

Human-AI collaboration in vocational writing: Building a framework for adaptive English learning

Şükran Türkmen Çiçek ^{a*} , Dilek Tüfekçi Can ^b 

^a National Defense University, Türkiye.

^b Balıkesir University, Türkiye.

Suggested citation: Türkmen Çiçek, Ş. & Tüfekçi Can, D. (2026). Human-AI collaboration in vocational writing: Building a framework for adaptive English learning. *Journal of Educational Technology and Online Learning*, 9(1), 45-62

Highlights

- There is a gap in the literature on integrating AI-based tools into the teaching process of Vocational English for writing skill.
- AI-based tools which provide real time and personalized feedback through adaptive learning environments can be used in vocational education in order to improve students' writing skill.
- The theoretical framework including second language acquisition, socio-constructivist theories, and adaptive learning environments determines three components of AI as personalization, contextualization, and digital feedback.

Abstract

The rapid technological advancements of the 21st century have substantially altered many aspects of education, including language learning and acquisition. Developments in Artificial Intelligence (AI) have reshaped perspectives on language education, offering new pedagogical opportunities. Numerous studies have investigated AI-powered tools to improve language proficiency. However, these studies mainly focus on general English. There is a gap in the literature regarding the application of AI-powered approaches for teaching Vocational English, particularly in developing writing skill within vocational contexts. This paper presents a theoretical framework that explains how AI-powered tools can be integrated into vocational language education to enhance writing proficiency. The framework combines theories of second language acquisition, socio-constructivist learning, and adaptive learning environments. It proposes that AI acts as a mediating agent by enhancing learner autonomy, providing scaffolded writing practice, and enabling individualized feedback. These aspects are particularly important for vocational language needs. The model identifies three core dimensions based on a synthesis of recent literature: personalization, contextualization, and digital feedback. By outlining these dimensions, the framework provides structured objectives for future studies and curriculum design. This paper also highlights the importance of ethical AI implementation, data privacy, and technology availability in supporting the specialized writing skills needed for learners of English for Specific Purposes (ESP).

Article Info: Review Article

Keywords: *Artificial Intelligence, Vocational English, Writing Skill, Theoretical Framework, Educational Technology*

1. Introduction

Artificial Intelligence (AI) has advanced more rapidly in recent years due to the continuous development of computer and information communication technologies (Chen et al, 2020). In addition, AI has precipitated profound changes in education, particularly within the domain of language learning along with the rapid technological improvements in the 21st century. The efficacy of AI has also been revealed in empirical research of educational contexts (Heffernan & Heffernan, 2014; Koedinger & Corbett, 2006).

* Corresponding author. Foreign Languages Department, National Defense University, Türkiye.
e-mail addresses: sukran.turkmen@msu.edu.tr / turkmensukran@gmail.com

Doi: <http://doi.org/10.31681/jetol.1821890>

Received 11 Nov 2025; Accepted 26 Dec 2025

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Pokrivcakova (2019) points out that AI-powered tools have been considered beneficial by many researchers and AI-powered education provides more flexible, personalized, and engaging learning.

There has been a growing interest in Artificial Intelligence in Education (AIED) which can be associated with the improvements in AI, its potential in education, and a need across diverse educational contexts (Durak et al., 2024). Furthermore, several studies have been carried out on the usage of AI in language education (Huang et al., 2020; Kartal, 2024; Korkut, 2025; Zou et al., 2025;). It is evident that AI in language education has affected changing pedagogical approaches and learners' engagement (Gutiérrez-Caneda et al., 2023). Moreover, AI has been changing the learners' learning styles and with the application of AI, students have the access to learning sources through different channels (Yong, 2020). Educators have extensively used AI to design teaching materials and provide an understanding for integrating it into language teaching since AI technologies have emerged as effective pedagogical tools by offering real-time feedback, personalized instruction, and adaptive learning environments. Moreover, Gevher et al. (2025) explore the potential usage of generative AI and highlight its capacity to enable continuous, natural, and personalized support. However, the field of Vocational English remains underexplored and further research is necessary.

Recently, technological improvements especially in the field of AI have begun remodeling English for vocational purposes (EVP) instruction. As Yong (2020) reveals, the integration of AI into English teaching is changing traditional approaches in higher and vocational education. Tools such as adaptive platforms, automated writing systems, and AI-powered simulations provide learners opportunities to practice vocational English in interactive, realistic, and personalized environments.

Vocational education is crucial in developing students' practical competencies for occupational needs; however, curriculum content need to be renovated constantly in order to fulfil emergent job requirements thanks to precipitous technological developments (Shi, 2025). On the other hand, students enrolled in vocational schools are expected to have competence in writing in accordance with the professional standards (Siregar et al., 2022). In vocational education, students are also expected to be knowledgeable about texts related to their vocational knowledge and abilities. For writing skill, teachers guide learners to study on the text in linguistic and contextual framework (Byrne, 1988). This requirement brings about implications for English language programs which serve the needs of diverse groups of vocational students (Widodo, 2016) as one of the main problems experienced by English teachers is related to teaching English writing skills (Alaamri, 2013; Loeb & Gustavsson, 2018).

The existing literature is used in a systematic review as a data source on a specific topic by providing substantial evidence concerning the strategies, applications, and synthesis of the identified information (Sampaio & Mancini, 2007). This research carries out a systematic review and proposes a theoretical framework for the usage of AI in developing writing skill in the vocational education. AI is conceptualized as a technological tool and a mediating agent in the framework. It is described as a tool that increases learner autonomy, scaffolds writing practices, and presents personalized feedback. Consequently, this study aims to fill a gap in the existing literature by proposing a theoretical framework which integrates AI-based approaches into the teaching of vocational English writing skill.

AI-based writing assistants or tools can help overcome challenges in vocational education through enabling personalization, giving feedback, and scaffolding. However, teachers should be careful about their effectiveness, ensure ethical usage, and provide human guidance alongside automated support. AI-powered approaches, teacher training, curriculum innovation, scaffolding learner progress can help support learner progress and indicate existing limitations. It is also required to enhance extensive ethical guidelines including concerns related to academic dishonesty, monotonous or generic content, and originality for using AI tools in academic writing (Durak & Cankaya, 2024). AI literacy education can be carried out for educators and students to develop their AI capabilities, limitations and ethical usage (Durak & Cankaya,

2024). AI may change the education system, however, its application in language education should remain balanced, pedagogically sound, and ethically responsible.

2. Theoretical Foundations of the Framework

2.1. Second Language Acquisition Theories

Second Language Acquisition (SLA) theories have been suggested for many years in order to shed light on how language learning happens and what variables influence SLA process (Gitsaki, 1998). The process of integrating AI-based tools into English writing skill development can be grounded in these theories in the vocational context. Combining these SLA perspectives with AI integration can reveal promising results for effective learning environment as each theory focuses on the acquisition and learning process from a different perspective.

Second language teaching has been mainly affected by Krashen's theories (Ariza & Hancock, 2003). Krashen's Input Hypothesis (1992), widely recognized model, underlines the comprehensible input which slightly exceeds the learner's current level ($i+1$). AI systems can be useful tools for providing this comprehensible input in vocational English writing by selecting workplace-relevant texts, adjusting vocabulary levels, and supporting learners' progress. According to Krashen's (1985) Affective Filter Hypothesis, learning is incomplete if learners have a mental barrier such as anxiety. Learners can be more relaxed and adaptable in their learning process when they use AI-based platforms in an environment free from prejudice. According to Swain's Output Hypothesis (1993), language production is essential because it allows students to test theories, determine their knowledge gaps, and develop their fluency. Automated Writing Evaluation (AWE) tools focus on this idea by helping students prepare written texts and receive prompt, formative feedback so they can revise their work.

The meaning of negotiation in communication is important in Long's Interaction Hypothesis (1980). AI chatbots and intelligent tutoring systems can provide opportunities to practice language skills relevant to their professions, as well as authentic vocational communication. Few studies tried to explore the effect of chatbots on interaction in L2 through providing the negotiation of meaning, and interaction (Dizon, 2017). It has been revealed that willingness to communicate (WTC) of the students increased after they talked to chatbots (Tai & Chen, 2023). Other studies also indicate that the integration of technology can help the students' readiness to start a conversation (MacIntyre et al., 1998). Furthermore, it is pointed out in Schmidt's Noticing Hypothesis (Robinson, 1995) that conscious attention to linguistic forms is necessary for acquisition. AI-powered chatbots can enhance oral interaction through developing awareness of specific L2 structures (Timpe-Laughlin & Dombi, 2020). AI can be used as an assistant by students to identify their linguistic gaps, detect their grammatical error or mistakes, and study on syntactic structures and cohesion.

It is suggested in Anderson's ACT-R Model (Anderson & Schunn, 2013) and the Skill Acquisition Theory (DeKeyser, 2020) that learning happens in a transformational process from declarative knowledge (knowing rules) to the procedural knowledge (automatic use). AI-powered tools can facilitate this process by offering adaptive exercises, repeating practice, and automating feedback until learners internalize the necessary skills. From a psychological perspective, the Cognitive Load Theory (Sweller, 1994) reveals that teaching should avoid overloading students' cognition. Intense cognitive load can interrupt learning outcomes (Sweller et al., 2011). With the help of corrective feedback, tasks appropriate for students' level, AI systems can decrease cognitive load through adjusting the tasks based on learners' performance. In a study conducted by Hong and Guo (2025), AI-enhanced multi-display language teaching systems on English as a Foreign Language (EFL) learners have been investigated and the findings of the research has indicated the theoretical possibility of AI-enhanced tools to develop EFL learning process and facilitate motivation, control cognitive load and enhance learner autonomy. In a comparative study on investigating the effects of AI-assisted language learning strategies on cognitive load and learning outcomes, it is suggested that these strategies are useful for reducing extraneous cognitive load as they provide the personalized feedback and adaptive learning approach (Feng, 2025).

SLA theories put forward the interrelated functions of input, output, interaction, noticing, automatization, and mediation in language learning within an integrated framework. These theories can assure that learning is adaptive, context-specific, and pedagogically grounded when incorporated into AI-powered tools that provide a thorough framework for vocational English writing instruction.

2.2. Socio-Constructivist Perspectives

Vygotsky (1978) suggests in Sociocultural Theory that learning is a socially-mediated process. Interacting with more experienced individuals fosters learners' cognitive development and help them align with their Zone of Proximal Development (ZPD). Two developmental stages are important for learning progress. The former one is the actual level in which learners experience independent problem-solving process and the latter one is the potential stage where teachers, peers or parents enable guidance. Thus, it can be suggested that AI is useful as a scaffolder at the potential level through giving feedback which is adaptable for their level and supporting their needs while they carry out the tasks. Likewise, Wood et al. (1976) point out that scaffolding principle helps learners achieve tasks on their own.

While scaffolding learners in educational tasks, educators will prepare tasks and activities which are beyond their current level and offer scaffolding to assist them (Du, 2021). Moreover, scaffolding in the context of vocational English writing can be enabled through preparing profession related documents or writing tasks and giving feedback. The feedback and assistance can be reduced gradually as learners improve their proficiency. For this respect, AI-powered tools can be regarded as digital agencies of scaffolding through offering writing assistance, corrective feedback, and suggestions. Specifically, learners can be guided step by step thanks to these AI tools. This scaffolding procedure with the help of AI aligns with constructivist view of learning in which knowledge is actively co-constructed through interaction rather than passively received. Moreover, chatbots and collaborative platforms further facilitate scaffolding opportunities by presenting interactive learning environments that simulate authentic workplace communication.

Socio-constructivist views put emphasis on subjectivity, collaboration, and learner agency (Lantolf & Thorne, 2006). AI tools can support these aspects by allowing learners to choose tasks, interact with peers or systems, and get feedback that matches their responses. In vocational English, this may mean using chatbots for role-play, simulating workplace conversations, co-editing documents online, or creating professional texts as a group. AI can be used as a scaffolder or mediator in learning. With these approaches, learners can build their skills and improve. When AI is integrated with human guidance and interaction, learners can take part in writing tasks that are contextualized, authentic, relevant, practical, and connected to real work situations.

2.3. Adaptive Learning Environments

As a method in education, adaptive learning uses technology to personalize learning for each learner, enhancing their learning process (Martin et al., 2020). Adaptive learning environments can be regarded as a basis for AI in education. Adaptive learning focuses on adjusting teaching to learners' needs, proficiency levels and pace, drawing on constructivist and cognitive theories. Unlike traditional teaching methods, adaptive learning environments can rearrange tasks and course content, adjust difficulty, and provide immediate feedback. Similarly, Johnson et al. (2021) put forward that implementing AI can help adaptive learning systems by modifying content difficulty and providing personalized feedback in real-time.

Educators and scholars who have been looking for more effective learning environments have sought to personalize education through adapting learning opportunities and instructional strategies to each student's individual skills and dispositions (Natriello, 2017). Determining students' individual learning differences and their impact on the learning process is vital to achieving effective variation in their performances (Sadeghi et al., 2012). In this contemporary world with the integration of AI, it is inevitable to expect that machine learning-based techniques can be included in e-learning systems for problem-solving and automatic identification of learners' learning styles and cognitive skills (Natriello, 2017). In this sense, adaptive learning enhances a learner-centered environment with active participation and learner autonomy by helping students take control of their learning journey (Little, 2007). Thanks to the support given to the

students to achieve their goals as they improve their skills, scaffolded learning is achieved in an adaptive learning process (Pan & Liu, 2022).

Taking advantage of technology to provide adaptable learning environment in which interactive exercises and real-time feedback are exhibited to develop student engagement plays a crucial role in adaptive learning (Shute & Towle, 2003). According to Harrigan et al. (2009) technology-enhanced learning environments provides reusability, personalization in provision of relevant learning materials, increased student motivation, avoidance of information overload, flexibility, and monitoring. Likewise, Gligorea et al. (2023) point out that AI and machine learning is crucial for personalizing learning experiences. According to Nicol and Macfarlane-Dick (2006) adaptive e-learning provides that education stands in line with students' individual changing needs via including ongoing evaluations which can enable fast modification in teaching. Likewise, AI based-adaptive learning systems can analyze students' progress, determine their weaknesses and adapt the curriculum to meet their needs (Poznansky et al., 2025).

There have been several studies on using adaptive learning environments in education. For instance, Yang et al. (2014) examine an online adaptive learning environment for critical-thinking-infused English literacy, exploring the effectiveness of blended learning on students' online discussions through the Moodle system, which improves students' English literacy. In a study of doctoral dissertation, Devilly (2021) investigates the impact of an adaptive learning environment on students' classroom-related and learning related emotions and concludes that students' academic emotional engagement, classroom academic emotional engagement, and learning academic emotional engagement increased after the adaptive learning environments (ALE) are used. Through integrating technology into the adaptive learning model, Kaur et al. (2023) investigate technology-assisted language learning adaptive systems. Furthermore, Poznansky (2025) attempts to examine the effectiveness of using educational technology (EdTech) and AI to adapt learning process to individual students' needs and concludes that AI provides opportunity to enable more personalized, engaging, and effective language learning.

Adaptive learning with AI uses intelligent tutoring systems which provides individual teaching and personalization for the learners' own progress (Bernacki et al., 2021). Likewise, Corbett and Anderson's (1995) ACT-R model of Intelligent Tutoring Systems indicates that adaptive learning systems can serve as examples of one-to-one tutoring. AI-based applications can determine learner errors, provide personalized corrective feedback, and give suggestions. The integration of AI technologies into Learning Management Systems provide adaptive feedback, personalized learning, and data-based decision making (Kaleci, 2025). Moreover, chatbots can arrange the difficulty of conversations from simple to more complex ones as the students improve themselves.

The effectiveness of using adaptive learning in education has been proven in a few studies; nevertheless, its implementation has some drawbacks such as financial expenditures for technology and the continual training of teachers (Means et al, 2014). In addition, personalizing learning pathways for each student can be time-consuming and difficult to manage, as it requires instructional design and extensive data analysis (Shute & Towle, 2003). Another issue stated in the literature is related to data privacy and security for students' personal information (Dabbagh & Kitsantas, 2012). Besides, there is a necessity for ongoing professional development and assistance for educators in order to provide successful application of adaptive learning (Jiménez et al., 2019). Thus, AI can be used in adaptive learning environments for effective learning; however, it is necessary to conduct more research and the drawbacks should be taken into consideration.

3. AI as a Mediating Agent in Vocational English Writing

Written communication skill is one of the fundamental competencies directly affecting learners' career as it is necessary to carry out tasks such as writing, reports and email correspondence, and technical documentation (Sulisworo et al., 2016). Writing is mainly important in job applications where candidates are assessed in terms of their ability to use language correctly (Shih, 2011). Therefore, writing is both essential and challenging for vocational English learners (Ying, 2022).

English for Vocational Purposes (EVP) mainly focuses on the use of English in professional context. Widodo (2016) defines EVP as a program which is prepared to teach students English aligned with their vocational expertise. In previous research, it is also indicated that collaboration between English teachers and vocational subject teachers is necessary for designing effective vocational English (VE) materials (Widodo, 2015). ESP or EVP teachers can decide on the texts which are relevant to students' professions thanks to this collaboration. EVP specifically focuses on the process of preparing learners to perform effectively in vocational settings. It lays emphasis on practical language use rather than only academic skills (Dudley-Evans & St. John, 1998). From this perspective, AI can provide effective virtual simulations in different dimensions and enhance human-computer interaction and presents new opportunities for vocational education through providing personalized and contextual learning experiences (Rongchang et al., 2024).

It is necessary for an effective teaching assistant to provide learner engagement in personalized conversations, give immediate feedback, and answer their questions (Zhang et al., 2024). AI can enable this support in vocational English writing. AI-based tools are capable of enhancing authenticity, creativity, and development in language learners' writing by helping learners engage in personalized learning experiences (Tomlinson et al., 2023). AI grammar checkers can be used to correct grammatical mistakes in written texts effectively (Park, 2019). Such AI-based writing tools as Grammarly or Quillbot have been examined in the context of higher education and found effective in improving writing skill (Lingaiah et al., 2024; Özçelik & Ekşi, 2024). AI assistant can enable quick support and provide learning environment which is secure and impartial in terms of mistakes (Petrova & Mikheeva, 2021). Thus, AI can serve as a mediating agent in the development of vocational English writing.

Scaffolding can be provided with the help of encouragement, partial answers, templates, hints along with direct presentation (Hartman, 2002). AI tools have offered new opportunities for scaffolded learning as they enable learner autonomy language accuracy and motivation by presenting personalized feedback, adaptable pacing, and interactive practice (Wang & Shi, 2021; Ibrahim & Bilquise, 2024). AI tools are useful for providing effective, self-directed, and personalized learning through proper scaffolding (Umutlu & Gursoy, 2022). Akram et al. (2025) report that students using AI-assisted learning showed improved problem-solving, better organization of ideas, and stronger self-regulation skills, suggesting that intelligent tutoring systems can foster self-regulated learning. In addition, Liao (2024) examined scaffolding computational thinking with ChatGPT and figured out that most students had positive attitudes toward the system considering it effective for developing computational thinking.

Eguara's action research in the U.K. demonstrates that technology-mediated scaffolding enhances learner autonomy and self-efficacy. Li and Wilson (2025) conclude that AI-integrated tools can decrease cognitive load, improve idea generation, and support self-regulated learning without hindering learner autonomy. Moreover, Kim et al. (2025) reveal that the integration of generative AI with cognitive scaffolding methods supports learning flow, self-efficacy, and overall learning satisfaction. Learners are capable of choosing their own content, getting individualized feedback, and monitoring their own learning pace thanks to these tools; therefore, their metacognitive awareness is enhanced (Korkut, 2025). In addition, learners can revise independently, improve their fluency, and have grammatical awareness with the help of tools such as Grammarly (Attali & Burstein, 2006; Wang & Shi, 2021). In line with cognitive load theory (Sweller, 1988; Hornay, 2021), mental effort can be decreased by AI-powered tools as these tools can provide manageable input and direct guidance. In conclusion, the body of literature review display that AI-powered tools can both decrease cognitive load and support learner autonomy and satisfaction when they are used as scaffolder.

The growing interest in improving writing skill in both academic and professional settings underscore the necessity for advanced feedback systems which can provide individualized and contextualized support; however, traditional feedback implementations often fail to give timely-targeted and individualized views which are necessary for developing writing skills effectively (Dasam et al., 2024). Likewise, language education mainly depended on traditional methods including lectures, textbooks, language labs that provided restricted opportunities for real time feedback and personalized instruction before AI was invented

(Warschauer & Healey, 1998; Warschauer, 2004). Nevertheless, scholars point out the importance of AI-based agents in giving instant feedback to language learners, correcting errors on time, and scaffolding their learning processes (Heift & Schulze, 2007). These tools are equipped with abilities such as automated feedback systems, real-time writing analysis, and grammar checkers, and enhance writing skill in terms of content, vocabulary, syntax, and grammar (Jeanjaroonsri, 2023). AI-based writing platforms provide self-directed learning through helping students to be actively engaged in their writing tasks and work independently (Wang et al., 2024).

Automated Writing Evaluation (AWE) can enhance students' writing skills when integrated with teacher feedback (Sari and Han, 2024). Researchers such as Schmidt-Fajlik (2023) and Zhang et al. (2024) have investigated artificial grammar instruction tools, suggesting that platforms like Grammarly, ProWritingAid, and LanguageTool offer real-time feedback on syntax and usage. Moreover, Wiboolyasarín et al. (2025) have investigated the AI-based corrective feedback for low-proficiency learners and the research results revealed that the components of writing including grammar, vocabulary, sentence structure, coherence, and task achievement improved significantly. In another study, Jegede (2024) studied on AI and English language learning demonstrated that AI-driven tools enhanced personalized learning experiences and instant feedback from AI tools were considered useful by the majority of the students. Tajik (2025) also carried out research on the writing platforms and concluded that participants in the AI group had positive attitude to AI-based instruction and cited that their engagement, autonomy and confidence increased in their writing skill. In that research, it was figured out that AI-based platform facilitated self-regulation and individualized learning experiences.

Chatbots are considered essential tools for providing synchronous tutoring and learner support thanks to their capacity to conduct natural language conversations (Ashfaque et al, 2020; Kerly et al., 2007). In addition, AI-based chatbots support everyday conversational practice while sustaining learners' interest and motivation, thereby contributing meaningfully to language skill development (Fryer et al., 2017; Kim et al., 2019). These chatbots, such as ChatGPT, enable flexible and available tools for language practice by mimicking real conversations (Gutiérrez-Caneda et al., 2023). The chatbots in AI-driven platforms have been considered effective and useful (Kim, 2016; Yang et al., 2022); however, such domains as coherence, organization, and lexical diversity have not been studied thoroughly (Underwood, 2017; Kessler, 2018). Some other researches have underlined some concerns related to the potential drawbacks of using AI tools and chatbots in education (Liu et al., 2023; Lund et al., 2023). These issues and ethical considerations about AI tools are presented in the next section below.

4. Ethical Considerations

There have been some important pedagogical and ethical problems which should be considered carefully by teachers and students (Yang et al., 2022; Huang et al., 2022). These ethical concerns are related to misinformation, job displacement, lack of transparency, privacy, plagiarism, creativity and reliance (Doyal et al., 2023). Integrating AI-based tools into the classroom can bring the common challenges such as the risks of privacy, biases and discrimination, surveillance, and autonomy (Akgun & Greenhow, 2022). The ethical concerns, accuracy of information, and cultural biases of AI-driven tools require a critical and reflective approach in order to use them in education (Gutiérrez-Caneda et al., 2023).

Although the potential benefits have been acknowledged, many educators, especially in schools, regard it difficult to evaluate how effective AI tools are and to use them meaningfully in their teaching (Kumar et al., 2024). Failure to obtain proper consent or the reinforcement of bias through algorithms can undermine both equity and trust in learning technologies (Ferrara, 2023). From another perspective, the usage of AI tools like ChatGPT offer opportunities for fostering creativity and arranging students' writing in accordance with the given AI feedback on grammar, vocabulary and structure; however, such ethical concerns as over-reliance on AI, plagiarism, and restricted critical thinking should be taken into consideration (Khup & Bantugan, 2025). Another important issue is to use AI as a supplement instead of a replacement for students' tasks and works (Cotton et al., 2024). Therefore, students should be guided on the ethical use of AI in order to prevent potential drawbacks, plagiarism, and over-reliance on AI-generated works (Gill et al., 2024).

Furthermore, large language model (LLM)-based generative AI tools are problematic in terms of plagiarism and inaccurate or fabricated references (Cheng et al., 2025), thus this situation brings about some serious concerns related to the integrity of AI in writing academic manuscripts. Since AI tools usually obtain data from available internet sources, some research studies have revealed important issues related to their utility, accuracy, and integration (Kim, 2024). In particular, there are key issues about AI tools: (1) plagiarism (Kim, 2024; Kacena et al., 2024), (2) fabricated or false information (Alkaissi & McFarlane, 2023; Athaluri et al., 2023), and (3) inaccurate or fabricated references (Alkaissi & McFarlane, 2023; Benichou, 2023).

AI tools offer important opportunities to facilitate teaching and learning especially for writing skill; however, their ethical and pedagogical implications should be criticized. Development of digital literacies is necessary for the principled use of AI tools (Gutiérrez-Caneda et al., 2023). The potential problems of plagiarism, misinformation, and cultural bias demonstrate the need for critical awareness and principled integration into educational contexts. Both educators and students should have digital and AI literacies. This can be enabled through trainings and AI education. Likewise, in a longitudinal case study conducted by Durak et al. (2025), it is concluded that two-week formal GenAI training program increased the students' understanding of GenAI and its ethical implications. Their study underscores the importance of integrating AI training into academic curricula in order for students to use these technologies effectively with critical digital literacy and ethical awareness.

To conclude, AI-powered tools should not be considered as a replacement for creativity. On the contrary, they should be regarded as a complementary agent with ethical application. Besides, the effectiveness of AI tools depends on the principled pedagogical design with ethical concerns; thus, there is a clear need for a structured approach to the integration of AI-powered writing tools in vocational English education. Instead of using AI-driven tools indiscriminately, a pedagogically grounded framework can guide educators and learners in utilizing AI effectively and reducing the risks of plagiarism, misinformation, and over-reliance.

5. Core Dimensions of the Proposed Framework

5.1. Personalization (*Vocational Field-Specific Writing Tasks*)

AIED has focused on designing systems which are efficient like human for one-on-one tutoring (VanLehn, 2011). Transitions and changes in education serve as an opportunity for contemporary educational theories to propose more agency and personalization (Collins & Halverson, 2010). Whereas theories propose that constructivist activities are helpful, the data obtained from the literature reviews puts forward that students require great support (Tobias & Duffy, 2009). Therefore, it can be pointed out that there is a need for personalization in education as classrooms include tasks and activities that could benefit from additional support.

The AI-based chatbots currently stand out for their flexibility as they can be personalized to support learners at any level of proficiency while facilitating the language learning experience simultaneously (Chiu et al., 2023; Huang et al., 2022). According to Korkut (2025), the main benefit of AI tools is their capacity to provide instantaneous and individualized feedback to learners. For instance, writing tools such as Grammarly and Write and Improve have been found effective in helping learners revise grammar, syntax, and cohesion in higher education settings (Lalira et al., 2024; Mohammad et al., 2024). As another technology-based tool, Computerized Dynamic Assessment (CDA) provides individualized feedback to meet the learners' needs through technology. CDA's capability in personalizing feedback has been investigated in some research. For example, Ebadi and Rahimi (2019) used dynamic assessment through Google Docs in their research and Ai (2017) explored the effectiveness of corrective feedback in ICALL environment.

The literature review reveals that learners need personalization and individualization in their learning process especially in vocational education. Writing tasks related to the specific professional context should be individualized and this can be achieved through AI-powered technologies and tools. As mentioned previously, AI-powered tools are useful for giving personalized and immediate feedback and arranging

learners' writing tasks in terms of grammar, vocabulary usage, syntax, coherence and cohesion; however, all process should be examined carefully with ethical consideration.

5.2. Contextualization (*Workplace Genres and Discourse*)

Contextualization is important in education, particularly vocational education in which learners are required to be engaged in engaged with genres, discourse patterns, and speaking practices in relation with their work life. Teaching can become more effective and comprehensible when the instruction is given meaningfully in a context (Kim, 2012). In vocational English learning, contextualization can be enabled through designing task which simulate workplace writing such as reports, technical documentation, or e-mail correspondence. In line with this, AI chatbots like ChatGPT facilitate contextual language production and provide flexible learner-centered practice (Belda-Medina & Calvo-Ferrer, 2022). Thus, it can be suggested that AI-powered tools can be utilized for providing contextualization in order to improve writing skills in EVP context.

5.3. Digital Feedback

Qualitative feedback gives information to the students about the level of the task related to how well the task is carried out and also influences students deeply to complete the task with self-regulated learning theory (Hattie & Timperley, 2007). In order to achieve this, teachers should provide relevant and contextual feedback for encouraging them to engage in self-reflection (Carless, 2019). Teachers are capable of giving high-quality feedback; however, the difficulty of this task can be decreased with the help of AI (Bulut & Wongvorachan, 2022). Moreover, great technological developments have revealed different learning routes though providing feedback with its digital form to enhance personalization and real-time access (Ryan et al., 2019; Bulut et al., 2019). Learning analytics (LA), natural language processing (NLP), and educational data mining (EDM) are AI-powered tools for giving digital feedback (Gardner et al., 2021; Zhang et al., 2021). Also, the AI-powered chatbots have an essential role in the procedure of familiarizing linguistic features with the learners and they have been regarded as important tool for providing learners more practice anywhere and anytime with continuous engagement and personalized feedback (Haristiani, 2019; Mackey, 2020). Therefore, AI can be used for receiving digital feedback to enhance the process of writing skill development in vocational context.

6. Conclusion

The theoretical framework related to the integration of AI-powered approaches into vocational English writing skill development is proposed in this research. This paper refers to a significant gap in the body of current literature review. Through revising second language acquisition theories, socio-constructive learning theories, and adaptive learning environments, the proposed framework suggests AI as both a technological tool and a mediating agent which facilitates learner autonomy, scaffolds in writing skill development, and enables personalized, real-time feedback in order meet vocational needs of the learners. In the framework, three elements are considered very important and these can be categorized as personalization, contextualization, and digital feedback. Development of writing skills requires these core constructs. In addition, they demonstrate the importance of using AI tools for learning work-place genres, providing authentic tasks and giving adaptive support. Consequently, the framework suggests curriculum development and usage of AI as a guide for future studies.

The education system has experienced an alteration from product-based learning to process-based learning which includes learner motivation, self-regulation and collaboration (Roll & Wylie, 2016). This pedagogical change requires using new technologies and replacing research priorities in the education system. Likewise, Chen et al. (2020) suggest that it is required to go beyond traditional or superficial teaching approaches and develop new methods which foster the usage of AI in education (AIED).

The usage of AI-based writing tools has been considered effective for improving students' writing proficiency and facilitating the process of teaching in an EFL classroom (Dong, 2023). Thus, there is a need

for curriculum of vocational education to be remodelled to adapt new occupational necessities (Durmuş & Dağlı, 2017). Professional development programs on AI can be carried out to increase teachers' knowledge and experience about AI technologies (Çayak, 2024). Writing skill in vocational English teaching can be developed effectively with the help of AI-based education and thereby meeting the needs of contemporary professional requirements. Yet, the ethical issues like plagiarism, students' availability for technology, and data privacy should be critically reflected upon while integrating AI into education. This can be overcome through The Comprehensive AI Assessment Framework (CAIAF) as it provides the ethical and efficient integration of GenAI tools in education (Kılınç, 2024). Technological background and educational precision are key factors for effective AI-based education and integration. It should be taken for that AI-based tools are only assistants instead of replacing human guidance. Consequently, AI should be used and integrated under pedagogical circumstances with ethical rules specifically for the vocational context.

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