



## AI-Based Feedback in Academic Writing: Insights from EFL Undergraduate Students at Saudi Higher Education

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### Abstract

With the rapid adoption of artificial intelligence technologies in higher education, understanding students' attitudes toward these tools is essential for shaping effective academic practices. By grounding the investigation of AI-based feedback within socio-cognitive and self-regulated learning theories, this study examined undergraduate students' perceptions of artificial intelligence (AI) tools such as Grammarly, ChatGPT, and MS Copilot as feedback tools for their academic writing. The study adopted a quantitative, cross-sectional survey design to capture students' perceptions. The sample consisted of 100 undergraduate students in the College of Medicine at Taif University. Data were collected using an adapted structured questionnaire employing a five-point Likert scale spanning from 'strongly disagree' (1) to 'strongly agree' (5). Data were analyzed using SPSS (v. 26) to ensure the validity and reliability of the questionnaire, and to perform descriptive statistical tests. The findings revealed that students held positive perspectives of AI as a feedback tool on their writing performance, learning and reflection, and affective impact. Furthermore, students reflected a high level of trust in the quality and credibility of AI-generated feedback for supporting academic writing tasks. The study recommended integrating AI literacy into writing curricula, establishing institutional guidelines for responsible AI use, and encouraging balanced reliance on AI tools with the teachers' guidance.

## 1. Introduction

There has been a remarkable advancement in the way academic writing is carried out because of the rapid adoption of artificial intelligence in educational institutions. ChatGPT, Grammarly, Gemini, and Microsoft Copilot are some of the most popular AI tools that are used to enhance writing skills. These tools help to provide students with automatic feedback regarding grammar, spelling, vocabulary use, coherence, cohesion, and organizing content. These tools, which are referred to as automated writing evaluation (AWE) systems, are well-received because they help facilitate quicker and more efficient provision of feedback on students' writing (Ding et al., 2025; Mekheimer, 2025).

In EFL contexts, academic writing is still one of the most challenging tasks as learners must balance their writing needs concerning linguistic proficiency, organizational skills, and conventions. Recent studies have indicated that AI feedback tools can benefit academic writing skills among EFL learners by facilitating revision, clarifying meaning, and improving organizational structure (Bai & Nordin, 2025; Song & Song, 2023). Unlike teacher feedback, which is often constrained by large class sizes and time restrictions, feedback from AI tools is rapid, continuous, and available at any time, which leads to learner autonomy in the writing process (Hyland, 2025).

Besides the positive results of AI tools in writing performance, AI-based feedback can positively influence the growth of reflective writing skills (Shen et al., 2023; Tran, 2025). This evidence is consistent with the use of process-oriented writing approaches, which focus on learning through revision rather than mere correction of errors. Moreover, the effect of AI feedback tools on affective writing processes has been widely discussed in the literature recently. Specifically, research indicates that AI-based writing tools are likely to promote higher levels of motivation and self-confidence to write, as well as foster self-efficacy in writing, all while mitigating anxiety about completing academic writing assignments (Maeng, 2025; Mekheimer, 2025).

However, several concerns have been raised regarding the validity and educational merits of AI feedback. It has been pointed out that artificial intelligence feedback tools can be more concerned about surface linguistic characteristics of a written piece, leaving insufficient suggestions on higher-order skills such as writing an argument or developing content, among other elements that can help students position themselves within the discipline (Deep & Chen, 2025; Ding et al., 2025). The need to investigate perceptions of the validity and educational merit of AI feedback is therefore crucial.

Research focusing on the use of AI in the academic writing of EFL learners in Saudi Arabia has been conducted, although it seems scarce in terms of large-scale studies based on perceptions. It shows positive attitudes toward AI tools and implies that students believe AI technologies to be helpful in improving their writing skills, but require proper implementation, AI literacy knowledge, and appropriate policy development for maintaining academic integrity (Alshammari, 2026; Hameed, 2025). Accordingly, the current study aims to investigate Saudi EFL undergraduate students' opinions of AI-based feedback tools in academic writing. Specifically, it seeks to (1) assess EFL undergraduate students' perceptions of the efficiency of AI feedback tools on their writing performance, (2) determine the extent to which AI-based feedback tools support their reflective writing practices, (3) determine how AI-based feedback tools support their affective responses toward academic writing, and (4) evaluate EFL undergraduate students' opinions of the reliability and overall value of AI-based feedback tools for academic writing. The findings aim to contribute theoretically and pedagogically to current debates on AI and writing and to inform evidence-based integration of AI-based feedback tools in the EFL writing field.

## 2. Literature Review

### Artificial Intelligence in Academic Writing

Recently, AI has emerged as a powerful tool in the academic writing context as a result of the rapid advances in generative AI and automated writing evaluation systems (AWEs). Current AI technologies influence the process of natural language to provide instant writing feedback on elements such as grammar, coherence, register, and organization (Ding et al., 2025; Kohnke et al., 2023; Warschauer & Xu, 2024). A study by Wang and Ren (2024) indicated that using ChatGPT as an assistive tool for writing, specifically for vocabulary development, grammar, organization, and idea generation, was straightforward. In addition, these AI tools are increasingly positioned not as proofreading software, but as "an interactive writing assistance technology [that] works with writers to augment the writing and revision process" (Pellas, 2023; Polakova & Ivenz, 2024).

Empirical studies have demonstrated that AI-based writing feedback tools can significantly improve surface accuracy, revision efficiency, and overall writing performance among students, especially at the higher education level (Abduljawad, 2024; Wang & Ren, 2024). Furthermore, several studies suggest that AI tools improve writers' cognitive load by automating lower-level mechanical processes in writing, which permits more cognitive resources to be allocated towards developing content and organizing texts (Lai, 2025). These affordances may be particularly beneficial for L2/EFL writers in that writing tasks in academic contexts present learners with unique linguistic challenges.

On the other hand, researchers have brought up pedagogical and ethical concerns regarding AI-assisted writing; they express concerns about the depth and appropriateness of feedback generated by AI, bias, and the destruction of learner agency as a result of mindless use of AI writing tools (Cheng et al., 2025; Lund et al., 2025). As a result, current research emphasizes that learners' perceptions, interactions, and processing of AI-generated feedback determine the pedagogical usefulness of AI in academic writing rather than AI technologies alone (Yan, 2023).

Regardless of the expansion of AI writing research, most studies have been outcome-oriented, focusing primarily on performance enhancement or the effectiveness of AI writing tools. There is a lack of theory-driven research focusing on AI feedback as a multidimensional construct that encompasses cognitive, affective, and evaluative dimensions. This area needs empirical research that is learner-centered and focuses on the students' experiences of interacting with AI feedback in genuine academic writing contexts.

### **AI Feedback Tools in EFL Writing Contexts**

Academic writing poses persistent challenges for English as a Foreign Language (EFL) learners, who must compose texts that meet linguistic, rhetorical, and disciplinary expectations simultaneously. AI feedback tools have gained increased attention as supplementary resources in EFL writing instruction as they provide immediate, individualized, and repetitive feedback outside classroom constraints (Özçelik & Yangın Ekşi, 2024; Wang & Ren, 2024). Therefore, AI has the capability to improve student-teacher engagement by providing prompt feedback and enabling tailored communication, thereby resolving some of the drawbacks frequently connected with conventional teaching techniques (Chen & Gong, 2025).

A growing number of studies report that EFL learners generally perceive AI feedback tools positively, particularly with regard to grammar correction, sentence clarity, and organization. Research conducted across diverse EFL contexts revealed that AI feedback can increase revision frequency, promote error awareness, and support more autonomous writing practices (Abduljawad, 2024; Biju et al., 2024). Learners often report that AI feedback is accessible, fast, and less face-threatening than teacher feedback, which may reduce anxiety and encourage experimentation with language (Algraini, 2024; Aiman et al., 2025).

However, empirical evidence also points to some remarkable limitations. Several studies indicated that AI feedback tends to prioritize surface-level features and may offer limited support for higher-order writing skills such as argumentation, coherence across extended texts, and disciplinary genre conventions (Yan, 2023; Wang & Ren, 2024). These limitations have led scholars to argue that AI feedback should be viewed as complementary rather than substitutive, functioning most effectively when embedded within pedagogically guided writing instruction (Asiri & Alharbi, 2025).

Importantly, perception-based research in EFL contexts remains fragmented. While studies from East Asian and European settings are expanding, research focusing on Arab and Saudi EFL learners is still relatively limited, particularly large-scale quantitative studies examining multiple perceptual dimensions (Al-Alami, 2024; Gasaymeh et al., 2024). Moreover, many existing investigations isolate cognitive outcomes without adequately considering affective responses or learners' trust in AI feedback. Addressing these gaps is crucial for understanding how EFL learners experience and evaluate AI feedback within academic writing tasks.

### **Socio-Cognitive Theory of Writing**

The socio-cognitive approach to writing views writing as a dynamic process where cognitive actions are socially mediated. The cognitive actions in this case refer to cognitive acts that are performed during writing, including planning, generation, and revision of the texts (Flower & Hayes, 1981). Feedback, instructional scaffolding, and technological resources are some of the factors that can affect cognitive actions in writing through social mediation. In this regard, feedback plays an important role in facilitating social cognition in writing. According

to Hyland and Hyland (2019), feedback allows writers to notice gaps between intended meaning and text produced by them.

Research shows that the socio-cognitive approach to writing can be applied to digital space as well. With the emergence of technology, especially artificial intelligence, there have been attempts to use computational devices as mediational devices in the same way. This can be seen from recent studies, which demonstrate that AI-based feedback systems can serve as mediational tools and assist writers in regulating their attention and engaging in writing activities iteratively (Shen et al., 2023; Bai & Nordin, 2025).

AI feedback software such as ChatGPT and Grammarly can be viewed as socio-cognitive mediators that provide instant and dialogic feedback to writers. As learners engage in a conversation with AI, they externalize mental cognition, experiment with language, and improve writing techniques. This dialogue fits into the socio-cognitive paradigm of learning that conceptualizes knowledge acquisition as a socially distributed process between humans and objects and in the context of other people and situations (Lantolf & Poehner, 2014). It should be noted that the efficiency of the above-mentioned mediation strongly relies on learners' beliefs about the nature of feedback sources. If the AI feedback is viewed as trustworthy and relevant, it is likely to contribute to the process of writing. On the contrary, if it is considered unreliable and irrelevant, it may not play a role as a mediator (Ding et al., 2025).

While the importance of the socio-cognitive perspective in exploring AI-mediated writing is apparent, little empirical research has grounded its exploration of students' perceptions of AI feedback within the socio-cognitive theoretical tradition. This theoretical gap emphasizes the necessity of doing perception-related research based on socio-cognitive theories and limits our understanding of AI as a mediating artifact in EFL academic writing.

### **Self-Regulated Learning (SRL) Theory**

The main focus of self-regulated learning (SRL) theory is the students' active engagement in the regulation of their mental, behavioral, and emotional processes involved in learning (Zimmerman, 2000; Zimmerman & Schunk, 2011). The model of self-regulation includes setting goals, selecting and using appropriate strategies, and monitoring and reflecting upon progress. Writing as a recursive process is a great example of how one should be able to regulate one's actions and thinking while doing such tasks (Graham et al., 2017). One of the key tools that allows students to perform self-regulation in writing is feedback. As per the SRL theory, learners get feedback as a source for regulating their progress and evaluating it in relation to setting goals (Nicol & Macfarlane-Dick, 2006). Several recent works show that feedback produced by AI allows increasing the effectiveness of self-regulation since it helps to notice mistakes immediately and make necessary changes (Tran, 2025; Shen et al., 2023).

AI-based feedback systems have an intrinsic link to important SRL processes. They assist self-monitoring in that they help learners see recurring patterns and mistakes in language usage. Secondly, they encourage students to make strategic decisions by presenting clear directions for revisions to be made. Finally, they help in the process of self-evaluation because they provide opportunities for comparing consecutive drafts. With multiple repetitions of feedback/revision cycles, students learn certain writing strategies without relying heavily on external input (Bai & Nordin, 2025).

In addition, SRL theory emphasizes the affective components of learning such as motivation, confidence, and anxiety management (Zimmerman & Schunk, 2011). The existing research shows that there is a positive impact on the former due to such characteristics of AI feedback as non-judgmental nature, confidentiality, and timeliness, which can result in reducing writing anxiety and improving self-efficacy among EFL students (Maeng, 2025; Mekheimer, 2025). Unfortunately, few empirical studies have investigated the relationship between SRL constructs and students' perception of AI feedback. Consequently, adopting a theoretical framework of SRL will enable the researcher to consider both academic and affective benefits of utilizing AI-based systems for writing feedback among EFL learners in higher education.



### **3. Research Questions**

1. How do undergraduate EFL students evaluate the effectiveness of AI-based feedback systems on their writing performance?
2. How do undergraduate EFL students perceive the role of AI-based feedback tools in supporting their reflective writing practices?
3. What are the perceptions of undergraduate EFL students toward the affective impact of AI-based academic writing feedback tools?
4. How do undergraduate EFL students evaluate the reliability and overall value of AI-based academic writing feedback tools?

### **4. Methodology**

#### **Design**

The current study adopted the descriptive, quantitative, and cross-sectional survey approach to investigate the perception of AI feedback tools among undergraduates in academic writing. The cross-sectional approach involves collecting information on respondents at one point in time. This methodology is effective in gathering relevant information quickly because it does not require collecting data for an extended period of time (Creswell, 2014). The cross-sectional approach is appropriate when examining issues related to educational technology adoption and use (Bryman, 2016).

#### **Context and Participants**

The study was conducted at Taif University, an institute of higher learning where English writing is an integral part of their undergraduate programs. This indicates a prevailing trend in which AI digital technologies are increasingly integrated into students' academic processes, particularly to help them write better through feedback. The target sample for the study consisted of 100 undergraduate students in the College of Medicine at Taif University. The purposive sampling technique was employed in which the sample included students having a similar academic background and regular use of AI technologies for writing. Moreover, purposive sampling is most appropriate in studies related to perceptions as it guarantees that all the participants have some level of experience with regard to the issue under investigation (Palinkas et al., 2015). Therefore, all the participants of the current study were exposed to ChatGPT, Grammarly, and MS Copilot.

#### **Instrument**

This study utilized a questionnaire to determine the students' attitudes towards AI-based academic writing feedback tools (Appendix A). It employs the five-level Likert scale ranging from Strongly Disagree to Strongly Agree. The Likert scale is popular in educational research since it allows researchers to study people's attitudes and opinions in a statistically valid way (Likert, 1932; Boone & Boone, 2012). It includes five dimensions: writing quality and clarity (7 items); efficiency and organization (5 items); learning and reflection (5 items); affective aspects (5 items); reliability and overall value (5 items).

To validate the questionnaire, first, face validity was conducted. The developed questionnaire was reviewed by five subject-matter experts who evaluated whether the items were clear, relevant, and appropriate. Based on the experts' suggestions, necessary revisions were made to improve the questionnaire's clarity and accuracy. After that, construct validity and reliability were estimated through piloting the questionnaire among 30 students.

Construct validity of the research instrument was tested by applying the corrected item-total correlations (CITC) using SPSS (v.26). This criterion analyzes the correlation levels between the scale's items and their dimensions. Usually, the acceptable level of CITC is about 0.30, while above 0.50 means high levels of correlation (Field, 2018; Nunnally & Bernstein, 1994). The results of corrected item-total correlation are shown in Table 1.

**Table 1. Corrected Item-Total Correlation between the Scale's Items and their Dimensions**

| Dimension                   | Item | Corrected Item-Total Correlation |
|-----------------------------|------|----------------------------------|
| Writing Quality and Clarity | 1    | .437                             |

|                               |   |      |
|-------------------------------|---|------|
|                               | 2 | .663 |
|                               | 3 | .543 |
|                               | 4 | .657 |
|                               | 5 | .589 |
|                               | 6 | .803 |
|                               | 7 | .577 |
| Efficiency and Organization   | 1 | .562 |
|                               | 2 | .771 |
|                               | 3 | .433 |
|                               | 4 | .618 |
|                               | 5 | .660 |
| Learning and Reflection       | 1 | .759 |
|                               | 2 | .772 |
|                               | 3 | .703 |
|                               | 4 | .891 |
|                               | 5 | .670 |
| Affective Impact              | 1 | .708 |
|                               | 2 | .776 |
|                               | 3 | .511 |
|                               | 4 | .766 |
|                               | 5 | .796 |
| Reliability and Overall Value | 1 | .765 |
|                               | 2 | .813 |
|                               | 3 | .745 |
|                               | 4 | .843 |
|                               | 5 | .688 |

Table 1 shows that all items had a corrected item-total correlation of more than 0.5, which indicated a strong positive relationship, except for two items (1 and 3) in the dimension of Writing Quality and Clarity, one item (3) in the dimension of Efficiency and Organization, and one item (3) in the dimension of Affective Impact had a corrected item-total correlation of 0.437, 0.543, 0.433, and 0.511, respectively. These values indicated an acceptable relationship. Therefore, all items are internally consistent with their dimensions.

Furthermore, Pearson Correlation Coefficient was used to assess each dimension's correlation with the total score of the scale. The results are displayed in Table 2.

**Table 2. Pearson Correlation Coefficients between the Scale's Dimensions and its Total Score**

| Dimension                     | Pearson Correlation |
|-------------------------------|---------------------|
| Writing Quality and Clarity   | .883**              |
| Efficiency and Organization   | .869**              |
| Learning and Reflection       | .821**              |
| Affective Impact              | .890**              |
| Reliability and Overall Value | .762**              |

\*\**. Correlation is significant at the 0.01 level (2-tailed).*

Table 2 illustrates that the correlation coefficients of the dimensions with the scale's total score are significant at the 0.01 level and indicate a positive correlation. The minimum correlation coefficient is 0.762, whereas the maximum is 0.890. So, all the dimensions are internally consistent with the total score of the scale. Thus, based on the results of the construct validity that are shown in Tables 1 and 2, it can be concluded that the questionnaire is considered valid and can be utilised in the actual study sample.

On the other hand, the questionnaire reliability was tested using Cronbach's alpha coefficient. The overall score of the questionnaire reliability was 0.947, indicating a high level of internal consistency. This value surpassed the generally accepted minimum limit of 0.7 (Kline, 2023).

This study was granted ethical approval by Taif University, which is the affiliation of the researcher. Consent from the participants was obtained during data collection. Since there were no individually identifiable variables involved in the survey, no personal information was collected. Confidentiality of information was preserved, and data were only used for research purposes.

## 5. Data Collection

The study data were collected during the second academic semester of the year 2025-2026 using a structured questionnaire. The participants were asked to write about four different topics during a month (one topic per week). Firstly, they were asked to write the first draft. Then, they sent their first drafts to one of the AI tools (ChatGPT, Grammarly, or MS Copilot) to get feedback using this prompt: review my paragraph and give feedback on clarity, structure, grammar, spelling, punctuation, and vocabulary. Then, they revised their first draft based on the AI tools' feedback and wrote their final draft. After a month, they were invited to complete the survey after confirming their experience with AI feedback tools. The questionnaire was processed in a controlled manner to ensure consistency in instructions and response conditions.

## 6. Data Analysis

The analysis of the questionnaire data to find answers to the research questions was conducted using SPSS software (v.26). Descriptive statistics, such as means, standard deviations, percentages, and frequencies, were calculated to indicate the respondents' perception of AI-based feedback tools on their writing process.

## 7. Findings and Discussion

### The Efficiency of AI-Based Feedback Tools on Writing Performance

The first research question examined how EFL undergraduate students perceive the efficiency of AI-based feedback tools on their writing performance. This question was answered by reporting the results of the first and second dimensions of the questionnaire which reflect the writing performance in terms of quality, clarity, and organization. Table 3 displays the results of these two dimensions.

**Table 3. The Efficiency of AI-based Feedback Tools on Writing Performance**

#### Dimension 1: Writing Quality and Clarity

| Item               | SA            | A             | N        | D        | SD       | Mean | Std. Dev. | Rank |
|--------------------|---------------|---------------|----------|----------|----------|------|-----------|------|
| 1                  | 64<br>(64.0%) | 33<br>(33.0%) | 2 (2.0%) | 1 (1.0%) | 0 (0.0%) | 4.60 | .586      | 5    |
| 2                  | 73<br>(73.0%) | 23<br>(23.0%) | 4 (4.0%) | 0 (0.0%) | 0 (0.0%) | 4.69 | .545      | 2    |
| 3                  | 73<br>(73.0%) | 22<br>(22.0%) | 4 (4.0%) | 1 (1.0%) | 0 (0.0%) | 4.67 | .604      | 3    |
| 4                  | 78<br>(78.0%) | 19<br>(19.0%) | 3 (3.0%) | 0 (0.0%) | 0 (0.0%) | 4.75 | .500      | 1    |
| 5                  | 65<br>(65.0%) | 28<br>(28.0%) | 6 (6.0%) | 1 (1.0%) | 0 (0.0%) | 4.57 | .655      | 6    |
| 6                  | 61<br>(61.0%) | 29<br>(29.0%) | 9 (9.0%) | 1 (1.0%) | 0 (0.0%) | 4.50 | .704      | 7    |
| 7                  | 72<br>(72.0%) | 20<br>(20.0%) | 7 (7.0%) | 1 (1.0%) | 0 (0.0%) | 4.63 | .661      | 4    |
| Weighted mean      |               |               |          |          |          | 4.63 |           |      |
| Standard deviation |               |               |          |          |          | .446 |           |      |

#### Dimension 2: Efficiency and Organization

| Item               | SA            | A             | N             | D        | SD       | Mean | Std. Dev. | Rank |
|--------------------|---------------|---------------|---------------|----------|----------|------|-----------|------|
| 1                  | 63<br>(63.0%) | 32<br>(32.0%) | 4 (4.0%)      | 1 (1.0%) | 0 (0.0%) | 4.57 | .624      | 3    |
| 2                  | 66<br>(66.0%) | 26<br>(26.0%) | 7 (7.0%)      | 1 (1.0%) | 0 (0.0%) | 4.57 | .671      | 2    |
| 3                  | 64<br>(64.0%) | 31<br>(31.0%) | 4 (4.0%)      | 1 (1.0%) | 0 (0.0%) | 4.58 | .622      | 1    |
| 4                  | 49<br>(49.0%) | 31<br>(31.0%) | 12<br>(12.0%) | 8 (8.0%) | 0 (0.0%) | 4.21 | .946      | 5    |
| 5                  | 58<br>(58.0%) | 32<br>(32.0%) | 10<br>(10.0%) | 0 (0.0%) | 0 (0.0%) | 4.48 | .674      | 4    |
| Weighted mean      |               |               |               |          |          | 4.48 |           |      |
| Standard deviation |               |               |               |          |          | .535 |           |      |

Note(s): Strongly agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly disagree (SD)

It can be seen from Table 3 that the Item-level analysis of Dimension 1 (Writing Quality and Clarity) shows that Item 4 (AI tools help me identify and correct spelling errors and

punctuation) ranked the highest with a mean score of 4.75 (SD = 0.500), where 78% of respondents selected Strongly Agree and 19% selected Agree. This indicates that most students held very positive perceptions regarding the help of AI tools in identifying and correcting spelling mistakes and punctuation, which are known as surface linguistic level. This result is consistent with several empirical studies (Escalante et al., 2023; Mun, 2024; Song & Song, 2023) that report strong student approval of AI-assisted feedback for surface-level writing concerns such as spelling and punctuation.

On the other hand, although Item 6 (AI feedback helps me improve my use of academic vocabulary) ranked lower within this dimension, it still demonstrated strong positive perceptions, with a mean score of 4.50 (SD = 0.704). This indicates that the feedback generated from AI tools can enhance EFL students' vocabulary. This result aligns with studies showing that generative AI tools such as ChatGPT promote lexical growth, which helps learners refine vocabulary use during revision (Kasneci et al., 2023; Yang et al., 2024).

Overall, the results of Dimension 1 (Writing Quality and Clarity) indicate a consistently high level of agreement among participants across all seven items. The weighted mean for this dimension was 4.63 (SD = 0.446), suggesting strong overall agreement and low variability in responses. This means that participants perceived AI-assisted feedback as highly effective in enhancing the overall quality, coherence, and clarity of their academic writing. These results align with studies showing that students consistently perceive AI-assisted feedback as effective in improving writing quality, clarity, and organization (Anwer, 2026; Ding et al., 2025).

Furthermore, the results for Dimension 2 (Efficiency and Organization) revealed generally positive perceptions, though with slightly greater variability than Dimension 1. The weighted mean for this dimension was 4.48 (SD = 0.535), indicating a high level of agreement overall. Among the five items, Item 3 (AI feedback helps me identify weaknesses in my drafts) ranked highest, with a mean score of 4.58 (SD = 0.622); 64% of respondents strongly agreed, and 31% agreed. This means that EFL students view AI as a diagnostic tool that helps evaluate early drafts and guides targeted improvements. This result aligns with research showing that EFL students value AI tools such as ChatGPT and Grammarly for their ability to highlight gaps in coherence, language use, and organization, thereby supporting more targeted and efficient revision processes (Escalante et al., 2023; Teng, 2024).

In contrast, Item 4 (AI feedback is specific enough to guide my revisions) ranked lowest, with a mean score of 4.21 and the highest SD (0.946), which indicates greater variation in participants' responses. This item also recorded the highest percentage of Disagree responses (8%), suggesting comparatively less agreement compared to other items. This means that while AI feedback is perceived as useful, it is not always considered sufficiently specific or context-sensitive to guide deeper revisions independently. Recent studies report that learners sometimes find AI feedback too general or repetitive, particularly for higher-order concerns, and therefore benefit more from AI feedback when it is supplemented by teacher guidance or explicit instruction (Ding et al., 2025; Roe et al., 2024).

Despite these differences, the overall findings for Dimensions 1 and 2 show that participants demonstrated a strong positive direction towards the usefulness of AI feedback tools on their writing performance, including the quality and clarity, and the efficiency of AI feedback tools in organizing their ideas in the process of writing. From a socio-cognitive and self-regulated learning perspective, the use of AI tools for error identification may foster greater learner autonomy and self-monitoring. When students receive immediate automated feedback, they can independently revise their work and reflect on recurring errors, which supports the development of self-regulated writing behaviors (Zimmerman, 2002; Nicol & Macfarlane-Dick, 2006). The positive perceptions reported in this study, therefore, suggest that AI tools not only function as corrective mechanisms but also act as scaffolding agents that promote learner responsibility for linguistic accuracy.

However, while students perceive AI tools as highly effective for mechanical corrections, previous research cautions against over-reliance on automated feedback. Scholars argue that



AI tools are most beneficial when used as complementary support rather than replacements for instructor feedback, particularly for higher-order writing concerns such as argumentation and critical thinking (Hyland & Hyland, 2006; Ranalli & Yamashita, 2022). Thus, the strong endorsement of AI tools for spelling and punctuation in this study reinforces their value at the lower-level writing domain, while highlighting the need for balanced integration with human feedback.

### **AI-Based Feedback Tools and Reflective Writing Practices**

The second research question investigated how EFL undergraduate students perceive the role of AI feedback tools in supporting their reflective writing practices. It was explored by analyzing the participants' responses to the third dimension of the questionnaire which is Learning and Reflection. Table 4 illustrates the results of this dimension.

**Table 4. AI-based Feedback Tools and Reflective Writing Practices**

| Item                      | SA            | A             | N             | D        | SD       | Mean        | Std. Dev. | Rank |
|---------------------------|---------------|---------------|---------------|----------|----------|-------------|-----------|------|
| 1                         | 66<br>(66.0%) | 32<br>(32.0%) | 1 (1.0%)      | 1 (1.0%) | 0 (0.0%) | 4.63        | .562      | 1    |
| 2                         | 57<br>(57.0%) | 29<br>(29.0%) | 13<br>(13.0%) | 1 (1.0%) | 0 (0.0%) | 4.42        | .755      | 4    |
| 3                         | 55<br>(55.0%) | 37<br>(37.0%) | 7 (7.0%)      | 1 (1.0%) | 0 (0.0%) | 4.46        | .673      | 3    |
| 4                         | 44<br>(44.0%) | 29<br>(29.0%) | 24<br>(24.0%) | 3 (3.0%) | 0 (0.0%) | 4.14        | .888      | 5    |
| 5                         | 57<br>(57.0%) | 34<br>(34.0%) | 8 (8.0%)      | 1 (1.0%) | 0 (0.0%) | 4.47        | .688      | 2    |
| <b>Weighted mean</b>      |               |               |               |          |          | <b>4.42</b> |           |      |
| <b>Standard deviation</b> |               |               |               |          |          | <b>.569</b> |           |      |

*Note(s): Strongly agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly disagree (SD)*

Table 4 displays that Item 1 (AI feedback helps me understand my writing errors and learn from them) ranked highest, recording a mean score of 4.63 (SD = 0.562). A substantial majority of participants expressed strong agreement with this item, with 66% selecting Strongly Agree and 32% selecting Agree. This means that students had a positive attitude towards AI feedback as a reflective tool that enables them to understand their mistakes and learn from them to enhance their writing sustainably. This result matches research emphasizing the role of AI-generated feedback in promoting reflection, metacognitive awareness, and sustainable writing improvement among EFL learners (Chen,2024; Teng, 2024).

In contrast, the lowest-ranked item in this dimension was Item 4 (AI feedback encourages me to evaluate my arguments critically), which recorded a mean score of 4.14 and the highest SD (0.888). While this item still reflected overall agreement, it had the largest percentage of Neutral responses (24%) and a slightly higher level of Disagree responses (3%), indicating comparatively less consensus among participants. This means that AI feedback tools lack the ability to improve the skills of critical thinking among EFL students. This finding aligns with recent studies suggesting that, while AI feedback is effective for linguistic and structural aspects of writing, it is less capable of fostering higher-order critical thinking skills among EFL learners. For instance, Aljuaid (2024) reported that AI writing tools primarily support grammar, style, and surface-level clarity but remain limited in promoting critical evaluation, argument strength, and independent reasoning.

On the other hand, contrasting evidence suggests that AI feedback can support critical thinking when strategically integrated into instruction. Zhang (2025) demonstrated that students who received AI-mediated feedback showed significant improvements in organization and content development, indicating gains in analytical and evaluative writing abilities. Likewise, Chan and Lo (2024) found that generative AI feedback enhanced students' engagement with revision and argument refinement when combined with guided reflection and instructor scaffolding.

Overall, the results of Dimension 3 (Learning and Reflection) indicate a generally high level of agreement among participants across the five items. The weighted mean for this

dimension was 4.42, with a SD of 0.569, reflecting overall positive perceptions with moderate variability in responses. This reflects that participants held positive attitudes toward AI feedback tools regarding their role in supporting their writing learning and the reflection process on their writing practices. These findings support previous research suggesting that AI-generated feedback can enhance learners' self-regulated learning by promoting reflection, self-monitoring, and strategic revision during writing tasks (Teng, 2024).

From a socio-cognitive perspective, AI feedback functions as an external mediational tool that provides scaffolding and metalinguistic guidance, enabling learners to internalize feedback, recognize patterns of errors, and gradually regulate their own writing performance (Zimmerman, 2002; Chen, 2024). Recent studies further confirm that when students engage with AI feedback reflectively, they develop greater awareness of their learning processes and adopt more autonomous and intentional writing practices, reinforcing both self-regulation and socially mediated cognitive development (Li et al., 2024).

### AI-Based Feedback Tools and Their Affective Impact

The third research question investigated EFL undergraduate students' views toward the affective impact of AI feedback tools on academic writing. The data for this question is collected via the participants' responses to the fourth dimension of the questionnaire, which is Affective Impact (Table 5).

**Table 5. The Affective Impact of AI-based Feedback Tools**

| Item                      | SA            | A             | N             | D        | SD       | Mean        | Std. Dev. | Rank |
|---------------------------|---------------|---------------|---------------|----------|----------|-------------|-----------|------|
| 1                         | 46<br>(46.0%) | 35<br>(35.0%) | 13<br>(13.0%) | 6 (6.0%) | 0 (0.0%) | 4.21        | .891      | 5    |
| 2                         | 46<br>(46.0%) | 41<br>(41.0%) | 9 (9.0%)      | 4 (4.0%) | 0 (0.0%) | 4.29        | .795      | 2    |
| 3                         | 48<br>(48.0%) | 31<br>(31.0%) | 16<br>(16.0%) | 4 (4.0%) | 1 (1.0%) | 4.21        | .924      | 4    |
| 4                         | 47<br>(47.0%) | 32<br>(32.0%) | 17<br>(17.0%) | 4 (4.0%) | 0 (0.0%) | 4.22        | .871      | 3    |
| 5                         | 52<br>(52.0%) | 38<br>(38.0%) | 8 (8.0%)      | 2 (2.0%) | 0 (0.0%) | 4.40        | .725      | 1    |
| <b>Weighted mean</b>      |               |               |               |          |          | <b>4.26</b> |           |      |
| <b>Standard deviation</b> |               |               |               |          |          | <b>.622</b> |           |      |

Note(s): Strongly agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly disagree (SD)

Table 5 shows that Item 5 (I feel satisfied with my writing when using AI feedback) ranked highest, achieving a mean score of 4.40 (SD = 0.725). A large majority of participants agreed with this item, with 52% selecting Strongly Agree and 38% selecting Agree. This result reflects a strong endorsement of students' satisfaction with using AI tools as a feedback tool for their writing tasks. Likely, the studies of Anwer (2026) and Ravšelj et al. (2025) support this finding, as both reported that higher-education students expressed strong satisfaction with AI-assisted feedback due to its efficiency, supportive tone, and perceived contribution to improving writing quality and confidence.

In contrast, both Item 1 and Item 3 recorded identical mean scores of 4.21, ranking fifth and fourth, respectively. Item 1 (Using AI tools increases my motivation to complete writing tasks) showed 46% strong agreement and 35% agreement. Similarly, Item 3 (Using AI feedback reduces my anxiety about writing tasks) demonstrated 48% strong agreement and 31% agreement. This means that most of the students agree that AI feedback tools had a positive affective impact towards increasing their motivation to complete writing tasks and decreasing their anxiety about these tasks. This finding aligns with previous research reporting that AI-generated feedback can positively increase motivation and reduce writing anxiety, mainly due to its immediacy, non-judgmental nature, and supportive tone (Teng, 2024; Song & Song, 2023). On the other hand, a study by Roe et al. (2024) states that some students remain skeptical about relying on AI feedback for emotional support, noting that the absence of human interaction may limit its effectiveness in addressing deeper affective needs such as confidence-building and sustained motivation.

Generally, the findings for Dimension 4 (Affective Impact) indicate overall positive perceptions among participants, with a weighted mean of 4.26 (SD = 0.622), suggesting high agreement and moderate variability in responses. This means that participants generally had positive attitudes towards the affective impact of AI-based feedback tools. From a self-regulated learning perspective, the high level of agreement suggests that AI-based feedback helps learners regulate their motivation and emotions, which are essential for sustaining engagement, persistence, and reflective revision in writing tasks (Zimmerman, 2002; Nicol & Macfarlane-Dick, 2006). At the same time, socio-cognitive theory explains this affective response by viewing AI feedback as a mediational tool that provides consistent, non-judgmental support, thereby reducing anxiety and enhancing learners' confidence and emotional engagement during writing (Bandura, 1986).

### **Reliability and Overall Value of AI-Based Feedback Tools for Academic Writing**

The fourth research question explored the extent to which EFL undergraduate students evaluate the reliability and overall value of AI feedback tools for academic writing. It was answered by reporting the results of the last dimensions of the questionnaire (Reliability and Overall Value). Table 6 displays the results of this dimension.

**Table 6. Reliability and Overall Value of AI-based Feedback Tools**

| Item                      | SA            | A             | N             | D             | SD       | Mean        | Std. Dev. | Rank |
|---------------------------|---------------|---------------|---------------|---------------|----------|-------------|-----------|------|
| 1                         | 32<br>(32.0%) | 39<br>(39.0%) | 23<br>(23.0%) | 6 (6.0%)      | 0 (0.0%) | 3.97        | .893      | 4    |
| 2                         | 54<br>(54.0%) | 42<br>(42.0%) | 4 (4.0%)      | 0 (0.0%)      | 0 (0.0%) | 4.50        | .577      | 1    |
| 3                         | 36<br>(36.0%) | 29<br>(29.0%) | 21<br>(21.0%) | 14<br>(14.0%) | 0 (0.0%) | 3.87        | 1.060     | 5    |
| 4                         | 34<br>(34.0%) | 41<br>(41.0%) | 22<br>(22.0%) | 3 (3.0%)      | 0 (0.0%) | 4.06        | .827      | 2    |
| 5                         | 56<br>(56.0%) | 36<br>(36.0%) | 6 (6.0%)      | 2 (2.0%)      | 0 (0.0%) | 4.46        | .702      | 3    |
| <b>Weighted mean</b>      |               |               |               |               |          | <b>4.17</b> |           |      |
| <b>Standard deviation</b> |               |               |               |               |          | <b>.618</b> |           |      |

*Note(s): Strongly agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly disagree (SD)*

Table 6 illustrates that Item 2 (I recommend the use of AI tools to other students as a form of writing support) ranked highest, achieving a mean score of 4.50 (SD = 0.577). A very high proportion of participants agreed with this item, with 54% selecting Strongly Agree and 42% selecting Agree. This suggests that EFL students believe AI tools are helpful and effective in supporting the writing process and therefore encourages other students to use them as well. Although those students had a positive personal experience with AI tools, they saw them as a supportive aid, not a replacement for learning, teachers, or independent thinking. This result aligns with previous studies that EFL learners perceive AI tools such as Grammarly and ChatGPT as valuable supplementary support systems that facilitate drafting and revision while preserving the central role of instructors and learner autonomy (Kasneci et al., 2023; Teng, 2024).

On the other hand, the lowest mean score was observed for Item 3 (I consider AI feedback reliable enough for use in academic tasks), with a mean score of 3.87 (SD = 1.060). It demonstrated the greatest variability in responses, with 21% neutral and 14% Disagree responses, indicating comparatively mixed perceptions. Despite this, agreement responses still exceeded disagreement, suggesting that attitudes remained more positive than negative. This means that participants trust the feedback provided by AI tools enough to use it in academic writing. Although AI may not replace teachers or human judgment, the students view it as a reliable supporting resource that can be safely used alongside traditional academic guidance (Aljuaid, 2024; Roe et al., 2024).

Overall, the results of Dimension 5 (Reliability and Overall Value) reveal generally positive perceptions among participants, though with more variability compared to the earlier dimensions. The weighted mean for this dimension was 4.17 (SD = 0.618), indicating overall

agreement alongside moderate dispersion in responses. This indicates that EFL students reflect a high level of trust in the quality and credibility of AI-generated feedback for supporting academic writing tasks. Likewise, a large-scale global study by Ravšelj et al. (2025) reported that higher-education students generally viewed AI feedback tools as credible and dependable for academic support, especially for writing-related activities.

## 8. Limitations

The current study encountered several limitations. Firstly, it can be viewed as a preliminary investigation of undergraduate EFL students' perceptions of AI-generated feedback within a specific educational context. The sample was drawn from the College of Medicine at Taif University using purposive sampling, which limits the representativeness of the participants and constrains the generalizability of the findings to students from other institutions and disciplines. Secondly, the reliance on self-report survey design means that the results reflect students' perceptions rather than objectively measured improvements in writing performance or learning outcomes. In addition, the cross-sectional design that captured students' views at a single point in time limits insight into how students' opinions of AI feedback might change with prolonged use or increased familiarity. The absence of qualitative data further restricts a deeper understanding of why some dimensions (e.g., critical thinking support) showed greater variability in responses. Future research should therefore employ mixed-methods and longitudinal designs, include participants from multiple institutions and academic disciplines, and utilize probability-based sampling approaches. Additionally, studies incorporating objective measures of writing performance and learning outcomes would provide stronger evidence regarding the educational effectiveness of AI-generated feedback. Such research would help determine the extent to which the findings of this preliminary investigation can be generalized across diverse educational contexts.

## 9. Conclusion and Implications

This study examined EFL students' perceptions of AI-generated feedback tools across five dimensions: writing quality and clarity, efficiency and organization, learning and reflection, affective impact, and reliability and overall value. The findings revealed that students generally held positive attitudes toward the use of AI-based feedback in academic writing, with high levels of agreement across most dimensions. Participants perceived AI feedback as effective in improving writing clarity, diagnosing weaknesses in drafts, supporting reflective learning, and enhancing motivation while reducing writing anxiety. These results suggest that AI tools are viewed not purely as corrective instruments but as meaningful supports in the writing process. However, students were less certain about AI's ability to raise higher-order skills such as critical evaluation of arguments, indicating clear boundaries to its perceived pedagogical value.

Taken together, these results indicate that AI-based feedback tools can be effectively integrated as complementary supports rather than replacements for teacher feedback. In terms of practical application, instructors may integrate feedback from AI tools into the writing process at different stages, including planning, drafting, and editing, to foster independent identification of mistakes by the students and their improvement. Another way to encourage the students to evaluate feedback from AI tools critically and not to take it passively is to conduct some reflective exercises, revision journals, and class discussions about the feedback from AI tools led by the teachers. The strategy of giving the students AI feedback first and then giving the teachers' feedback on higher-order issues, such as argumentation, critical thinking, and content creation, may be particularly effective.

Furthermore, the results of the present study have theoretical implications regarding the further development of theories about how AI-generated feedback works within self-regulated learning (SRL) and socio-cognitive frameworks. These results show that the use of AI generates necessary processes of self-regulation, such as self-monitoring, goal-directed revision, motivation, and emotional regulation while performing writing tasks. In addition, the socio-cognitive approach considers AI feedback as a mediator, providing students with timely,

easy-to-access, and non-threatening feedback. The students have found that AI feedback was useful not only for the improvement of language accuracy but also for enhancing reflection and engagement in the writing process. Thus, this study provides evidence of AI in supporting both cognitive and affective dimensions of learning.

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## Appendix A: Students' Questionnaire

Table 7. Students' Questionnaire Items by Dimension

| Dimension                   | Items                                                                                                      | SA | A | N | D | SD |
|-----------------------------|------------------------------------------------------------------------------------------------------------|----|---|---|---|----|
| Writing Quality and Clarity | 1. I realize that artificial intelligence tools help me express my ideas more clearly in academic writing. |    |   |   |   |    |
|                             | 2. I find AI feedback on writing style useful for revision and editing.                                    |    |   |   |   |    |
|                             | 3. AI tools help me identify and correct grammatical errors in my writing.                                 |    |   |   |   |    |
|                             | 4. AI tools help me identify and                                                                           |    |   |   |   |    |

**AI-Based Feedback in Academic Writing: Insights from EFL Undergraduate Students at Saudi Higher Education**

|                                            |                                                                                    |  |  |  |  |  |
|--------------------------------------------|------------------------------------------------------------------------------------|--|--|--|--|--|
|                                            | correct spelling errors and punctuation.                                           |  |  |  |  |  |
|                                            | 5. AI tools help me improve sentence structure.                                    |  |  |  |  |  |
|                                            | 6. AI feedback helps me improve my use of academic vocabulary.                     |  |  |  |  |  |
|                                            | 7. I realize that AI feedback has a positive impact on the quality of my writing.  |  |  |  |  |  |
| <b>Process Efficiency and Organization</b> | 1. Using AI tools makes the proofreading process more efficient.                   |  |  |  |  |  |
|                                            | 2. AI feedback helps me organize my writing.                                       |  |  |  |  |  |
|                                            | 3. AI feedback helps me identify weaknesses in my drafts.                          |  |  |  |  |  |
|                                            | 4. AI feedback is specific enough to guide my revisions.                           |  |  |  |  |  |
|                                            | 5. AI feedback is usually provided quickly whenever I need it.                     |  |  |  |  |  |
| <b>Learning and Reflection</b>             | 1. AI feedback helps me understand my writing errors and learn from them.          |  |  |  |  |  |
|                                            | 2. AI feedback encourages me to reflect on how I write and revise.                 |  |  |  |  |  |
|                                            | 3. AI feedback helps me develop writing strategies that I can apply independently. |  |  |  |  |  |
|                                            | 4. AI feedback encourages                                                          |  |  |  |  |  |

|                                      |                                                                                    |  |  |  |  |  |
|--------------------------------------|------------------------------------------------------------------------------------|--|--|--|--|--|
|                                      | me to evaluate my arguments critically.                                            |  |  |  |  |  |
|                                      | 5. I realize that AI feedback supports my continuous development in writing.       |  |  |  |  |  |
| <b>Affective Impact</b>              | 1. Using AI tools increases my motivation to complete writing tasks.               |  |  |  |  |  |
|                                      | 2. AI feedback makes me feel more confident in my academic writing ability.        |  |  |  |  |  |
|                                      | 3. Using AI feedback reduces my anxiety about writing tasks.                       |  |  |  |  |  |
|                                      | 4. AI feedback helps me manage the pressure associated with writing deadlines.     |  |  |  |  |  |
|                                      | 5. I feel satisfied with my writing when using AI feedback.                        |  |  |  |  |  |
| <b>Reliability and Overall Value</b> | 1. I trust the suggestions provided by AI tools when revising my writing.          |  |  |  |  |  |
|                                      | 2. I recommend the use of AI tools to other students as a form of writing support. |  |  |  |  |  |
|                                      | 3. I consider AI feedback reliable enough for use in academic tasks.               |  |  |  |  |  |
|                                      | 4. I realize that AI tools are credible sources for supporting writing.            |  |  |  |  |  |
|                                      | 5. Overall, I perceive AI tools to be useful in my                                 |  |  |  |  |  |



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|--|---------------------------|--|--|--|--|--|
|  | academic writing process. |  |  |  |  |  |
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### **AUTHOR'S BIO**

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