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REVOLUTIONIZING SCIENTIFIC WRITING: THE ROLE OF ARTIFICIAL INTELLIGENCE FOR STUDENTS IN WRITING SCIENTIFIC ARTICLES

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A B S T R A C T

This research is a conceptual research that contains the role of artificial intelligence in writing scientific articles for students. This research method uses a qualitative descriptive approach. This research approach uses a descriptive approach, where in this research describes the role of AI in writing scientific articles. This research is part of conceptual research that contains theories about AI in writing scientific articles for students. Data sources were obtained through books and journal articles that are relevant to this study. The results and discussion contained in this study discuss the role of artificial intelligence (AI) in the learning process of writing scientific articles for students. The purpose of the research is to explore how AI technology can improve students' ability to produce quality scientific articles. AI provides support in designing article structure, providing content suggestions, and correcting grammatical errors. The implications of this study provide insights into the potential integration of AI in the writing learning curriculum in higher education.

INTRODUCTION

In the ever-evolving digital era, artificial intelligence (AI) has changed many aspects of human life, including higher education. Higher education as a learning and research institution plays a central role in generating new knowledge and preparing future generations. One of the main indicators of the success of a higher education

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program is the ability of students to produce original and quality scientific work. In the academic curriculum, writing scientific articles is a very important activity because it not only demands a deep understanding of a field of study, but also hones the ability of analysis, synthesis, and scientific communication. Circular Letter of the Ministry of Education and Culture (Kemendikbud) through the Directorate General of Higher Education (Ditjen Dikti) number 152/E/T/2012 dated January 27, 2012, called on universities throughout Indonesia to add graduation requirements by writing published scientific articles. This requires students to understand scientific article writing.

However, the process of writing a scientific article is not easy. Students often face challenges such as designing the right structure, selecting relevant content, avoiding plagiarism, and maintaining consistency in citations and references. According to Ratna K, Prastikawati, & Setyorini, 2012) many students think writing is difficult, unmotivated, and unimportant. The lack of motivation among students is also the cause of their lack of interest in writing (Sugiarti, Anggraini, & Musaffak, 2015). This lack of interest in writing scientific articles is due to not knowing what scientific articles are and how they are systematized.

This is where artificial intelligence comes in as a solution. One of the advantages of AI in supporting students is to assist in writing scientific articles. Students today are faced with the demand to not only produce high-quality scholarly work but also master relevant technological skills. In this context, AI provides a potential solution by assisting in various aspects of writing, such as designing article structures, providing relevant content suggestions, and ensuring accuracy and consistency of writing. In addition, AI can be used to filter relevant literature, extract key information, compile reference lists, and even evaluate the similarity of writing to previous works to prevent plagiarism. Thus, AI serves not only as a tool but also as a partner that helps students improve the quality and efficiency of their writing.

Since the beginning of the 21st century, the development of AI has made significant progress, especially in the fields of natural language processing (NLP) and machine learning, Carthy in Duggal (2024). Artificial Intelligence is no longer a science fiction idea but has become an integral part of various applications in everyday life, including in education. AI can process and analyze data quickly,

provide recommendations based on recognized patterns, and interact with users intuitively.

Previously there has been research on the role of AI in learning in higher education. The research was conducted by Putri, et al (2023) with the title "The Role of Artificial Intelligence in the Student Learning Process at Surabaya State University". The results of the study show that students see AI as very useful in their learning as evidenced by 47% of respondents rated 5 and 29% rated 3 which suggests AI has not been fully integrated in their lectures. This shows that the implementation of AI in learning needs to be applied considering the potential of AI to improve the learning process.

As such, higher education institutions need to explore how AI can revolutionize the scholarly writing process for students and to see to what extent it can positively contribute to the quality and efficiency of students' academic writing. AI technology can also facilitate the writing process, address the challenges faced by students, and improve the final outcome of the scholarly articles produced. Research on the role of AI as a contemporary technology needs to be conducted. It aims to observe the digital transformation in higher education, especially in the context of academic writing.

RESULT AND DISCUSSIONS

Writing Scientific Articles

Writing is the activity of giving birth to ideas and packaging these ideas into graphic symbols in the form of writing that others understand, Nurhadi (2019). From this explanation, it can be seen that the first activity that must be mastered by the writer is to generate ideas through the thinking process and then these ideas are assembled. After these ideas are assembled, they are poured into a cohesive form of writing. Therefore, students as agents of change must be able to express their ideas through writing.

Scientific articles are scientific reports with certain variations and adaptations published through a scientific journal or publication by paying attention to the structure and systematics of writing scientific articles, Wasmana (2018). The scientific article is a short version of a research report. The writing systematic consists of an introduction, method, findings or discussion, conclusions and recommendations, and a list of references.

In addition to the things mentioned above, scientific articles must also pay attention to scientific notation, linguistic rules following EBI, and writing references.

Scientific articles have several main components that must be well understood by students in writing and reading scientific articles. According to Sugiarti, et al (2015), the details of the main components of a scientific article are as follows:

1) **Title**: The title should reflect the essence of the research conducted concisely and clearly. A good title gives an idea of the topic, methods, and main findings of the article.

2) **Abstract**: An abstract is a summary of the entire article. It usually consists of one paragraph or a few short paragraphs that include the purpose of the study, research methods used, main findings, and conclusions. The abstract aims to give the reader a brief overview of what they can expect from the article.

3) **Introduction**: The introduction section explains the research background and theoretical context of the topic under study. Here, the authors explain why this topic is important to research, outline the gap in knowledge that their research aims to fill and formulate the research objectives or hypotheses.

4) **Methods**: The methods section describes in detail how the research was conducted. This includes a description of the research design, population or sample used, data collection techniques, instruments used, and data analysis procedures. The purpose of this section is to enable the reader to evaluate the validity and reliability of the research conducted.

5) **Results**: The results section contains the main findings of the study. It is usually presented in the form of text, tables, or figures. These results should be related to the research questions posed and should be presented objectively without excessive judgment or interpretation.

6) **Discussion**: The discussion section is an interpretation of the research results. The authors interpret and explain the meaning of their findings, relate them to the relevant literature, and consider the implications of their findings. The discussion also includes an explanation of the strengths and limitations of the study and suggestions for future research.

7) **Conclusion**: The conclusion section summarizes the main findings of the research and summarizes the practical or theoretical implications of the research. These

conclusions should relate directly to the objectives or hypotheses proposed in the introduction.

8) **Bibliography**: The bibliography or reference lists all the sources cited in the article. This allows the reader to find the sources the author used and verify the information presented.

These components form the basic structure of a scientific article that enables authors to convey their research clearly, logically, and scientifically. Students who understand each of these components can write strong, quality scientific articles and can read and evaluate scientific articles more effectively.

The Role of AI in Writing Scientific Articles

Efforts to help students be more productive and efficient in writing scientific articles require technological systems. The development of technology in general and artificial intelligence (AI) in particular has had an impact on every student.

Scientific writing. Scientific writing is a crucial skill for students and researchers to contribute to the development of knowledge and innovation in various fields. With the advancement of technology, especially artificial intelligence (AI), the paradigm of scientific writing is undergoing a significant revolution. Recent technological advancements in artificial intelligence (AI) have paved the way for the increased creation of completely new and innovative electronic writing tools. These writing support systems help during and after the writing process making it indispensable for many writers in general and students in particular who can get human-like sentence completion and text creation suggestions. Artificial intelligence comes as a system that helps students to write scientific articles. Artificial intelligence is a general term to describe automated devices that can carry out human intelligence processes such as learning, reasoning, and self-correction (Popenici and Kerr, 2017). One of the most important goals of AI is to design automated devices that can analyze the environment and perform human-like tasks. New writing apps have the potential to offer a flexible and time-saving addition to an integrated writing curriculum to provide AWE, AES, and AWCF features in one integrated app (Koltovskaia, 2020). While AI can help students with deciding on a title, finding ideas, assisting with discussion, and finding relevant references, students must develop paragraphs creatively because AI assistance is not the result of the article. This AI revolution not only affects the way we collect and analyze data but also the way we present and disseminate scientific findings. Here are some key aspects of this revolution:

a) Access to Information

Before the digital and AI era, access to scholarly literature was often limited by physical restrictions, such as the availability of books and journals in libraries. However, with the advancement of the internet and electronic databases, students can now easily access scholarly journals from around the world using online platforms. Artificial intelligence can also help in filtering relevant information and making it easier to find literature that matches the research topic.

b) Deeper Data Analysis

Artificial intelligence allows researchers to perform deeper analyses of the data collected. AI can be used to identify patterns that are invisible to traditional human analysis, provide new insights into relationships between variables, and support data-driven decision-making. This significantly improves our ability to extract deeper information from existing data.

c) Collaboration and Knowledge Sharing

With AI-powered online collaboration platforms and communication tools, students can collaborate with their peers around the world without having to meet in person. This allows for a faster exchange of ideas and thoughts and facilitates a more effective peer review and feedback process in scientific article writing.

d) Effective Presentation and Communication

Artificial intelligence also plays an important role in the presentation and communication of scientific findings. Tools such as automated data visualization, interactive graph generation, and automatic summary generation make it easier for researchers to present their research results clearly and understandably to a wider audience.

The artificial intelligence-driven revolution in scientific writing is not only changing the way we write and access information but also provides great potential to improve the quality and relevance of scientific research in the future. AI also facilitates the writing process itself. Through language generation algorithms, such as GPT (Generative Pre-trained Transformer), students can use AI to generate initial text based on the information and data entered. This makes it easier to outline the article and develop the main ideas.

Artificial intelligence (AI) has changed the way students and researchers go about the process of writing scientific articles in several significant ways:

Initial Draft

Students can use language models such as GPT to generate early drafts of their articles. By providing input in the form of main ideas, research results, or the outline structure of the article, the AI can generate relevant paragraphs or sections of text automatically. This helps in starting the writing process quickly and organizing ideas more systematically. Several AI platforms and technologies can help in the creation of initial drafts for different types of content, including scientific articles. Here are some of them:

a) **GPT-3 (Generative Pre-trained Transformer 3)**: Models like the one I use, GPT-3, can generate text based on the input given. It can be used to generate a paragraph or even a few initial paragraphs for a scientific article, based on given guidelines or questions.

b) **BERT (Bidirectional Encoder Representations from Transformers)**: BERT is an NLP (Natural Language Processing) model that can also be used to understand and generate text based on input. Although more commonly used for language understanding, this technology can be applied in generating initial content for scientific articles.

c) **Grammarly**: Grammarly is a tool that uses AI to help write and edit text. While it doesn't specifically generate initial drafts, it can assist in correcting grammar, spelling, and writing style, which is very useful in improving or refining an existing draft.

d) **ScribeAI**: This is a platform developed specifically to aid in the writing of scientific articles. ScribeAI uses AI to generate an initial draft based on the information or input provided by the user.

e) **Cortex**: Cortex is another AI tool that can be used to generate text and provide suggestions on how to structure or develop scientific articles based on existing content.

f) **Wordtune**: Wordtune is a tool that uses AI to provide suggestions and alternatives to words in the text being written. This can help in improving the clarity and quality of writing, including in creating early drafts of scientific articles.

g) **Summarization**: AI can be used to create summaries of long articles or texts. This helps readers to get an overview of the content without having to read the entire text.

Such summaries can also be used for abstracts of scientific articles that must be included in publications.

Correction of Language and Writing Style

AI is also used to assist in the correction of grammar, spelling, and writing style. Natural language processing (NLP) algorithms are used to evaluate and correct language errors in texts, such as grammatical errors or inconsistencies in the use of scientific terminology. In addition, AI can provide suggestions to improve the clarity and cohesion of the written text. The application of artificial intelligence in language correction and writing style helps improve the quality and clarity of scientific articles. Several AI platforms and tools can help in the correction of grammar and spelling in texts. Here are some of them:

a) **Grammarly**: Grammarly is one of the most popular grammar correction tools. It uses AI technology to identify and correct grammar mistakes, spelling, writing style, and proper use of words. Grammarly is available as a browser extension, desktop app, and mobile app.

b) **Microsoft Word (Grammarly Editor)**: Microsoft Word provides enhanced editor features with Grammarly integration, which can help correct grammar and spelling automatically while writing documents.

c) **ProWritingAid**: ProWritingAid is a comprehensive grammar correction tool that uses AI to evaluate and improve writing based on various aspects, including grammar, spelling, sentence structure, writing style, and proper use of words.

d) **Hemingway Editor**: Hemingway Editor not only helps in grammar and spelling corrections but also provides suggestions to make the text clearer and more effective. It focuses on long or complex sentences, as well as the overuse of words.

e) **Ginger**: Ginger is a grammar and spelling correction tool that uses AI to check and correct grammar, spelling, and writing style errors in text. Ginger is available as a browser extension, desktop app, and mobile app.

f) **WhiteSmoke**: WhiteSmoke is a grammar correction tool that uses AI technology to evaluate and correct grammar, spelling errors, as well as provide suggestions for better writing style.

g) **LanguageTool**: LanguageTool is a grammar correction tool that supports multiple languages and uses AI to detect and correct grammar, spelling, and sentence structure errors.

Data Integration and Visualization

AI also enables better integration between text and data. For example, using automated data analysis algorithms, researchers can automatically generate informative data visualizations, such as graphs or charts, that support the findings presented in the article. This helps in explaining the complexity of the data in a way that is clearer and easier for readers to understand. One of the main contributions of artificial intelligence in scientific writing is its ability to collect and analyze data. AI technology can identify trends, patterns, and relationships that may not be detected manually. For example, in meta-analysis research, AI can efficiently extract information from hundreds or even thousands of articles to support more in-depth research. Artificial intelligence (AI) has an important role to play in facilitating this process through the following techniques and applications:

1) Large Scale Data Analysis

Artificial intelligence enables in-depth analysis of huge volumes of data in a relatively short period. For example, in meta-analysis, where researchers have to integrate findings from multiple existing studies, AI can be used to collect, categorize, and evaluate data from hundreds or even thousands of scientific articles. This helps in finding common trends, differences, or patterns that may not be seen easily by human analysis.

2) Search for the Right Information

With intelligent search algorithms, AI can help students find relevant and accurate sources of information for their research. This includes identifying the latest scientific publications, accessing databases, and filtering relevant information according to the specific needs of the research topic.

3) Pattern and Relationship Recognition

AI is equipped with the ability to recognize complex patterns and relationships between different variables. This could mean identifying significant correlations between certain factors in a study or highlighting findings that don't match initial

expectations. By utilizing techniques such as machine learning, AI can learn from existing data to provide deeper insights.

4) Process Automation

The use of AI can also automate some aspects of data collection and analysis. Examples include processing raw data, grouping information based on certain criteria, and filtering results to find the most relevant ones. This not only increases efficiency but also reduces human errors that may occur during manual processes.

There are several AI platforms and tools that can help in automated data analysis for scientific article writing. Here are some of them:

a) **IBM Watson Studio**: Watson Studio provides tools for data analysis, predictive modeling, and integration with multiple data sources. It can assist in performing statistical analysis and data visualization to support research findings in scientific articles.

b) **Google Cloud AI Platform**: Google Cloud AI Platform provides tools for data analysis and machine learning that can be used to process and analyze big data in the context of scientific research.

c) **Microsoft Azure Machine Learning**: Azure Machine Learning is a platform that provides various tools for data analysis, machine learning, and predictive model development that can be applied in the context of scientific research.

d) **KNIME**: KNIME is a visual data analysis platform that can be used to integrate data from multiple sources, perform statistical analysis, and create visualizations useful for data interpretation in scientific articles.

e) **RapidMiner**: RapidMiner is a data analysis platform that provides tools for data processing, predictive analysis, and data visualization. It can help in managing and analyzing data in scientific research.

f) **Python (with pandas, NumPy, and sci-kit-learn)**: Python is a very popular programming language among researchers and data scientists. By using libraries such as pandas for data manipulation, NumPy for numerical computation, and sci-kit-learn for predictive analysis, Python can be used to perform in-depth data analysis in scientific article writing.

g) **Tableau**: Tableau is a powerful data visualization tool that can be used to create interactive visualizations of research data, which can be included in scientific articles to support findings.

The selection of tools depends on the type and scale of data used, as well as the analysis methods required for a particular scientific study. It is important to select tools that match the needs and technical competence of the author of the scientific article.

Format Consistency and Compliance Check

Scientific publications often have strict formatting guidelines. AI can help in ensuring consistency and adherence to the required format. AI can help in organizing and structuring the article according to the required chapters such as introduction, methods, results, and discussion. This helps in maintaining the cohesion and alignment of the article as a whole. In addition, AI can manage references and citations in the article, ensuring that all references are properly cited according to the desired writing style, such as APA, MLA, or Chicago. Several AI tools can assist in organizing and arranging content to fit the desired format and structure. Here are some examples:

a) **Outline AI**: Outline AI is a platform that uses artificial intelligence to assist in outlining scientific articles. It can help in organizing ideas, establishing key sections such as introduction, methods, results, and discussion, and ensuring the logical flow of the article.

b) **SciNote**: SciNote is a laboratory management tool that also provides features for planning, organizing, and writing scientific articles. It helps in managing research data and integrating it into a structured scientific article structure.

c) **Manuscripts**: Manuscripts is a scientific writing tool specifically designed to help researchers easily organize scientific articles. It provides templates and tools to organize and customize the structure of articles based on different writing style rules.

d) **Mendeley**: Mendeley, in addition to being a reference management tool, can also assist in organizing and structuring scientific articles by allowing users to organize and manage references, as well as integrate them into the text efficiently.

e) **Scrivener**: Scrivener is a writing tool that provides features for organizing and structuring long documents, including scientific articles. It allows writers to create sections, manage sub-sections, and navigate the structure of the article with ease.

f) **Google Docs (Smart Compose)**: While not an AI tool specifically for scientific articles, the Smart Compose feature in Google Docs can provide automatic suggestions for completing sentences and finalizing ideas based on the context of the text being written.

g) **EndNote and Zotero**: Although better known as reference management tools, EndNote and Zotero can also help in structuring and organizing the structure of scientific articles by making it easy to manage and integrate references into the text.

The selection of tools depends on the specific needs and preferences of the authors in organizing their scientific articles. The use of these AI tools can help improve the efficiency and quality of writing and ensure adherence to the structure and format expected in scientific publications.

Several AIs and tools can help in finding references for writing scientific articles. Here are some of them:

a) **Google Scholar**: Although not AI directly, Google Scholar is a very useful academic search engine for finding scholarly articles, papers, books, and technical reports from various disciplines. It allows researchers to find relevant references to support their scientific article writing.

b) **Semantic Scholar**: Semantic Scholar is an AI search engine specialized for scientific literature. It uses AI technology to provide article recommendations based on relevance to the specified research topic.

c) **Mendeley**: Mendeley is a reference management tool that also provides features for finding and saving scientific references. Users can use Mendeley to search for articles based on keywords, evaluate relevance, and save found references for use in writing scientific articles.

d) **Zotero**: Zotero is a reference management tool similar to Mendeley, which can help in finding and managing scholarly references from various sources. It provides features for searching, storing, and integrating references into research documents.

e) **Scopus**: Scopus is a scientific reference database that provides access to scientific journals, conferences, and other scientific literature. It also provides tools for analyzing literature, finding research trends, and compiling reference lists for scientific articles.

f) **IEEE Xplore**: IEEE Xplore is a resource for scientific literature in engineering and technology. It provides access to journals, conferences, standards, and technical reports that can be used to support the writing of scientific articles.

By using artificial intelligence in these ways, authors can improve the quality of their scientific articles by minimizing language errors, strengthening data validity, and ensuring conformity with scientific publication standards. In addition, the use of AI also improves writing efficiency by automating some of the administrative and technical aspects of the writing process, allowing authors to focus on the analytical and creative aspects of their research.

CONCLUSIONS

Based on the research discussion above, the role of artificial intelligence has opened new doors for students to write scientific articles more effectively and efficiently. This revolution not only changes the way students conduct research and present findings, but also requires them to continue to hone their critical skills in adopting this technology. Thus, artificial intelligence is not just a tool, but also a potential partner for students in achieving success in the world of scientific research and publication.

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