International Journal of Literature, Linguistics and Translation Studies
Volume-IV, Issue- I (June, 2024)

ISSN: (E)2790-9808 (P) 2790-9794
DOI: https://doi.org/10.37605/ijllts.v4i1.4

Date of Submission: 5th March, 2024
Date of Acceptance: 2nd April, 2024
Date of Publication: 30th June, 2024

A SYSTEMATIC REVIEW ON COGNITIVE AND MOTIVATIONAL IMPACT ON ENGLISH LANGUAGE LEARNING THROUGH ARTIFICIAL INTELLIGENCE

*** Zartashia Kynat Javaid ** Muhammad Ramzan & ***Sayyam Ijaz**

Abstract

How AI can be utilized in language education field and the influences on both learning, motivation, and engagement are the core of current research. As a result of the present study, 9 papers were made part of the research. These studies cover different AI-based treatments which can help different types of learning systems from kindergarten to university classroom in various environments. The data provided evidence for theme analysis compared with previously conducted studies, and thus the methodological quality of the research was evaluated. Findings demonstrate that AI-based methods of treatment are considerably more effective than the traditional ways of teaching the same language. Students had greater cardinal direction knowledge, and each individual also had some part of the concept. Further, AI computing technologies play the part of giving learners the intrinsic motivation, self-regulation and learner autonomy. This can stimulate students' engagement and interest in their studies. By way of the instructor support, and AI interface design the contextual factors as tools that help or hamper the effectiveness of interventions are used. Results have proven that AI is the most likely future of the language training and educators, governments, and researchers need to be kept informed. The need for longer-term viability and scalable solutions, as well as ethical aspects concern the process of AI-powered digital systems implementation requires deeper research. In view of the two-sided picture of AI-aided language learning trend, this systematic review provides outcomes that may lead to further investigation and practice of AI in the field of language learning.

* Lecturer, Department of Applied Psychology, Government College University Faisalabad, Pakistan. zartashiakynat@gcuf.edu.pk.

** PhD scholar, Department of English Linguistics, the Islamia University of Bahawalpur, Pakistan.
Corresponding author email: ramzanmalik122@gmail.com.

*** BS Scholar, Department of Applied Psychology, Government College University Faisalabad, Pakistan.

Keywords: Artificial intelligence, Language learning, Systematic review, educational technology, Motivation.

Introduction

One of the biggest paradigms shifts in the language of instruction field is a use of AI technologies in the language education process. Although the traditional language curriculum has been led mostly by teacher-centered education and standardized system, the ground-breaking influence of artificial intelligence (AI) presents a golden chance for learners to have improved learner engagement according to their needs, a personalized education, and accelerated language acquisition. Although AI-driven interventions, which have become popular in language teaching, require massive research to assess their effectiveness, investigate to what extent the interventions affect the learners' motivation, and what constitutes good intervention results, a solid foundation will be created for this field of research. In order to create evidence-based practices and policies that fully utilize artificial intelligence (AI) to advance language education, it is imperative to address these gaps.

Artificial Intelligence was one of the technologies already widely used in education, but the current climate has sped up its complete application in pandemic and the propensity for app personalization, as shown by research like Parra-Sánchez's (2022). It is more a matter of technology being widely used in areas of society where they had not previously permeated as much as it is of artificial intelligence.

For instance, virtual glasses have been there since Nintendo's Virtual Boy was introduced in 1995, but their use hasn't become commonplace until recently. Teenagers and post-adolescents in education can overuse their smartphones and social media accounts, to the point where, for example, it's become an effective means of promoting reading habit. In this sense, artificial intelligence begins to replace human intelligence in cultures that can afford to employ large amounts of technology.

Artificial Intelligence (AI) in computer programs is specifically created to understand and react to human inquiries; it functions as a platform that depends on human intelligence to provide relevant data (Khosravi et al., 2022; Nemorin et al., 2023). Based on user questions, ChatGPT, an AI-enabled tool, can effectively provide users with the information they need (Fitria, 2023; Yan, 2023). Indeed, the advent of AI has brought about revolutionary shifts in a multitude of industries, including education and

language acquisition (Su et al., 2023). The potential of artificial intelligence (AI) to transform conventional teaching and learning approaches has drawn interest from scholars, educators, and politicians across the globe (Ilkka, 2018).

The term artificial intelligence in education (AIEd) describes the use of AI technologies to help and improve education. For instance, these technologies comprise chatterbots, intelligent tutoring systems, auto-grading platforms, and performance-predicting systems for students (Chiu et al., 2023). The advancement of Artificial Intelligence (AI) led to the exploration on Artificial Intelligence (AI) ed tools and systems which include the checking of the AI learning algorithms, the AI ethics, and the fundamental rights of learners using AI (Chiu et al., 2022).

At present, AIEd is most prominently represented in the educational domains of teaching, learning, assessment, and administration, as evaluated by a system review (Chiu et al., 2023). Moock learning system can propose lesson plans and assignments, as well as instruction techniques; chatbots can encourage the independent learning of students, and also respond to the investigation of students about the administration; automatic grading can bring in more efficient grading. These studies indicate the tendency to consider AIEd as a simple process and fail to recognize its complex and multidimensional challenges and difficulties (Williamson & Eynon, 2020; Zawacki-Richter, Grönlund, et al., 2019). It is not revealed what students mean in and with AI technologies taking into account that they use them in a way that correlates to their education. Thus, we need to learn what a common AI application is.

A complement to the conventional techniques for the language learning process - the so-called Computer Assisted Language Learning (CALL) - reveals positive results (Jen-Jiun & Huifen, 2019; Khafaga & Alghawli, 2021). Developing apps was the last breakthrough in the type of software; now they are believed to be the dominant factor.

The app of educational tourism is on the increase as it has been proven most suitable and effective teaching tool for adult education overall (García-Aretio, 2016), as well as learning English, especially with Artificial Intelligence(AI) technology used (Jin et al., 2019). A growing trend among English learners is to incorporate various techniques such as task scaffolding, conversational engagement, speaking (Moreno-Ibañez et al., 2016), writing (Liou, 2016) as well as reading.

Artificial intelligence (AI) is now being used by teachers to update the learning resources in communication lessons that are designed to help students acquire foreign language skills (Tafazoli et al., 2019). The capacity of language learners' language skills and subskills in tasks, such as reading comprehension, listening, writing, and speaking, may grow by using the AI-aided language learning capabilities of ChatGPT. (Baskara and Mukarto, 2023; Hong, 2023; Kohnke et al., 2023). Through this, students can get ideas for writing and the sentences that will help them to better write are provided for, with these goals also advance their language learning (Su et al. 2022; Yan 2023). Through the help of AI-led language learning tools, which are considered the best method in creating an immersed and engaging learning environment for users, learners can easily complete general language learning activities and also increase their competency in language proficiency (Divekar et al., 2022).

Chatbots are artificial intelligence (AI) apps designed to simulate human interactions and hold impromptu discussions with people in real-time. They play a peripheral function in classroom instruction, especially in language education (Fryer et al., 2019; Yin et al., 2021). Relevant research from the past has concentrated on how they understand human conversations and inspire pupils to learn.

The ability of chatbots to have "authentic-like" conversations may be restricted, according to research on chatbot competency, or comprehension. Interacting with first-generation chatbots, which were created as language learning aids in the 2000s, could be annoying for students.

Students are required to accurate spelling in input (Coniam, 2008). Moreover, it was not always possible for chatbots to precisely follow the course of a discussion in response to queries from students (Fryer et al., 2019; Yin et al., 2021). Their answers were frequently ambiguous and occasionally led pupils astray (Fryer et al., 2019). There wasn't much of an educational value to these early chatbots. Nonetheless, chatbots have advanced within the past ten years (Coniam, 2014; Fryer et al., 2019; Yin et al., 2021). For instance, Shah et al. (2016) discovered that users give current chatbots noticeably higher ratings than they do first-generation chatbots constructed with early natural language processing. According to a Coniam (2014) evaluation study, the majority of contemporary chatbots can provide grammatically correct responses.

Smutny and Schreiberova (2020), for instance, claimed that after evaluating 47 educational chatbots for higher education on the Facebook

Messenger platform, they found that the chatbots needed refinement and were still in the early stages of becoming teaching assistants. Students still find chatbots to be cozy, engaging, and enjoyable to play with, despite the lack of significant advancements in chatbot language communication skills (Fryer et al., 2019; Hill et al., 2015; Yin et al., 2021). For instance, research by Hill et al. (2015) found that college students conversed with chatbots for noticeably longer than they did with normal people, but they did so by using shorter phrases and simpler vocabulary.

Papua, the software, is an artificial intelligence-based tool that has multiple features, such as pronunciation coaching and speech recognition. Its goals are to improve grammar, reading and writing comprehension, and spoken fluency as well as sociocultural competencies. Its primary characteristics are as follows:

a. Universal learning and immediate instruction. This allows students to make the most of their time by enabling them to access the app from anywhere.
   b. Compatibility with the majority of gadgets, including tablets and smartphones, to facilitate connection and interaction between students and the interface.
b. Teacher supervision. Via the platform on the PAPUA website, the app enables teachers to monitor and assess the measurable progress of their students.
c. instruments for getting assistance and progress reports. When required, the program divides user learning into smaller, more digestible chunks and scaffolds it (Botero et al., 2021).

After entering a password to access the website, users can get performance feedback from DA as well as evaluations from the teacher.

There is evidence that students' motivation directly affects their learning strategies, degree of engagement, perseverance in achieving objectives, and thinking processes (Chiu, 2022). The degree to which AI technologies are implemented successfully in real-world settings influences how motivated students are to engage and learn from them.

Since adolescence is a particularly unstable time for motivation (Eccles et al., 1997), research and practice in AIEd both heavily rely on understanding student motivation in the classroom.

Investigating the connection between AIEd and student motivation is essential. Furthermore, comprehending the function of the teacher in mediating and assisting learning with AI technologies in the classroom—as

a fundamental facilitator of student motivation and academic advancement—will offer a clear knowledge of how such technologies could be employed.

Self-determination Theory (SDT) is proposed by Ryan and Deci (2020) as a conceptual framework for motivation. Numerous research in a variety of fields, including the motivation of K–12 students to learn, have confirmed SDT. It makes the case that for learners to develop autonomous motivation—the ideal kind of motivation for learning that can result in higher levels of engagement and persistence—their psychological needs—autonomy, competence, and relatedness—must be met. Understanding AI-based learning tools' relationship with student motivation through SDT research will only increase as these tools get more sophisticated (Chiu, 2022). Ryan and Deci (2020) recently urged academics to look more closely at the ways that contemporary technology might drive students to learn as well as to use it.

Although there is evidence in the literature that AI has the potential to improve learning, especially in school education, its scientific influence on learning has not yet been demonstrated (Williamson & Eynon, 2020). For instance, it has been proposed that motivated and/or high achievers will benefit more from chatbots, an AI technology (Kolchenko, 2018). The functions that technology plays in the education of students vary depending on their level of competence and how they respond to technology-based learning. Students' motivation to learn in schools is greatly influenced by the way teachers instruct them (Pitzer & Skinner, 2017). More research is needed, however, it is currently lacking in regards to teacher practices in creating learning activities, offering resources, and interacting with students to fulfill their requirements in AI-enhanced environments (Kolchenko, 2018; Pitzer & Skinner, 2017).

Theoretical Framework:

This article's theoretical underpinning is based on some aspects of the Artificial Intelligence theories together with Language Teaching concepts. One approach to the development of learning environments within the framework of Vygotsky’s sociocultural learning theory, whose idea is the sociocultural notion of learning, is that the cultural environment has an intrinsic social function. The AI technologies are the means of mediation used for language acquisition and development, in which they act as language supporters and scaffolds, almost functioning like enablers as the learners can interact with language in the real world to learn.

The constructivist learning theory as proposed by Jean Piaget, keeps the knowledge actively constructed through learner-centered, experiential learning subjects, which is also included in the framework. The AI-based approaches which include chatbots and virtual reality tools support hands-on and inquiry methods of learning by enabling students to interact with the content and acquire a deep understanding of the concepts.

Moreover, the framework adapts to the fact that the management control model has incorporative features of the social interaction, self-efficacy, and intrinsic motivation theories. These theoretical conceptions consist of the work of self-determination theory (Ryan & Deci, 2020) and Bandura's social-cognitive theory. Using individualized, interactive learning techniques that are specifically targeted to each student's needs and preferences, AI technologies can boost learner motivation and engagement.

The rationale for the study:

The issue of this study arises through the observation that artificially intelligent (AI) technologies may operate as game-changers for language acquisition research; thus, it is pivotal to detect if such technologies achieve this or not as well as which factors and consequences such technologies may have on educational practice and policy. With the increasing penetration of AI-based interventions in language learning settings, such systematic studies that analyze learning success are becoming of vital importance concerning the stimulation of language growth and the motivational and autonomous development of learners. The purpose of this analysis is to provide additional insights into the perpetual changes that the embrace of artificial intelligence brings to language education shortly by meticulously covering the outcome of AI-enabled language learning interventions and unwinding their primal mechanisms of effect.

This study has crucial results for a lot of the stakeholders in the language education arena, for instance, educational institutes, school administrations, parents, and many others. The results of the research allow educators, lawmakers, and curriculum designers to know the causes and provide evidence-based solutions regarding how AI will enhance language learning procedures and teaching methods. Teachers can put a premium on inclusion and equity in language learning making the element of modification of learning experiences to the different demands and inclinations of the learner using the identifying of most effective AI-leading strategies. Moreover, the proposed study may lead to the provision

of material for scholars and researchers in the industry by trailblazing interdisciplinary discourse on the subject which will in turn expand knowledge in the field. As a result, the present study might be regarded to bring about the forthcoming revolutions of language education procedures and guidelines; manifestly making language acquisition interesting, effective, and engaging for the modern world.

Research Gap:

Deep learning-centered solutions have begun to pop up across the whole language education spectrum, but the existing research does not cover the universal applicability and effect of these solutions for all situations the learners and community face. Indeed, several studies have documented encouraging findings regarding AI systems for language learning. Nevertheless, the majority of those studies focused on specific domains of language acquisition, e. g. academic or professional vocabulary, and they also often were conducted within laboratory environments or targeting certain learner groups.

Additionally, opinions differ on what techniques should be used to develop, apply, and to information technology, as well as systems for language of education and education. Determining the effectiveness of the intervention and its possibility for application outside the specific context of instruction becomes even more difficult by the fact that there is no universal design of AI interface, method of instruction, or kind of support (mentoring) for the learner.

In addition, the topic of ethical issues in AI-based language education is still something where the research is not sufficient. The same problems can be mentioned, like the bias of algorithms, students' privacy, and data security. It is imperative to conduct this research and to develop precision and fair usage of AI in language education as this technology becomes dominant in the educational environment.

The accomplishment of research work which will entail the creation of evidence-based practices and policies that fully utilize AI's potential for making language education appealing and ensuring equitable access to learners of high-quality education is calling for filling these research gaps. Through the integration of the available research, by spotting the trends and patterns, and through processing new insights from which future studies, practices, and policies related to AI-mediated language learning

relying on may be done, this systematic review aims to fill these gaps in the literature.

Objectives:

-To assess the effectiveness of AI-driven interventions in enhancing English language proficiency across diverse learner populations and educational settings.

-To examine the impact of AI technology features on learner motivation and engagement in English language learning.

-To evaluate the influence of AI-mediated language instruction on key language learning outcomes, including speaking, listening, vocabulary acquisition, and writing proficiency.

-To investigate the moderating effects of contextual factors on the effectiveness of AI-based interventions in promoting English language learning outcomes.

METHOD

Research Design:

To capture and analyze the documents and findings related to the use of artificial intelligence (AI) in language learning through a qualitative approach, this study puts forward a qualitative research design and a review process. Systematic reviews allow a clear picture of the research environment to be achieved which then makes it possible to find such missing, repeated or impending patterns and trends.

Inclusion Criteria:

Journal Studies published that have been peer-reviewed.

A study of AI technology as a means of language learning was carried out, which combined chatbots and applications of AI, virtual reality in language learning and writing aids driven by AI technology.

Research that reported on the empirical information such as effectiveness, impact or outcomes of AI-integrated language learning plans.

Studies were carried out with different learner groups such as adults, teenagers, younger learners, and people who study different languages.

Search Strategy:

A systematic search of relevant databases, including PsycINFO, Google Scholar, PubMed, ERIC, Scopus, and Web of Science, was conducted to identify eligible studies. Keywords and search terms used in the search strategy included "artificial intelligence," "AI," "language education," "language learning," "English as a second language," "foreign language learning," "chatbot," "virtual tutor," "writing assistant," and variations thereof.

Study Selection:

The first search produced a large collection of possibly pertinent studies. The inclusion criteria and the relevance of the titles and abstracts to the study topic were evaluated during the screening process. Next, research that might be qualified for inclusion in the review were evaluated based on their full-text articles. The research team discussed and came to a consensus on any differences in the selection of studies.

Data Extraction:

Using a pre-established data extraction form, data extraction from the included studies was done methodically. Authors, publication year, study design, sample size, participant demographics, AI intervention(s) used, outcomes measured, primary findings, and implications for policy and practice in language instruction were among the pertinent details that were taken from each study. Research designs, sample representativeness, measurement validity and reliability, and bias risk were among the criteria used to evaluate the studies.

Data Synthesis and Analysis:

The process of data synthesis entailed compiling and arranging the information that was taken out of the included studies. In order to find recurring themes, patterns, and trends in the literature, thematic analysis was used. The results were narratively summarized, emphasizing important discoveries, patterns, and areas where the investigations agreed or disagreed.

Ethical Considerations:

The study discussed here, by the very nature being a mere compilation and analysis of currents, did not require an ethical clearance. On the other hand, not of face, the ethical issues were considered while doing the review, for

instance protection of study participants' privacy and confidentiality and true reports after summary of included studies.

Systematic review might be subject to the uncertainty that emerged as a result of exclusion of non-English language publications, so as a consequence the language bias could appear and because of the nature of published literature the publication bias could also appear. On top of these, studies of a varied caliber of those included could also put the credibility of conclusion of the review into question.

To promote openness and repeatability in the review process, a CONSORT flow diagram detailing the steps involved in selecting studies—including the number of studies that are screened, evaluated for eligibility, and included in the review—will be supplied.

This section on methodology describes the methodical strategy that was used to carry out the review, guaranteeing openness, accuracy, and repeatability in the study process.

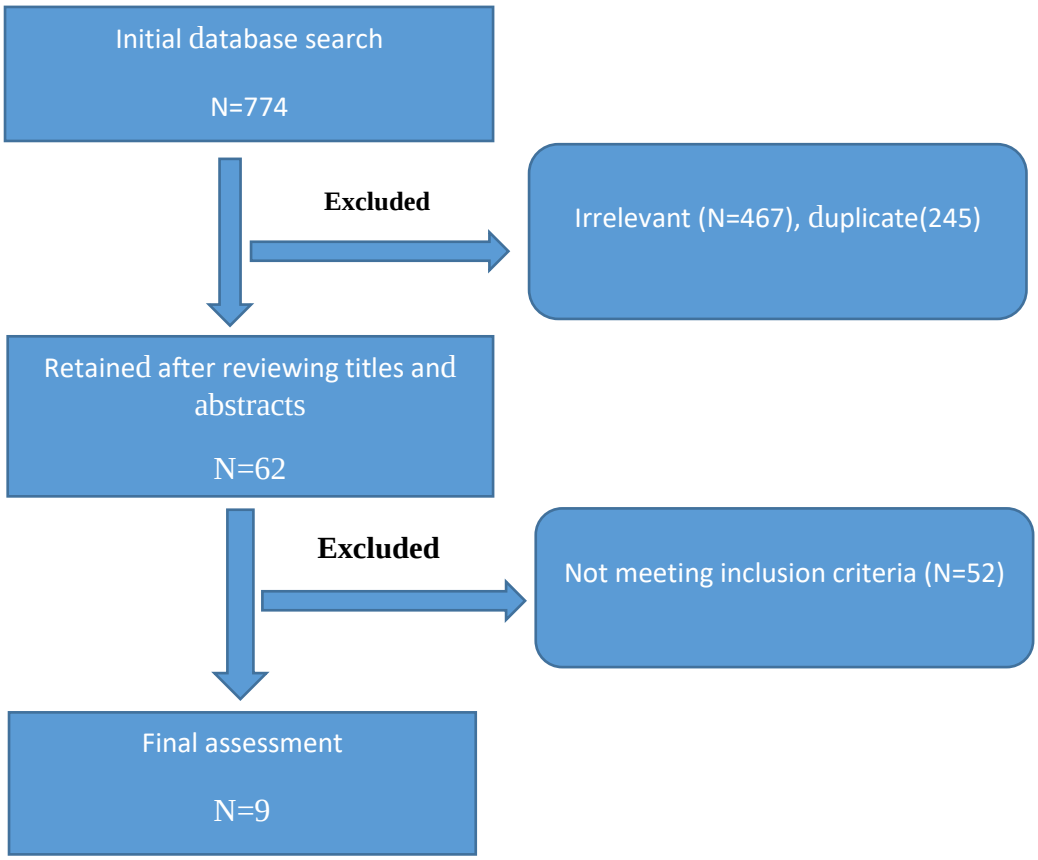

Fig 1. Flow Diagram

RESULTS

As a matter of fact, the implementation of AI into the process of teaching a language means a drastic change in the modern educational environment that aims to achieve better outcomes of learning and experiences among the students. The focus of this chapter is the synthesis of findings from systematic review that encompasses nin philosophical line-of-thinking studies intended to build evidence on the artificial intelligence and the English language learning links. For instance, studies that were conducted using different techniques and geographic zones are what contribute to the research results regarding the pros to study AI driven intervention for accuracy in language learning.

Table 1. Characteristics of the Participants

Sr No	Author(s)	Year	Sample Size	Age Range	Level	Study Design	Country
1.	Ebadi and Amini	2024	256	18-24	EFL learners	Mixed-methods study	Iranian
2.	Liu et al.	2023	Experimental: n=50; Control: n=53	20	University students	Quasi-experiment	Chinese
3.	Chiu et al.	2023	123	15-17	Grade 10 students	Experimental study	-
4.	Wei	2023	60	19-23	University students	Mixed methods study	Chinese
5.	Gayed et al.	2022	10	-	EFL participants	Counter-balanced experiment	Japanese
6.	Divekar et al.	2022	10	18-22	University students	Mixed-methods study	Chinese
7.	Chien et al.	2022	73	-	English language learners/ Students	Quasi-experimental study	Taiwan
8.	Pena-Acuna an Crisman-Perez	2022	128	23 mean	University students	Quasi-experimental study	Spain
9.	Nazari et al.	2021	Equipped AI: n=60; NEAI: n=60	26-39	Postgraduate students	Randomized controlled trial	-

Through the numbers 9, the overview of researches using language instruction with the aid of artificial intelligence (AI) is shown in the table below. The publication year, sample size, range of participant ages, educational level, study design, and number goal countries are the fact a debate for each study. Many of the studies have been conducted with different learner populations, for instance, with EFL participants, university students, Grade 10 students, and at postgraduate level, and they use a different methodology as well; for example, counter-balancing groups, combining different methods, using quasi-experiments, and employing randomized controlled trials. The papers from Spain, Japan, Iran, China and Taiwan stand to be considered.

Table 2. Summary of the Studies

Sr No.	Author(s)	Purpose	Interventions	Outcomes	Key Findings
1.	**Ebadi and Amini**	Assessing the Impact of Social Presence and Human-like Features on Iranian EFL Learners' Motivation Utilizing AI Technology: A Case Study of CSIEC Chatbot	Interaction with chatbot CSIEC	Increased learner motivation predicted by social presence and human-likeness	CSIEC chatbot enhanced learner motivation, eagerness, and confidence to learn English.
2.	**Liu et al.**	Integrating Reflective Thinking Mechanisms into AI-supported English Writing Environments to Foster Learning	Reflective thinking promotion mechanism-based AI-supported English writing (RTP-AIEW)	Significantly improved English writing performance, self-efficacy, and self-regulated learning	RTP-AIEW approach deepened learners' thinking and improved EFL writing quality.
3.	**Chiu et al.**	Analyzing Teacher Support and Student Motivation in Learning with an AI-based Chatbot	Chatbots as AI-based technologies in the experiment	Intrinsic motivation and competence depended on teacher support and student expertise	Teacher support moderated effects of student expertise on intrinsic motivation and competence in learning with AI technologies.
4.	**Wei**	Investigating the Effects of AI in Language Instruction on English	AI-mediated language	Higher English learning achievement, L2	AI-mediated instruction positively impacted English

		Learning Achievement, L2 Motivation, and Self-regulated Learning	instruction	motivation, and self-regulated learning	learning achievement, motivation, and self-regulated learning among EFL learners.
5.	**Gayed et al.**	Investigating the Influence of an AI-driven Writing Assistant on English Language Acquisition Among Learners	AI-based web application "AI KAKU" to assist EFL learners in reducing cognitive barriers	Potentially useful tool for EFL learners needing structured assistance	AI KAKU positively impacted writing proficiency and satisfaction among EFL learners.
6.	**Divekar et al.**	Exploring Foreign Language Acquisition Through Artificial Intelligence and Extended Reality: Design and Assessment	Cognitive Immersive Language Learning Environment (CILLE)	Statistical improvement in CFL vocabulary, comprehension, and conversation skills	CILLE facilitated comprehensive CFL acquisition through AI and XR technologies.
7.	**Chien et al.**	Assessing the Impact of an AIML-Based LINE ChatBot on Contextual English Learning	LINE ChatBot contextual learning environment	Improved English speaking and listening ability	LINE ChatBot significantly improved learners' English speaking and listening ability.
8.	**Pena-Acuna and Crisman-Perez**	Researching Papua: A Digital Tool Utilizing AI for English Language Learning and its Influence on Linguistic Attitudes Towards Learning English	Digital tool "Papua" with AI	Enhanced oral skills, vocabulary memorization, and motivation	Papua significantly improved oral skills, vocabulary memorization, and motivation among learners.
9.	**Nazari et al.**	Conducting a Randomized Controlled Trial to Evaluate the Efficacy of an AI-powered Digital Writing Assistant in Higher Education Settings	AI-powered writing tool for English academic writing context	Significant improvement in behavioral and emotional engagement, cognitive engagement, self-efficacy, and	AI-powered writing tools promoted learning behavior and attitudinal technology acceptance among postgraduate students.

emotional
responses

Several important conclusions are drawn from this comprehensive analysis of research on the effects of artificial intelligence (AI) technologies on language learning, with an emphasis on EFL and other contexts for foreign language acquisition. The interventions included chatbots, immersive language learning environments, and AI-powered writing assistance. Significant gains in a number of language acquisition domains, such as writing ability, motivation, oral communication, vocabulary growth, and self-regulated learning, were noted in this research.

In order to make the learning process with English as a Foreign Language easy for learners, engineering staff developed “AI KAKU”, that proved to be useful and enhancing writing proficiency and satisfaction. A study conducted by Ebadi and Amini, as indicated, found that students were more interested in English learning, bold, and enthusiastic in learning while using their CSIEC Chatbot. This was primarily the chatbot's social credibility, his authenticity and his human-like equipment. A study carried about by Divekar and his team among the Cognitive Immersive Language Learning Environment (CILLE) was evidenced that the use of artificial intelligence and extended reality technology resulted in statistical improvements in the French as a Foreign Language (FFL) vocabulary, comprehension, and conversational abilities. Therefore, in addition to loaning reflective thinking skills to the AI-assisted writing success not only self-efficacy, but also self-regulated learning and writing performance would have been improved.

All this makes up the process of AI positively influencing language teaching successes in different backgrounds. The reviewed research has revealed that AI-learning interventions can cater to learning through different approaches to support a range of writing abilities to increase motivation and self-regulated learning. These discoveries not only serve to aid in the detection of new methods in language instruction and advancement, but they also reveal how AI technology can be used to address the multitude of cells in the learning process of teaching and mastering languages.

DISCUSSION

The dialogue that surfaces after it reveals a critical analysis of the study, uncovering numerous and sometimes transversal effects on a different

range of stakeholders like academia, education researchers, and policymakers who desire to equip AI with the transformative elements required in English language instruction. The studies reveal how imperative it becomes for teachers to introduce AI-inspired interventions in varied situations if the potential for improvement in these contexts is to be fully realized, however, the decision geared towards taking such a step should be made taking into account the contextual factors like learner demographics, pedagogical ethos, and technology infrastructure. And so, the dialogue proves to be an important means of information and advice on AI introduction within a language classroom setting that, in turn, underscores the importance of crafting an individualized learning environment favoring learning with a clear motivation and engagement.

1. Effectiveness of AI-Driven Interventions:

The utility of human middleware interventions was explored through experimental setups with audio and visual input by a vast set of demographics, eventually revealing the complex nature of the influence of AI technology on language learning. Twelve adolescents from a school in Japan, who are English as a Foreign Language students (EFL), participated in a control experimental experiment conducted by Gayed et al. (2022), which investigated the potential of the Artificial Intelligence KAKU system in improving writing skills and removing cognitive barriers. In human androids, like in their CSIEC chatbot study of 256 Iranian EFL students, Ebadi and Amini, (2024) highlighted the influence of social presence and human-like interaction on motivation and engagement among students that consequently hikes motivation and engagement, to an extent. The effects of AI-driven interventions on language learning have been proven once again to serve us as a platform that can be used by diverse learner populations and for different educational purposes.

Reviewing and analyzing works on how learning technology impacts student competence using the past and most recent studies, Researchers note that instructional design with technology may cause differentiated advantages to low or high-achieving students (Chiu et al., 2020; Chiu & Mok, 2017).

2. Impact of AI Technology Features on Motivation and Engagement:

In various studies with many age groups and educational levels motivation and engagement of learners concerning AI-enabled technology aspects were analyzed. Accordingly, deeper distinctions were made in an analysis

of forms of learner-technology interactions. Ten university students volunteered to take part in a study in which Divekar et al. say that Cognitive Immersive Language Learning Environments (CILLE) can lead to the Fundamental Transformation of language learning. The outcome showed improvements in word recognition and reading comprehension phonics. Consequently, Chiu et al. (2023) investigated the moderation of AI-supported chatbots on the motivation and the competence of 123 Grade 10 students which greatly revealed the key roles pedagogical assistance performs in enhancing learner independence and interaction.

In the case of the study by Yin et al. (2021), scholars noticed that the classmates who engaged in chatting with bots had higher motivation compared to ones who were not engaging in such learning. From this article, thus, we can conclude that as far as the chatbots are concerned, students have felt more comfortable and said more during their conversations. A chatbot can persuade students to share their views as much as they want by its conversational interaction mode—a non-threatening playing game if the students accept the chatbot as a playful application that places no fear-provoking situation before the people. Therefore, in addition to teaching conversations to spark students' indomitable curiosity and endurance, chatbots' major function lies in education and learning (Fryer et al., 2019). Learning motivation is enhanced through the use of technology and by using collaborative strategies (Ramzan et al., 2023). Social support improves academic achievement (Maqbool et al., 2021). Teachers should be motivated to be an influencer as language, tone, and medium matter for effect (Ramzan et al., 2023). Work stress can largely impact interaction (Javaid et al., 2023).

3. Influence of AI-Mediated Language Instruction on Learning Outcomes:

The researchers used different research methodologies to study the effects of AI-based language learning mode upon the results of training, and, finally, came to the ways how these results can give rise to new educational tendencies. Aiming to verify RTP-AIEW (Reflection-based Thinking Mechanism-supported English writing) ways of increasing writing performance, self-efficacy, and self-regulated learning, Liu et al. (2023) held a quasi-experiment with 50 students in experimental and 53 in control groups which were Chinese university students. In addition, Nazari and associates (2021) included in their randomized research a school experiential study that was based on postgraduate students to determine the

aid writing instruments driven by AI provide in improving student engagement, self-confidence, and emotions during research exercises.

Students can have less sophisticated self-regulated learning skills (SRL) and a wider diversity of learning needs. Therefore, chatbot competency is crucial to school-age students, particularly low-achieving or proficient students (Fryer et al., 2019). These students need more accurate responses from chatbots and are more likely to give up easily when feeling confused or facing failure during learning. Using apps may help assess English vocabulary and pronunciation (Ikramullah et al., 2023).

4. Moderating Effects of Contextual Factors on Intervention Effectiveness:

Contextual factors' moderating effects on the effectiveness of treatments were carefully examined in research with a wide range of participant demographics and educational contexts, providing insight into the complex interactions between contextual subtleties and technology interventions. According to Chien et al. (2022), 73 Taiwanese English language learners/students who participated in a quasi-experimental study highlighted notable improvements in speaking and listening abilities enabled by the LINE ChatBot contextual learning environment. Pena-Acuna and Crisman-Perez (2022) conducted a study on 128 Spanish university students, examining the complex relationship between contextual factors and the effectiveness of AI-mediated instruction. The study highlights the critical role that supportive learning environments play in maximizing language learning outcomes and fostering student autonomy.

Contextual game designing and mind mapping were carried out by Fu et al. (2019) and the former was interpreted in a more contextualized fashion to make learning English as a foreign language (EFL) more efficient and interesting. Peer involvement (Javaid & Mahmood, 2023) and positive learning environment (Ramzan et al., 2023) improves learning. Lin (2019) totally reinvigorated student engagement and skill development in English writing by applying brainstorming skills (mind-mapping) and peer assessment in a flipped learning model. However, most of the past researches are about the writing of EFL learners while classes focus mostly on writing without reflecting highly regarded thinking phenomena. This non-substantiality resulted in writers' incapability of integration and reflecting on their personal progress (Avarzamani & Farahian, 2019). Expressive writing resolves emotional issues of students (Javaid &

Mahmood, 2023). Language is learned well by EFL learners through emotional involvement (Javaid et al., 2023).

The substantiated dialogue becomes a holistic analysis of the mathematics between the drive of AI operations and the outcomes in language learning to be able to function effectively and compel the complexities presented in the study review. The fact that the AI technologies are actual tools that can meet the needs of diverse types of learners and individuals for having a good experience in language learning is the focus of the dialogue. The research highlights that adaptive AI interventions really do accelerate language advancement, learner motivation, and class engagement in many different educational scenes.

In this respect, the discourse further addresses the issue ranging from the diverse environmental factors that can affect the effectiveness of AI empowered language learning. Critical components of an intervention that closely relate to can be its context, which includes details of the students, instructional strategies, and institutional structure. Indeed, what stands out is the fact that the discussion posits the need for alternative learning systems which are customized to meet the varied needs and characteristics of diverse groups of students. The dialogue also stressed out the significance of pedagogical guidance and assistance while precise AI-driven interventions were in runtime and the question of a team of teachers had to be still answered putting the teachers' job in its due position.

The talk then delves into the implications of AI powered interventions implemented in education for practice and policy Narration: Finally, the conversation is elaborated on the wider implications for AI powered interventions implemented in education practice and policy. This highlights the significance of setting up a welcoming and motivational environment which will thus facilitate the usage of AI technologies to the aid of learners and ultimately enhance the results. This includes the importance of multiple disciplinary collaboration and empirically proven teaching methods, and the continuous search for the best solutions in deep neural networks-aided foreign languages education.

As we go along, the comprehensive face-off helps make the results of the methodical research fit within the bigger picture that sees technology as a boon in the field of language teaching. Discourse formulates useful findings and informed debates for educators, policymakers and academic staff on how they can improve language learning outcomes in the digital

era. It helps to explain some complex issues that confront AI-driven interventions

To sum up, it outlines the main findings of the systematic review and, in particular, demonstrates how AI driven interventions could be employed with learners of various ages and in diverse learning environments in order to enhance the learning success. Among the practical outcomes of the debate is that it would offer useful views on how English language is changing as we move ever deeper into the age of digital technology. Also, the debate suggests actual methods that can be considered for the thoughtful introduction of AI-driven innovations that will enhance student abilities and improve language learning outcomes. In general, the review system is the best basis for additional research and learning activites that promote a consistent improvement and impactful innovation in the area of AI-facilitated education.

Implications for Educational Practice and Policy:

The findings from the systemic study are of tremendous significance for educational deliberations as well as for the creation of a discourse on the impact of AI-based interventions for language education, which opens up a vista for transformations. Research illustrates that these factors can serve as powerful tools to help educators and policymakers in their decision-making process regarding the use of technology, pedagogical strategies, and curricula development. The relevance of the learner-based approach to technology integration with AI focused on the needs, likes and levels of learners becomes a focal point in designing AI driven learning intervention strategies. Aside from serving as one of the sources of evidence that can push policy-makers to provide funding for AI-based language learning programs development and implementation, the findings discussed can in no way be considered irrelevant to the overall plan.

Future Research Directions:

Despite all the possibilities for even more informative research to detail and expand on the key findings of this systematic review which describes the main features of AI-enhanced linguistic cognition, the article itself is of high didactic value and puts into service what is known about human language acquisition. For this evaluation and assessment of the sustainability and long term benefits of such interventions, future research should be designed to examine the longitudinal effects of AI-driven interventions on language learning outcomes, measuring the outcomes

progress as the learners develop over protracted periods of time. Researchers could also study how different learners are being affected differently by AI technology, choosing data such as age, problem solving level, culture, and place of living. Besides, research aimed at solving the problems related with ethical AI-mediated languages, among them data privacy, algorithmic bias, and unequal access to digital resources, is of paramount significance as well.

Limitations of the Study:

Understanding the limitations of systematic review study is very important since they determine how far and in what way, the results are applicable and trustworthy. One clear disadvantage may be referring to the diversity of methodologies used in the studies, ranging from different participant demographics to different study designs and outcome measures. This is probably the reason for that the trials or other studies of AI-driven therapies may not be as reliable, as they are comparably hard to conduct. To add, applying the reminders to just the published articles may result in the publication bias, which in turns may distort the review's overall conclusions because research with statistically significant findings are more likely to be published. Along this line, the oversight of studies in languages other than English might distort the scope and breadth of the review. This might include relevant studies that were published in other linguistic contexts.

Conclusion:

The results can be considered as providing the information about the efficiency and possible input of AI-driven progress for English language learners. The state-of-the-art AI and technologies significantly enhance the quality of language instruction. Moreover, the learners are highly motivated by this experience and they are more engaged. The review that we conducted, with specifically this in mind, can provide educators, policy-makers, and researchers with a comprehensive picture of the current state of the art and practical developments in AI-mediated language learning by systematically overviewing nine outstanding works. New fields of study and solutions to come as a result may yield even better learning results and opportunities in the digital age.

REFERENCES

Avarzamani, F., & Farahian, M. (2019). An investigation into EFL learners' reflection in writing and the inhibitors to their reflection. *Cogent Psychology*, *6*(1), 1690817. https://doi.org/10.1080/23311908.2019.1690817

Baskara, F. R., and Mukarto, F. X. (2023). Exploring the implications of Chat GPT for language learning in higher education. *Indonesian J. English Lang. Teach. Appl. Linguist. 7*, 343–358.

Chien, Y. C., Wu, T. T., Lai, C. H., & Huang, Y. M. (2022). Investigation of the influence of artificial intelligence markup language-based LINE ChatBot in contextual English learning. *Frontiers in Psychology*, *13*, 785752.

Chiu, T. K. F. (2022). Applying the Self-determination Theory (SDT) to explain student engagement in online learning during the COVID-19 pandemic. *Journal of Research on Technology in Education, 54*(sup1), 14–30. https://doi.org/ 10.1080/15391523.2021.1891998

Chiu, T. K. F., & Mok, I. A. C. (2017). Learner expertise and mathematics different order thinking skills in multimedia learning. *Computers & Education, 107*, 147–164. https://doi.org/10.1016/j.compedu.2017.01.008

Chiu, T. K. F., Jong, M. S. Y., & Mok, I. A. C. (2020). Does learner expertise matter when designing emotional multimedia for learners of primary school mathematics? *Educational Technology Research and Development, 68*(5), 2305–2320. https://doi.org/10.1007/s11423-020-09775-4

Chiu, T. K. F., Meng, H., Chai, C. S., King, I., Wong, S., & Yeung, Y. (2022). Creation and evaluation of a pre-tertiary artificial intelligence (AI) curriculum. *IEEE Transactions on Education, 65*(1), 30–39. https://doi.org/10.1109/TE.2021.3085878

Chiu, T. K. F., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence, 4*, 100118. https://doi.org/10.1016/j.caeai.2022.100118

Chiu, T. K., Moorhouse, B. L., Chai, C. S., & Ismailov, M. (2023). Teacher support and student motivation to learn with Artificial Intelligence (AI) based chatbot. *Interactive Learning Environments*, 1-17.

Coniam, D. (2008). Evaluating the language resources of chatbots for their potential in English as a second language. *ReCALL, 20*(1), 98–116. https://doi.org/10.1017/S0958344008000815

Coniam, D. (2014). The linguistic accuracy of chatbots: Usability from an ESL perspective. *Text & Talk, 34*(5), 545–567. https://doi.org/10.1515/text-2014-0018

Divekar*, R. R., Drozdal*, J., Chabot*, S., Zhou, Y., Su, H., Chen, Y., ... & Braasch, J. (2022). Foreign language acquisition via artificial intelligence and extended reality: design and evaluation. *Computer Assisted Language Learning*, *35*(9), 2332-2360.

Ebadi, S., & Amini, A. (2022). Examining the roles of social presence and human-likeness on Iranian EFL learners' motivation using artificial intelligence technology: A case of CSIEC chatbot. *Interactive Learning Environments*, 1-19.

Eccles, J. S., Midgley, C., Wigfield, A., Buchanan, C. M., Reuman, D., Flanagan, C., & Mac Iver, D. (1997). Development during adolescence: The impact of stage–environment fit on young adolescents' experiences in schools and in families (1993). In J. M. Notterman (Ed.), The evolution of psychology: Fifty years of the American psychologist (pp. 475–501). *American Psychological Association.* https://doi.org/10.1037/10254-034

Fitria, T. N. (2023). Artificial intelligence (AI) technology in Open AI Chat GPT application: a review of Chat GPT in writing English essay. *ELT J. English Lang. Teach. 12*, 44–58. doi: 10.15294/elt.v12i1.64069

Fryer, L. K., Nakao, K., & Thompson, A. (2019). Chatbot learning partners: Connecting learning experiences, interest and competence. *Computers in Human Behavior, 93*, 279–289. https://doi.org/10.1016/j.chb.2018.12.023

Fu, Q. K., Lin, C. J., Hwang, G. J., & Zhang, L. (2019). Impacts of a mind mapping-based contextual gaming approach on EFL students' writing performance, learning perceptions and generative uses in an English course. *Computers & Education, 137*, 59–77. https://doi.org/10.1016/j.compedu.2019.04.005

García-Aretio, L. (2016). El juego y otros principios pedagógicos. Supervivencia en la educación a distancia y virtual. *Revista Iberoamericana de Educación a Distancia. 19*, 9–23. doi: 10.5944/ried.19.2.16175

Gayed, J. M., Carlon, M. K. J., Oriola, A. M., & Cross, J. S. (2022). Exploring an AI-based writing Assistant's impact on English language learners. *Computers and Education: Artificial Intelligence*, *3*, 100055.

Hill, J., Ford, W. R., & Farreras, I. G. (2015). Real conversations with artificial intelligence: A comparison between human– human online conversations and human–chatbot conversations. *Computers in Human Behavior, 49,* 245–250. https:// doi.org/10.1016/j.chb.2015.02.026

Hong, W. C. H. (2023). The impact of Chat GPT on foreign language teaching and learning: opportunities in education and research. *J. Educ. Technol. Innov. 5*, 37–45.

Ilkka, T. (2018). The impact of artificial intelligence on learning, teaching, and education. *Maastricht*: *European Union*.

Ikramullah, Ramzan, M. & Javaid, Z. K. (2023). Psychological Factors Influencing Pashto Speaking ESL Students' Pronunciation of English Vowels. *Pakistan Journal of Society, Education and Language (PJSEL*), 9(2), 52–63.

Jen-Jiun, L., and Huifen, L. (2019). Mobile-assisted ESL/EFL vocabulary learning: a systematic review and meta-analysis. *Comput. Assist. Lang. Learn. 32*, 878–919. doi: 10.1080/09588221.2018.1541359

Javaid, Z. K., Andleeb, N., & Rana, S. (2023). Psychological Perspective on Advanced Learners' Foreign Language-related Emotions across the Four Skills. *Voyage Journal of Educational Studies,* 3 (2), 191-207. DOI: https://doi.org/10.58622/vjes.v3i2.57

Javaid, Z. K., & Mahmood, K. (2023). Efficacy of Expressive Writing Therapy in Reducing Embitterment among University Students. Pakistan *Journal of Law, Analysis and Wisdom, 2*(02), 136-145.

Javaid, Z.K. & Mahmood, K. (2023). Exploration of Embitterment among University Students: A Qualitative Study. *Journal of Policy Research*. 9 (3), 124–129. DOI: https://doi.org/10.61506/02.00005

Javaid, Z. K., Khan, K., & Anjum, A. R. (2023). Antecedents of Employee Wellbeing: Review of Organizations in Pakistan. *ESIC Market, 54(*3), e313-e313.

Javaid, Z. K., Mahmood, K., & Ali, A. A. (2023). Mediating Role of Mindfulness between Quality of Life and Workplace Stress among Working Women. *Journal of Workplace Behavior, 4*(1), 68-80.

Jin, N., Zili, C., and Wan, J. (2019). TI designing a Mobile-assisted English Reading class for college students. *18th Annual International Conference on Web based Learning (ICWL)*. September 23–25, 2019

Khafaga, A., and Alghawli, A. S. A. (2021). The impact of CALL software on the performance of EFL students in the Saudi university context. *Int. J. Adv. Comput. Sci. Appl. 12*, 304–312. doi: 10.14569/ijacsa.2021.0120734

Khosravi, H., Shum, S. B., Chen, G., Conati, C., Tsai, Y. S., Kay, J., et al. (2022). Explainable artificial intelligence in education. *Comput. Educ. Artif. Intell. 3*:100074. doi: 10.1016/j.caeai.2022.100074

Kohnke, L., Moorhouse, B. L., and Zou, D. (2023). Chat GPT for language teaching and learning. *RELC J. 54*, 537–550. doi: 10.1177/00336882231162868

Kolchenko, V. (2018). Can modern AI replace teachers? Not so fast! Artificial intelligence and adaptive learning: Personalized education in the AI age. *HAPS Educator, 22*(3), 249–252. https://doi.org/10.21692/haps.2018.032

Lin, C. J. (2019). An online peer assessment approach to supporting mind mapping flipped learning activities for college English writing courses. *Journal of Computers in Education, 6*(3), 385–415. https://doi.org/10.1007/s40692-019-00144-6

Liou, H. C. (2016). "CALL tools for reading and writing," in The *Routledge Handbook of Language Learning and Technology*. eds. F. Farr and L. Murray (London: Routledge).

Liu, C., Hou, J., Tu, Y. F., Wang, Y., & Hwang, G. J. (2023). Incorporating a reflective thinking promoting mechanism into artificial intelligence-supported English writing environments. *Interactive Learning Environments, 31*(9), 5614-5632.

Moreno-Ibañez, A., Jordano de la Torre, M., and Vermeulen, A. (2016). VISP design and evaluation, a mobile application to practise oral competence. *Revista Iberoamericana de Educación a Distancia. 19*, 63–81. doi: 10.5944/ried.19.1.14580

Nazari, N., Shabbir, M. S., & Setiawan, R. (2021). Application of Artificial Intelligence powered digital writing assistant in higher education: randomized controlled trial. *Heliyon, 7*(5).

Nemorin, S., Vlachidis, A., Ayerakwa, H. M., and Andriotis, P. (2023). AI hyped? A horizon scan of discourse on artificial intelligence in education (AIED) and development. *Learn. Media Technol. 48*, 38–51. doi: 10.1080/17439884.2022.2095568

Parra-Sánchez, J. (2022). Potencialidades de la Inteligencia Artificial en Educación Superior: Un enfoque desde la personalización. *Revista Tecnológica-Educativa Docentes 2.0 14*, 19–27. doi: 10.37843/rted.v14i1.296

Peña-Acuña, B., & Crismán-Pérez, R. (2022). Research on Papua, a digital tool with artificial intelligence in favor of learning and linguistic attitudes towards the learning of the English language in students of Spanish language as L1. *Frontiers in Psychology*, *13*, 1019278.

Pitzer, J., & Skinner, E. (2017). Predictors of changes in students' motivational resilience over the school year: The roles of teacher support, self-appraisals, and emotional reactivity. *International Journal of Behavioral Development, 41*(1), 15– 29. https://doi.org/10.1177/0165025416642051

Maqbool, H., Mahmood, D. K., Zaidi, S. M. I. H., Ajid, A., Javaid, Z. K., Mazhar, R. (2021). The Predictive Role of Social Support in Social Adjustment and Academic Achievement among University Students. *Psychology and Education, 58* (5), 2745-2753.

Ramzan, M., Javaid, Z. K., & Ali, A. A. (2023). Perception of Students about Collaborative Strategies Employed by Teachers for Enhancing English Vocabulary and Learning Motivation. *Pakistan Journal of Law, Analysis and Wisdom, 2*(02), 146-158.

Ramzan, M., Javaid, Z. K., Kareem, A., & Mobeen, S. (2023). Amplifying Classroom Enjoyment and Cultivating Positive Learning Attitudes among ESL Learners. *Pakistan Journal of Humanities and Social Sciences, 11* (2), 2298-2308. https://doi.org/10.52131/pjhss.2023.1102.0522

Ramzan, M., Javaid, Z. K., & Khan, M. A. (2023). Psychological Discursiveness in Language Use of Imran Khan's Speech on National Issues. *Global Language Review, VIII* (II), 214-225. https://doi.org/10.31703/glr.2023(VIII-II).19

Ramzan, M., Javaid, Z. K., & Fatima, M. (2023). Empowering ESL Students: Harnessing the Potential of Social Media to Enhance Academic Motivation in Higher Education. *Global Digital & Print Media Review, VI* (II), 224-237. https://doi.org/10.31703/gdpmr.2023(VI-II).15

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective. Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Shah, H., Warwick, K., Vallverdú, J., & Wu, D. (2016). Can machines talk? Comparison of eliza with modern dialogue systems. *Computers in Human Behavior, 58*, 278–295. https://doi.org/10.1016/j.chb.2016.01.004

Smutny, P., & Schreiberova, P. (2020). Chatbots for learning: A review of educational chatbots for the Facebook messenger. *Computers & Education, 151*, 103862. https://doi.org/10.1016/j.compedu.2020.103862

Su, Y., Lin, Y., & Lai, C. (2023). Collaborating with chat GPT in argumentative writing classrooms. *Assess. Writ.* 57:100752. doi: 10.1016/j.asw.2023.100752

Tafazoli, D., María, E. G., and Abril, C. A. H. (2019). Intelligent language tutoring system: integrating intelligent computer-assisted language learning into language education. *Int. J. Inform. Commun. Technol. Educ. 15*, 60–74. doi: 10.4018/IJICTE.2019070105

Wei, L. (2023). Artificial intelligence in language instruction: impact on English learning achievement, L2 motivation, and self-regulated learning. *Frontiers in Psychology*, *14*, 1261955.

Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. *Learning, Media and Technology, 45*(3), 223–235. https://doi.org/10.1080/17439884.2020.1798995

Yan, D. (2023). Impact of Chat GPT on learners in a L2 writing practicum: an exploratory investigation. *Educ. Inf. Technol. 1-25*, 1–25. doi: 10.1007/s10639-023-11742-4

Yin, J., Goh, T. T., Yang, B., & Xiaobin, Y. (2021). Conversation technology with micro-learning: The impact of chatbot based learning on students' learning motivation and performance. *Journal of Educational Computing Research, 59* (1), 154–177. https://doi.org/10.1177/0735633120952067

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 1–27. https://doi.org/10.1186/s41239-019-0171-0