



# Utilization of artificial intelligence technology in an academic writing class: How do Indonesian students perceive?

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## ABSTRACT

Research shows that artificial intelligence (AI) technology positively influences students' writing skills, but this area has yet to be touched by Indonesian researchers. This study aims to map perception, obstacles, and recommendations for optimizing use of AI in teaching academic writing in Indonesian. This article focuses on a case study of three senior high schools in Central Java, Indonesia. It employs quantitative and qualitative data. The researcher collected the data using questionnaires presented with Likert scale, followed by an in-depth interview through mobile instant messaging interview. Findings show that (1) AI-based learning tools help students to do academic research, especially in the planning step, to identify and develop the topics, as well as in the drafting step, to develop a paper draft, (2) AI-based learning tools are deemed flexible in accessibility despite not being able to cover all necessities required by students in writing process, (3) students are interested in using AI technology in academic writing class so that learning process will not be boring. Although AI has been used in academic writing classes, tools have not positively impacted quality of students' academic papers in all indicators. There are several obstacles to using AI, namely (1) need for more available feature, especially in editing Indonesian text, and (2) in contrast, the features still need to be optimized. These are the recommendations for the optimization of AI-based learning tools, which are (1) adding features to edit Indonesian text, including spelling, diction, and sentence structure, and (2) enhancing AI literacy to be able to explore and leverage the existing features optimally. This research has yet to accommodate the possible coverage in checking the originality and accuracy of the written product assisted by AI-based learning tools, which could become a focus for future researchers.

**Keywords:** perception, AI technology, learning tools, academic writing

## INTRODUCTION

Writing is an essential skill for students to master. Writing is the primary competence for lifelong study (UNESCO, 2017). Writing is a means of communication, interpreting information, recording experiences, self-

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This study is a part of the first author's doctoral dissertation.

expression, and facilitating meaningful learning processes (Graham et al., 2013; Peter & Singaravelu, 2020). Previous research show strong evidence that many students in developed countries still have low writing skills, such as in the USA (National Center for Educational Statistics, 2012), Portugal and Brazil (Veiga-Simao et al., 2016), Chile (Agencia de Calidad de la Educación [Education Quality Agency], 2017; Bañales et al., 2020), and Australia (Australian Curriculum and Assessment Reporting Authority [ACARA], 2021; Thomas, 2020). The same thing happens in Indonesia, where students' writing skills are concerned. According to Inayah and Nanda (2016), Indonesian students have problems with their writing skills, especially with the contents, outline organization, wording, sentence structure, and writing mechanics.

Low writing skills have a crucial impact on students in that it affects their achievement, shows a low level of literacy, and possibly spreads the practice of plagiarism (Elmunsyah et al., 2018; Graham, 2019; Sureda-Negre et al., 2015). Several research have discussed the reasons on why the students have low writing skills, ranging from the lack of comprehension in grammar, mastery of vocabulary, spelling, and sentence arrangement (Madison et al., 2019), to the lack of students' motivation (Camacho & Alves, 2017; De Smedt et al., 2016), and the uninteresting sessions in writing class (Myers et al., 2016).

In Indonesia, students, including senior high school students, must learn to write. Amongst all genres, most students need help in writing academic research. Pitrianti and Gasanti (2020) states that writing academic research is complex and challenging. A problematic factor that could be highlighted in a writing class is the need for technology. Utama and Utama (2017) confirms the issue by stating that out of the 15 potential technologies in the classroom, only 0.40% were potentially leveraged by the teachers. The use of technology is limited to finding theoretical ground, text models, and scoring models for the written product. The problem happens because the teachers need better competence in using learning tools, including artificial intelligence (AI)-based learning tools.

Meanwhile, AI technology has been used in teaching and learning in different countries, especially in writing classes. Some research show that AI could improve the quality of a written product (Fitria, 2021), improve writing skills (Mediyawati et al., 2021), help students understand theoretical concepts, help the processes in writing, help students in learning and engaging in a writing class (Gayed et al., 2022; Kangasharju et al., 2022; Koltovskaia, 2020; Nazari et al., 2021; Sumakul et al., 2022a), as well as aiding in achieving the learning objectives (Ng et al., 2022).

Some of the research above shows that using AI-based learning tools positively impacts the students in a writing class. However, there is a minimum of research focuses on using AI technology in an Indonesian academic writing class for senior high school students. In addition, a mapping identification should exist to ensure that AI-based learning tools can be developed and updated based on the students' requirements. Therefore, this research aims to map the perception of utilizing AI technology to teach Indonesian academic writing. The mapping focuses on the reception of technology (Davis, 1989; Davis et al., 1989), specifically on the perceptions of usefulness, ease of use, and attitude toward usage. Thus, the research questions for this study are, as follows:

- RQ1.** How do Indonesian students perceive the usefulness of AI technology in their academic writing class?
- RQ2.** How do Indonesian students perceive the ease of using AI technology in their academic writing class?
- RQ3.** What do Indonesian students' attitudes toward the usage of AI technology in their academic writing class?

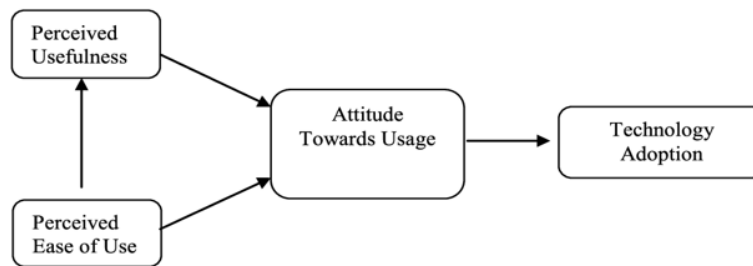
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## LITERATURE REVIEW

### Artificial Intelligence Technology in An Academic Writing Class

Academic writing requires unique methods and techniques to make the product original and valid in the arrangement process. The students have to do research, observe, and use many references. Academic writing should be taught to resolve problems using presented data and facts. Hence, the objective should be adequately achieved (Fang, 2021).

Process writing is an approach to learning writing that emphasizes the writing processes. This approach focuses on how the writer finds, develops, and revises their text. Tompkins and Hoskisson (1995) presents



**Figure 1.** Technology acceptance model (Davis, 1989; Davis et al., 1989)

five writing steps: planning, drafting, revising, editing, and publishing. The main focus of the writing process is how the writer finds, develops, and revises texts. The approach is vital since, based on Kurniasih et al. (2020) and Sudiati and Nurhidayah (2008), it helps make learning writing effective and improves the students' skills.

Integrating AI in classroom activities is a critical paradigm that substantially impacts learning language. The integration emerges new patterns. AI helps create a learning environment that follows the era's development, intensifying involvement, and showcasing flexibility in learning (Miller & Wu, 2021; UNESCO IITE, 2020). In a writing class, AI is implemented through the use of different apps, such as AI Kaku, ChatGPT, Eskritor, Grammarly, Plot Generator, Poem Generator, Speech-to-Text, Text-to-Speech, Smodin, and other apps (Fitria, 2021; Gayed et al., 2022; Kangasharju et al., 2022; Razack et al., 2021; Sumakul et al., 2022b; Widyana et al., 2022).

### Students' Perceptions of Artificial Intelligence Technology

Students' perceptions are practical tools which determine the students' behavior (Scherer et al., 2016). The perception should be comprehensive in depicting the behavior. Students' positive perception of technology also increases their motivation, enthusiasm, and academic success rates. Students' perception measurement could be used as the evaluative effort and the post-evaluation action plan for revision (Labonté & Smith, 2022).

Teo (2019) mentions that in utilizing learning tools, the students consider the technologies' ease of use and usefulness, apart from their relevance to the learning objectives, the technical competencies of the users, and the availability of the facilities. This is relevant to the technology acceptance model (TAM) concept, which could be used to measure the reception and utilization of technology. TAM is a development of the theory of reasoned action (TRA), which is aimed at exploring the interaction between the internal factors of the users (Davis, 1989; Davis et al., 1989). This research refers to TAM formula, which assumes three aspects of the user's beliefs: perceived usefulness, perceived ease of use, and attitude toward usage. The design of TAM for this research is displayed (Figure 1). Perceived usefulness represents users' trust and confidence in integrating technology to improve their achievement and ability. This means that the concept measures the effectiveness of technology integration in users' life. Perceived ease of use illustrates trust and confidence that integrating technology is easy and does not require much effort, thought, and learning time. Attitude towards usage is the tendency to respond to a condition of a particular object. This means that behavior reflects the users' feelings on a specific matter (Davis, 1989; Davis et al., 1989).

## METHODOLOGY

This research uses a case study approach. The authors mapped the students' perception of AI, specifically on the use of two intelligent writing assistants. The first tool observed in this research is an AI-based software for writing version 3.0, available in 42 languages, including Indonesian. The students can use different features as required, such as Conclusion Writer, Continue Writing, Expand Text, Idea Generator, Intro Writer, Rephrase Text, Shorten Text, and Text Summarizer. The second tool could help the students write a text quickly. Practically, the students could operate the tool by entering their inquired prompts or ideas. Then, the tool will offer some ideas to the students.

**Table 1.** Participants' responses to the questionnaire

| Statements                                                           | Responses (%) |    |    |   |    |
|----------------------------------------------------------------------|---------------|----|----|---|----|
|                                                                      | SA            | A  | N  | D | SD |
| AI-based learning tools help my performance in writing.              | 26            | 60 | 14 | 0 | 0  |
| AI-based learning tools improve my writing skills.                   | 22            | 43 | 33 | 2 | 0  |
| AI-based learning tools help me in achieving my learning objectives. | 26            | 36 | 38 | 0 | 0  |
| AI-based learning tools improve the quality of my writing.           | 28            | 41 | 28 | 3 | 0  |
| AI-based learning tools are accessible.                              | 31            | 47 | 22 | 0 | 0  |
| AI-based learning tools features quickly follow the instruction.     | 24            | 55 | 19 | 2 | 0  |
| AI-based learning tools are flexible.                                | 35            | 51 | 14 | 0 | 0  |
| AI-based learning tools have various features.                       | 27            | 38 | 33 | 0 | 2  |
| I like using AI-based learning tools.                                | 47            | 41 | 12 | 0 | 0  |
| I am motivated to learn using AI-based learning tools.               | 28            | 48 | 22 | 2 | 0  |
| I am eager to learn using AI-based learning tools.                   | 32            | 50 | 16 | 2 | 0  |
| I am not bored with learning using AI-based learning tools.          | 35            | 41 | 22 | 2 | 0  |

Note. SA: Strongly agree; A: Agree; N: Neutral; D: Disagree; & SD: Strongly disagree

## Participants

This research involves three senior high schools in Semarang, Indonesia. We chose the location since the schools have already used AI-based learning tools in an IT-based classroom. In this case, most students were proficient enough in using the learning tools. The participants were determined with purposive sampling. Then, we had 58 participants, with n=25 (43.10%) male participants and n=33 (56.90%) female participants.

Participants are eleventh-grade students, and one of the basic competencies taught is writing a scientific paper (Peraturan Menteri Pendidikan dan Kebudayaan [Ministry of Education and Culture Regulation], 2018). The students work in a group consisting of two-four members. They must get through the writing stages inside and outside the classroom. The teacher presents and simulates AI-based learning tools. The students can explore and apply the tools' features, such as Continue Writing, Idea Generator, Intro Writer, etc.

## Instruments and Data Collection

The research data was obtained through a questionnaire followed by an in-depth interview. The questionnaire was taken online with Google Forms. From the 15 items of the arranged questionnaire, the experts judged that we only had 12 items left (Table 1). The questionnaire items were developed from their theoretical construction of TAM (Davis, 1989; Davis et al., 1989). The strategy refers to the theory of triangulation, where a particular approach could support an observed phenomenon. The strategy is implemented to articulate the reliability of qualitative research and the validity of research questions (Ary et al., 2018; Muñoz & Ramirez, 2015). The response on the questionnaire is measured using a Likert scale under five options of answers, which are 5 for strongly agree (SA), 4 for agree (A), 3 for neutral (N), 2 for disagree (D), and 1 for strongly disagree (SD).

Semi structure, in-depth interview was conducted to follow up on the questionnaire. The research implemented a mobile instant messaging interview (MIMI) through messaging applications like WhatsApp. The benefits of using an in-depth interview with a short messaging application are flexibility (time and place), cost-efficiency, and rich data (Kaufmann & Peil, 2020; Maeng et al., 2016).

## Data Analysis

The quantitative data from the questionnaire could be counted in percentages following the Likert scale scoring system. The qualitative data came from the interview to elaborate the statement in the questionnaire (Creswell, 2009). For the interview, we had 11 participants who were chosen randomly to represent the result of the questionnaires' findings. The interview data focuses on the answers to the initial questions, which was developed. The writing team reads the transcription of the responses several times to get the points of the answer, followed by a code. The naming of the subject is coded with the initial A for male students and B for female students, followed by the participants' number. During the process, the researchers remove duplicated and unnecessary data. Hence, we got the interview data from nine participants. The relevant excerpts are reported on the results.

**Table 2.** Average score for perceived usefulness

| Statements                                                           | Mean |
|----------------------------------------------------------------------|------|
| AI-based learning tools help my performance in writing.              | 4.12 |
| AI-based learning tools improve my writing skills.                   | 3.85 |
| AI-based learning tools help me in achieving my learning objectives. | 3.88 |
| AI-based learning tools improve the quality of my writing.           | 3.74 |

## RESULTS AND DISCUSSION

### Results

The collected data are displayed in [Table 1](#).

#### *Students' perception of usefulness of artificial intelligence technology utilization*

The perceived usefulness aspect maps the students under the perception that AI-based learning tools

- (1) help their performance in writing,
- (2) improve their writing skills,
- (3) help in achieving their learning objectives, and
- (4) improve the quality of their writing.

The average scores are presented in [Table 2](#).

Most of the participants (86.00%) confirmed that AI-based learning tools help their performance in the writing process. The average score reached 4.12, which means positive. From the in-depth interview, the participants stated that the writing process in planning, drafting, revising, and editing was done in a small group. AI-based learning tools could help the group resolves the difficulty in planning the topics. The finding is reiterated in the excerpts below.

"Our initial topic was 'digital literacy'. Since we only brought up general points from our discussion, we utilized the function of idea exploration feature. We got more specific options for the ideas. Then, we deemed the topic based on the agreement of the group members" (A-18).

Apart from planning, the participants also use the "continue writing" feature to help them draft. This feature was used by giving one-two initial sentences as a stimulant to the topic. Automatically, the software helps in continuing the sentences.

"I was helped in elaborating an argument or the content of my written product. Although it is not perfectly structured, this learning tool gives us some options of elaborating sentences that we can use to develop our script" (A-9).

"We began the drafting with "Intro Writer" feature, which gave us the opening paragraph. Next, we move on to activating "continue writing" to help us in developing the script" (B-20).

The participants stated that they did not use AI-based learning tools to help them revise and edit. They had difficulties because of the absence of Indonesian language options to support them. Besides, revising and editing require specific mastery, where the students need to see through the writing mechanics, including the substance and the language. Below is the response from a participant.

"In my opinion, the decision of using the offered sentences from the apps depends on our group and us. Moreover, in revising and editing, we must re-arrange the script, so it is still logical" (A-20).

The perception that AI-based learning tools can improve writing skills scores an average of 3.85. 65.00% of the participants support the statements. They felt that the apps helped them stimulate and organize ideas. Nevertheless, 33.00% of participants gave neutral responses since they thought that the skills of using written language and writing mechanics should be manual. Hence, as the participant said, students must use AI-based learning tools.

**Table 3.** Average score for perceived ease of use

| Statements                                                   | Mean |
|--------------------------------------------------------------|------|
| AI-based learning tools are accessible.                      | 4.09 |
| AI-based learning tools feature easy-to-follow instructions. | 4.01 |
| AI-based learning tools are flexible.                        | 4.21 |
| AI-based learning tools have various features.               | 3.88 |

"In my view, expressing an idea, the ability to do visualization and literal meaning cannot be changed with technology because it has a very slim chance to express it in detail" (B-30).

The statement that AI-based learning tools can help students achieve the learning objective was scored neutral by 38.00% of participants, with an average score of 3.88. In the interview, the participants felt that using AI-based learning tools does not merely impact the achievement in written communication and critical and systematic thinking. However, it is not being deemed harmful as well. The excerpts below show a reason for the neutral response.

"Learning tools could ease the last objective of learning. Yet, we have to be able to do something without technology if we do not want to forget the basic of writing" (B-30).

The use of AI-based learning tools is perceived as improving the quality of writing is supported by 69.00% of participants, with an average score of 3.74. Based on the interview, the participants stated that the criteria of creativity proposed in the academic paper were deemed improving because of the topics offered by AI-based learning tools. Participants who disagree with the statement noted that the features in AI-based learning tools could not cover the indicators, which determine the quality of the academic paper, which are the accuracy of analysis, the readiness to write synthesis, and the ability to conclude something. These things are implied in the following response.

"My inspiration for writing becomes varied. At least my creativity is not producing something monotonous again" (B-1).

"The learning tools cannot transform the idea to become ready and summarized academic paper. In my opinion, this is the most crucial indicator in writing" (A-22).

The questionnaire and the interview show that using AI-based learning tools helps the participants write, improve their writing skills, and help them achieve the learning objectives. AI-based learning tools also directly enhance the quality of their script. However, using features in AI-based learning tools can only partially support the students in the writing process, especially in the planning and drafting stage. Besides, it was also shown that the quality of students' writing did not improve in all indicators. The improvement was only seen on the criteria of creativity of idea.

### ***Students' perception of ease of using artificial intelligence technology***

The aspect of perceived ease of use focuses on

- (1) accessibility,
- (2) the difficulty of instruction,
- (3) flexibility, and
- (4) the availability of various features.

The average scores are displayed in **Table 3**.

In terms of accessibility, the average score was 4.09. Most participants said they had no difficulties accessing AI-based learning tools. This is correlated to the condition of most participants who are familiar with the technology of information and how to operate it, as stated by a participant below.

"It was easy for me to use. I did not find any difficulty in using it because I am literate enough in using technology" (B-30).



**Table 4.** Average score for attitude towards usage

| Statements                                                 | Mean |
|------------------------------------------------------------|------|
| I like using AI-based learning tools.                      | 4.35 |
| I am motivated to learn using AI-based learning tools.     | 4.02 |
| I am eager to learn using AI-based learning tools.         | 4.12 |
| I am interested in learning using AI-based learning tools. | 4.09 |

The questionnaire's analysis on the ease of instruction in AI-based learning tools shows an average score of 4.01. Only 2.00% of the participants found obstacles in understanding the instruction at the initial point when they finally found the practical solution by themselves. Below are the responses from the participant.

"I did not think it is difficult. I understand what I have to do after choosing and opening a feature. The setting is also in Indonesian, which eases my job even better" (A-19).

"I am confused since I do not know how to use it. I often asked my friend, a SWAT (Smanda Work at Technology) extracurricular member. The extracurricular is a technology-based and digital community of students in my schools. Finally, I was able to use it" (B-1).

AI-based learning tools have high flexibility, with an average score of 4.21. In the interview, most participants viewed using the learning tools that help them finish their writing tasks as straightforward. They also explored the offered features as required. The responses of the participants supported this statement.

"When using the apps at school with my community or when I studied at home, it was easy for me to access it. I am familiar enough with the way of using this learning app" (A-18).

Most participants agreed on the variety of features in the learning tools, with an average of 3.88. 33.00% of participants stated that they are neutral since they have types of features, yet they have yet to be able to fulfil all requirements in writing. However, they can utilize other learning tools. Here is the response from the participants.

"During planning and drafting, we use the "intro writer", "continue writing", and "expand text" features. In revising and editing, we use SIPEBI (non-AI). To present our paper, we used Canva and Text-to-Speech for the presentation slides. We kept in contact with our group members using Google Docs with the "sharing" setting" (B-16).

Based on the data from the questionnaire and interview, the participants were relatively easy to access AI-based learning tools because they have the technical skills and are accustomed to operating different learning tools. The participants felt the ease of using and following the instruction of the learning tools, although, in the beginning, they needed clarification. AI-based learning tools were deemed flexible for the participants to work in a group or independently. However, the variety of features has yet to cover the necessities of the participants in the writing processes. They have to use other AI-based learning tools.

### ***Students' attitude towards use of artificial intelligence technology***

The student's attitude toward the use of AI-based learning tools in an academic writing class focuses on

- (1) likeability,
- (2) motivation,
- (3) convenience, and
- (4) boredom.

The average scores are presented in **Table 4**.

The questionnaire's data on the likeability of AI-based learning tools show an average score of 4.35. It shows that most participants have a positive interest in the use of it. Here are the responses from a participant.

"Yes, I was happy. Moreover, I needed it. I feel more creative and confident when I am helped with digital tools. I also loved it because it was faster for me to finish it" (A-18).

With an average score of 4.02, the participants have the motivation to learn with AI-based learning tools. In the interview, most participants stated that they were enthusiastic about getting new experiences in exploring the learning tools. Then, the participants viewed that using AI-based learning tools helps them fulfil their needs by minimizing their writing difficulties, as mentioned below.

"It was amazing! The stress or long discussion at the beginning of the writing process could be minimized. Usually, we have writer's block in the middle of writing. Nevertheless, it could be reduced because of that" (B-16).

Regarding the convenience of using AI-based learning tools, the average score is 4.12, which means the participants did not find anything annoying or disruptive. In the interview, the participant stated that they enjoy the learning process with AI, as they said below.

"The processes were not only manual, but it was also involving a discussion with my groupmates since also use the learning tools practically. It was interesting. I did not feel burdened by it" (A-20).

The questionnaire shows that the participants did not feel bored using AI-based learning tools. The average score on this aspect is 4.09. However, 22.00% of participants were neutral on the statement. They felt the learning process was more varied, although they hoped they used it sparingly. This means that learning tools are adjusted to what they need and where they need to explore the other learning tools. The following claims support this statement.

"It was not monotonous because it was new to us. The automatization gave us varied information. I used it to finish my writing tasks. I hope that I could use other apps as alternatives" (A-9).

The data from the questionnaire and interview illustrate that the students were more pleased, motivated, convenient, and joyful when having an academic writing class using AI-based learning tools. Most participants had positive interest and enthusiasm and were not bored. Nevertheless, they hoped that they could explore other learning tools so that they could use alternative apps to support them in writing.

## Discussion

This research shows that most students positively perceive AI technology in academic writing classes. We see that from three indicators: usefulness, ease of use, and attitude. Despite not getting a comprehensive agreement, we see that AI was helpful to the students. From its usefulness to the students, AI can help the students in their performance in writing. 14.00% gave neutral responses to using AI's features. The features help them encounter difficulties in planning their script. However, on the other hand, they opined that their ideas were no longer original. This finding aligns with Nakazawa et al. (2022), who states that AI-assisted writing influences the originality of the writer's idea. The originality of the writer's idea should align with the writer's role so that it becomes personal. Hence, there should be an adaptation for using additional writing learning tools to change the interpretation of the unique idea to become collaborative with AI, especially when they have writer's block.

At the same time, 38.00% of the participants gave neutral responses to achieving learning objectives using AI-based learning tools. In the interview, they stated that the accomplishment of written communication and systematic and critical thinking still needed to be optimally proliferated with the learning tools. The tools can only help them with basic writing, specifically planning and drafting. The fact means that the development and fulfilment of a well-organized paper should be emphasized to ensure good-quality writing. The finding is in line with Abdalkader (2022), Inayah and Nanda (2016), and Mursyid (2023), who affirm the importance of teachers in strengthening students' writing competence and giving feedback on their writing product. The teachers' role cannot be changed with AI. On the other hand, we provide opportunities for the students to use AI-based learning tools if possible (Cutler & Graham, 2008; Halaweh, 2023). AI technology can be a part of learning writing as an additional tool with correct operation and timing (Alharbi, 2023; Altmäe et al., 2023; Godwin-Jones, 2022; Kangasharju et al., 2022; Razack et al., 2021).



On the comprehensiveness of the instruction for AI-based learning tools, 19.00% of students gave neutral views. They have digital competence that was good enough to help them access and understand the instruction. Specifically, they are aided by IT-supported classrooms. Nevertheless, AI-based learning tools are relatively new in academic writing classes. The tools made some students need clarification in operating them. The training of the operationalization should be done to introduce the features inside of them, including the function of each feature (Halaweh, 2023). Burkhard (2022) and Indriyani and Solihati (2021) state that it is essential to be critical of integrating AI to develop skills. Hence, although the facilities and infrastructure were very supportive, the school should continue using AI-based learning tools. Still, they also need to optimize the training that has yet to be included in AI technology, such as training students to notify topics and develop topical sentences in a paragraph in an orderly and organized way.

33.00% of students gave neutral comments on the variety of features in AI-based learning tools. They thought the feature was developed enough to help them in the writing process. However, they also deem that the features did not completely cover all stages in which they need help while writing a text. Therefore, they hope that the features are continuously developed. Some researchers show that the development of model and features are continuing apart from improving the accuracy of the ever-growing AI technology (Gayed et al., 2022; Godwin-Jones, 2022; Halaweh, 2023; Molenaar, 2022).

Most of the students viewed that they had improved learning motivation with AI-based learning tools because they were enthusiastic about their new experiences while exploring the tools. This finding is in line with Chen et al. (2020), who stated that AI gives new learning experiences to students, although they need to adjust. Motivation in writing is relevant to performance in writing as it is a crucial challenge for students (Cutler & Graham, 2008; De Smedt et al., 2016; Feliks et al., 2019).

## CONCLUSION AND RECOMMENDATIONS

Based on the results and discussion, most Indonesian secondary students positively perceive the usefulness, ease of use, and attitude toward using AI technology in their writing classes. However, using the features in AI-based learning tools has ultimately helped the process of writing an academic paper. Therefore, different learning tools should be explored to make it more varied. Then, the teachers are still required in the academic writing class, primarily to strengthen the competence in writing academic papers and giving systematic feedback to the students. The existence of AI in academic writing classes could be used as a supplementing tool. The obstacles to using AI are

- (1) incomplete available features, especially in editing Indonesian text and
- (2) the available features that need to be used optimally.

This research still needs to be expanded to the perspective of IT-supported classrooms for secondary school students. Additionally, we only cover the utilization of two AI-based learning tools. Hence, we propose three recommendations:

- (1) the stakeholders at school to improve AI literacy and the anticipation of AI technology's ethical guidelines to all students,
- (2) AI developer to improve the features that the tools can help the students in all stages of writing, and
- (3) future researchers to conduct future research to explore the utilization of different AI-based learning tools along in a broader population along.

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**Data availability:** Data generated or analyzed during this study are available from the authors on request.

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