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Exploring EFL Students' AI Literacy in Academic Writing: Insights into Familiarity, Knowledge and Ethical Perceptions

İngilizceyi Yabancı Dil Olarak Öğrenen Öğrencilerin Akademik Yazımda Yapay Zekâ Okuryazarlığını Keşfetmek: Aşinalık, Bilgi ve Etik Algılar Üzerine İçgörüler

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ABSTRACT: As artificial intelligence (AI) increasingly influences education, understanding learners' experiences, engagement and literacy of these tools is critical. This study explores AI literacy among Turkish English as a Foreign Language students regarding their familiarity, knowledge, and ethical perceptions of AI technologies in academic writing. Using a descriptive exploratory approach, the study surveyed 427 students from two Turkish universities. Findings reveal a moderate level of AI familiarity and usage among participants, with a significant reliance on AI tools for translation and grammar proofreading. Despite recognizing AI's potential to enhance academic writing, students exhibited limited technical proficiency and understanding of AI's underlying mechanisms, highlighting a need for targeted and structured AI education for EFL writing. Moreover, ethical perceptions emerged as a critical dimension of AI literacy: while students acknowledged the utility of AI in improving academic writing, the majority expressed concerns about plagiarism and academic integrity, emphasizing the importance of transparent and responsible AI use. The findings contribute to the ongoing discourse on AI integration in EFL education, offering insights for policymakers, educators, and researchers to better prepare students for an AI-driven academic environment.

Keywords: Artificial intelligence literacy, EFL, academic writing, generative artificial intelligence, Türkiye.

ÖZ: Yapay zekanın (YZ) eğitim üzerindeki etkisi giderek artarken, öğrenenlerin bu araçlarla ilgili deneyimlerini, etkileşimlerini ve okuryazarlık seviyelerini anlamak büyük önem taşımaktadır. Bu çalışma, Türk EFL (İngilizceyi Yabancı Dil Olarak Öğrenen) öğrencilerinin akademik yazımda YZ teknolojilerine yönelik aşinalıkları, bilgileri ve etik algıları açısından YZ okuryazarlığını keşfetmeyi amaçlamaktadır. Betimleyici-keşfedici yaklaşım kullanarak, çalışma iki Türk üniversitesinden 427 öğrenci üzerinde bir anket gerçekleştirmiştir. Bulgular, katılımcılar arasında YZ'ye yönelik orta düzeyde bir aşinalık ve kullanım olduğunu, çeviri ve dilbilgisi düzeltmeleri için YZ araçlarına önemli bir ölçüde bağımlılık olduğunu ortaya koymaktadır. Öğrenciler, YZ'nin akademik yazımı geliştirme potansiyelini kabul etmelerine rağmen, YZ'nin temel mekanizmalarına dair sınırlı teknik beceriler ve anlayış sergilemiş, bu da EFL yazımı için hedefli ve yapılandırılmış bir YZ eğitimi ihtiyacını ortaya koymuştur. Dahası, etik algılar YZ okuryazarlığının kritik bir boyutu olarak ortaya çıkmıştır: öğrenciler akademik yazımı geliştirmede YZ'nin faydasını kabul ederken, çoğunluk intihal ve akademik dürüstlükle ilgili endişelerini dile getirmiş, şeffaf ve sorumlu YZ kullanımının önemini vurgulamıştır. Bulgular, EFL eğitiminde YZ entegrasyonu konusunda süregelen tartışmalara katkıda bulunmakta, politika yapıcılar, eğitimciler ve araştırmacılar için öğrencileri YZ odaklı bir akademik ortamda daha iyi hazırlamak adına önemli içgörüler sunmaktadır.

Anahtar kelimeler: Yapay zekâ okuryazarlığı, yabancı dil olarak İngilizce, akademik yazım, üretken yapay zekâ, Türkiye.

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In recent years, the development of artificial intelligence (AI), particularly Generative AI (GenAI), has radically impacted education (Bahroun et al., 2023). This change and transformation of AI in education is predicted to continue in the future (Becker et al., 2018). With the emergence of the Transformers infrastructure and Large Language Models (LLMs) and their intensive use by users (i.e. 1.5 billion visits per month for ChatGPT) (Bianchi, 2023), there have been significant developments, especially AI-based text generation. Similarly, research reported that the substantial capabilities and features of AI tools have profound implications for English as a Foreign Language (EFL) learning and teaching (Jiang, 2022; Layali & Al-Shlowiy, 2020). AI tools can support academic writing in areas such as text generation, grammar and spelling checking, text editing and brainstorming about writing processes (Conde et al., 2024; Kong et al., 2024; Roe et al., 2023). The proliferation of such technologies in EFL writing creates the need to explore how such a phenomenon is first understood. Understanding students' perceptions, knowledge levels and ethical perspectives on integrating AI technologies into EFL and academic writing processes is imperative for making policy on this issue (Chan & Hu, 2023; Jiang, 2022). By exploring EFL students' AI engagement and literacy—encompassing their awareness, knowledge and ethical perspectives—we can establish a solid foundation for developing informed policies and teaching strategies. This study not only guides the thoughtful implementation of AI tools in educational contexts but also promises to empower students to use these technologies ethically and effectively in their EFL writing, thereby enhancing the quality of education.

It has been proposed that AI literacy and AI citizenship is a way of defining competencies for students needed to succeed in everyday life and work with AI (Hossain, 2024; Stolpe & Hallström, 2024). To date, research on AI in EFL and academic writing has emerged (Jiang, 2022; Kong et al., 2024; Roe et al., 2023). Nevertheless, to our knowledge, studies concentrating on AI literacy in the EFL writing or academic writing context tend to be comparatively scarce. Accordingly, this study attempts to explore tertiary-level Turkish EFL students' AI literacy regarding their familiarity, knowledge and ethical understanding of AI technologies in academic writing contexts. The following specific objectives helped guide the study in exploring the various aspects of AI literacy among the participating EFL students in 2 public universities in Türkiye.

- To explore the level of familiarity, recognition and usage experience of AI technologies and applications among EFL students in Turkish universities.
- To understand how Turkish students use AI, specifically GenAI, in their academic writing.
- To investigate EFL students' perceptions regarding the ethical issues of using AI in academia, particularly in academic writing, concerning academic integrity.

To achieve these research objectives, the following research questions (RQs) were addressed:

RQ1: What is the level of AI familiarity and literacy of Turkish EFL students?

RQ2: To what extent and for what purposes do Turkish EFL students use AI tools in their academic pursuits?

RQ3: In the context of academic integrity, what are Turkish EFL students' ethical viewpoints on AI integration in academic writing?

Literature Review

AI Literacy

With the rapid integration of AI tools into our daily lives, the concept of AI literacy has come to the fore. According to UNESCO (2022), AI needs to be steered for the common good by equipping all citizens with skills, knowledge, understanding and value orientation, which can be called AI literacy. Hossain (2023) defined AI literacy simply as "the ability to identify, understand, develop ideas and critically evaluate AI technologies, their applications, and ethical implications'' (p.1). Building on Hossain's (2023) definition, in this study, we define AI literacy as students' familiarity, knowledge and ethical perceptions of AI. The familiarity domain refers to the degree of familiarity of students with AI in general and in EFL education, while the knowledge domain focuses on how often and to what extent students use AI tools in their daily lives and at school. The ethical perceptions dimension aims to measure the level of students' perceptions of the ethical aspects of using such tools in accordance with the principles of academic integrity when using AI tools at school. Collectively, these three dimensions reveal students' AI literacy levels.

Generative AI Application in Education

We are living in a time where AI is increasingly becoming an integral part of our daily lives, our workplaces and our public services, including education (Hossain, 2024). The application of AI in education, known as AIEd, has been a focus of academic research for over three decades (Luckin et al., 2016). This field explores learning in diverse contexts, be it traditional classrooms or professional settings, to support both formal education and continuous learning initiatives (Luckin et al., 2016). With the proliferation of AI tools, AIEd was estimated to grow by 43% from 2018 to 2022 (Becker et al., 2018), whereas the Horizon Report 2019 (Alexander et al., 2019) predicts even greater impacts. Furthermore, Limna et al. (2022) noted that educational institutions have been infiltrated by AI through the rapid advancement and adoption of GenAI tools.

AI has been widely embraced in higher education institutions in a variety of forms and formats. The World Economic Forum stressed the importance of integrating AI into education through traditional and innovative methods in order to shape tomorrow's workforce (Milberg, 2024). AI's machine learning models (MLMs) capabilities enable the creation of personalised curriculum and content, which results in greater student engagement, retention and overall learning effectiveness (Ge & Hu, 2020). Similarly, UNESCO's Global Education Monitoring Report 2023 highlights many new AI tools can prove invaluable in providing personalised support for students, particularly those with disabilities or living in remote areas. Further, the use of AI tools and platforms helped streamline administrative processes as well, such as the review and grading of assignments (Ge & Hu, 2020; UNESCO, 2023). Similarly, Hollands and Breazeal (2024) assert that the explosion of AI applications in our everyday lives makes it imperative for teachers and students to become AI literate. The authors concluded that learning about AI technologies increased students' (and perhaps teachers') optimism

about how AI tools can benefit society and contribute to shaping its future. As outlined by Hossain et al. (2024), teachers should teach their students how to use AI technology ethically and legally in order to prepare them to be AI-ready.

Nevertheless, the integration of AI into education faces various challenges and ethical dilemmas (Tahiru, 2021), including false information and privacy, AI hallucinations, deepfakes, academic integrity, plagiarism and copyright issues (Hossain et al., 2024; Udell, 2024). Further, Su et al. (2023) identified a set of challenges to AI literacy including (1) lack of teachers' AI knowledge, skills and confidence (2) lack of curriculum design, and (3) lack of teaching guidelines. UNESCO (2022) stated that policymakers in the education sector must comprehend unique ethical issues associated with using AI in education. Consequently, UNESCO published its 'Recommendation on the Ethics of Artificial Intelligence' and a guide for policymakers on AI and education in 2021 (UNESCO, 2023). In addition, to address the disruptions caused by AI technologies, UNESCO published its first guidance for GenAI in education and research in September 2023. The European Union also adopted the draft "EU AI Act" in 2023, as proposed by the EU Commission in April 2021, to ensure better conditions for the development and usage of AI in EU states (European Parliament, 2024).

It is worth mentioning that as of August 2024, 70 states (Bangladesh has developed a 'National Strategy for Artificial Intelligence' in 2020 which isn't in the OECD list), both developed and developing, have already published their national AI policies and strategies (OECD.AI, 2021 & 2024). As a result of these national policies and strategies, AI benefits are guaranteed, and rules and frameworks are established for the safe and ethical use of AI while protecting citizens' rights and privacy. The government of Türkiye published the country's National Artificial Intelligence Strategy for 2021-2025 in August 2021 within the framework of the "Digital Türkiye" vision and Türkiye's "National Technology Move" (Özdemir, 2021, p. 6).

Essentially, Türkiye's National AI Strategy includes 6 main strategies: (i) training AI employment opportunities in the field, (ii) supporting research, entrepreneurship, and innovation, (iii) improving access to quality data and technical infrastructure, (iv) accelerating socioeconomic adjustment, (v) strengthening international cooperation, and (vi) accelerating structural and workforce transformations. By 2025, Türkiye plans, among others, to increase AI's share of Gross Domestic Product (GDP) to 5%, create 50,000 new jobs in the sector, and increase the number of AI postgraduate students by 10,000 (Digital Transformation Office, 2021). A major objective of the strategy is to place Türkiye among the top 20 countries in international AI rankings (Moss, 2021). To achieve these state ambitions, according to Digital Transformation Office (2021), Türkiye should increase universities' academic and technical capacity in AI and related disciplines and the quota of students who will enroll in undergraduate and postgraduate degree programs. The researchers believe that Turkish schools and universities should also focus on developing and integrating AI literacy into their curricula and teachers need necessary training and professional development opportunities for a vertical and horizontal contribution to the Turkish National Artificial Intelligence Strategy. According to the UNESCO report (2023), the most effective way to build AI competencies in schools, technical and vocational institutions, and higher education institutions is to mainstream them into national curricula.

AI Tools and Application in EFL Learning and Academic Writing

As AI tools evolve, their influence on teaching and learning is becoming more evident including in EFL settings. Moreover, AI tools based on LLMs offer significant opportunities to improve students' writing process thanks to their substantial capacity to generate text. ChatGPT, for example, excels in understanding and producing language, making it valuable for dialogue and text generation. As part of EFL education, OpenAI's ChatGPT provides students with personalised feedback and writing support, helping them to improve their expression abilities. Additionally, other AI tools, such as speech recognition and text-to-speech technology, expand opportunities for English learning and writing enhancement (Wu, 2024). Students at five South African universities were found in a study by Bosch and Uzuegbunam (2023) to prefer other AI-powered tools like translation and referencing tools over ChatGPT. The study found that 46.5% of respondents used online writing assistants like Quillbot to improve their writing style, while 80.5% used Grammarly or similar tools to help them write in appropriate English. Only 37.3% of respondents had used ChatGPT to answer an essay question. Students acknowledged that AI-powered tools could lead to plagiarism or affect their learning. However, they also stated that they did not use these tools in problematic ways. Amirjalili et al. (2024) study focused on authorship and voice in academic writing using ChatGPT. Their study reported that despite potential benefits, limitations exist in ChatGPT's current ability to generate academic text, emphasising the need for ongoing improvement.

Recently, AI-powered writing assistants have garnered significant interest as a novel method to improve students' academic writing prowess (Zhao et al., 2024). Shofiah and Putera (2024) stated that in academic writing, AI technology has surfaced as a cutting-edge solution capable of improving both the effectiveness and caliber of students' writing. Based on interviews with 30 participants, Zhao and colleagues (2024) investigated how Chinese international students in higher education utilise Wordtune, an AI-powered writing assistant. Regardless of English proficiency, students found the rewriting options helpful, particularly for formal language. They expressed a desire for improved functionality to better align with academic writing standards. This study sheds light on international students' use of digital tools in writing.

Syahnaz and Fithriani (2023) explored how EFL students perceive QuillBot usage in an academic writing course. Their qualitative case study involving 20 English education majors reveals positive responses towards Quillbot, highlighting its benefits in improving writing quality and enhancing attitudes toward writing. In another study, Kurniati and Fithriani (2022) examined post-graduate students' perceptions of Quillbot as a digital tool for English academic writing. The study underscores the significant role of AI-powered technologies like Quillbot in fostering high-quality writing in academic contexts.

In another study, Al Mahmud (2023) stated that AI-powered writing tools like Wordtune and Grammarly are increasingly used in L2 (EFL) writing. The study found that Saudi students using Wordtune showed better performance than those in the control group. Quantitative results showed improved writing and higher scores in the final exam for the Wordtune users. Qualitative findings indicated modest improvements in lexical and syntactic aspects, with enhancements in nouns, adjectives, verbs and sentence

structures. The tool had a similar effect on writing quality for both male and female participants.

Malik et al. (2023) found that students had a positive view of AI-powered writing tools, acknowledging their benefits in grammar checks, plagiarism detection, and essay outlines. While AI improved writing skills and academic integrity, some students were concerned about its potential impact on creativity and critical thinking. In this context, Shibani et al (2024) study reported that AI tools contribute to critical thinking skills by helping students brainstorm before and after the writing process. A study by Song and Song (2023) reported that the quantitative analysis showed significant improvements in writing skills and motivation with AI-assisted instruction. The experimental group demonstrates enhanced proficiency in organisation, coherence, grammar, and vocabulary. Qualitative findings revealed mixed views on AI's role, emphasising the need for ongoing development for sustainability.

Tran (2023) demonstrated that teachers and students have positive attitudes towards AI usage in academic writing. This study provides valuable insights for educators and students, especially those preparing for standardised English tests, improving cohesion, coherence, vocabulary, grammar, and accuracy. Another finding from Nazari et al. (2021) indicated that AI-driven writing tools might effectively encourage learning behaviour and foster technology acceptance among non-native postgraduate students in English academic writing through formative feedback and assessment. By providing students with fast and high-quality feedback on their writing processes, Darvishi et al. (2022) and Lee (2023) assert that such tools can serve as responsive peers independent of time and space. All these pedagogical outcomes support the notion that integrating AI tools into EFL learning and academic writing processes has a positive effect, and integration is therefore inevitable (Dong, 2023; Kong et al., 2024; Shibani et al., 2024; Tran, 2024).

However, debates persist concerning AI tools' effectiveness in EFL and academic writing contexts. To explore this, a study was carried out by Sumakul et al. (2022) to understand the perceptions of eight (8) EFL students in an Indonesian university who used an AI app in their writing class. Results indicated positive student perceptions, highlighting enjoyment and helpfulness in writing tasks. The study also emphasised the importance of considering various factors when integrating AI into writing classes. Gayed et al. (2022) explored the increasing use of English as a Lingua Franca, highlighting the need for tools to aid EFL learners in achieving fluency. "AI KAKU," an AI-based web application, was developed to assist EFL learners in overcoming cognitive barriers when writing in English. Initial findings from an experiment suggest its potential as a valuable resource for learners needing structured writing assistance beyond traditional word processors. Ginting et al. (2023) mentioned students prefer using AI for their final assignments despite its scarcity. Their positive outlook on AI's role in writing enhances the quality of their work, emphasising its benefits in project completion. Thus, integrating AI writing tools can be beneficial for improving EFL students' academic writing. Most importantly, if used ethically, AI tools can be seen as an important aid in the development of students' identity as writers.

The research emphasised a balanced AI integration approach to preserve human ingenuity in language learning and academic writing. Integrating AI tools like ChatGPT, Grammarly, QuillBot and Wordtune aids EFL students in overcoming

writing challenges, yet further research is needed to fully understand its impact in language classrooms (Amirjalili et al., 2024; Malik et al., 2023; Syahnaz & Fithriani, 2023). It is imperative, however, to establish students' AI literacy before developing policies and educational interventions, and this study attempted to fill this research gap by studying Turkish EFL students' AI literacy.

Methodology

This study adopted a descriptive approach (Creswell, 2014) to investigate AI literacy among Turkish university students. Descriptive quantitative research is particularly suited for capturing participants' rich, detailed perspectives on emerging topics like AI literacy.

Data Collection Procedure and Tools

Based on the objectives of the study and relevant literature, we developed an AI literacy survey questionnaire comprising four distinct sections: Demographic Information, AI Familiarity, AI Applications, and AI Ethical Concerns, as detailed in Table 1.

Table 1

Components of AI Literacy with Details Breakdown

AI Components	Details Breakdown
Familiarity	AI Awareness, recognition and usage experience
Knowledge & Application	Conceptual and technical AI knowledge and understanding
Ethical perceptions	AI impact on academic integrity

After assembling a pool of survey items and drafting the initial version of the survey, feedback was sought from co-authors, resulting in minor revisions that improved the content before piloting. To further ensure clarity and accuracy, the survey underwent evaluation through the think-aloud method. This approach allowed for an in-depth exploration of participants' understanding of the survey items and assessed whether the survey effectively captured the intended information. Three students participated in these think-aloud sessions, each lasting approximately 15-20 minutes. During the sessions, the students were asked to verbalise their thoughts while completing the survey, offering real-time insights into their comprehension of the questions. The sessions were recorded and thoroughly reviewed to identify any areas of confusion or misunderstanding. The think-aloud protocols confirmed that the survey items were generally well understood, though a few minor adjustments were made based on the feedback to enhance clarity and ensure the questions were as straightforward as possible. Following these refinements, the survey was piloted with a larger sample of 50 students. The initial results from the pilot indicated strong reliability of the survey scale, with a Cronbach's alpha of 0.85, demonstrating high internal consistency.

Various question formats, including checkboxes, Likert scales, multiple-choice and statement-type questions, were employed to capture nuanced responses from

participants. Purposive sampling targeted a diverse cohort of respondents enrolled in various programs across multiple academic institutions. The survey was delivered using a Google Forms link and distributed through the authors' academic networks to various institutions in the participating country from December 2023 to February 2024.

Participants and Setting

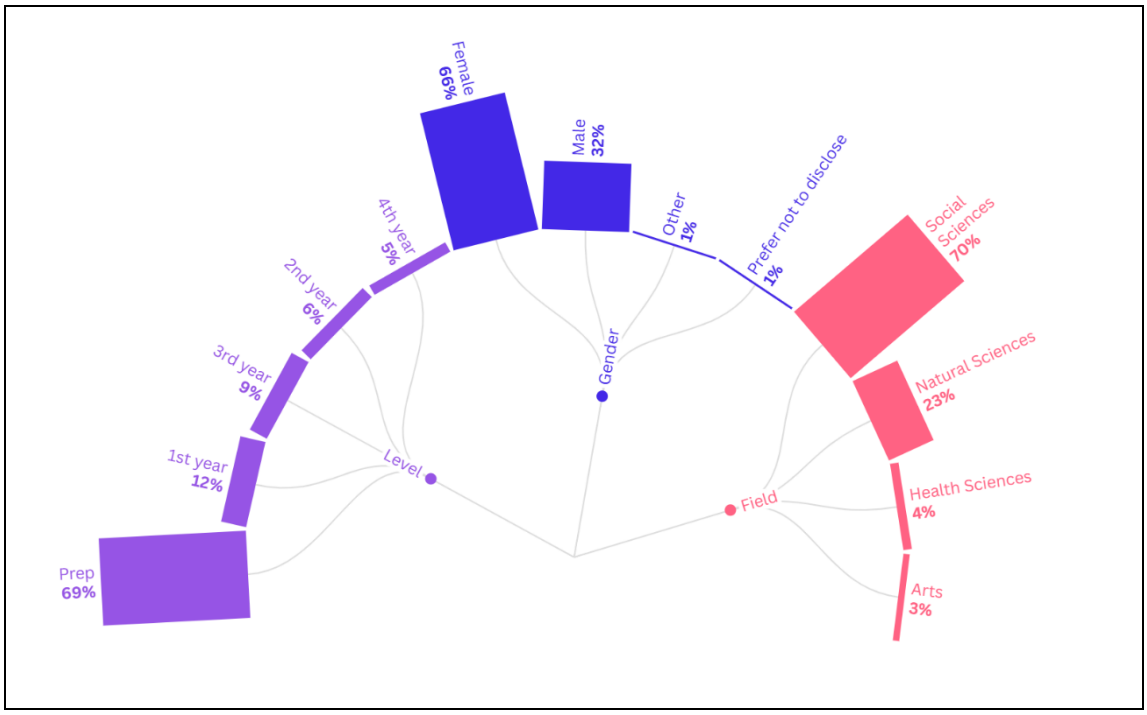
This research was conducted at two well-established and prestigious public universities in Türkiye, both founded in 1992. The first university has a broad educational network with 10 campuses, 18 faculties, and 13 vocational schools, offering a diverse range of academic programs to approximately 50, 000 students. The second university, with a more centralised campus structure, serves approximately 50,000 students through its 13 faculties and 12 vocational schools. Both universities provide extensive opportunities for students, including international exchange programs, scholarships, rich library resources, and a variety of social activities. These universities were selected using a combination of convenience sampling and typical site sampling. This approach provided ease of access while also representing the broader landscape of Turkish higher education at both regional and national levels.

At the first university, the survey was conducted under the guidance of one of the researchers. A QR code was generated for the survey link uploaded to Google Forms. Students scanned the QR code using their smartphones, allowing them to access and complete the survey under the supervision and guidance of the researcher. At the second university, the survey was administered through the researchers' network. Faculty members were informed about the survey and its application, and they facilitated the distribution of the survey link to students, who then completed it under the supervision of these faculty members.

A total of 427 students participated in the study, with ages ranging from 18 to 50 years old (see Figure 1). Participants were selected using a combination of convenience and random selection methods, based on their availability and willingness to participate. The majority of participants were between 18 and 20 years old, with 19 being the most common age (n = 142). A smaller number of participants were aged 21 or older, with only two participants aged 50. In terms of academic standing, most participants were in the English Preparatory level (n = 294), with fewer students in their 1st (n = 50), 2nd (n = 26), 3rd (n = 37), and 4th years (n = 20) of study. Participants represented a wide range of academic majors, with the most common being International Relations (n = 71), Economics (n = 66), Business Administration (n = 60), and Molecular Biology and Genetics (n = 54). Gender distribution indicated a majority of female participants (n = 283), followed by male participants (n = 138), with a small number identifying as "Other" (n = 1) or choosing not to disclose their gender (n = 5).

Figure 1

Percentages of Participants' Genders, University Levels, and Fields



Data Analysis

The collected data was initially processed through a data cleaning phase to ensure accuracy and reliability. Then, the data was analyzed using descriptive statistics using the Jamovi software. To enhance the interpretability, the results were further visualized with the online data visualization tool, Flourish.

Ethical Concerns

This study received approval from the Research Ethics Committee at Balıkesir University. Ethical guidelines were rigorously followed, ensuring the anonymity and confidentiality of participants, who all provided informed consent. Participation was entirely voluntary, and surveys were conducted in a manner that did not disrupt the educational process, with prior permission obtained from course instructors.

Findings

The findings of this study are organized in alignment with the research questions. Each section of findings will delve into the specific aspects of the research questions.

AI Familiarity and Literacy of Turkish EFL Students

We initially asked participants to indicate their overall familiarity with AI technologies and applications on a five-point scale. Upon analysing the reported responses, we found that Turkish students, on average, have a moderate level of familiarity with AI technologies and applications (M = 2.64), with a marginal difference in familiarity between males (M = 2.78) and females (M = 2.57) participants. Similarly, we also asked the participants about their ability to recognize if a software or digital tool utilises AI technology. The average score (M = 2.70) aligns with their self-reported overall familiarity score (M = 2.64).

Secondly, we wanted to explore where students heard about AI tools to uncover which sources can play an important role in students' interaction with AI technologies and whether they have taken any education.

Figure 2

Sources of AI Awareness and Participation

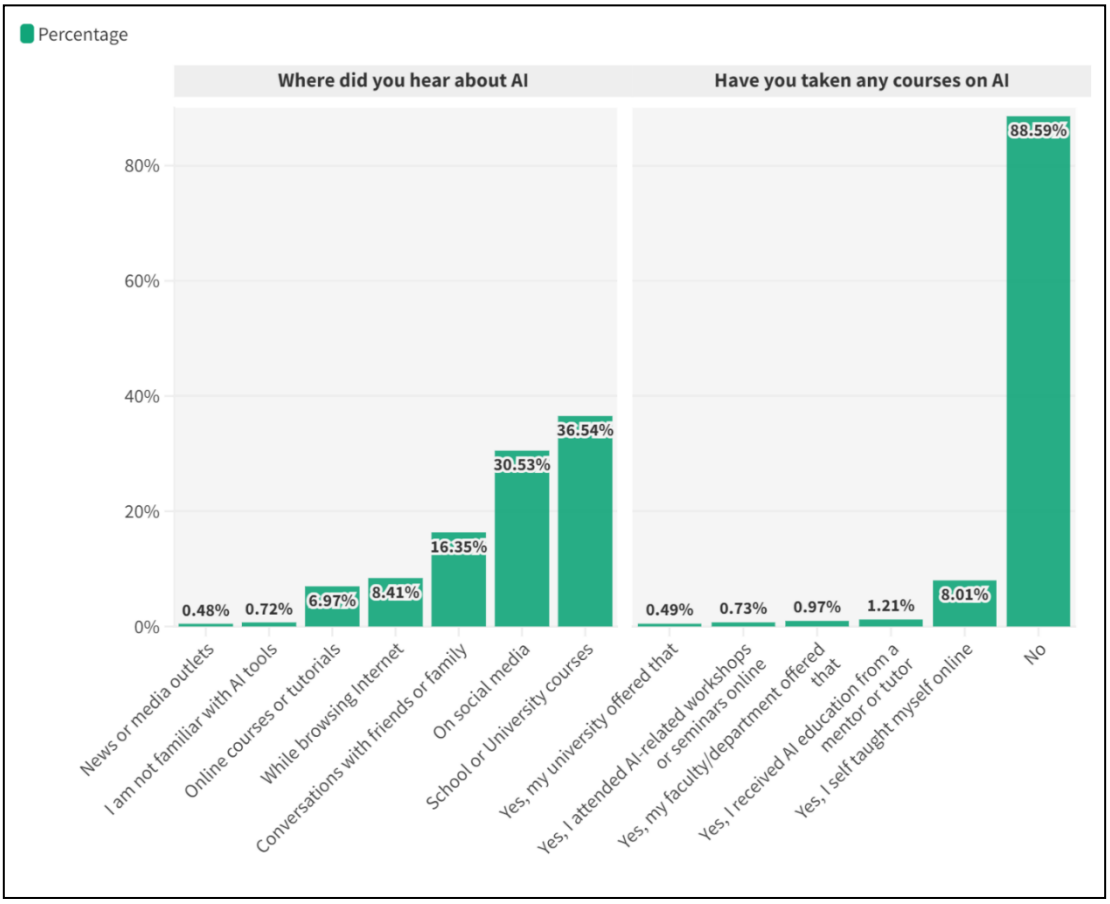
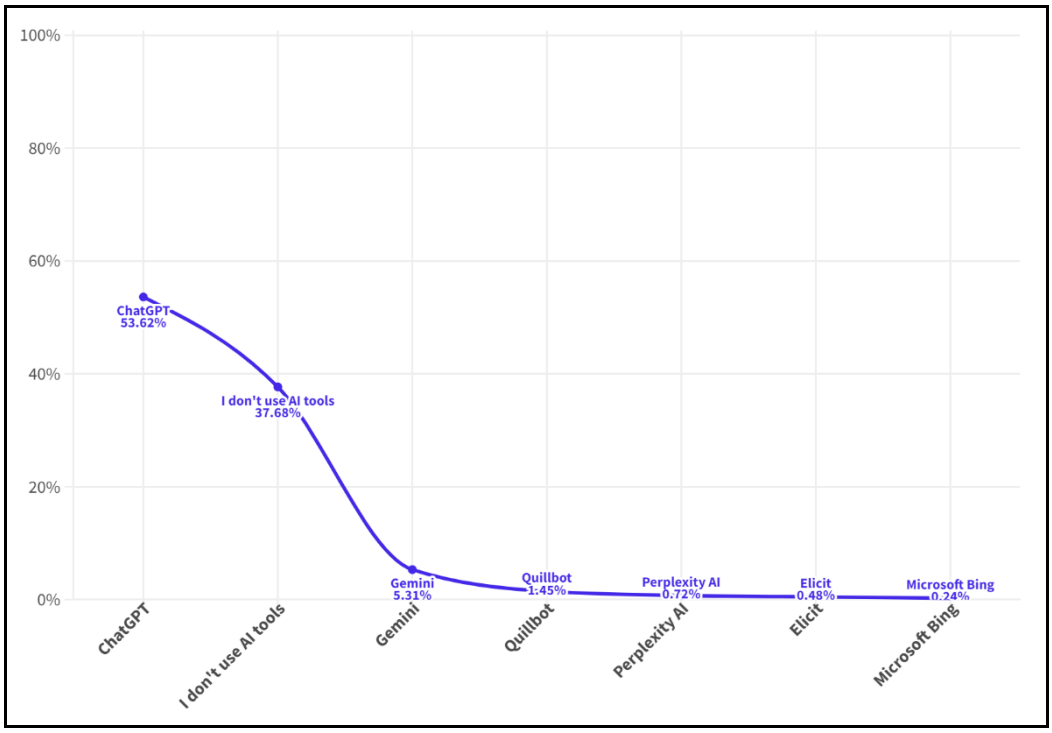


Figure 2 shows that "School or University courses" stands out as the most common source of information with 36.5%, followed by "Social media" with a percentage of 30.5%. The total share of these two sources exceeds 67%, emphasising the importance of formal education and digital platforms in students' familiarisation with AI technologies. On the other hand, "Conversations with friends or family" has a share of 16.35%, indicating that interpersonal communication also plays a role in this familiarisation. In terms of education, 88.59% of participants reported that they had not taken any courses or received formal education about AI-related topics. Only around 8% of participants familiarised themselves with AI technologies with their own efforts. Interestingly, very few participants (n = 6) reported that they received education on AI from their university or department, which is a significant finding.

Next, we shifted the focus to academic writing and first asked the participants which AI-based text generation tools they use most.

Figure 3

Preferred AI Text-generation Tools



More than half of the participants (53.62%) reported using ChatGPT for text generation purposes, followed by Gemini (5.31%). Notably, almost 38% of participants (n = 156) reported that they do not use any AI tools for text generation purposes. It can be seen that ChatGPT remains the leading AI tool among participants who use AI tools for text generation purposes.

We continued to explore students' use of AI tools in academic writing by uncovering their purposes and frequency of use. In order to explore their interaction with AI tools, we requested them to rate their level of engagement using a five-point scale, ranging from never to always. We then computed the percentages of engagement frequency for each purpose, as well as an overall percentage for each purpose. In Figure 4, the bars illustrate the students' level of engagement for specific purposes, while the line represents the overall percentage for each purpose.

Figure 4

Purpose and Frequency of Using AI Tools for Academic Writing

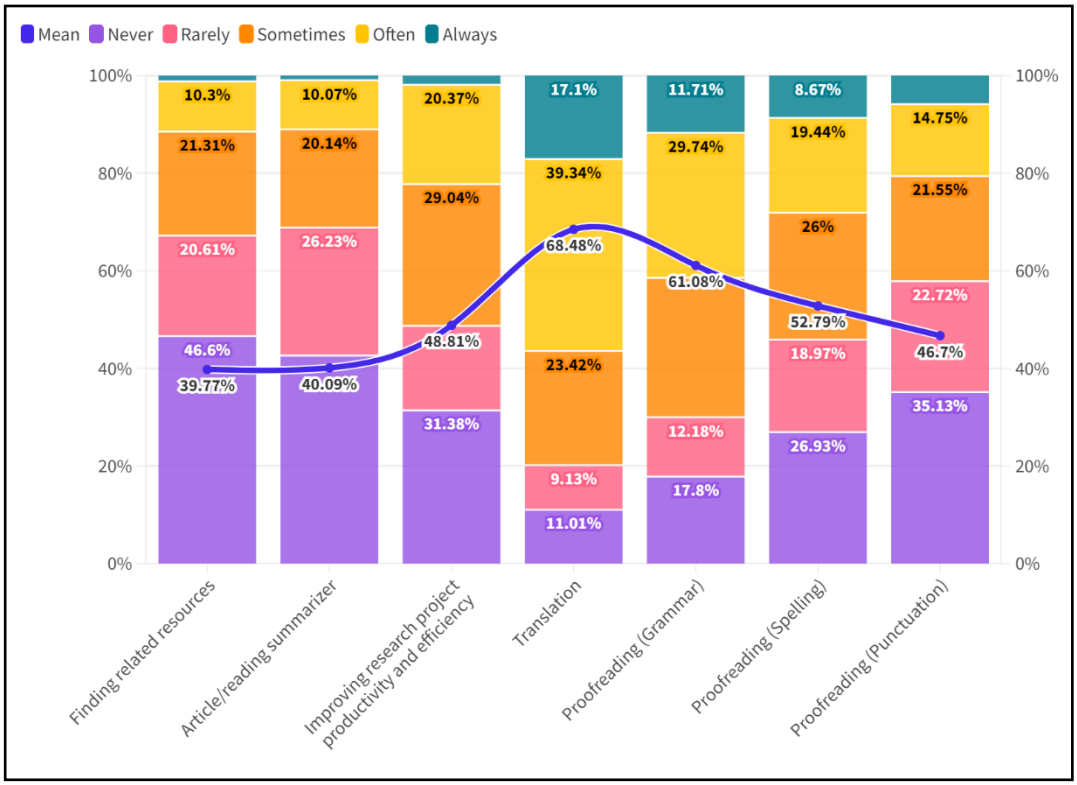


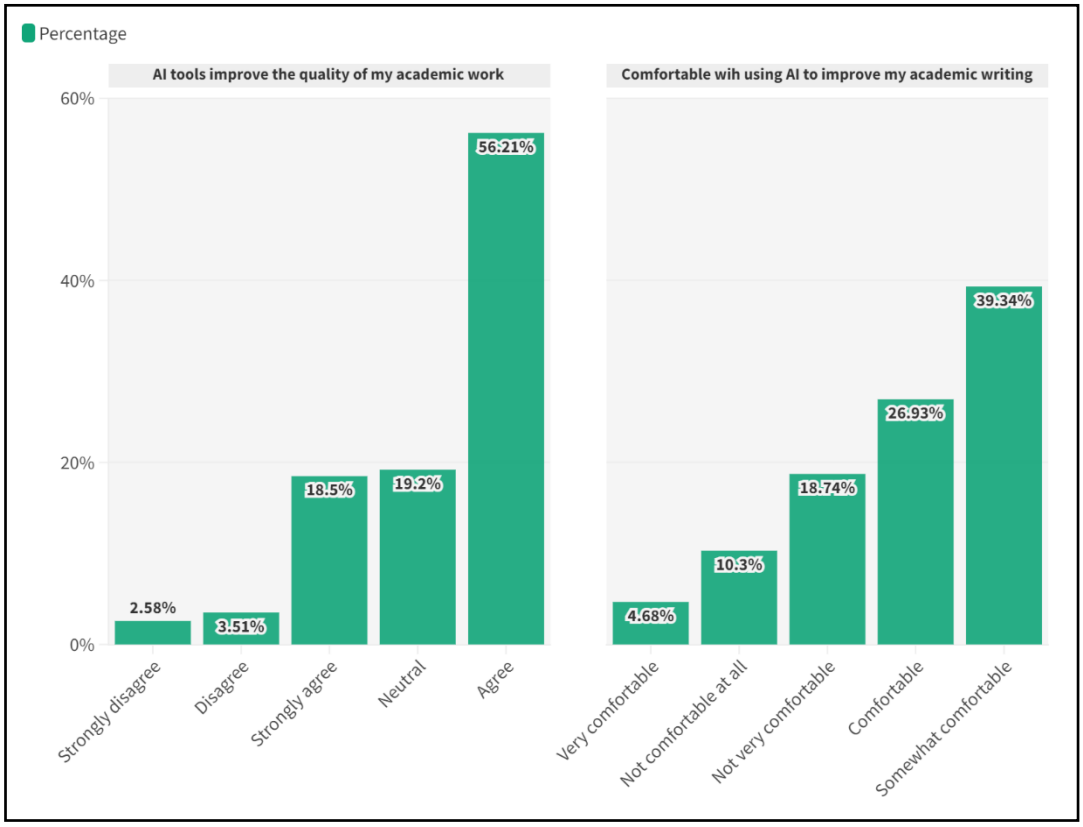
Figure 4 clearly shows that translation emerges as the most prevalent area of AI use among students, with a mean usage of 68.48%, and this is closely followed by grammar proofreading (61.08%), which suggests that students strongly rely on AI tools for translation and grammar proofreading purposes. Spelling checks (52.79%) and improving research productivity and efficiency (48.81%) show moderate levels of usage. On the other hand, more specific tasks such as punctuation checks (46.7%), article/text summarization (40.09%), and finding related resources (39.77%) exhibit relatively lower AI usage.

The Use of AI Tools by Turkish EFL Students in Academic Writing

In this research question, we started by surveying students to elicit their perceptions regarding the relationship between AI tools and academic writing. We posed two initial questions. Firstly, we inquired about their belief in the potential of AI tools to enhance the quality of their academic writing by asking, “Do you believe using AI tools in academic writing can enhance the quality of your academic work?”. Secondly, we asked to what extent they feel comfortable in utilizing AI to improve the coherence and flow of their academic writing with the following question: “How comfortable are you with the use of AI to improve the coherence and flow of your academic writing?”. Figure 5 below presents the findings related to these two questions.

Figure 5

Perceptions of AI Tools in Enhancing Academic Work and Comfort Level in Using AI for Academic Writing



According to Figure 5, the majority of the participants agreed that AI tools improve the quality of their academic work. As data shows, 56.21% (n = 240) of the participants agreed with this statement, while 18.5% (n = 79) strongly agreed. These results show that the total positive perception reached 74.71%. The rate of neutral respondents was 19.2% (n = 82). The proportion of those who expressed a negative opinion was very low, with only 3.51% (n = 15) disagreeing and 2.58% (n = 11) strongly disagreeing. On the other hand, students' perceptions of using AI to improve the coherence and fluency of academic writing showed a more diverse distribution. The highest rate was observed in the "Somewhat comfortable" option with 39.34% (n = 168). This was followed by "Comfortable" with 26.93% (n = 115) and "Very comfortable" with 4.68% (n = 20). In total, 70.95% of the participants expressed some degree of comfort with using AI. However, 18.74% (n = 80) responded "Not very comfortable" and 10.3% (n = 44) responded, "Not at all comfortable". These data suggest that students recognize the potential benefits of AI tools in academic writing but may still have some reservations about using them.

In the following questions, our goal was to delve into the scope of students' understanding of AI, ranging from surface-level knowledge to more technical comprehension with two specific questions. The first question was "How would you rate your proficiency in the technical aspects of AI tools used in academic writing?" while the second one was "How would you rate your understanding of the MLMs that underlie AI text generation tools used in academic writing?"

Figure 6

Perceived Proficiency in Technical Aspects of AI Tools and their Understanding of MLM for Academic Writing

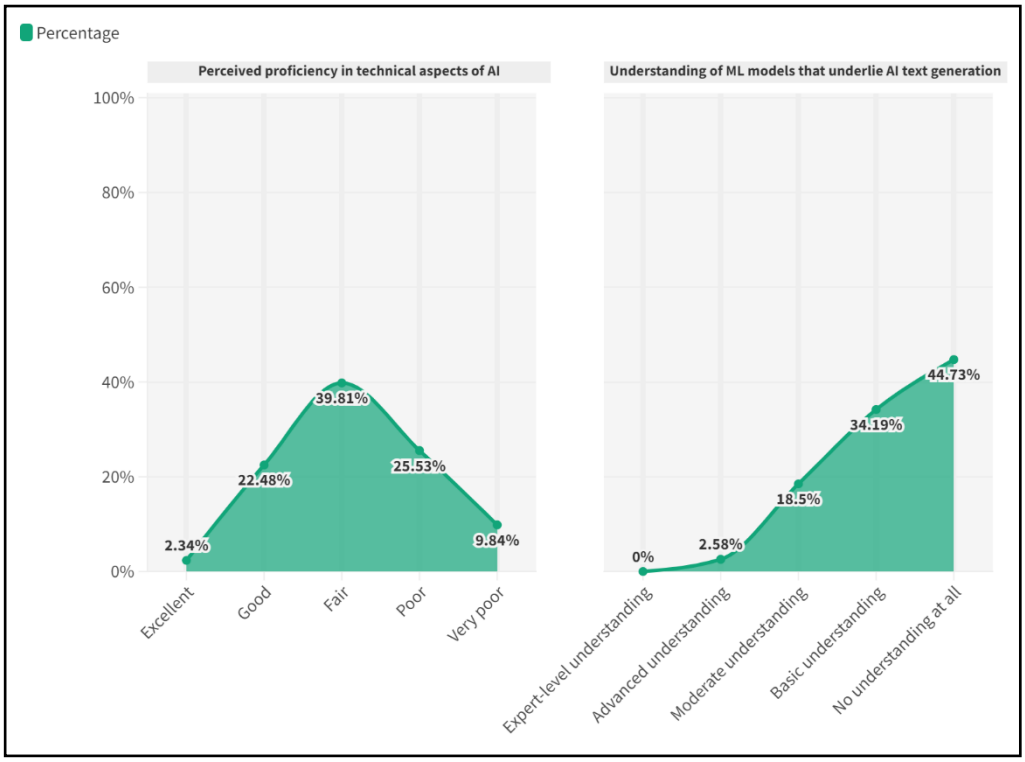


Figure 6 shows that the majority of the participants (39.81%, n = 170) see themselves as moderately competent. This was followed by the categories of "poor" (25.53%, n = 109) and "good" (22.48%, n = 96). A few participants rated themselves as "very poor" (9.84%, n = 42) or "excellent" (2.34%, n = 10). This distribution shows that students have various levels of competence in the technical aspects of AI tools, but the majority have a perception of moderate or lower competence. Figure 5 also shows students' level of understanding of MLMs underlying AI text generation. The majority of the participants (44.73%, n = 191) indicated that they had "no understanding at all" of these models. This was followed by "basic understanding" (34.19%, n = 146) and "moderate understanding" (18.5%, n = 79). Very few participants reported "advanced understanding" (2.58%, n = 11) and there were no participants in the "expert understanding" category. These results suggest that students face significant difficulties in understanding the technical mechanisms underlying AI text generation tools.

Lastly, in this domain, we aimed to explore whether students can customise or adapt AI tools for their special academic writing purposes such as adhering to an academic writing style or adjusting discipline-specific terminology, etc. In this respect, we asked them about their perceived proficiency in customising AI tools for academic writing purposes.

Figure 7

Students Perceived Proficiency in Customising AI Tools for Academic Writing Purposes

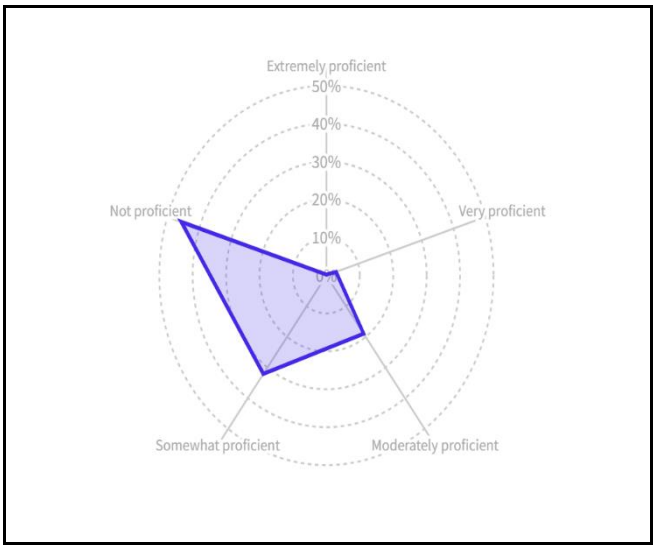


Figure 7 indicates that a substantial portion of the participants lacks proficiency in customising AI tools for academic writing purposes. Specifically, 45.67% (n = 195) of respondents reported being "Not proficient" in customising AI tools for academic writing. This category represents the largest segment of the surveyed population. The second-largest group, comprising 32.08% (n = 137) of respondents, identified themselves as "Somewhat proficient." This suggests that while these students have some ability to customise AI tools, their skills may be limited or inconsistent. "Moderately proficient" students accounted for 18.97% (n = 81) of the sample, indicating a smaller but significant group with a more advanced level of competency in adapting AI tools for academic writing tasks. Only a small fraction of students reported high levels of proficiency. "Very proficient" students made up 3.04% (n = 13) of the respondents, while those considering themselves "Extremely proficient" represented a mere 0.23% (n = 1) of the sample. These findings suggest a significant skills gap in AI tool customization for academic writing purposes among the surveyed student population. The data reveals that the majority of students (77.75%) fall into the lower two categories of proficiency, indicating a potential area for skill development in the context of AI literacy and its application to academic writing.

Turkish EFL Students' Ethical Viewpoints on AI Integration in Academic Writing

In this research question, we aimed to explore students' ethical perceptions regarding the use of AI for academic writing purposes, with a special focus on academic integrity. Our initial question was, "How concerned are you about issues related to plagiarism when using AI for academic writing?".

Figure 8

Students' Perceptions Related to Plagiarism About Using AI for Academic Writing Purposes

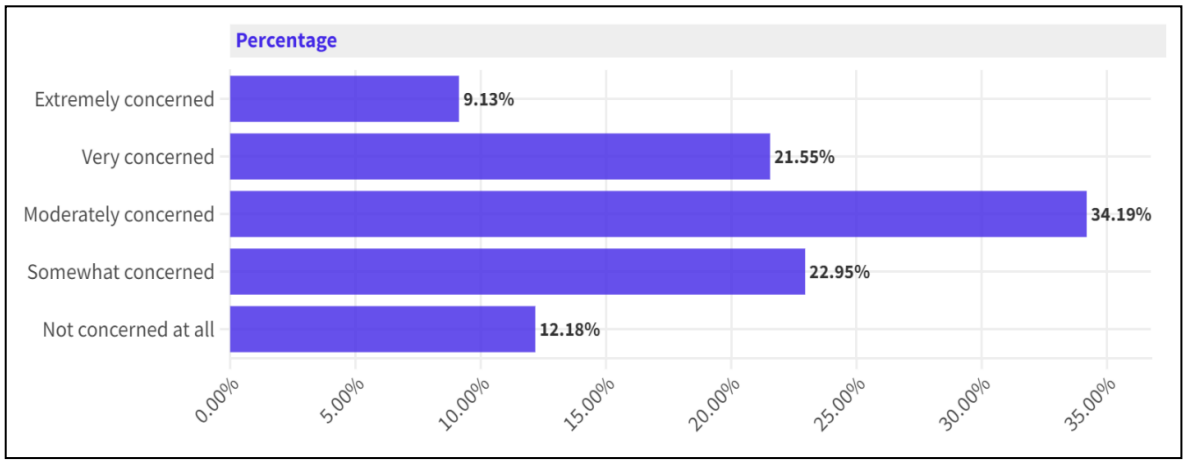


Figure 8 shows students' levels of concern regarding plagiarism issues when using AI for academic writing. It can be observed that participants reported varying degrees of concern. The majority of students (34.19%, n = 146) reported being moderately concerned about plagiarism issues related to AI use in academic writing. This was followed by 22.95% (n = 98) of students who were somewhat concerned and 21.55% (n = 92) who were very concerned. A smaller proportion of students (12.18%, n = 52) indicated no concern at all, while 9.13% (n = 39) expressed extreme concern about potential plagiarism when using AI for academic purposes. The distribution of responses suggests that the majority of students (87.82%) have some level of concern about plagiarism issues associated with AI use in academic writing, with only a small percentage expressing no concern.

Lastly, we measured the ethical perceptions of students regarding using AI in academic writing through their agreement levels to certain statements illustrated in Figure 9.

Figure 9

Students' Ethical Perceptions About Using AI in Academic Writing

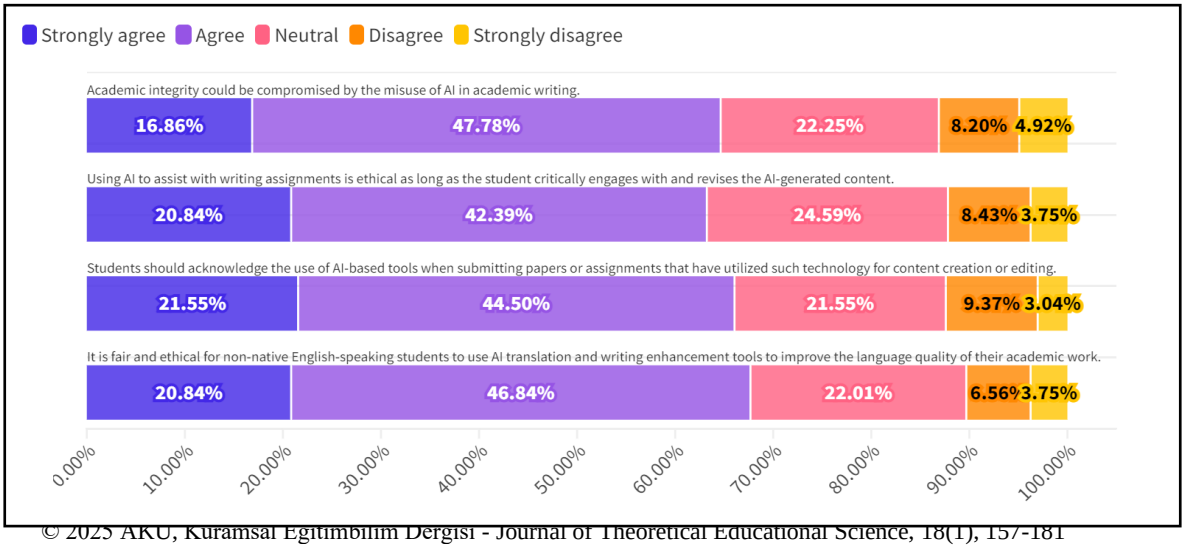


Figure 9 shows students' agreement levels with the statements regarding ethical perceptions of AI use in academic writing, revealing varying levels of agreement across different ethical perceptions. For the statement "Academic integrity could be compromised by the misuse of AI in academic writing," a majority of students expressed agreement (47.78%; n = 204 agree, 16.86%; n = 72 strongly agree), while 22.25% (n = 95) remained neutral, and a minority disagreed (8.20%; n = 35 disagree, 4.92%; n = 21 strongly disagree). Regarding the ethical use of AI in writing assignments in a supervised way, 63.23% of students agreed (42.39%; n = 181 agree, 20.84%; n = 89 strongly agree) that it is ethical when students critically engage with and revise AI-generated content. Neutral responses accounted for 24.59% (n = 105), while 12.18% disagreed (8.43%; n = 36 disagree, 3.75%; n = 16 strongly disagree). The statement on acknowledging AI use in submitted work showed 66.05% agreement (44.50%; n = 190 agree, 21.55%; n = 92 strongly agree), with 21.55% (n = 92) neutral responses, and 12.41% in disagreement (9.37%; n = 40 disagree, 3.04%; n = 13 strongly disagree). Lastly, 67.68% of students agreed (46.84%; n = 200 agree, 20.84%; n = 89 strongly agree) that it is fair and ethical for non-native English speakers to use AI for translation and writing enhancement. Neutral responses comprised 22.01% (n = 94), while 10.31% disagreed (6.56%; n = 28 disagree, 3.75%; n = 16 strongly disagree). These findings indicate generally positive ethical perceptions of AI use in academic writing among students, particularly when used thoughtfully and transparently.

Discussion

This study aims to investigate EFL students' AI literacy in Turkish higher education contexts, particularly in the context of academic writing, and their familiarity, knowledge, and ethical perceptions. The findings offer both pedagogical and theoretical insights into the ongoing discourse on AI integration in EFL writing.

The study reveals that Turkish university students possess a moderate level of familiarity with AI technologies. Moreover, students demonstrate a moderate ability to recognize AI-driven tools, indicating that while AI has become increasingly present in diverse fields and settings, participants' comprehensive understanding and practical use of these tools in EFL writing remain limited. Despite the widespread availability of AI tools, a significant majority (88.59%) reported not having taken any formal AI-related courses, indicating a potential gap in structured AI education. While school or university courses are the main source of information for learning about AI, the low percentage of students receiving formal education on AI indicates a lack of structured learning opportunities, echoing concerns that Luckin et al. (2016) and Limna et al. (2022) raised regarding the inconsistent integration of AI topics in educational settings. The findings align with broader trends found in recent studies, where familiarity with AI varies significantly depending on contextual factors such as educational exposure and social media influences (Alexander et al., 2019; Chen et al., 2020; UNESCO, 2023).

The results indicate that ChatGPT is the most widely used AI tool for EFL writing, with 53.62% of students relying on it, while the next most popular tool, Gemini, is used by only 5.31% of respondents. This heavy reliance on a single AI tool like ChatGPT, which is designed for general usage rather than specifically targeting EFL writing, has significant implications for students' learning experiences and outcomes. While ChatGPT's accessibility and user-friendly interface may make it a

convenient choice, overreliance on one tool can lead to a limited approach to language learning. Students may miss out on the diverse functionalities offered by other AI tools, such as those focused on different aspects of writing, editing, or critical thinking enhancement. To ensure a more comprehensive learning experience, it is important to encourage the use of a variety of AI tools, each offering unique strengths in different areas of writing and language development. This diversification can help students build a broader set of skills, making them more versatile and adaptive in their language proficiency. Additionally, educators should guide students in critically assessing the feedback from these tools, promoting independent thinking and the ability to refine their work beyond what a single AI tool suggests.

The finding that AI tools are predominantly used for translation and grammar proofreading in academic contexts aligns with Bosch and Uzuegbunam's (2023) observations on the prevalent use of AI for language-related tasks. This finding suggests that students tend to use AI to translate from their native language to English, rather than using it to support their writing. Further studies should investigate how the use of AI tools for translation impacts foreign language writing skills. Moreover, this finding suggests that students must be educated and supported in using AI to enhance and improve their writing by receiving feedback, editing, and correcting, rather than just translating from their native language to English.

Participants' use of AI tools to enhance the quality of academic writing aligns with the positive perceptions reported in other studies (Gayed et al., 2022; Jiang, 2022; Shofiah & Putera, 2024). AI tools are valuable not only for editing and grammar checks but also for providing insights into various stages of the writing process, such as identifying and generating topics, brainstorming ideas (Conde et al., 2024; Kong et al., 2024; Roe et al., 2023), and checking the coherence, cohesiveness, and relevance of content. However, despite these advantages, participants primarily utilised AI for technical aspects of writing, such as translating, editing, and grammar checking. Moreover, a significant portion of students (38%) reported not using any AI tools for text generation at all, suggesting a divide in attitudes and practices regarding AI's role in academic writing. This indicates that while many embrace AI for improving technical elements of writing, a considerable number of students are either hesitant or uncertain about relying on AI for more complex aspects. This hesitation could be attributed to their lack of structured education on the use of AI. It appears that students used AI based on their perceived needs and skills rather than maximising its functionality or fully benefiting from its potential in EFL writing, all while considering ethical issues.

The study also explores students' self-reported proficiency in the technical aspects of AI tools and their understanding of machine learning models. The majority of students perceive themselves as having only moderate or lower proficiency in these areas, consistent with previous research indicating that students often struggle with the technical complexities of AI (Shofiah & Putera, 2024; Song & Song, 2023). This lack of advanced understanding, combined with difficulties in customising AI tools for specific academic purposes, highlights a significant area for targeted education for the utilisation of AI. The findings underscore the need for targeted educational interventions to enhance technical proficiency and address learners' concerns and potential anxieties about using AI tools.

The study also examines students' ethical perceptions related to AI use in academic writing, revealing a critical aspect of AI literacy. Although students acknowledge the potential benefits of AI, their ethical concerns about academic integrity and the authenticity of AI-generated content reflect broader debates about responsible AI use in education (Nazari et al., 2021; Sumakul et al., 2022; Tahiru, 2021). The majority of students (87.82%) expressed some level of concern about plagiarism when using AI, with 34.19% being moderately concerned. This concern is reflected in the ethical perceptions surrounding the use of AI, where most students agreed that improper use could compromise academic integrity (64.64% agreeing or strongly agreeing). There was also strong support (63.23%) for the ethical use of AI when students critically engage with and revise AI-generated content. A significant majority (66.05%) believed it is necessary to acknowledge AI use in submitted work, indicating a preference for transparency. Additionally, 67.68% agreed that it is fair and ethical for non-native English (EFL) speakers to use AI for translation and writing enhancement, suggesting a recognition of AI's potential to level the playing field in academic writing.

Conclusion

The study offers pedagogical and theoretical implications regarding the integration of AI tools in foreign language education. The moderate familiarity and utilisation of AI tools among Turkish EFL students indicate the necessity for a more structured and comprehensive integration of AI education in university curricula. To address this, universities should provide adequate support and resources to help students navigate the complexities of AI tools. This could involve the development of formal courses, training programs, workshops, and support services aimed at enhancing students' familiarity and technical proficiency with AI technologies. An interdisciplinary approach, combining technical AI knowledge with practical applications in targeted foreign language courses such as reading, writing, listening, speaking, grammar, and vocabulary, would be particularly beneficial. Such an approach would not only equip students with the necessary skills to utilise AI tools effectively but also foster a deeper understanding of the ethical and practical implications of AI use in diverse academic contexts.

The moderate familiarity and utility of AI tools among students may be linked to the familiarity of educators with these technologies (Kong et al., 2024; Sperling et al., 2024; Tran, 2023). The novelty and rapidly evolving nature of AI technology could contribute to this gap, as educators may also struggle to keep pace with advancements and incorporate them effectively into their teaching practices. To address this, future research should explore foreign language educators' perceptions, proficiency and professional development needs concerning AI integration. Understanding foreign language educators' views and needs can provide valuable insights into the barriers they face and the support they require to effectively integrate AI. While poor or inadequate use of AI tools can create a competitive disadvantage for students, overdependence on these tools may affect students' cognitive, emotional and social development negatively. Educators are pivotal in determining the extent and effectiveness of AI integration in education. Therefore, targeted professional development programs should be offered to educators to ensure the effective integration of AI. These programs should equip them

with the knowledge and tools necessary to guide students in the responsible and effective use of AI in academic writing.

Future research should explore whether learners experience anxiety about using AI tools due to a lack of self-efficacy, concerns about plagiarism or perceived threats to cognitive development, as suggested by Lee (2023) and Shibani et al. (2024). In the current landscape of AI integration in Türkiye, there is still a lack of clear guidelines for students and teachers concerning the ethical and effective use of AI. Some teachers may forbid the use of AI without a guiding principle, while some learners may refrain from using it due to fears of facing consequences or negatively impacting their cognitive skills. To explore and mitigate these concerns and prevent potential anxieties, ongoing research on targeted education and clear AI usage policies is essential. Otherwise, the moderate, ineffective, and inefficient use of AI by some learners may create a competitive disadvantage and potentially lead to societal inequalities in the future.

Further research is also needed to explore the long-term impacts of AI integration in EFL academic writing and to develop best practices for its implementation. Studies should investigate the effectiveness of different educational interventions in enhancing AI literacy and technical proficiency in promoting various foreign language skills. While this study focused specifically on writing skills, further research can explore the familiarity and use of AI for other language skills. This broader perspective could provide a more comprehensive understanding of how AI can support language learning and the development of critical skills in EFL students. By addressing these issues, educators, researchers, and policymakers can better prepare students for the evolving landscape of AI-driven academic environments.

At the time of data collection, AI technologies had been widely available for a year, and students' utilisation and skills in using these tools were still limited. The findings indicate that integrating AI into language education and academic writing may not be as straightforward or rapid as anticipated. There is a clear need for targeted education for both teachers and students to ensure they can effectively and ethically utilise AI tools. The study emphasises the necessity of global and contextualised guidelines to support the appropriate use of AI in academic settings. With proper education and policies in place, AI could significantly contribute to the development of academic writing skills. However, without these measures, AI risks being used superficially or unethically. Overlooking, banning or avoiding AI is nearly impossible due to its increasing capabilities, accuracy, and speed. Therefore, there is an urgent need to reform curriculum and educational policies to adapt to the evolving role of AI in education.

Limitations

This study acknowledges several limitations that may have impacted the findings. First, the research was conducted within a specific demographic of Turkish EFL students, which may limit the generalizability of the results to other contexts or populations. Second, the study primarily relied on self-reported data through surveys, which may be subject to response biases or inaccuracies in participants' self-assessments of their AI literacy and ethical perceptions. Additionally, the study focused on participants' experiences with ChatGPT, which may not fully capture the broader range of AI applications in academic writing.

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Statement of Responsibility

The authors accept full responsibility for the article content. Author contributions are as follow: Introduction: ÖÇ and ZH; Literature: ZH; Methodology: ZH, GH; Data Collection: GH; Data Analysis: ÖÇ; Data Visualization and Reporting: ÖÇ; Discussion and Conclusion: GH and ZH; Review of the Paper: ZH, ÖÇ and GH.

Conflicts of Interest

No potential conflict of interest was reported by the authors.

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