communication purposes. The utility of using AIEd in the learning of the English language is an additional component in processes that can be evolved and transformed into engaging experiences, captivating learning, greater enjoyment, as well as better retention of knowledge and understanding.

Research on technology integration in EFL has been popular in recent years because of its positive pedagogical contributions (Ulla et al., 2020). In the Indonesian context, the existence of AIEd in English as a foreign language (EFL) settings is now trending as a solution to captivate the different challenges and fulfil the students' needs (Wulyani et al, 2024. A concrete example of AIEd used in language learning manifests when students engage with, for instance, BBC Learning English, Cake, Chatbots, Duolingo, Hellotalk, Smalltalk, Tiktok, and YouTube, with pronunciation and vocabulary practices facilitated to learn listening and speaking skills. Chat GPT, Google Assistant, Google Translate, Grammarly, Quillbot, and Wordtune contribute to improving students' writing skills (Sumakul et al., 2022).

Previous research studies have explored many aspects of AIEd. Extensive research indicates that teachers and students in English language classrooms are generally familiar with and have been exposed to AIEd (Suci et al., 2022). A notable study conducted by Kim (2021) revealed a substantial enhancement in the speaking skills of Korean EFL students when instructed through AIEd using chatbots. Kim's study affirmed the positive influence of integrating AI chatbots in fostering language proficiency, but it centred on testing only one AIEd application, so there is a notable gap in research. This is a lack of studies delving into the perspectives of students regarding use of a diverse, full range of AIEs in English language learning experiences.

Another kind of research focuses on AI plot generators, as exemplified by the work of Roe et al. (2023), who investigated the implications of 'AI-powered writing tools' on academic integrity within language classrooms. Existing studies on this topic have mostly focused on technical factors, analysing the effect of AI plot generators on writing performance, and paying very little attention to students' opinions. Sumakul et al. (2022) conducted a case study consisting of interviews with EFL students in Indonesia, who explained their positive perspectives on the AI plot generators used in only one writing class. However, empirical research related to students' perspectives on the use of various AIEd applications is limited, especially in terms of the students' cognitive and affective aspects, and limitations due to sample sizes.

It is essential to measure students' perspective as the result of their perceptions will contribute to how students see or view one particular variable (Khotimah et al., 2023), which is AIEd in our study. Our research study then provides a fresh perspective taken from the unresearched territory by looking at students' perspectives on the use of AIEd in English language learning, which has never been done by previous researchers. For this purpose, our study endeavours to answer the following questions:

1. What is the students' perception of the usefulness of AIEd in English language learning?
2. What is the students' perception of the usefulness of AIEd on affective aspects of English language learning?
3. What is the students' perception of the usefulness of AIEd on cognitive aspects of English language learning?
4. What are the types of AIEd tools used in English language learning?

Review of literature

Framework of technology acceptance model (TAM)

The technology acceptance model (TAM), introduced by Davis in 1986, was derived from the theory of reasoned action (Venkatesh & Davis, 2000). It focuses on two key external factors: perceived usefulness and perceived ease of use, which influence users' acceptance of technology (Al-Emran et al., 2018). These factors significantly contribute to users' intention to engage with technology. TAM forms the theoretical foundation, with a positive correlation noted between users' intent to adopt new technology and its actual use (Wu & Chen, 2017). Perceived usefulness reflects the belief that technology enhances task performance, positively correlating with users' performance expectations (Chen et al., 2020). Perceived ease of use gauges the belief in using a technology effortlessly, with an easier-to-use technology fostering positive attitudes and user willingness for adoption. The TAM framework is chosen for our research, primarily due to its comprehensive approach to finding students' perspectives on their technology acceptance of AIEd.

We adopted the TAM framework and modified it by correlating with pedagogical aspects, namely cognitive and affective aspects. The adaptation and modification make the framework strongly connected to pedagogical aspects. The relationship between each dimension is depicted in Figure 1.

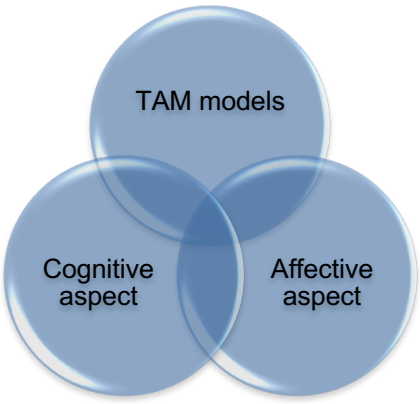

Figure 1: The adoption of TAM framework

Figure 1 describes the relationship between the TAM framework and cognitive and affective aspects of English language learning. The TAM framework helps to assess the perceived usefulness of using AIEd in English language learning in terms of intensity and needs, combining with the perceived usefulness of affective, comprising excitement and enjoyment, and with cognitive aspects, comprising reading comprehension, language learning improvement, learning speaking and writing, pronunciation, vocabulary, sentence paraphrasing, and grammar. As learning English cannot be separated from the pedagogical aspect, modifying the TAM framework is essential to making the framework more complete.

AIEd in English language learning

While pedagogical aspects have been a focus, AIEd integration enables support and facilitates students' language learning (Xiao & Yi, 2021). UNESCO noted that AIEd's impact on educational research output has improved significantly with a projected growth rate of 43% between 2018 and 2022 (UNESCO, 2019). This shows that the integration of AIEd into language learning is gaining the attention of researchers.

The integration of AIEd into English education boosts students' motivation, and fosters their enthusiasm for language acquisition. In EFL classrooms, AIEd applications have shown stronger empirical support employing advanced systems such as machine learning and natural language processing which have a profound influence on language learning (Chen & Hwang, 2020). The convergence of expert systems with language programs embedded in AI machines enables advanced language processing for personalised guidance to students (Bin & Mandal, 2019).

In English language teaching, AIEd provides personalised feedback which is needed, especially in students' language acquisition (Anggraini et al., 2023). AIEd-driven English education enriches classroom experiences, enhancing students' performance and proficiency (Kumar, 2019). The integration of AIEd is indeed proven to contribute positively to various aspects of students' English language learning.

Types of AIEd used in English language learning

The types of AIEd that have been frequently used in English language learning include chatting robots (Chatbots), ChatGPT, and Google Translate.

Chatting robots (Chatbots)
A growing number of academic works highlight the potential benefits of using AIEd, especially in language training (He, 2020; Klimova et al., 2023). Chatting robots, also known as 'chatbots', play an important role in enhancing students' speaking performance and have proven their efficacy in the domain of EFL learning area. Kim (2021) conducted an empirical study that showed a significant improvement in Korean EFL students' speaking ability enabled by the use of an AI chatbot that improved skills and fostered motivation and curiosity in students. However, debate on the general usefulness of AI chatbots across different levels of English competence continues, with some observations identifying issues in the areas of pronunciation and language interpretation (Kim, 2016; Kim, 2021). Other research conducted in Indonesia also supports the idea of using AI chatbots in language focus, coinciding with global efforts to use AI to improve speaking. Findings show Chatbots have a positive impact and implications for supporting learning speaking (Yang et al., 2022).

Chat GPT
The rising interest in AIEds such as Chat GPT (Generative Pre-trained Transformer), has caught students' attention, possibly beyond the learning needs (Atkinson, 2023). Chat GPT is a type of Open AI developed though a machine learning system. As an AIEd tool,

Chat GPT provides fresh ideas and content, and comprehensive feedback to increase students' knowledge. The use of Chat GPT is real evidence that AIEd plays an essential role in language learning (Montenegro-Rueda et al., 2023). Ever since the launch of ChatGPT3, there have been a variety of reactions from teachers, including worries regarding academic dishonesty and plagiarism (Lund & Wang, 2023; Yeo-Teh & Tang, 2023). While students found it useful and practical to use for assistance in doing assignments, it is crucial to evaluate the influence of this tool on traditional research procedures and the possibility of bias, while at the same time recognising its capacity as a quick tool to gain information and raise awareness about the development of critical thinking skills and the preservation of stereotypes (Atkinson, 2023; Pavlik, 2023). Finding a healthy balance between the advantages and disadvantages of AIEd-based tools is a way to create a successful and ethical educational environment (Gayed et al., 2022; Zhao, 2023).

Google Translate

In contrast to conventional statistical machine translation systems, a type of AIEd named *Neural Machine Translation* (NMT) is widely used by students: Google Translate (Faradiba & Aini, 2024). It is a type of AIEd designed to create translation automatically. Programs such as Google Translate and Microsoft Translator are used in language teaching and learning and have received extensive positive feedback (Jiang, 2022; Vanjani & Aiken, 2020), although Zhu (2020) found that NMT tools can reduce critical thinking in learning. Klimova et al. (2023) considered NMT to be appropriate for advanced second language (L2) learners. Pedagogically, NMT tools support activities such as comparisons, analytical language, and awareness-raising exercises (Tarsoly, 2019). Although several research reports highlight existing flaws, empirical research shows that NMT tools can be beneficial for EFL students (Lee, 2020). As EFL students often struggle with English language acquisition and linguistic competence, AIEd tools such as Google Translate and Microsoft Translator are valuable in assisting their comprehension of English materials by translating from a source language (Indonesian) to a target language (English) or vice versa.

Method

The research design

Our research investigated students' perspectives on integrating AIEd for English language learning in an Indonesian university context. It focuses the perceived usefulness of AIEd based on both cognitive and affective aspects. To answer the research question, a quantitative survey methodology was used, involving a systematic collection of numerical data, guided by a structured and predetermined research design, ultimately yielding empirical findings that lead to quantifiable and measurable conclusions (Creswell & Creswell, 2023).

Participants

The participants are EFL undergraduate students from 10 different universities in Indonesia. They are English department students from faculties of education, majoring in English education. Their study programs prepare them to become English teachers in junior or senior high schools. They gain knowledge concerning English language, literature, linguistics, and pedagogy.

A survey questionnaire was sent to all students in the targeted faculties, obtaining 285 responses (Table 1).

Table 1**:** Demographic profile (N= 285)

Aspects	Characteristics	Total No.	Percent
University location	Java	7	70%
	Sumatra	1	10%
	Kalimantan	1	10%
	Nusa Tenggara	1	10%
Students' location	Java	233	82%
	Sumatra	16	6%
	Kalimantan	17	6%
	Nusa Tenggara	19	6%
Extent of experience	Moderate	138	48%
	Experienced	147	52%
Semester of enrolment	Third	130	46%
	Fifth	155	54%
Subjects	Academic speaking	130	46%
	Academic writing	130	46%
	Advanced speaking	155	54%
	Writing for publication	155	54%

The demographic profile highlights the diversity among participants, drawn from 10 universities across 4 islands in Indonesia. Students in the 3rd semester are learning academic speaking and academic writing, while those in the 5th semester are studying advanced speaking and writing for publication. The level of participants' exposure to AIEd is quite high, with 45% self-rating as moderate and 52% as experienced users.

Instrument

A questionnaire comprising 14 items was administered to comprehensively gauge their perspectives on using AIEd in their English language learning. The questionnaire was distributed via *Google Forms*; 13 items used a 4-point Likert-style scale, namely: Strongly Disagree (SD)=1; Disagree (D)=2; Agree (A)=3; and Strongly Agree (SA)=4. Items 1 to 13 are cited in Tables 4 to 6. Item 14 was a short answer question about what types of AIEd were used in supporting English language learning. The detailed plan is presented in Table 2.

Table 2: Plan of the questionnaire

Concept	Dimension	Subdimension	Statement	Item No
Davis (1986)	Technology acceptance model (TAM)	Perceived usefulness (PU) of using AIEd in English language learning	Intensity, needs	1, 2
		Perception about usefulness of affective aspect of English language learning	Excitement, enjoyment	3, 4
		Perception about usefulness of cognitive aspect of English language learning	Reading comprehension	5
			Language learning improvement	6
			Learning speaking	7
			Learning pronunciation	8
			Learning writing	9
			Learning vocabulary	10, 11
			Sentence paraphrasing	12
			Learning grammar	13
			Types of AIEd	14

The questionnaire items were aligned with the technology acceptance model (TAM) by Davis' framework (1986). It was adopted and focused only on the aspect of perceived usefulness, then was modified explicitly by adding questionnaire items related to affective aspects, such as interest, needs, excitement, enjoyment, and cognitive aspects of language learning, such as learning reading, speaking, pronunciation, writing, grammar, and sentence paraphrasing.

The questionnaire was presented in English and Indonesian (the students' native language). The Indonesian version was included as the translation of the English version. This dual language presentation strengthened clarity and minimised ambiguity, as it acknowledged the diverse linguistic backgrounds of the participants. To ensure the suitability and validity of the questionnaire for the study's participants, the researchers implemented several measures. Firstly, we conducted a back translation of the questionnaire from English to Indonesian, undertaken by a doctoral student specialising in translation studies and an active practitioner of translators with 5 years of experience in the translation area. Secondly, face validity was established by consulting three professionals in the fields of education and languages. Thirdly, a content validity analysis was conducted by engaging the expertise of four expert validators who serve as active lecturers in research methodology courses and are prolific in producing articles. These esteemed experts were chosen for their deep knowledge and experience in the respective fields, highly qualified to assess the content validity of the research instrument.

The instrument underwent refinement through a pilot test administered to 30 EFL students from an Indonesian university. Data were analysed using SPSS 23 software, and certain items were found to have r values below the critical r table value, indicating the reliability analysis, assessed by Cronbach's alpha, produced a high internal consistency value of 0.850. Additionally, the obtained r values fell within the range of 0.45 to 0.71,

surpassing the r table value of 0.31. These findings collectively affirm the validity and reliability of the instrument, exceeding the established criteria for reliability

Data collection

Data were collected in September 2023. A questionnaire was distributed widely to EFL university students majoring in English education using Google Forms. It was advertised initially via a WhatsApp group comprising the heads of the English education study program, who distributed the questionnaire to the students. Based on the students' availability and accessibility, the students then filled out the form. Data were collected for 13 items provided in a Likert-style scale (see Tables 4 to 6) and one short question item regarding types of AIEd used by students in English language learning. The survey link was made accessible for two weeks, affording participants ample time to respond, with an estimated completion time of approximately 15 minutes.

To maintain a high standard of ethical conduct, the online questionnaire incorporated a consent form. This form comprehensively delineated the study's nature, objectives, data collection method, the rights of the participants, and the assurance of anonymity and confidentiality regarding their responses. Only upon providing their digital consent were the respondents granted access to the questionnaire, enabling them to proceed to the subsequent sections of the form. This approach ensured that participants were fully informed about the study and engaged in the data collection process on a voluntary basis.

Data analysis procedure

Raw data obtained from questionnaire items 1 to 13 were processed using SPSS 23 to determine the frequency distribution of responses to each item. The total score for each item was also calculated to determine the index score value of each item (see Table 4). This index score was then classified into three categories as shown in Table 3

Secondly, Item 14 about types of AIEd used by students in English language learning was analysed by mentioning and describing them (Tables 7 and 8; Figures 2 and 3).

Table 3: The range and category of the index score

No.	Category	Index score range
1.	High	74-100
2.	Medium	49-73
3.	Low	≤48

Findings and analysis

Our research investigated students' perceptions of integrating AIEd into English language learning, examining the variables of perceived usefulness of AIEd, and their perceptions of affective and cognitive aspects. The first subdimension referred to the perceived

usefulness of using AIEd in English language learning, with the sub-items of intensity and needs (Table 4).

Table 4: Students' perceptions about usefulness of AIEd (N=285)

Statement	Responses								Score	Index score	Category
	SD		D		A		SA				
	f	%	f	%	f	%	f	%			
1. I always use AIEd as a platform for education in learning English.	0	0	0	0	201	70.5	84	29.5	939	82.4	High
2. In the era of modernisation, I really need AIEd as a helpful resource in learning English.	0	0	13	4.6	160	56.1	112	39.3	954	83.7	High

Note: With SA=4 and N=285, Index score for Item 1 is (Score x 100)/(4 x N) = [(201 x 3) + (84x4)] x 100/(4x285) = 939 x 100/1140 = 82.4. Similarly for Items 2 to 13.

Table 4 reveals an interesting finding for the sub-dimension "perceived usefulness of using AIEd", reflected in items 1 (intensity) and 2 (needs), with index scores of 82.4 and 83.7, respectively and classification into the high category. This means that the students always use AIEd as a platform for educational purposes when learning English. It also implies that, in the era of modernisation, the students really need AIEd as a helpful resource in learning English.

Students' perceptions about usefulness of AIEd on affective aspect

The second subdimension refers to the perceived usefulness of using AIEd for affective aspects of English language learning, with the sub-items of excitement and enjoyment (Table 5).

Table 5: Students' perceptions about usefulness of AIEd on affective aspect (N=285)

Statement	Responses								Score	Index score	Category
	SD		D		A		SA				
	f	%	f	%	f	%	f	%			
3. I do enjoy and feel comfortable using AIEd-based apps in helping and supporting me learning English.	1	0.4	6	2.1	186	65.3	92	32.3	939	82.4	High
4. I like using AI in learning English. By using AIEd, my English learning has become interesting and motivating.	1	0.4	11	3.9	182	63.9	91	31.9	933	81.8	High

Similar to the previous section, the same phenomenon also appears in the second sub-dimension (Table 5), namely the perceived usefulness of AIEd on affective aspects of English language learning. In terms of excitement, the students do enjoy and feel

comfortable using AIEd-based apps to help them learn English. Similarly, Item 4 also has a highly positive interpretation, indicating that by using AIEd, the students strongly believe that their English learning process has become interesting and motivating.

Students' perception about usefulness of AIEd on cognitive aspect

The third subdimension refers to the perceived usefulness of the cognitive aspect of English language learning, with the sub-items of reading comprehension, language learning improvement, learning speaking, learning pronunciation, learning writing, learning vocabulary, sentence paraphrasing, and learning grammar (Table 6).

Table 6: Students' perceptions about usefulness of AIEd on cognitive aspect (N=285)

Statement	Responses								Score	Index score	Category
	SD		D		A		SA				
	f	%	f	%	f	%	f	%			
5. AIEd helps me having better understanding of the lesson.	1	0.4	13	4.6	180	63.2	91	31.9	931	81.7	High
6. AIEd helps me improve my productive skills: speaking and writing with vocabulary, pronunciation and grammar components.	1	0.4	20	7	186	65.3	78	27.4	911	79.9	High
7. AIEd such BBC Learning English, Cake, Chat-bots, Google Assistant, HelloTalk, Smalltalk, TikTok, YouTube, or other helps me speak English more fluently.	0	0	19	6.7	176	61.8	90	31.6	926	81.2	High
8. My pronunciation is improved when I learn with AIEd such BBC Learning English, Cake, chatbots, Google Assistant, HelloTalk, Smalltalk, TikTok, YouTube, or other.	2	0.7	12	4.2	184	64.6	87	30.5	926	81.2	High
9. AIEd such Chat GPT, or other helps me organising ideas in writing.	2	0.7	32	11.2	168	58.9	83	29.1	902	79.1	High
10. AIEd such Duo Lingo, online dictionary, Google Translate, or other helps me guess meanings of unfamiliar words.	0	0	6	2.1	163	57.2	116	40.7	965	84.6	High

11. AIEd such as Duo Lingo, online dictionary, Google Translate, Webtoon, Wordtune, You Tube, TikTok or other increases the number of new words I learn.	0	0	9	3.2	187	65.6	89	31.2	935	82	High
12. AIEd such as Quill-Bot or other help me improve my ability in paraphrasing sentences.	2	0.7	20	7	181	63.5	82	28.8	913	80	High
13. AIEd Grammarly, Chat GPT or other help me improve grammar.	1	0.4	12	4.2	192	67.4	80	28.1	921	80.8	High

The third sub-dimension, the perceived usefulness of the use of AIEd on English language learning, especially the improvement point, in Table 6 shows an interesting phenomenon where all items have index scores that fall into the high category. Items 5 and 6, which represent comprehension and skill improvement, have index scores of 81.7 (931), and 79.9 (911), respectively, meaning that students perceive very strongly that they can better understand the lesson and can improve their comprehension and reading skills with the help of AIEd. In the same sub-dimension, items 7 and 8 explore information about whether AIEd such as BBC Learning English, Cake, Chatbots, Google Assistant, HelloTalk, Smalltalk, TikTok, and YouTube, help students with speaking and pronunciation. The score results and index score obtained for these items are relatively high, namely 926 (81.2), and 926 (81.2). This indicates that AIEd helps students speak English more fluently while improving their pronunciation.

In terms of writing, students also felt that AIEd such as Chat GPT helped them organise ideas better. Items 9, 10, 11, 12, and 13 show equally positive student perspectives regarding the use of AIEd for vocabulary recognition, and acquisition (Duolingo, online dictionary, Wordtune), sentence paraphrasing (Quillbot), and grammar improvement (Grammarly). With a score of and 902 (79.1). for item 9, while 965 and an index score of 84.6 for item 10 and a score of 935 and an index score of 82 for item 11, those figures show that AIEd helps students guess the meaning of words they do not know while increasing the amount of vocabulary they have. The final two items probe information about students' perceptions regarding the use of AIEd to help improve their ability to paraphrase sentences (item 12) and improve their grammatical skills (item 13). The survey results show that item 12 has a score of 913 with an index score of 80, while item 13 has a score of 921 with an index score of 80.8 and is classified in the high category. This means that students strongly believe that their sentence paraphrasing ability and grammatical skills have improved by using AIEd.

Types of AIEd tools used in English language learning

Drawing from the participants' responses, it becomes evident that there are various types of AIEd tools used by students in learning English, based on two categories. The first is

cognitive aspects, including listening and speaking skills (vocabulary and pronunciation practice) and reading and writing skills (editing, grammar checker, paraphrasing, translation, idea content generators, and text generators). The second is the types of AIEd tools based on numbers of students who use the tools. Based on the data, there are a total 39 types of AIEd used by the students (16 identified in Table 7; 23 in Table 8).

Types of AIEd used for listening and speaking skills

Specifically, 16 types of AIEd tools were identified for listening and speaking skills in English language learning. The detailed classification is presented in Table 7.

Table 7: Types of AIEd used for English listening and speaking skills

Multimedia contents through videos as learning sources	BBC Learning English	https://www.bbc.co.uk/learningenglish/
	Cake	https://cake.day/
	Reels on Instagram	https://www.instagram.com https://www.instagram.com/pronunciationwithemma/
	TED Talks	https://www.ted.com/talks
	TikTok	https://play.google.com/store/apps/details?id=com.ss.android.ugc.trill&pcampaignid=web_share
	YouTube	https://www.youtube.com/
Vocabulary and pronunciation practice	Duolingo	https://id.duolingo.com/
	ELSA (English Language Speech Assistant)	https://elsaspeak.com/id/
	Google Assistant	https://play.google.com/store/apps/details?id=com.google.android.apps.googleassistant
	Hellotalk	https://www.hellotalk.com/
	toPhonetics	https://tophonetics.com/
Chatbots	Alexa	https://www.alexa.com/
	Chatbot	https://chat.chatbotapp.ai/
	Siri App	https://www.apple.com/in/siri/
	SmallTalk	https://smalltalk2.me/
	Speechify	https://speechify.com/

Such a diverse array of AIEd tools is utilised to enhance students' cognitive aspect in English language learning, catering to various aspects of language acquisition, communication, and skill development and focusing on learning listening and speaking with vocabulary and pronunciation practice. For instance, BBC Learning English, Reels on Instagram, TED Talks, TikTok, and YouTube stand as meaningful platforms offering diverse learning resources, including videos that help the students learn English skills. In addition, those platforms leverage multimedia content to enrich language exposure, providing authentic contexts for language use and cultural understanding, which is good for practising speaking. Other AIEds such as Duolingo, ELSA (English Language Speech Assistant), Google Assistant, Hellotalk, and toPhonetics focus on refining pronunciation skills through interactive exercises and feedback by providing pronunciation and vocabulary practice and offering dynamic language exchange and gamified language learning experiences, respectively, fostering engagement and proficiency. Chatbots like

Amazon Alexa, Cake, Siri, and Smalltalk provide conversational practice through some vocabulary practices, immersing learners in direct speaking practice.

Some detailed information about the number of students who report using various AIEd tools is presented in Figure 2, based on an ordering from the most frequent or major use to less occasional or minor use.

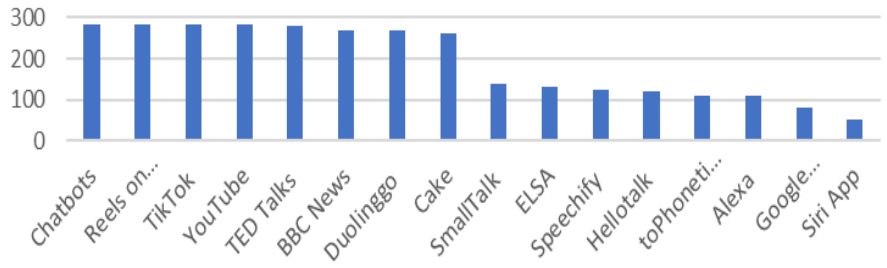

Figure 2: Number of students using AIEd for listening and speaking skills (N=285)

A strong majority gravitate towards tools enhancing listening and speaking skills, namely Chatbots, Reels on Instagram, Tiktok, and YouTube. We concluded that a varied total of students use different AIEd depending on their learning needs.

Types of AIEd used for reading and writing skills

We identified 23 types of AIEd used by students to enhance cognitive aspects, namely reading with vocabulary enrichment, and writing skills with features of translation, vocabulary buildings, grammar checkers, sentence paraphrasers, idea content generators, and citation management. The detailed list is presented in Table 8.

Webtoon is a type of AIEd used as a medium to improve reading skills. There are other AIEd focused on vocabulary building, such as Drops and U dictionary. Certain apps provide translation such as Google Translate and Deep L. AIEd tools also provide the features of grammar checkers such as Grammarly and Ginger Grammar. Quillbot can enhance language learning by offering features such as paraphrasing. Websites like Chat GPT, Copy.ai, Gemini, Humata, Jasper Chat, Jenny.ai, Jetpack, MyEssayWriter, Paperpal, Perplexity, Scite, Wordtune, Write Sonic, YOU, and Youchat help students improve their writing skills by providing various features such as grammar checkers, idea content generators, paraphrasing, plagiarism checker, punctuation correction, and text summariser, text editor, citation management. Those tools facilitate students to improve their writing skills. With these examples of tools, the use of AIEd in English language learning becomes of paramount importance and needs to be recognised as comprehensive and individualised to meet various individual demands and preferences.

Table 8. Types of AIEd used for English reading and writing skills

Types of AIEd		
Reading media	Webtoon	https://play.google.com/store/apps/details?id=com.naver.linewebtoon&hl=en_US
Vocabulary building	Drops	https://languagedrops.com/
	U dictionary	http://u-dictionary.com/#/Translator/English
		https://play.google.com/store/apps/details?id=com.youdao.hindict&hl=id&gl=US
Translation	Google Translate	https://translate.google.com/
	DeepL	https://www.deepl.com/translator
Grammar checker	Grammarly	https://www.grammarly.com/
	Ginger Grammar	https://www.gingersoftware.com/grammarcheck
Paraphrasing	Quillbot	https://quillbot.com/
Chatbots: Grammar checkers, Idea content generators, Paraphrasing, Plagiarism checker, Punctuation correction, and Text summariser, text editor, citation management	Chat GPT	https://chatgpt.com/
	Copy.ai	https://www.copy.ai
	Gemini	https://gemini.google.com/
	Humata	https://www.humata.ai/
	Jasper Chat	https://www.jasper.ai/
	Jenny.ai	https://jenni.ai/
	Jetpack	https://jetpack.com/ai/
	MyEssayWriter	https://www.myessaywriter.ai/
	Paperpal	https://paperpal.com/
	Perplexity	https://www.perplexity.ai/
	Scite	https://scite.ai/
	Wordtune	https://www.wordtune.com/
	Write sonic	https://writesonic.com/chat
	YOU	https://you.com/
	Youchat	https://web.youchat.com/

Examining the number of students who use AIEd for reading and writing skills, we found an array of student preferences across various platforms. Figure 3 provides a comprehensive overview of students' engagement with AIEd tools to enhance reading and writing skills. These findings illustrate the wide diversity in students' selection of different types of AIEd they find aligned with their learning objectives and needs.

Discussion

Our research has shown that students agreed strongly with the integration of AIEd in English language learning. Respondents had positive perceptions of the items, including the perceived usefulness of AIEd from both cognitive and affective aspects. It strengthens the findings of positive reactions to the implementation of AIEd from other researchers (Liu & Ren, 2022).

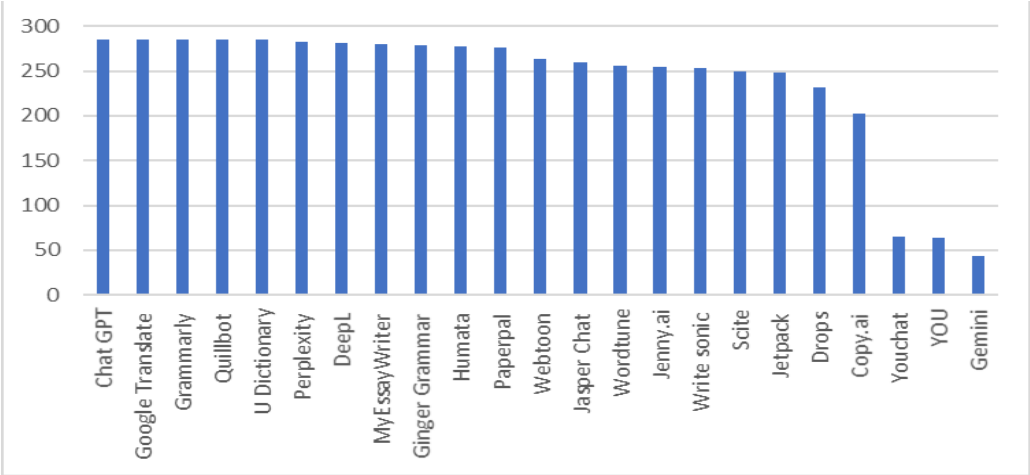

Figure 3: Number of students using AIEd for reading and writing skills (N=285)

Students showed strong interaction with the AIEd tools through the requests and intensity with which they feel comfortable using. This will show their real interest and excitement in the new AIEd technology, and enhance their learning experience. This summary supports the findings that consistently show a growing interest in AIEd research (Alkathiri, 2019). The use of gamification components and communicative simulations, as demonstrated by platforms such as Hello Talk and Duolingo, has effectively changed the idea of learning from a regular everyday activity to a fun process that is far from boring and difficult. This change has contributed to enhancing students' understanding of English and increasing their motivation for learning. In addition to academic support, respondents perceive the development of key information skills as a beneficial side of AIEd integration. The students' overall responses indicate a good fit and acceptance of the incorporation of AIEd in their English learning experience.

Our research showed good positive perceptions, particularly with the two variables in perceived usefulness, affective and cognitive aspects in the context of English language learning. The results indicated that the students highly agree and are very positive concerning the use of AIEd in their English learning to improve their English abilities and their enthusiasm and motivation in the learning process. This accords with other studies finding that AIEd has enhanced understanding as well as increasing enjoyment and excitement, thereby improving the learning experience and retention (Smith & Short, 2022; Yang et al., 2022).

For cognitive aspects, the students were asked to express their perspectives on how learning English with AIEd improved their cognitive skills. Our findings are similar to Burkhard (2022) and Al Mukhallafi (2020), who found that students perceive AIEd as a means to access education on learning English and therefore, they become more knowledgeable and fluent in English. *BBC News* (Aini et al., 2023), *TikTok* (Rasyid et al., 2023; Smith & Short, 2022), *TED Talks* (Aini et al., 2022; Al-Jarf, 2021; Leopold, 2016), and *YouTube* (Alkathiri, 2019) were reported as valuable English language learning sources

based on multimedia contents in videos. Students used AIEd tools such as *ELSA* (Khalizah & Damanik, 2024), *Google Assistant* (Moulieswaran & Kumar, 2023), and *ToPhonetics* (Fiktorius, 2020) to correct their pronunciation. Students leveraged *HelloTalk* (Aini et al., 2022) and Duolingo (Ajisoko, 2020) for social and gamified learning experiences. There is use of AI chatbots (Haristiani, 2019; Yang et al., 2022) and interactive platforms like *Cake* (Anggreini et al., 2023) to assist students' language skills. Kim (2021) found a remarkable improvement in speaking ability of Korean EFL learners after using AI chatbots. Our findings strengthen existing research findings related to AIEd used in conversational skills.

Other AIEd tools used by students are reading media such as Webtoon. For writing, U-Dictionary (Nalyvaiko et al., 2020) and Drops (Yuliyanti & Siahaan, 2022) are proven tools for enhancing English vocabulary. Google Translate (Fibriana et al., 2021; Tarsoly, 2019;) and Deep L (Sidiq & Syafryadin; 2024) strongly impacted students' writing processes through translation. A popular type of AIEd, Quillbot, is used intensively for paraphrasing (Kurniawati & Fithriani, 2023). Based on students' perspectives, the most advanced Open AI, chatbots, such as Chat GPT (Motlagh et al., 2023), Copy.ai, Jenny.ai, MyEssayWriter (Marzuki et al., 2023), and Wordtune (Zhao, 2023) are highly proven as the tools in improving students' writing skills.

The results obtained by Roe et al. (2023) have highlighted the roles undertaken by AI such as Chat GPT in language teaching and learning, emphasising its notable capacity to accelerate the acquisition of a new language. Other previous studies mentioned that Chat GPT can have a positive impact on students' learning (Montenegro-Rueda et al., 2023), with a strengthening of the process of accessing information (Nazari et al., 2021), though some adverse effects on learning outcomes may occur (Mishra et al., 2023).

Finally, to strengthen these results, Sumakul et al. (2022) conducted a case study with EFL students in Indonesia. The findings reveal that the students have positive perceptions of an AI plot generator implemented in their writing classes. The findings from our research appear to be compatible with Sumakul et al.'s research.

Conclusion

The overall highly positive perception of Indonesian university students towards the perceived usefulness of AIEd in English language learning, particularly in the affective and cognitive aspects, underscores the transformative potential of AIEd integration into English language learning. The integration of AIEd is seen as beneficial in creating an enjoyable and emotionally engaging learning environment, and as a powerful tool for enhancing cognitive and affective aspects crucial for language proficiency. As English learning continues to navigate the evolving landscape of technology-enhanced learning, these positive perceptions offer valuable insights for further research and implementation strategies. Students' perspectives on integrating AIEd into English language learning suggest that future researchers should investigate how the integration of AIEd tools may vary in effectiveness across different proficiency levels.

Our research offered strong evidence that students perceive the integration of AIEd in English language learning in a positive light. The demographic profile of students from four different islands in 10 universities in Indonesia represent a diversity of participants and it shows the uniqueness of the subjects. However, the participants reported their experience in using AIEd at their third and fifth semester stages, so there may be different findings for other stages. The sample could be comprised mainly of active AIEd users, as shown in the intensity related to Item 1 of the questionnaire. For this reason, future research could include early adopters and first semester students to get other perspectives upon AIEd. Conducting qualitative research using semi-structured interviews could provide additional information to gain a well-balanced perspective regarding the integration of AIEd in English language learning.

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