

**People's Democratic Republic of Algeria  
Ministry of Higher Education and Scientific Research  
University of Tlemcen**



**Faculty of Letters and Languages  
Department of English  
Section of English**

**The Impact of Artificial Intelligence on Academic  
Writing: Case of Tlemcen Science PhD Students**

Dissertation submitted to the Department of English as a partial fulfillment of the requirements for a Master's degree in Language Studies

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**2023 – 2024**

## Declaration of Originality

I, Mr. Omar Abdel Bassit Benlakhdar, declare that this submitted dissertation to the Department of English at Tlemcen University for the master's degree in language studies is a personal product of my research and effort. I confirm that it has not been submitted for any other degree or professional qualification.



Date: 10/06/2024

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*Signature*

## **Dedication**

I dedicate this work to my parents, my grandfather, my aunts, my brother, and my sister Nour El Houda for her constant encouragement and support as well as her help in my studies throughout these five years.

## **Acknowledgments**

I would like to express my gratitude to Prof. Zakia Djebbari for accepting to supervise my study and for her seriousness throughout my research. Her help was without a doubt very contributive.

A thank you to both Dr. Khedidja Hammoudi and Dr. Zekri Wafa for taking the time and consideration to go through my work and examine it.

I would also love to express my gratitude to all who agreed to diffuse my questionnaire to as many participants as possible. Dr. Nour El Houda Benlakhdar, Dr. Fatima Louati, Mr. Mouadh Zetili, Dr. Faiza Haddam, Prof. Chaâbane, and Ms. Aaicha Hamzaoui.

A special thanks to Dr. Fatima Louati for contacting teachers whom I could interview. Their insights were definitely a contribution to my advancement in my research work.

A thank you to the PhD students who took the time and put the effort into providing useful insights in my questionnaire.

At last, I would like to thank my friends who have always been there for me to help me ease my mind and push me.

## **Abstract**

Academic writing is a crucial part of any academic's career. It allows them to express their ideas, thoughts, and arguments in a clear and concise manner. Academic writing has stringent rules that one must adhere to. The study at hand has described how the incorporation of Artificial Intelligence within academic writing can affect it. To achieve this, a descriptive case study that has included 34 Tlemcen science PhD students in addition to four teachers has been conducted. A mixed-method approach has been used. It has included a questionnaire handed to students and an interview conducted with teachers. The analysis of the results provided by the research instruments has led to the conclusion that Tlemcen science PhD students have used Artificial Intelligence to improve their writing in terms of grammar, spelling, accuracy, and methodology. The results have also shown that the ethical issues that these students have encountered are unintentional plagiarism, unreliable data, inexistent resources, and lack of validity. Ultimately, this research work has provided a description of the ways in which Artificial Intelligence can be helpful in the students' academic writing as well as the risks that arise with its use.

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## List of Acronyms

**AI:** Artificial Intelligence

**PhD:** Doctor of Philosophy

**NLP:** Natural Language Processing

**LLM:** Large Language Model

**ChatGPT:** Chat Generative Pre-trained Transformer

# **General Introduction**

Throughout history, technology has always had an impact on the way humans live. This is noticed nowadays with the rapid growth of Artificial Intelligence (AI) which influences every aspect of one's life ranging from the way one researches, thinks, and works. A notable area experiencing the influence of AI is academic writing. The latter is known for its difficulties among the Algerian scientific community, particularly among doctoral science students. Therefore, AI is taken advantage of in order to facilitate the task of writing academically. Because of the momentum it is gaining in the academic context, it is important to study how AI is used by doctoral science students in their academic writing.

Regarding AI and academic writing, there is still a lack of clarity concerning the delineation between acceptable and unacceptable practices. This is engendered by the complex nature of academic writing and its demand for scientific accuracy which can be subjected to deficiencies caused by Artificial Intelligence. Often, students overlook the key features of academic writing, mistakenly assuming that AI tools can complete their writing effortlessly, and even perfectly for some. The essence of this is that it is crucial to both recognize the limitations of AI in academic writing, especially concerning ethical issues, and to recognize the ways AI tools can be helpful in this task.

The motivation for undertaking this study originates from the dependency of doctoral science students on Artificial Intelligence in their academic writing. Thus, this research may assist both reviewers and doctoral students to understand how AI tools can be appropriately used in academic writing as well as the boundaries of its utilization. The present study aims to explain how Artificial Intelligence tools can be used by doctoral students enrolled in scientific streams to enhance their academic writing in terms of form. Moreover, it seeks to highlight the ethical considerations which may arise as AI tools are unable to be critical and creative like human beings.

The researcher attempts to answer the following research questions:

1. How may AI help students in their academic writing?
2. What ethical issues may arise in the use of AI in academic writing?

In order to answer these questions, the following hypotheses have been formulated:

1. AI may be used to enhance writing in terms of grammar, spelling, accuracy, and methodology.
2. Ethical issues that may arise when using AI in academic writing are unintentional plagiarism, unreliable data, inexistent resources, and lack of validity.

The investigation is conducted using a descriptive case study method that focuses on Tlemcen science PhD students who use AI for their academic writing. With the aim of collecting a solid amount of data, the researcher uses a mixed-method approach. For quantitative data, questionnaires asking Tlemcen doctoral science students about their use of AI in academic writing will be delivered. To ensure the validity and reliability of data, interviews are held with teachers as a qualitative instrument of research.

The dissertation at hand is divided into two chapters. The investigation of the impact of Artificial Intelligence on academic writing requires meticulous reading of the literature. Therefore, the first chapter is dedicated to the review of the literature concerning this topic. It builds the foundation of the study as it introduces the terms, themes, and shows the gaps in the field.

The second chapter moves beyond the theoretical framework. The essence of this is that the researcher moves towards the practical side of his study. Thus, the second chapter deals with the research objectives, research methodology, data analysis, and interpretation of the results.

# Chapter One

## The Review of the Literature

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## **Chapter One: The Review of the Literature**

### **1.1 Introduction**

Within the realm of academia, writing is considered as one of its most prominent aspects. Academics constantly work on the crafting of clarifications which explain how academic writing is best presented. Such a crucial task is done throughout the provision of definitions, techniques, and the establishment of clear ethical standards. In the present day, researchers are shifting their attention toward the use of Artificial Intelligence (AI) within academic writing because of the prominence it gained through decades. While some investigators foresee a positive future for the use of AI, other researchers think that it poses ethical challenges which may be menacing to academic honesty. As sensitive as it is, AI's integration into academic writing should be handled with caution to maximize its positive sides and vice versa. Hence, this chapter aims at exploring the related works about this topic to understand it.

### **1.2 Academic Writing**

One of the most prominent skills that a researcher must possess is academic writing. The reason behind this lies in the ways it allows investigators from various disciplines and fields to convey their ideas in a clear, direct, and creative manner. Like any skill, the mastery of academic writing can be challenging due to its restrictions and rules. Overcoming the obstacles related to it (like ethics, language proficiency, and critical thinking) requires a significant amount of time and effort. Nevertheless, having a good command of academic writing permits researchers to actively contribute in their fields.

#### **1.2.1. Academic Writing: Defined**

Daminova et al. (2017) perceive academic writing as one's capacity to suggest hypotheses, gain conclusions, sort, and arrange the text. In a similar, but with greater depth, Hyland (2012) asserts that academic writing revolves around the ability to diffuse useful information and arguments. He further explains that such skills are acquired by authors through constant participation with their scientific communities. In simpler terms, Oshima and Hogue (2007) define academic writing as a formal piece of writing

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that is empty of slang and contractions and one that differs from other types of writing such as creative writing.

Overall, a summary of the definition of academic writing is explained by Fang (2021) who thinks that it is “the writing done for academic purposes” (para.1). Moreover, he says that it should be a portrayal of a researcher’s ideas which arise as a reaction to another party’s ideas. In the same work, Fang states that the author’s ideas are to be “carefully elaborated, well supported, logically sequenced, rigorously reasoned, and tightly stitched together.” (para.1). In this sense, academic writing is an efficient tool that is used by professionals from diverse disciplines to deliver their thoughts with great accuracy.

### **1.2.2. Technical Academic Writing**

Academic writing has led professionals of different fields to the publication of many scholarly works. Despite the differences between disciplines, academic writing represents a skill that gives a standardized set of guidelines which are to be followed for attaining professional success. In this regard, Axtell et al. (2008) explain that “Successful writing for publication requires prospective authors to be experts in their content areas and to be familiar with the unique requirements of different journals” (p.95). In other terms, holding knowledge about a given domain is insufficient for professionals to successfully produce an academic work. Therefore, one cannot explicate concepts or ideas without taking into consideration the various characteristics, aspects, and techniques of academic writing.

An important aspect which professionals should consider when writing academically is clarity. The latter is arguably the most prominent overlap between professional and academic writing. In this sense, Cleveland State University (n.d) emphasizes on the idea that in academic writing, professionals must be “compassionate towards professional readers”. They explained that any idea or concept should be conveyed in a rapid and clear manner which means that the writer has to meticulously think about how to simplify their thoughts so one can understand them easily.

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Moreover, it is argued that professional academic writing serves as “a key ‘property’ determining the conditions and criteria of legitimate membership for academics in the ‘field’ of higher education” (French, 2019, p.1). The crux of this is that such type of writing cannot be performed by anyone. Instead, it requires a specific set of skills and criteria in order to effectively produce an academic piece of writing. In this respect, French explains that academics utilize academic writing as a means of building their professional profiles. However, Bourdieu (1984, as cited in French, 2019) believes that professional identity for academics is a:

struggle to determine the conditions and the criteria of legitimate membership and legitimate hierarchy, that is, to determine which properties are pertinent, effective, and liable to function as capital so as to generate the specific profits guaranteed by the field (p.1).

Thus, one may think that academic writing has stringent guidelines and criteria for its efficiency.

### **1.2.3. Techniques of Academic Writing**

Various disciplines may differ in their characteristics in reference to terminology, writing style, methodology, or theories. Nevertheless, the academic writing of these disciplines presents itself as a set of more or less rigid set of criteria which are to be followed to enable one to produce a good academic product. Because of its demanding nature, researchers in the field of academic writing work on finding techniques which facilitate its task. Academically speaking, one may successfully write an academic text if he applies the following techniques:

- **Formality**

As explained by Oshima and Hogue (2007), academic writing is dissimilar to other types of writing like creative writing (where informality is allowed). According to Ellis (n.d.), academic writing “is very explicit and provides the reader with all the information they need to understand your meaning.” On this basis, they further explain that informal expressions like contractions or colloquial language should not be used to reach explicitness; and thus, formality.

- **Objectivity**

An important aspect of scientific research is objectivity which allows the researcher to be neutral and faithful. Because scientific research is tightly linked to academic writing, investigators are to exhibit objectivity in their writing. In this context, Ellis (n.d.) states that “Academic writing presents and evaluates issues and arrives at an objective position.” Any sort of subjectivity is, therefore, not accepted in academic writing.

Additionally, personal pronouns “especially ‘I’, ‘you’ and ‘we’ are usually avoided, as these are often associated with subjective views that are influenced by personal preferences or biases” (Ellis, n.d.). Although the use of personal pronouns is discouraged, some scholars believe that there are some instances where they can be useful. Hyland (2002, as cited in Macintyre, 2017) claims that “self-mention plays a crucial role in mediating the relationship between writers’ arguments and the expectations of their readers.” Hence, the use of personal pronouns can be allowed in cases where the researcher wants to engage with his readers and convey his ideas more clearly.

- **Hedging**

In the context of academic writing, hedging is a term that refers to the researcher’s prudence in his diction (Ellis, n.d.). The main idea of hedging is for writers to avoid absoluteness and to “soften their statements to avoid criticism for being radical or overconfident”(The Writing Center, 2020). For example, the expression “Students of English use Artificial Intelligence to complete their essay assignments” is a case where hedging is not used because not all students use Artificial Intelligence for writing their essays. To avoid such an issue, academic writers use quantifiers, adverbs, and modal verbs (Ellis, n.d.).

Hedging also implies that academic writers have to explicitly acknowledge that their writing contains limitations. The aim behind this is to clarify that they cannot fully explore the discussed topic as well as showing that they are conscious of the limitations (Bartram, 2023).

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- **Accuracy**

One of the main goals of academic writers is to be as clear and simple as possible. Thus, accuracy is a paramount aspect of academic writing. In fact, researchers should use the appropriate terminology as well as avoid the use of terms they do not fully comprehend. In this regard, Carini (2002) believes that using a simple language is preferable to avoid a radical change in the meaning and/or flow of ideas. Considering accuracy gives one's piece of writing an academic print due to the clarity it displays.

- **Statement of Evidence**

A paramount aspect of academic writing is the display of evidence which supports one's points. The essential point of this is that academic writers have the right to express their own thoughts. However, they should be strengthened based upon credible sources like articles and books (Bartram, 2023). According to Oxbridge Editing (2019), Writers need to collect "clear sources, quotations, and passages that appropriately back-up their claims" (para.22). Furthermore, academic writing demands that the researchers state their position concerning the ideas that they read (whether they are for, against, or neutral) (University of Technology Sydney, 2021).

- **Referencing System**

With every quote, paraphrase, or summary of a source in an academic product, one must mention their references in the reference list (University of Arizona, n.d.). It is crucial that writers use the appropriate style of referencing (APA, MLA, Harvard etc.) (Oxbridge Editing, 2019). Every system has specific characteristics and ways of referencing. In scientific disciplines, the American Psychological Association referencing style is used (Theodorou, 2022). Therefore, scientific academic writers are to use APA.

An important aspect mentioned by Oxbridge Editing is that one's academic writing must have a homogenous referencing. For example, if a writer starts using APA style, his whole referencing should be in APA. Oxbridge Editing emphasizes that such consistency displays the writer's academic proficiency and dismisses any suspicion of plagiarism.

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- **Proofreading**

According to Theodorou (2022), proofreading is among the most crucial techniques that one should focus on. She explains that the core of this is that proofreading leads to error spotting concerning sentence structure, spelling, inconsistencies ... Theodorou also states that one can use online tools like Grammarly to correct some mistakes which go unnoticed by the writer. Henke (2012) mentions other factors not to include in academic writing like metacommunicative statements, plagiarism, haphazard quotations, and irrelevant information.

In summary, while different fields require specific characteristics in terms of terminology, writing style, methodology, or theories, the core of academic writing abides by a set of rigid criteria. The latter act as an insurance for the production of decent academic work. It is, therefore, important that researchers focus on honing their academic writing techniques.

### **1.2.4. Ethical Issues in Academic Writing**

The success of academic written works is a product of strict guidelines that writers should go by. These guidelines are subsumed within a variety of ethical issues that ensure academic integrity; and thus, ensure the production of a faithful scholarly work. Among these ethical issues, authors must pay attention to aspects such as honesty, transparency, attribution etc. It is imperative that academic writers adhere to the various ethical principles to achieve honest and efficient academic work.

#### **1.2.4.1. Ethical Issues**

A crucial aspect of academic writing is understanding the distinct ethical considerations related to it and the possible discrepancies that arise. To comprehend the term ethical considerations in the context of research, Bhandari (2021) explains that they refer to a sum of fundamentals which guide one's research. She further states that academics are bound to these fundamentals when gathering data from a given sample.

While some researchers take them for granted, respecting ethics is important for one's research. Bhandari (2021) believes that disregarding their cruciality leads to a

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violation of academic integrity. This, in turn, lowers an author's credibility as it becomes difficult for their audience to trust them. Moreover, an article published on Enago.com (2023) shows many researchers provide falsified data and cause serious repercussions like a decrease in the number of publications and a loss of budget. In this context, an article published on Zandy.io (2023) states that a researcher who respects ethics is more credible; and thus, would attract more funding for their research.

**1.2.4.1.1. Plagiarism**

When it comes to the ethical issues related to academic writing, plagiarism is considered as one of the most common breaches of academic integrity. Plagiarism is an aspect which weakens and discredits any academic piece of writing. The definition of this aspect is more or less agreed on. According to the University of Oxford (n.d), plagiarism is when one submits information and claims that it belongs to him while it is not the case. The essence of this is that it occurs when a view is stated without giving credit to its original owner. On the other hand, the University of Luxembourg (2023) mentions that plagiarism is when “you reproduce, use or present an idea, line of reasoning, insight, data or else of which you are not the author or that has been presented by somebody else before you, without properly acknowledging the source” (p.4). In brief, plagiarism is a common ethical issue which arises when one appropriates an idea as his own. Such practice causes a work to be less credible and may also diminish the efforts made by the original author of the plagiarized idea.

It is crucial that plagiarism, being a breach of academic integrity, is avoided regardless of which field the researcher is working on. Accordingly, the University of Luxembourg (2023) states that to achieve such a goal, it is paramount that one makes extensive readings of the literature that is related to the studied topic. This way, academic writers can identify whether their ideas are authentic; and thus, avoid plagiarism. In conclusion, a researcher who delves into learning about the subtleties of plagiarism will have the capacity of producing an academic text that does not breach academic integrity to a given extent.

### **1.3. Artificial Intelligence**

Artificial Intelligence is a rapidly growing technology. This technology is known for its completion of assignments that require human intelligence. In the recent years, AI has been gaining mass popularity. The reason for this is due to its quick completion of tasks, that demand humans a long time, within seconds. Because of how useful it is, Artificial Intelligence is nowadays a hot topic of discussion in different contexts.

#### **1.3.1. Artificial Intelligence: Defined**

Artificial intelligence (AI) as a prevalent field in various domains demands researchers to give a clear and simple definition of it. Such a definition would allow humans to properly understand the use of AI and avoid any ethical infringements. Boddington (2023) believes that the term AI could be viewed as a technology as well as a scientific discipline. He goes further and explicates that AI uses computer technology to replicate human intelligence when it concerns the accomplishment of tasks which require it ranging from human behavior to problem-solving. In simpler terms, Boddington attempts to explain that AI is a computer system that imitates human intelligence to accomplish specific tasks.

A seemingly different view of AI was given by the European Commission's Communication on AI (2018) where it is stated that Artificial Intelligence refers to “systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals” (p.1). From this perspective, the High-Level Expert Group on Artificial Intelligence (2018) explains that researchers in this field find that the concept of intelligence is broad in the sense that it can be perceived differently when speaking about human intelligence or machine intelligence. Thus, they prefer to focus on rationality regarding the studies in AI.

#### **1.3.2. History of Artificial Intelligence**

The roots of Artificial Intelligence go back to 1950 when Alan Turing proposed the question “Can machines think?” in his work “Computing Machinery and Intelligence”. In the same work, Turing designed a test which became known as “The

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Turing Test”. It is, however, elaborated that such a process was so intricate for Turing that it seems improbable.

The coining of the term “Artificial Intelligence” was only five years after Turing’s work. In 1955, four scientists mentioned this term within a document named “A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence”. McCarthy et al. (1955), explain that their study will be an attempt “to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves” (p.2). It is crucial to note, however, that this is merely a mention of a new term and not the establishment of a new field. The actual formation of a new field was only one year later during the “Dartmouth Summer Research Project on Artificial Intelligence” (Dartmouth, n.d.).

According to Anyoha (2017), AI witnessed a significant growth allowing computers to store more data, become faster, solve problems, and interpret languages from 1957 to 1974. He also states that in the 1980s experts in the field discovered a way to train AI on various subjects. In this vein, Anyoha says that “the program would ask an expert in a field how to respond in a given situation, and once this was learned for virtually every situation, non-experts could receive advice from that program.” This achievement reflects the capacity of AI programs to imitate humans in the completion of tasks that are normally done by them. Nonetheless, Mainzer (2020) argues that “in contrast to the human expert, the knowledge of an expert system is limited. It has no general background knowledge, no memories, no feelings and no motivations ...” (p.12). The peak of AI development in the 20<sup>th</sup> century was in 1997 when IBM’s Deep Blue chess robot beat the then-world champion, Gary Kasparov (History.com Editors, 2021). This performance reflects the possibility that AI programs may excel to an extent where they surpass human intelligence.

The precedent accomplishments in the field of Artificial Intelligence led to what humanity is currently witnessing. Today, generative AI is prevalent in this field. Gold (2023) claims that generative AI is “a subfield of Artificial Intelligence (AI) that involves creating AI systems capable of generating new data or content that is similar to data it was trained on. This can include generating images, text, music, and even

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videos.” Moreover, he believes that it is this subfield which resulted in the development of large language model tools like ChatGPT which can “generate human-like text on a wide range of topics”.

### **1.3.3. Artificial Intelligence Revolution in Academia**

The growing field of AI is leaving its prints in every existing domain ranging from technology to academic research. Similar to previous technologies, like the printing press, Artificial Intelligence is considered as a major shift in academia. The reason for this is due to the ability of AI to learn a large amount of data within a short period. In this line of thought, Shoja et al. (2023) state that AI can “tackle complex factual queries and perform a range of tasks such as writing essays, composing poems, performing literature reviews, and translating, summarizing, paraphrasing, or expanding and adapting texts to different contexts or perspectives” (p.1)

Because of its development, Artificial Intelligence is being incorporated in various higher educational institutions. In fact, Arizona State University (ASU) is in a collaboration with OpenAI, the company that developed ChatGPT (Salcido, 2024). Salcido states that one of ASU’s main focal points is to take advantage of AI for the improvement of research. ASU President Crow, personal communication, as cited in Salcido (2024), claims that “Our collaboration with OpenAI reflects our philosophy and our commitment to participate directly in the responsible evolution of AI learning technologies” (para.2). In addition, Guo (2024) mentions that AI is seriously taken into consideration as a relevant module in Hong Kong University of Science and Technology as students are learning about AI in-depth.

The quick advancement of AI allows one to understand intricate concepts through simple explanations. Watson assistant, for example, is an AI tool that supports researchers by explaining various ideas and answering their questions as well as suggesting helpful resources (Young, 2023). A noteworthy idea is that AI tools can enhance one’s performance due to their analytical capacities. Abgaryan et al. (2023) state that AI tools can “analyse and categorise large volumes of educational content, such as textbooks, research papers” (p.7).

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Artificial Intelligence is continuously establishing itself in academic contexts. It is believed that AI's inclusion into academia is an inevitable advancement which leads to the growth of higher education (Young, 2023). It is, therefore, of utmost importance that academics react and decide on what to do. In this regard, Clief (2024) states, "As we stand on the cusp of an AI revolution in academia, we have a choice. We can cling to tradition for tradition's sake, or we can embrace the possibilities of a new era" (para.22).

### **1.4. Artificial Intelligence in Academic Writing**

Since the advent of Artificial Intelligence, it was integrated within several areas. Among them is academic writing. Artificial Intelligence proved its efficiency in the academic community as it was widely incorporated by academic writers in their works. One could notice its utility in various tasks such as paraphrasing, translating one's thoughts into clear language, structuring etc. In spite of the various advantages AI proposes, other academics are reluctant about using it in their works because of the ethical questions that it raises.

#### **1.4.1. Previous Research of Artificial Intelligence and Academic Writing**

Malik et al., (2023) believe that during the past recent years, interest in the study of the possibility to include AI within academic writing has risen. The literature of their work shows that the use of AI writing tools in academic writing is gaining momentum as they have a probable significance on "student writing skills, productivity, and academic performance" (p.3). Moreover, it is mentioned that various challenges face AI in the context of academic writing especially when it comes to critical thinking.

Furthermore, Narayanaswamy (2023) states the idea that despite their capacities, AI tools are mere machines which might be incapable of comprehending the various subtleties and intricacies of a given field of study. He further explains that critical thinking is one the main concerns in the use of AI-powered tools as they cannot fulfill an analysis which requires adequate reasoning for a research. In this regard, Dergaa et al. (2023) believe that teachers have to reshape their teaching techniques by engaging

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with their students with activities that require critical thinking and other tasks. The aim of this is to encourage students to depend on themselves instead of AI machines.

Extensive research in the field of AI and academic writing led Golan et al. (2023) to divide the use of AI in academic writing to “two broad categories: those that assist authors in the writing process; and those that are used to evaluate and assess the quality and validity of written work” (para.1). The researchers go on to explain that tools like natural language processing (NLP) have the ability to aid authors in their writing tasks. On the other hand, they also claim that reviewers and editors can utilize AI tools for different purposes such as plagiarism detection and quality assessment.

As AI continues to improve, reviewers will need to be more vigilant. In 2013, John Bohannon submitted a fake scientific paper to various open access journals like Elsevier and Sage and was accepted and published (Shaw, 2013). In today’s context, NLP technology presents itself with a high level of academic writing skills which can evade reviewers who are less competent; and thus, augment the menace of invalid science (Dergaa et al., 2023). Based on this interpretation, Dergaa et al. concluded that NLP is not to be perceived as a menace, but as a medium of improving science, academic organizations should “impose higher standards for academic writing, such as double author identification verification” (p.6), a module that concerns “NLP technologies, ethics, and the best way to use them” (p.6) should be incorporated for medical students, master’s and PhD students.

### **1.4.2. Impact of Artificial Intelligence on Academic Writing**

The prominence of AI-powered tools in the field of academia leads to an inevitable impact on academic writing. Artificial intelligence tools are perceived as robust due to their capacities. Despite their proficiency, one should have the expertise to efficiently manipulate these tools (Birhane et al., 2023, as cited in Lin, in press). This statement implies that AI tools can be positively taken advantage of as they can be used in ways which lead to negative consequences that infringe ethics.

**1.4.2.1. Positive Impact of Artificial Intelligence on Academic Writing**

Clief (2024) states that the best AI-assisted academic writings are the result of a cautious choice of different prompts and not the result of random inputs. In his work, Lin presents the idea that a writer may interact with a large language model (LLM) for structural purposes such as brainstorming, outlining, and feedback. In addition, LLMs can be used for “low-level compositional tasks (such as language polishing and line editing)” (p.2). In order to brainstorm using AI, one may attempt to enter keywords related to the subject matter (The Writing Center, 2023). In terms of editing, The Writing Center notes that LLMs have the ability to help writers to correct spelling or grammatical mistakes, but one should be careful about the changes that were made to accurately convey intended the idea. On this basis, one can think that AI allows authors to “focus on the content of their writing rather than on mechanics” (Golan et al., 2023, para.2).

In addition, Golan et al. explain that academics can use Artificial Intelligence for the sake of finding relevant works related to the studied subject and perform a literature review as well as finding a suitable sampling. In a study done by Khalifa and Albadawy (2024), they summarized the ways in which AI can enhance academic writing under six core domains which are “Idea Development and Research Design, Content Development and Structuring, Literature Review and Synthesis, Data Management and Analysis, Editing, Review, and Publishing Support, and Communication, Outreach, and Ethical Compliance” (p.10).

A seemingly controversial idea is stated by Clief (2024) where he says that the AI models he utilized in his works do not merely make a logical connection of sentences. Instead he believes that “they offer genuine insights, make compelling arguments, and even venture into the realm of original thought” (para.3). He goes on to prove his statement by claiming that AI aided him in writing a paper and publishing it in the Saints Academic Review. The latter’s peer-review team was even impressed by his work. One may state that his statement is highly debatable because it implies that Artificial Intelligence tools have the capacity of thinking. Such a complex process is known to be performed by human beings. The author, somehow, presents the idea that

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AI machines can interpret and think critically. Nevertheless, Clief advances the thought that such achievement is not an invitation to dismiss nor neglect human intelligence.

### **1.4.2.2. Ethical Issues of Artificial Intelligence in Academic Writing**

The use of AI-powered tools raises ethical concerns, which is considered as the negative impact of these tools, within the academic sphere ranging from AI hallucination to information privacy. This is mainly because these tools are mere machines which cannot replace the intelligence of a human, which allows him to make objective analyses and interpretations (Livberber & Ayvaz, 2023). Thus, the main ethical issues to consider when pertaining to this issue are the following:

- **AI Hallucination**

AI hallucination is considered as a major infringement in academic writing. As explicated by Hwang et al. (2023), AI hallucination refers to the output that is produced by an AI tool, especially LLMs, which contains a set of false information without it “knowing”. Another supporting statement is given by Currie (2023) where it is stated that ChatGPT (an LLM) can be taken advantage of to create false data or fabricated study results. In this instance, the major concern is when the LLMs “sound as confident as when they are giving correct information” (p.953). Hwang et al. give three reasons for this occurrence: “1) limitations in the training data, 2) transformer architecture, and 3) reinforced learning from human feedback (RLHF)” (p.953).

- **Plagiarism**

With the potential risk of AI causing plagiarism in an academic text, the term “AIgiarism” was coined to refer to plagiarizing using AI (Khalaf, 2024). Hwang et al. (2023) claim that the use of LLMs such as ChatGPT might lead to plagiarism as they are programmed to copy the words as they are found in a published work without giving a proper citation. A study conducted in 2023 showed how students’ easy access to AI tools is encouraging students to contribute in plagiarism (Mohammadkarimi, p.106). Hwang et al. and Mohammadkarimi believe that it is mandatory to counter such academic dishonesty. In order to achieve this, it is suggested that AI can be referenced to avoid plagiarism. However, referencing AI means that it possesses information. This,

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in turn, necessitates the application of strict guidelines which highlight the function of AI in scientific works (Livberber & Ayvaz, 2023). Additionally, Hwang et al. state that one may detect Aigiarism through AI tools detectors such as Turnitin or iThenticate.

- **AI Detectors**

The rapid growth of LLMs is constantly making pressure on AI companies to develop tools which can detect AI-generated texts. The most popular tools for such detection are Turnitin and iThenticate. In a study conducted by Khalil and Er (2023), it is found that AI detectors identified 40 out of 50 generated texts by ChatGPT from various domains as being authentic. In conclusion, Khalil and Er claim that ChatGPT's users might not get caught by AI detectors.

In fact, Edwards (2023) states that a text which does not cause perplexity will be flagged as AI-generated. He adds that the US Constitution was categorized as AI-generated due to the limited perplexity it caused.. A similar study suggested that AI detectors might sanction non-native speakers of English because of their constrained vocabulary (Liang et al., 2023). In this regard, Sadasivan et al. (2024) state that:

Our results highlight the sensitivities of a wide range of detectors to both evasion and spoofing attacks and indicate the difficulty of developing reliable detectors in practical scenarios — to maintain reliable detection performance, LLMs would have to trade off their performance. (p.4).

On the flip coin, Gao et al. (2022) claim that humans and AI detectors have the capacity of recognizing texts generated by ChatGPT in most instances. Desaire et al. (2023) displayed an effective method to identify AI-generated texts from human written texts. They summarize their method under four distinguishable segments including “(1) paragraph length, (2) diversity in sentence length, (3) punctuation differences, and (4) popular words among a given group” (p.7).

- **Data Privacy**

A major concern for individuals who use Artificial Intelligence technologies is the security of their information. It is crucial to note that AI tools represent a threat to

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their users' confidentiality. In fact, worldwide users complained that ChatGPT leaked their private data (Mudaliar, 2024).

In the academic sphere, it is mentioned that ChatGPT gains access to private data which is used for its own training without having the authors' consent (Guleria et al., 2023). In this context, Cohan (2023) mentions that companies like Meta and Bloomberg used 191,000 e-books to train their AI programs without the publishers' nor his consent. This poses a challenge for academic researchers to ensure the protection of their intellectual property.

The sensitivity of data forces one to think of protective strategies. A useful suggestion made by Hwang et al. (2023) was to include a feature that allows users to deactivate chat history and training option from LLMs like ChatGPT. Besides, Codecademy Team (n.d.) recommends LLM developers to minimize their data collection. The crux of this is that LLMs should only collect the right amount of information about their users which allows them to safely use their systems.

- **Bias**

Various researches proved that the use of AI systems can cause bias. Dergaa et al. (2023) mention that the use of ChatGPT in academic research may lead to the incorporation of fake or one-sided details. ChatGPT, as cited in Livberber and Ayvaz (2023), states that "While we have safeguards in place, the system may occasionally generate incorrect or misleading information and produce offensive or biased content" (p.7). On this basis, they conclude that the false information that is presented by ChatGPT raises ethical concerns.

Livberber and Ayvaz add that such bias is caused by the LLM's developers who are not cautious with their training data. Another study states that "AI systems are only as good as the data they are trained on" (Abgaryan, 2023, p.83). Supporting this notion, The Writing Center (2023) claim that AI technologies are extracting information from a large database, but they solely stick to what is mentioned on it. Ergo, one may consider these technologies as limited tools which lack human creativity and critical thinking. Guleria et al. (2023) believe that responsible corporations of ethics must impose

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stringent guidelines concerning the use of AI with the aim of ensuring that biased AI-generated information does not get published; and thus, ensure academic honesty.

- **Authorship**

The integration of AI within academic writing raises questions about whether or not an AI should be co-authored. Lee et al. (2022) states that “As authors, we can all resonate with how difficult it is to assess how a co-author has helped us with writing a paper” (p.3). They add that such assessment demands an examination on the basis on multiple definitions of effective cooperation.

Khalifa and Albadawy (2024) state that Elsevier’s Authorship Policy accentuates that authors must ensure that no AI-driven technology has been granted authorship of any article. Elsevier’s policy pertaining to the use of AI is summarized by Cooperman and Brandão (2024, p.2) under the following main points:

- Authors may use these technologies to improve readability and language, but with human oversight and control.
- Authors are responsible for carefully reviewing and editing the output to avoid incorrect, incomplete, or biased content.
- Authors must disclose the use of AI and AI-assisted technologies and a statement will appear in the published work.
- AI and AI-assisted technologies should not be listed as authors or co-authors.

Strict policies like this will lead to a responsible use of AI tools and result in a productive set of scientific publications.

In connection with authorship, Lee (2023) poses a question concerning the copyright perspective and asks “can the authorship of AI be acknowledged from the perspective of current copyright law?” (p.2). He answers his question by stating that some courts like the US courts reject all works produced by non-humans. Furthermore, he claims that AI is “denied a legal personality and cannot be a copyright holder serves as a strong argument that AI cannot be an author. Another argument is that AI cannot exercise rights by itself, even if certain rights are granted to AI” (p.3).

**1.5 Conclusion**

As a conclusion, the progress of AI is continuously growing in academic writing. Artificial intelligence exhibits various advantages in writing tasks such as summarizing, structuring, and outlining. However, it also raises ethical questions concerning AI hallucination, plagiarism, authorship, bias, data privacy, and the reliability of AI detectors. Additionally, AI is both exerting pressure and presenting challenges on higher educational institutions and journal article publishers as they urgently need to establish strict policies regarding its use in academic writing and create reliable AI detection tools. Crucially, academics should be on a constant lookout for AI's advantages in their writing tasks, but also be cautious of the disadvantages that can lead to.

# Chapter Two: **Research Design, Data Analysis, and Results**

- 2.1. Introduction
- 2.2. Research Objectives
- 2.3. Research Methodology
- 2.4. Sample Population
  - 2.4.1 Students' Profile
  - 2.4.2 Teachers' Profile
- 2.5. Research Instruments
  - 2.5.1. Students' Questionnaire
  - 2.5.2. Teachers' Interviews
- 2.6. Data Analysis
  - 2.6.1. Students' Questionnaire Analysis
    - 2.6.1.1. Results
  - 2.6.2. Teachers' Insights Analysis
- 2.7. Results' Interpretation
- 2.8. Conclusion

## **2.1. Introduction**

This chapter is dedicated to the analysis and interpretation of the collected data from both Tlemcen science PhD students and teachers. A mixed-method approach was used to achieve this aim. In this approach, a questionnaire is handed to students to collect quantitative data and an interview is conducted with teachers to collect qualitative data. The aim behind collecting these data is to interpret them and compare their outcomes to the advanced research hypotheses.

## **2.2. Research Objectives**

To produce a contributive research work, investigators have to set clear research objectives. Such objectives allow the researchers to have a clear vision of their work; and thus, to conduct it appropriately. In this context, the research at hand strives to look into the implications which arise from the use of Artificial Intelligence (AI) technologies by Tlemcen scientific PhD students when writing academically. More specifically, it aims at achieving a number of objectives.

First, the researcher attempts to describe how Tlemcen PhD science students may improve their academic writing skills. In addition, one aims at identifying the various ethical issues which arise from the use of AI in academic writing. Thus, the overall aim behind these research objectives is to give a description of the various instances in which Artificial Intelligence is used in academic writing.

## **2.3. Research Methodology**

A paramount aspect of research is methodology. Its accuracy leads the investigator to produce practical research work. Because this research is subsumed within the social sciences, one can use the case study method to conduct it. The gist of the case study method is to study one group with specific and shared criteria. Its utility lies in limiting the research scope and saving time. The case study is composed of three types: the descriptive case study (aims to describe the studied object), the explanatory case study (aims to explain the reasons behind the occurrence of an issue), and the exploratory case study (aims to understand the issue and suggest solutions to it). Further, the case study may be single or multiple. While the former focuses on a single group,

the latter studies multiple cases. Moreover, the single case study is divided into the instrumental case study, which gives importance to the generalization of the research results, and the intrinsic case study, which focuses on understanding the issue without generalization. Additionally, the case study may be holistic to provide an overall analysis of one entity or embedded to divide the studied unit into multiple groups and analyze them separately (Yin, Robert K. 2003).

Based on the aforementioned research objectives, the researcher investigates the present issue through a descriptive case study. This is due to the nature of the research which aims at describing aspects that already exist in Tlemcen PhD science students' academic writing. Concerning the number of cases, the researcher opts for the single instrumental case study as the investigation concentrates on the sole entity of science PhD students of Tlemcen. Such a number of case allows the researcher to generalize his findings, leading to a more scientific outcome. On this basis, the researcher uses the embedded case study due to the analysis of two different units within one entity (the second unit is that of teachers who give their insights on their students' use of AI in academic writing). Lastly, the investigator will provide an overall analysis about the studied case.

#### **2.4. Sample Population**

A crucial aspect of the data collection process is sampling. The latter consists of two paradigms which the researcher can choose from depending on the nature of the research. On one hand, the information-rich paradigm emphasizes on samples which contain information and leads to the collection of qualitative data. On the other hand, the representative paradigm, as the name suggests, centers around samples that represent the larger population; and thus, lead to the collection of quantitative data. In sum, the major difference between the two paradigms is that the former focuses on data quality, while the latter focuses on generalizability.

Sampling encompasses two methods: non-probability sampling and probability sampling. Non-probability sampling is a method in which not every member of the sample has the opportunity to participate in a study. Contrastingly, the probability sampling method allows every member of the sample to participate. In a similar manner

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to sampling paradigms, the distinction between these methods is that the former focuses on data quality and the latter focuses on generalizability.

In this study, the researcher studies the case of Tlemcen scientific PhD students. Due to the nature of the case study which is opted for, the investigator designs the appropriate sampling for the research. In this regard, the researcher chooses the representative sampling paradigm in order to use the probability sampling method. The essence of this is to coordinate the purpose behind the case study design, which is to generalize the results, with the sampling design; and thus, obtain an organized study.

Despite the main focus being on Tlemcen scientific PhD students, the researcher interviewed teachers to gain their insights on the studied subject. The researcher opts for the information-rich paradigm in choosing this sample. The method used is purposive sampling. Their opinions are deemed as paramount due to their expertise and role in controlling the quality of their students' academic writing.

### **2.4.1 Students' Profile**

- **Gender:**

The profiles of the 34 students who participated in this study are diverse. First, females represent the majority of the overall sample with a percentage of 71%. On the other hand, males only make up 29% of the participants. Thus, there is a large difference in numbers when it comes to the participants' gender.

- **Age:**

The respondents are asked about their age as part of their profile. Statistics show that they vary from different age groups ranging from 24 years old to 45 years old. Such statistics allow the researcher to study the various interpretations that are collected from diverse age groups.

- **Field of study:**

The researcher has also inquired about the students' fields of study. There have been various scientific disciplines who gave their perspectives on the studied matter. The following scientific specialties have been mentioned: technology, chemistry,

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biochemistry, electrical engineering, industrial engineering, medicine, mathematics, computer science, physics, process engineering, psychology, architecture, electronics, biotechnology, biology, economics, Artificial Intelligence, political sciences, science and technology, cyber security, and pharmaceutical engineering. The diversity of the mentioned scientific fields leads to the collection of different perceptions on the use of AI in academic writing; and thus, a more or less comprehensive analysis. In this context, the similarities between the responses reinforce the validity of the collected data and permit the researcher to make an in-depth interpretation of the data.

- **PhD year:**

Participants have been asked about their PhD years in order to gain an insight into their experience in academic writing. The results show that the majority of the respondents (44%) are 4<sup>th</sup> year PhD students. 23% of the sample are 3<sup>rd</sup> year PhD students. 18% of the respondents are 2<sup>nd</sup> year PhD students and 15% are 1<sup>st</sup> year PhD students.

### **2.4.2 Teachers' Profile**

The number of the interviewed teachers is 4. They all supervise PhD students. Two teachers have over a decade of experience when it comes to supervising PhD students with one having 20 years of experience and another having 15 years of experience. The other two teachers have less than a decade of experience (one with 5 years and the other with 6 years).

## **2.5. Research Instruments**

As previously mentioned, a research should be coherent and systematic. In other terms, the researcher has to design his study in a way where its various aspects fit. The choice of appropriate research instruments is no exception of this process. To conduct this investigation, the researcher adopts a mixed-method approach to optimize research findings. Moreover, the mixed method approach allows the researcher to reach generalization as well as to gain a deeper insight into the issue, due to the data quality.

### 2.5.1. Students' Questionnaire

An effective way to collect data is through the questionnaire. Researchers use them to maximize their results. Questionnaires are considered as a useful research tool due to the time and energy that they save. Their utility, also, lies within the way in which they allow researchers to collect various types of questions to obtain more information. In a questionnaire, investigators can pose close-ended questions, open-ended questions, and multiple-choice questions. While both close-ended and multiple-choice questions collect quantitative data, open-ended questions collect qualitative data. In scientific research, it is recommended that researchers opt for the employment of the three types.

Using Google Forms, the researcher designed a questionnaire designated to Tlemcen PhD science students. These students were from different scientific disciplines including technology, chemistry, medicine, mathematics, physics, psychology, etc. The variety of the respondents' fields allows the researcher to gather data about how AI is perceived and/or used in different domains. Consequently, the research at hand uses a solid bulk of data to conduct the study.

To ensure the collection of as much information as possible, the researcher includes all types of questions (see Appendix A). In this manner, the investigator obtains both quantitative and qualitative data, which aids him in his mixed-method approach. Moreover, this permits him to achieve objectivity and reliability. In consequence, the outcome of the study will be more scientific. The objectives of each section of the questionnaire are displayed in table 2.1:

**Table 2. 1:** Questionnaire Sections' Objectives

Question	Objectives
Section 1	It aims at collecting information about the participating students.
Section 2	It aims at collecting information about the students' knowledge about Artificial Intelligence
Section 3	It aims at collecting the ethical considerations that may arise from the use of AI

### 2.5.2. Teachers' Interviews

Because the questionnaire did not contain enough qualitative data to reach a research with a mixed-method approach, the researcher opts for an interview. The latter contains is used to collect qualitative data from PhD science students' supervisors (see Appendix C). The aim of this interview is to gain their insights on the use of AI in academic writing by their students. Its importance lies within its potential to show the researcher whether teachers are aware of the advantages and the risks of AI in this domain. In this way, one can analyze how teachers are helping their students and raising their awareness in terms of ethics. Intending to achieve coordination between the questionnaire and the interview, the researcher made his interview structured. The objectives of each section of the interview are shown in table 2.2:

**Table 2. 2:** Interview Sections' Objectives

Question	Objectives
Section 1	It aims at collecting the teachers' background
Section 2	It aims at gathering supervisors' general observations on their students' academic writing
Section 3	It aims at knowing whether the teachers know enough about AI
Section 4	It aims at showing the teachers' awareness of the ethical aspect of the studied matter
Section 5	It looks at what teachers foresee for AI's regulation in academia

### 2.6. Data Analysis

This section presents the approaches that are used to collect data from both students and teachers regarding the impact of AI on academic writing in line with the research questions. The aim of this is to gain a comprehensive understanding of how AI can be used effectively and responsibly. The data will be analyzed quantitatively and qualitatively. The former refers to examining numeric data as it deals with statistics and

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allows generalization. The latter deals with examining non-numeric data such as interviews to gain an in-depth insight into a given matter.

### **2.6.1. Students' Questionnaire Analysis**

This questionnaire was handed to Tlemcen PhD science students who responded to it by providing both qualitative data and quantitative data. Thus, data analysis incorporated qualitative and quantitative techniques. Because the questionnaire contains questions which share similar aims, it was divided into 3 sections which are analyzed separately. The reason behind this is a result of an attempt to design a questionnaire which encompasses all areas of the studied issue. Moreover, all three types of questions were included to ensure the collection of a maximum amount of data. In this regard, respondents have the capacity to share their views in different manners.

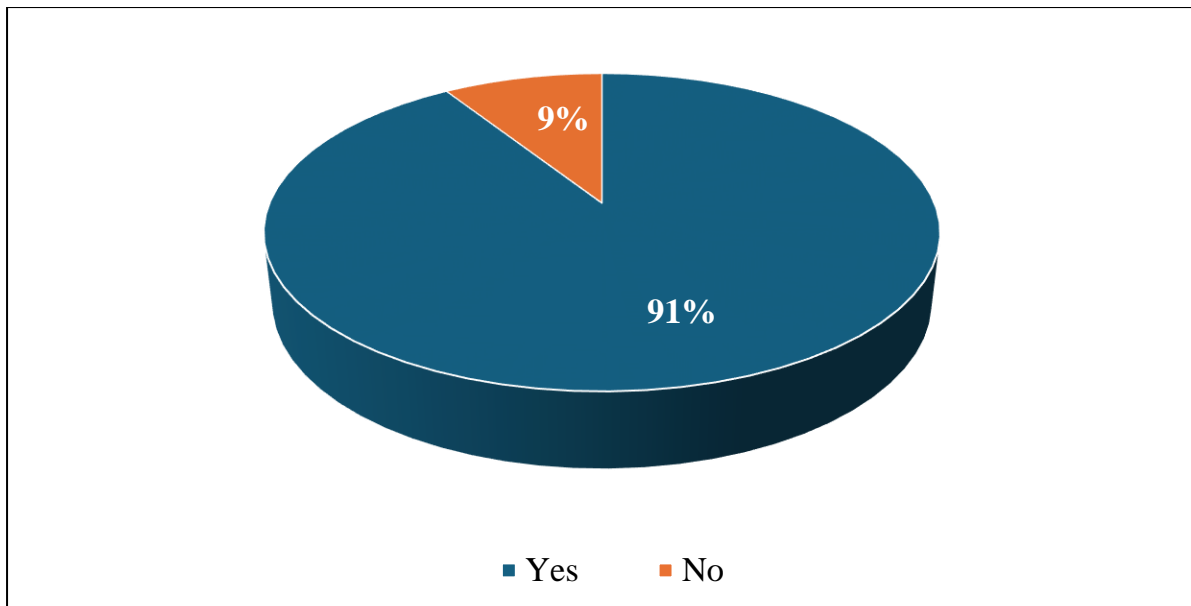
#### **2.6.1.1. Results**

The questionnaire was handed to 34 PhD students of scientific disciplines from Tlemcen University. The following results have been gathered:

Section one: students' background information about Artificial Intelligence.

This section is devoted to collecting information about the student's knowledge about AI.

Question 1 was asked to know students' opinions about the usefulness of AI in their academic writing. Results demonstrate that most of the students (91%) believe that the use of Artificial Intelligence in their academic writing is helpful. Only 9% of them claimed that it was not helpful. These results highlight the predominant utilization of Artificial Intelligence in the academic writing of Tlemcen science PhD students. This is shown in figure 2.1:

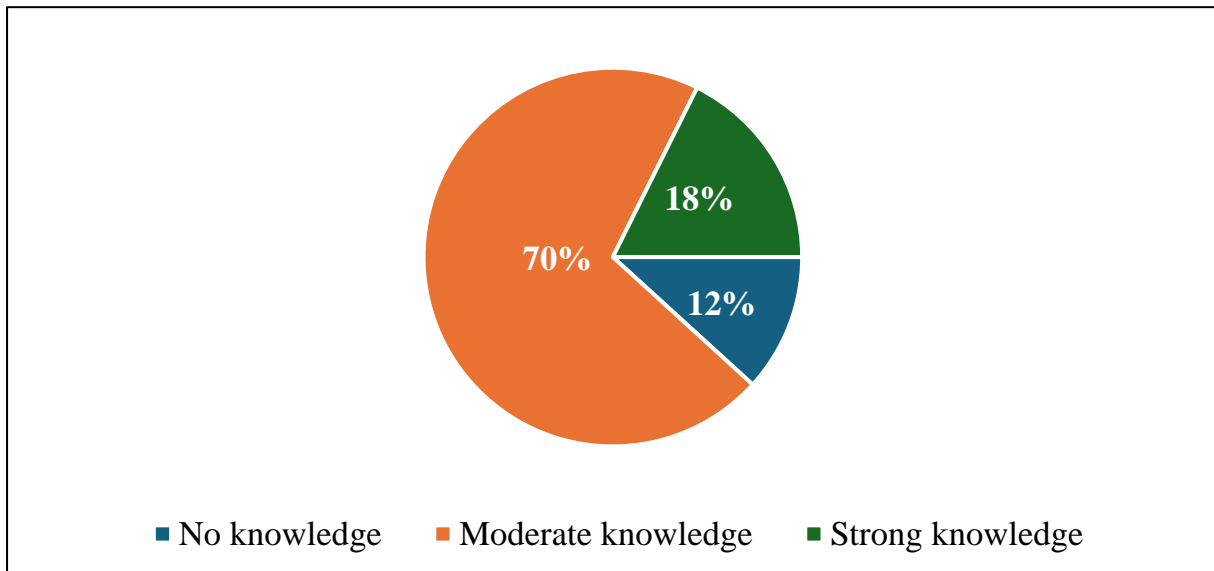


**Figure 2. 1:** Scientific PhD Students' Perceptions of AI's Helpfulness in Academic Writing

Question 2 was asked to gain the participants' insights on why they think that AI is helpful in academic writing. When it comes to students who find AI useful for their academic writing (91% of the sample), most of them claim that it helps them paraphrase their sentences. Among these students, some state that they use paraphrasing tools to understand certain concepts. With an equal number, other students state that AI tools contribute to the finding of sources and references. Some students believe that AI is a means that allows them to solely focus on their scientific research without being preoccupied with the writing quality of their content. Artificial intelligence does so by ameliorating their writing (correcting spelling mistakes, grammatical mistakes, and adjusting the sentences' consistency). Others mention that AI aids them in wording their ideas. Also, few state that AI allows them to save time and energy. Several students consider AI to be helpful for researchers to get inspiration from it; and thus, develop their ideas (without plagiarizing). A portion of students also believe that AI is useful for structuring their work as well as brainstorming ideas.

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Question 3 was asked for the respondents to provide the extent to which they know about the available AI tools. The results highlight that the majority (70%) of students have a moderate knowledge of the AI tools proposed to the public. Those with a strong knowledge make up 18% of the sample, while only 12% do not have knowledge about AI. The results are displayed in figure 2.2:



**Figure 2. 2:** PhD Science Students' Knowledge about the Available AI Tools

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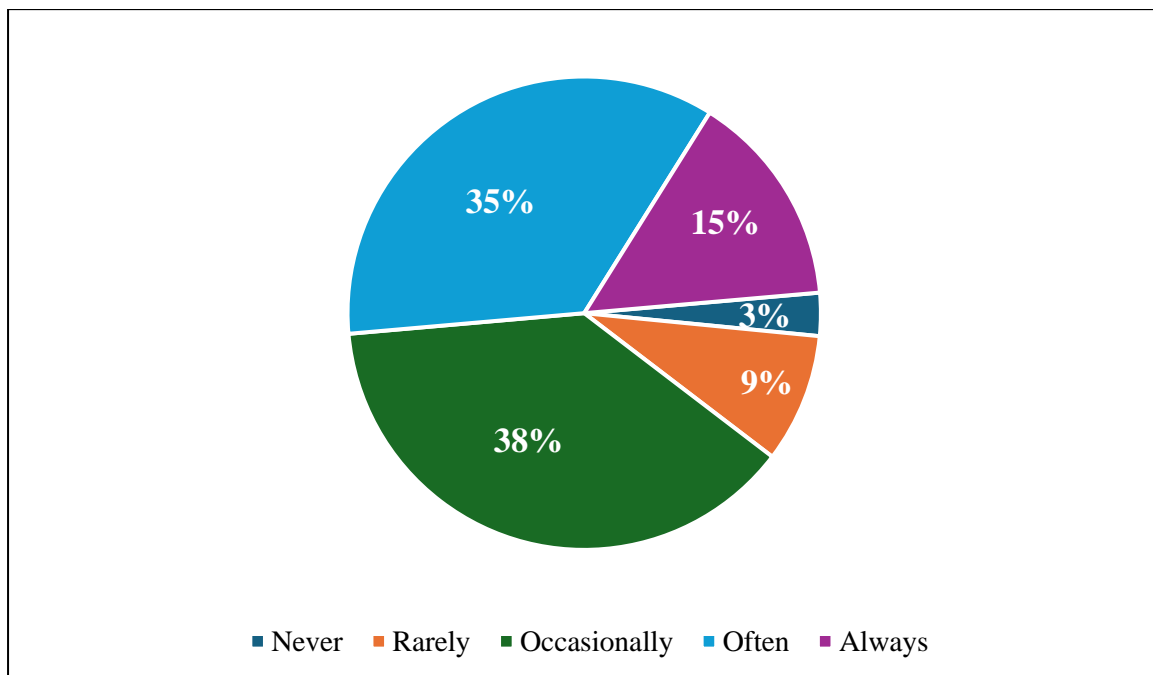
Question 4 was asked to PhD science students to inquire about the different AI tools that they use in their academic writing. Results show that PhD science students of Tlemcen use a wide range of Artificial Intelligence tools. In total, 12 AI tools are used by students. Most of the students (26) use ChatGPT and 25 of them use Google Translate, which makes these two tools the most used. 12 students use Quillbot and Copilot, while 5 students use Poe. Paper Digest (a literature review AI tool) is used by 3 PhD students and 2 others use Elicit. 2 students use Deepl (a translation tool) and 2 students use Scispace. The least used AI tools (the ones that are used only by one student each) are Gemini, Leonardo, and ChatPDF. The results are displayed in table 2.3:

**Table 2. 3:** The AI Tools Used by PhD Science Students of Tlemcen

Artificial Intelligence tool	Number of users	Function
ChatGPT	26	Large Language Model
Google Translate	25	Translation
Quillbot	12	Paraphrasing
Copilot	12	Large Language Model
Poe	5	Large Language Model
Paper Digest	3	Referencing
Elicit	2	Referencing
Deepl	2	Translation
Scispace	2	Summarization
Gemini	1	Large Language Model
Leonardo	1	Large Language Model
ChatPDF	1	Summarization

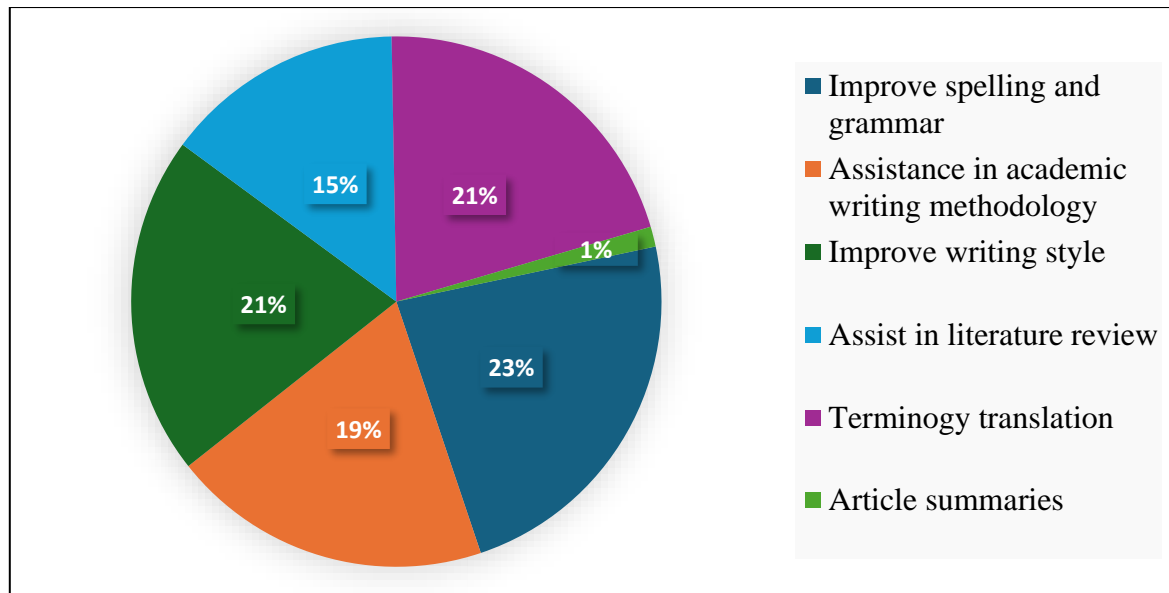
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As for question 5, students are asked about their rate of use of AI tools. PhD science students were asked about how frequently they use AI tools. Results show that the greater part of students (38%) claim that they use AI tools on an occasional basis. 35% of students often use AI tools in their academic writing. 15% of the participants persist in operating with AI technologies for their writing tasks. Those who use AI rarely make up 9% of the sample, while only 3% claim that they never use it. The collected data are displayed in figure 2.3:



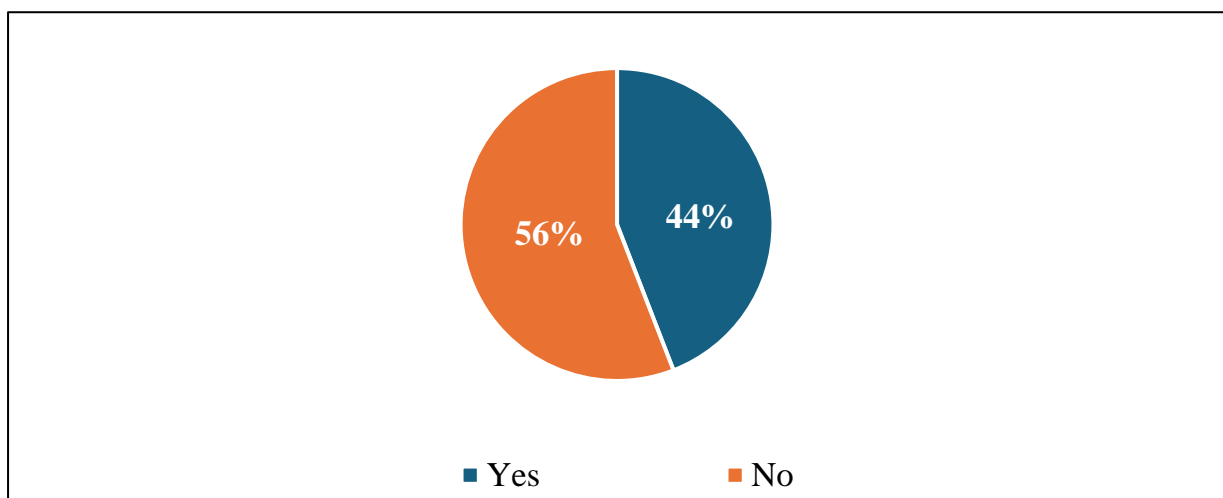
**Figure 2. 3:** PhD Science Students' Frequency of Using AI Tools

Question 6 was asked so respondents provide their purpose(s) behind using Artificial Intelligence tools in their academic writing. Most of the sample (23%) use AI to improve their spelling and make grammatical corrections to their writing. The second most common purposes are writing style improvement (21%) and terminology translation (21%). Also, 19% of the respondents assert that they use AI to obtain assistance with the academic writing methodology. 15% of the sample mention that they utilize AI to have assistance with their literature review process. Only 1% of students claim that they use AI to summarize articles. The results are illustrated in figure 2.4:



**Figure 2. 4:** Purpose(s) of PhD Students' Use of Artificial Intelligence

Question 7 was posed to see whether the respondents encounter any issues as a result of using an AI tool. The data shows that most students do not face any issues as a consequence of incorporating Artificial Intelligence tools in their academic writing. Predominantly (56%), students claim that they did not experience any problem with the integration of AI within their academic writing. On the other hand, 44% assert the opposite. The difference is, therefore, not large. The answers are portrayed in figure 2.5:



**Figure 2. 5:** PhD Science Students' issues in AI Use in Academic Writing

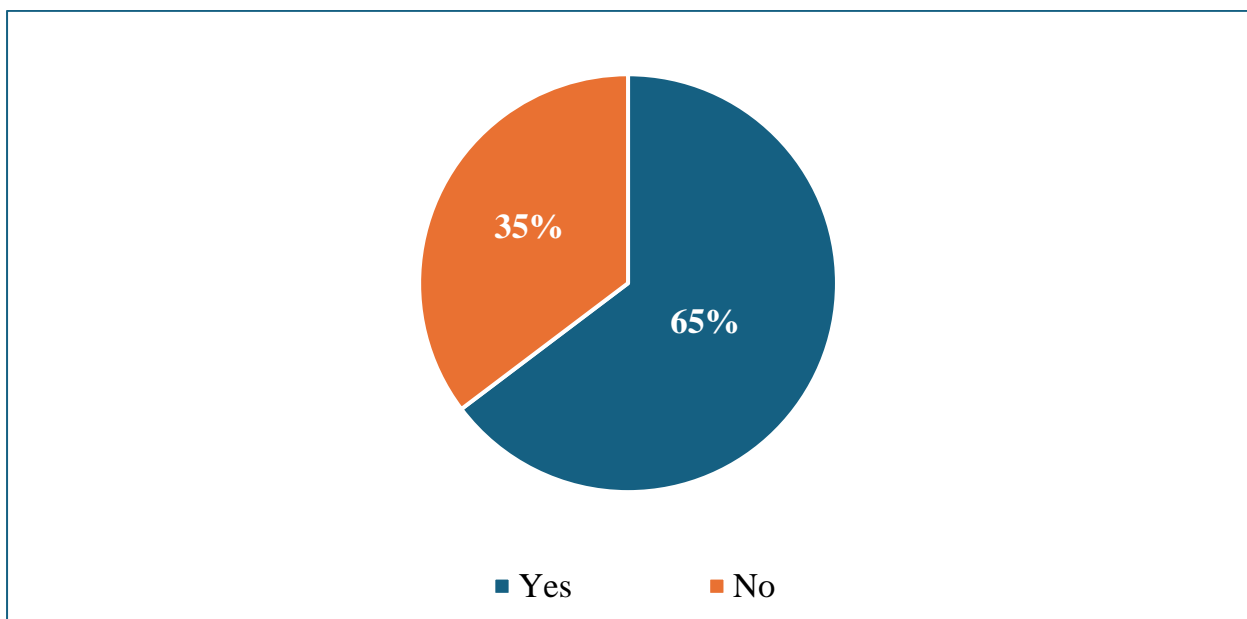
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Question 8 focused on the participants who claim that they face issues when using AI in their academic writing and were asked to elaborate on their answers. Most students posit the idea that AI tools often provide inaccurate responses. In this context, one student specified that it lacks logic. Others think that AI poses a problem concerning referencing and sources. Another group believes that one cannot rely on it to get valid information. However, one respondent of this group states that it is not an issue as long as one is aware of the risks associated with it. Lastly, several students think that AI causes them problems when it does not understand the prompt given to them.

### Section two: Ethical Considerations

This section focuses on the ethical considerations that may arise from the use of AI.

Question 9 was addressed to gather opinions on whether the use of AI in academic writing raises ethical concerns or not. The majority (65%) claim that AI does so, while 35% claim the contrary. The gathered evidence is illustrated in figure 2.6:

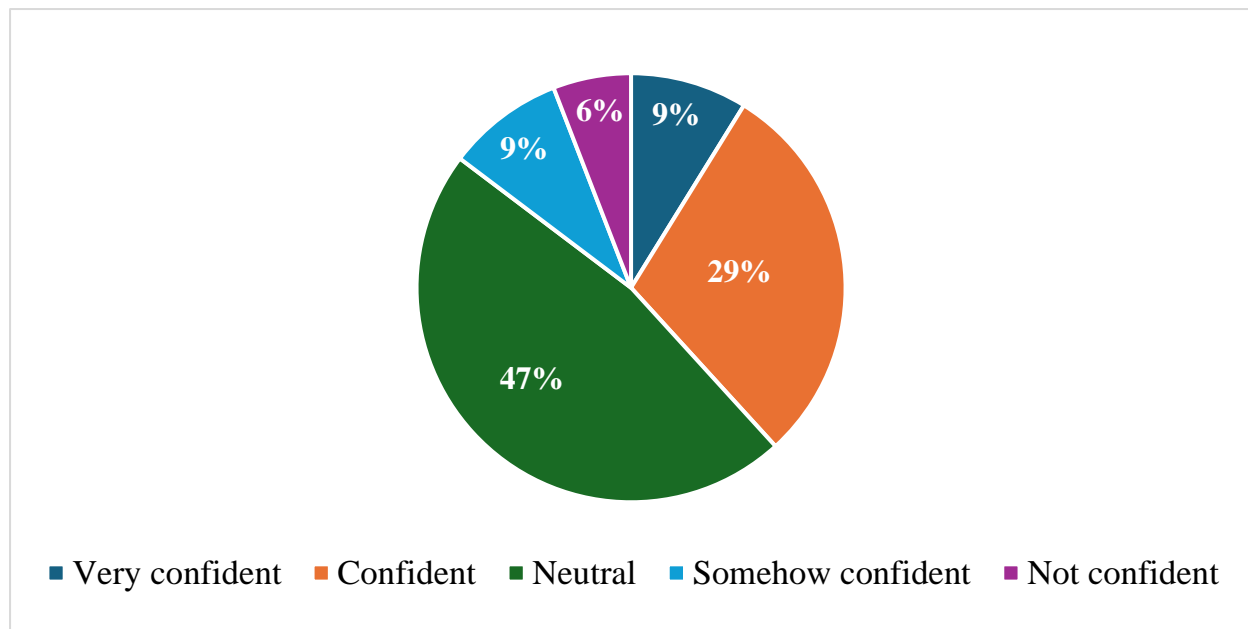


**Figure 2. 6:** Students' Thoughts on AI Causing Ethical Concerns in Academic Writing

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Question 10 was addressed to participants who claim that the use of AI raises ethical questions. They were asked to provide the reasoning behind their answers. The majority of the respondents claim that it often leads to unintentional plagiarism. Other students believe that the reliance on AI in academic writing inevitably causes a lack of innovation/creativity. Several students think that it provides inexistent sources to strengthen its statements. Only one student asserts that AI is biased in the information that it gives. Another student claims that AI tools do not make the right word choice when translating from one language to another.

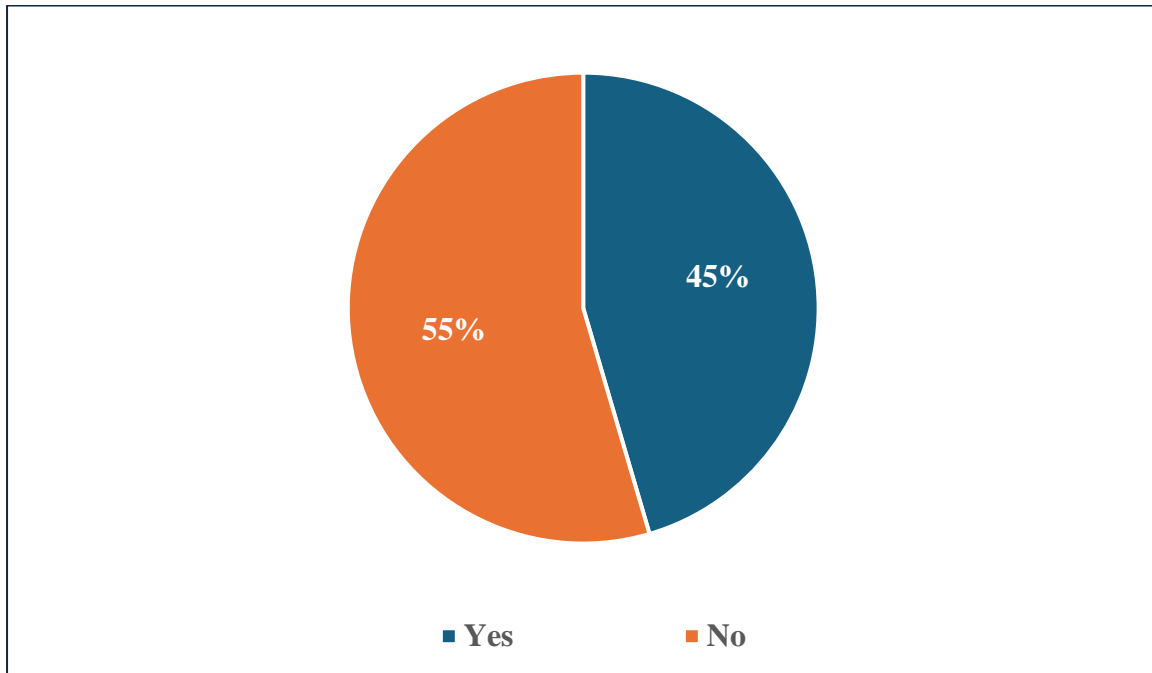
Concerning question 11, respondents were asked to provide their level of confidence in their capacity to judge whether the AI-generated suggestions can be included in their academic writing. The findings show that most students (47%) are confident at a neutral level in incorporating AI-generated text within their writing. 29% of them assert that they are confident in doing so, while 9% are very confident. On the other hand, 9% claim that they are mildly confident, and 6% are not confident. These statistics are represented in figure 2.7:



**Figure 2. 7:** PhD Science Students' Confidence in the Critical Inclusion of AI in Academic Writing

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Question 12 was devoted to seeing whether PhD students think that AI-generated text should be attributed or not. The majority of students (55%) think that AI should not be attributed to the texts it generates. On the other hand, 45% think that it should be attributed. The distance between the responses is, thus, not large. The answers are represented in figure 2.8:



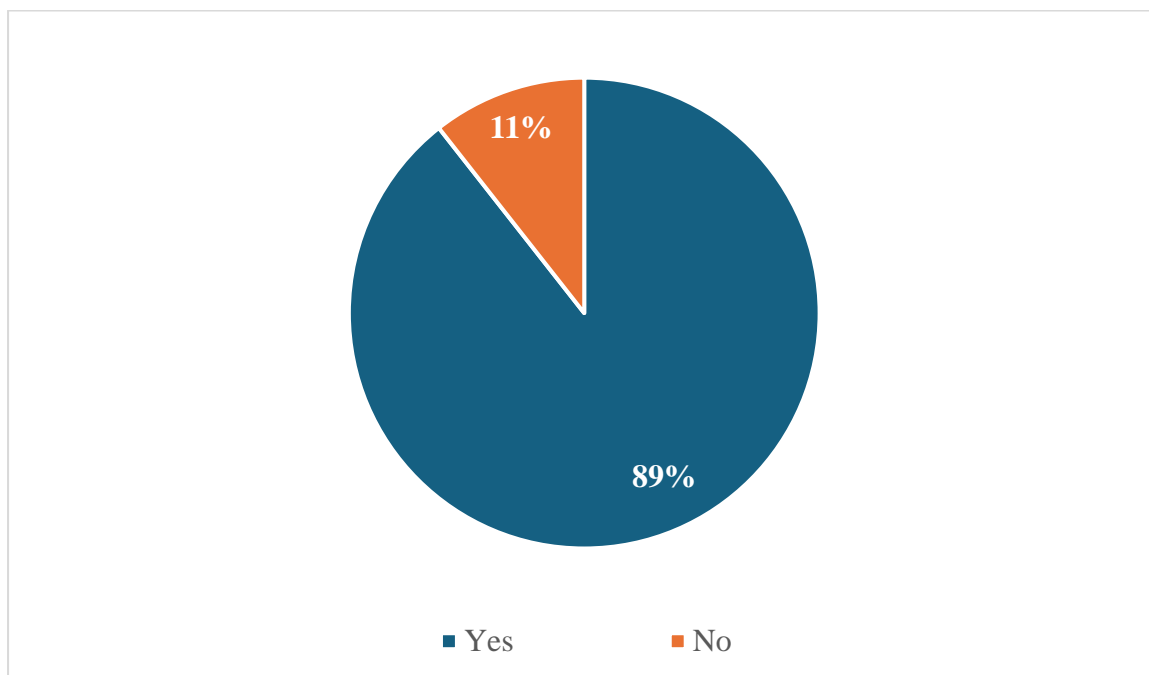
**Figure 2. 8:** Students' Perception of the Attribution of AI-Generated Text

Question 13 was directed to students who believe that AI is to be attributed with the aim of seeing why they think so. All of them assert that such a process is mandatory as it ensures transparency and avoids any form of plagiarism.

Conversely, question 14 was posed to students who are against the attribution of AI-produced text and are asked about why they believe so. The totality of these respondents claim that it is because AI does not represent a credible source.

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Question 15 was asked to inquire about the participants' thoughts on whether universities should set ethical constraints for students when it comes to the incorporation of AI tools in their writing. Most students (89%) think that ethical guidelines are to be set about the inclusion of AI in academic writing. 11% of them believe the opposite. The results are shown in figure 2.9:

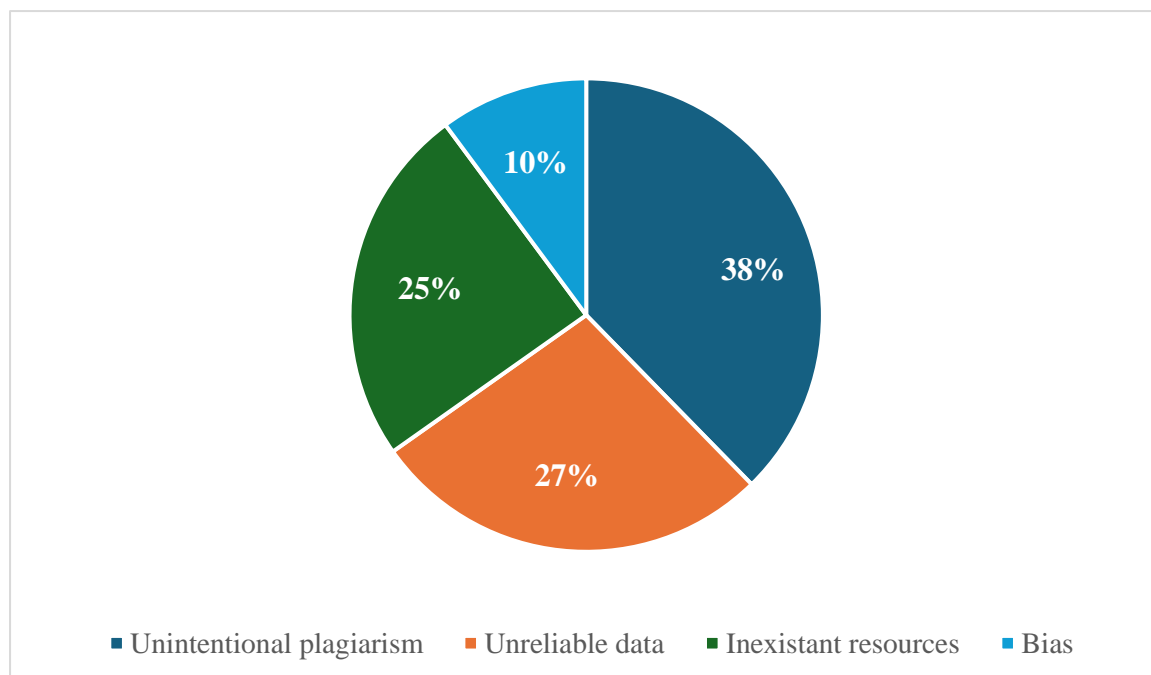


**Figure 2. 9:** Universities Providing Ethical Guidelines for AI Integration in Academic Writing

Through question 16, an inquiry was made with students who are for the establishment of ethical guidelines for the incorporation of AI in academic writing and are asked how such a process can be done. Most students assert that this can be done through workshops in which experienced academic writers (who use AI) explain how to safely use it without violating academic integrity. Another group thinks that universities should provide their PhD students with AI-powered tools that can detect the AI-generated texts in their writing. This way, they can adapt and rectify their work to maintain academic integrity.

Question 17 was asked to see the students' ethical concerns that arise from using AI in academic writing. The data highlight that most students (38%) believe that the major ethical issue in this context is unintentional plagiarism. 27% show concern about the data provided by AI and judge it as unreliable. 25% of the students think that the

main ethical issue raised by AI is inexistent resources. Only 10% claim that bias is a major concern. figure 2.10 displays the results:



**Figure 2. 10:** Ethical Considerations in the Use of AI in Academic Writing

### 2.6.2. Teachers' Insights Analysis

In this study, teachers are interviewed to obtain their views on the use of AI within academic writing. This is an important aspect of the study at hand because it reveals experts' opinions. Besides, supervisors are under the obligation to monitor their students' writing to guide them. By extension, they are required to be aware of the various AI tools and how they function.

#### Section 1: Supervisors' general observations

This section aims to provide the teachers' general observations on their supervisees' academic writing.

Question 1 was asked to see the supervisors' general observations about their PhD students' writing skills. The respondents express more or less similar opinions about the writing skills of their PhD students. All of them believe that students have issues with punctuation and writing style. Two teachers think that students are to be

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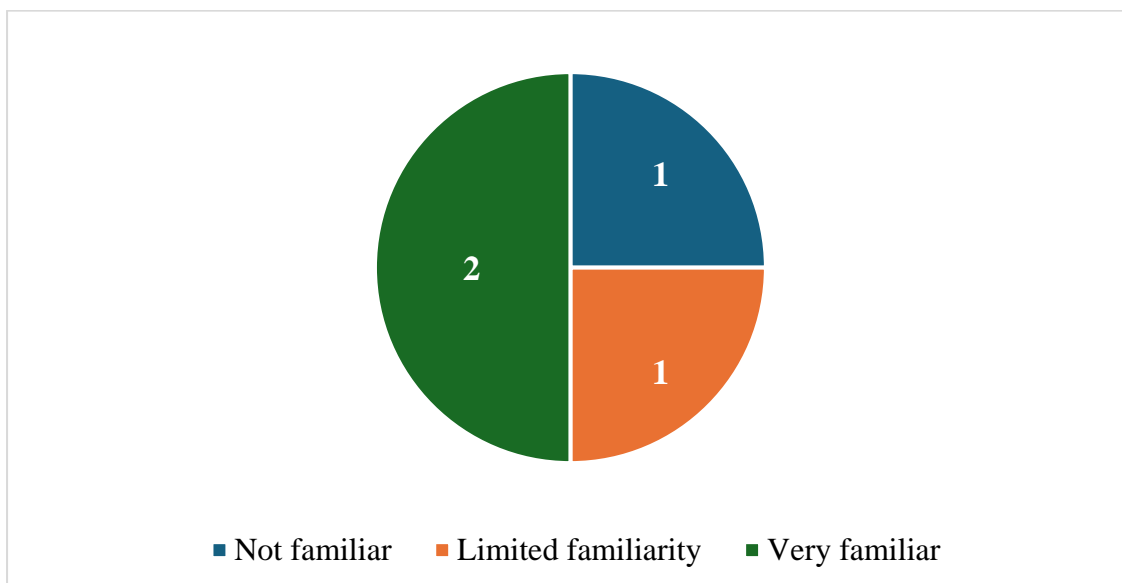
more coherent and cohesive and one teacher states that PhD students' writing is verbose. Their views are the following:

- Teacher 1 states that PhD students' writing is flawed by verbosity, incoherence, incohesion, and punctuation.
- Teacher 2 says that their writing could be enhanced in terms of punctuation, coherence, cohesion, and writing style.
- Teacher 3 thinks that most of them have weaknesses in punctuation and essay structure. Others could improve their grammar and academic style.
- Teacher 4 claims that students need to improve their language proficiency in terms of punctuation and writing style for readers to understand their thoughts.

### Section 2: Understanding AI in academic writing

This section is focused on knowing the teachers' knowledge about AI in the context of academic writing.

Question 2 was posed to analyze the teachers' familiarity with the available AI tools. The results show that one teacher claims to be familiar with AI technologies to a limited extent, one that claims not to be familiar, and two that claim to be very familiar with them. These data are displayed in figure 2.11:



**Figure 2. 11:** Teachers' Familiarity with AI Tools

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Question 3 was asked to teachers in order to know whether they observed their students using AI tools for their writing tasks. All respondents claim that they noticed their students using AI for their writing tasks. One teacher, however, specifies that it “can be hard to determine if an AI tool was used in writing, especially when we are not familiar with the student’s writing.” Nevertheless, they explain that they know AI is used due to how strenuous academic writing is for their students.

Question 4 was posed to collect the teachers’ thoughts on the potential benefits of AI tools in improving academic writing skills. Teachers express various views on this matter ranging from help with outlining to time saving and help with productivity tasks. Three teachers think that AI can improve students’ writing. The improvements they mention are in terms of spelling, writing style, methodology, and plagiarism checking. Two of them state that it is useful to save time and energy. Their answers are as follows:

- Teacher 1 believes that AI can be widely used for improving writing skills as well as helping with methodological tasks like structuring and outlining or even inspiring students on potential topics for articles.
- Teacher 2 states “Avec mes connaissances limitées, je peux juste dire que c'est utile pour gagner du temps et de l'énergie en accomplissant rapidement les tâches.”[Due to my limited knowledge, I can only say that it is useful for time and energy saving as it quickly accomplishes tasks.]
- Teacher 3 asserts that “It helps students gain time in writing and presenting their results in good and correct English. Today, students can provide well-written texts that ease the understanding of their research”.
- Teacher 4 claims that “AI can help with language enhancement -including spelling and writing style-, grammar, literature reviews, and checking for plagiarism”.

**Section 3: Ethical considerations**

This section is specific to the collection of the teachers' insights on the distinct ethical implications that may arise from the use of Artificial Intelligence in academic writing.

Question 5, thus, was devoted to knowing the possible ethical issues that arise from the use of AI in academic writing. The teachers' insights prove that they are cautious and aware of the various ethical implications which may arise from using AI in academic writing including unintentional plagiarism, passive thinking, inexistent resources and, biased data. Only one teacher is aware of the concern about data privacy and another is aware of the unreliability of AI detectors. Their views are expressed below:

- Teacher 1 maintains that AI raises ethical concerns in three main areas: over-reliance, academic integrity, and privacy. They state:

... doctoral students in Algerian universities are not prepared to write scientifically in English. Having such tools readily available online can make them lazy and hinder their chances of developing their writing skills as needed. Many would deny using an AI tool in writing because they know they are expected to write *themselves* and not have a tool do it for them, and so the academic integrity and honesty of a young researcher are at stake ... On a more technical level, specialists are saying that these tools might be invading the anonymity and confidentiality of one's work, which threatens the originality of your study if the data on that AI website gets leaked.
- Teacher 2 believes that students will lose their creativity because of the over-reliance on AI tools and will commit unintentional plagiarism.
- Teacher 3 thinks that excessive reliance on AI tools leads to passive thinking instead of critical thinking. They also emphasize that AI can be solely used for writing and not for thinking.
- Teacher 4 claims that tools such as ChatGPT provide inexistent data and are often biased. Also, they claim that it is very difficult to know whether AI has

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been used to produce a piece of writing. In this context, they state that “AI detectors are highly unreliable. I have tried Turnitin and it flagged a paper that I wrote 4 years ago as ChatGPT-generated.”

Question 6 collected information about how teachers address these ethical concerns in their teaching or advising of PhD science students. From their responses, one can say that teachers take the ethical aspect seriously and make sure that they raise their students’ awareness about it. One teacher states that ethics have to be included as part of the provided writing courses to students. Another teacher believes that AI does not represent a grave threat to academic writing, but it is crucial to remind students that it can only be used to embellish writing. A third teacher reminds them of the same aspect, but draws their attention to the notion that AI cannot criticize nor think. The last teacher encourages objectivity and explains to their students how to avoid any ethical violation in case one occurs. However, they clarify that their respect for ethicality is not guaranteed and cannot be reliably detected. Their answers on this matter are the following:

- Teacher 1 asserts that most students do not bother to search about the various ethical issues; and thus, lack awareness. In this context, they state that “Our job is to make [students] aware about these ethical problems ... It should be an essential part of the writing course provided to students.”
- Teacher 2 believes that there is no serious inconvenience in the use of AI in academic writing. However, they claim that they constantly raise their students’ awareness of the idea that such tools can only be used to improve their writing in general (and not to excessively rely on them).
- Teacher 3 states that they teach their students how to effectively use AI as a tool to “clearly present their thoughts, arguments, and ideas and not as a monitor of [these elements]”.
- Teacher 4 states “I encourage my students to be transparent and easy-going with them in case they violate ethics. It is important to explain how to avoid such a violation in the future and guide them.” They add that despite their accentuation

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on ethics, students still have a chance to evade the detection of any violation because of the unreliability of AI detectors.

### Section 4: Future implications

This last section is assigned to the insights of teachers about the future implications pertaining to the regulation of Artificial Intelligence in the field of academic writing

Question 7 was assigned to future implications. Supervisors were asked to provide their insights about how can students be prepared to use AI in their academic writing ethically. The participants' responses show that most teachers advocate the importance of organizing workshops that raise the students' awareness of how to responsibly use AI within their academic writing. Another teacher believes that teachers can make a list of ethical manners to include AI in their students' academic writing. The last teacher asserts that universities have the duty of enforcing ethical standards that are to be followed by students when doing their academic writing. Their responses are displayed below:

- Teacher 1 thinks that teachers must focus on teaching students about ethical considerations and make a list of how AI tools can be ethically incorporated. They also assert that students should be encouraged to act honestly to develop their author identity as future researchers.
- Teacher 2 asserts that this can be done through awareness campaigns and workshops provided by supervisors and institutions on how to responsibly use AI in academic writing.
- Teacher 3 proposes the notion that students should be introduced to the various AI tools that can be helpful in their research through tutorials and workshops.
- Teacher 4 advances the idea that universities have to set clear ethical guidelines for students to follow. An example they mention is journals that impose on authors to specify whether they used AI in their work and where they used it.

## **2.7. Results' Interpretation**

The investigator set two objectives for his research work. The first objective is to describe the possible ways that allow Tlemcen science PhD students to enhance their academic writing skills using AI tools, while the second aims to describe the ethical issues that may arise from using these technologies. These objectives are intended to be achieved by interpreting the collected data from the studied sample population.

The first hypothesis states that AI may be used by Tlemcen PhD science students to improve writing in terms of grammar, spelling, accuracy, and methodology. The collected data from the questionnaire that is handed to Tlemcen science PhD students displays an alignment with the advanced hypothesis. This is noticed from figure 2.4 which shows that AI is used for the mentioned aspects in the hypothesis. The data that is portrayed in this figure is believed to be solid. Such belief is strengthened by the fact that most of the sample consists of 4<sup>th</sup> year PhD students (who have more experience than other students). Furthermore, the participants have a scientific background that pushes them to be constantly informed about the various available AI tools. In parallel, teachers, too, assert that AI can improve grammar, spelling, accuracy, and methodology. They explain so due to the distinct problems that they observe in their students' academic writing like punctuation, coherence and cohesion, and accuracy (which is mainly affected by verbosity as it makes their writing seem more poetic and literate than academic). The results collected from the questionnaires and the interviews show that AI can be taken advantage of for effective and responsible academic writing by Tlemcen PhD science students. In this way, the first hypothesis is confirmed.

The second research question deals with the ethical issues that may arise when Tlemcen PhD science students use AI in academic writing. In this vein, the results of the questionnaire show that most students think that incorporating AI in academic writing leads to unintentional plagiarism. This is supported by the neutral confidence (represented in figure 2.7) which students have in critically incorporating AI in their academic writing. Further, students express concern about unreliable data and inexistent resources. A minority believes that bias is an issue to be considered. These results are displayed in figure 2.10. As a fortification, the responses to question 10 show the same

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results with the exception of unreliable data. Similarly, the teachers' views align with those of the students. The responses from the teachers to question 6 display that agreement. Other interesting ethical concerns that are raised are the data privacy of students and the unreliability of AI detectors. As a consequence, the second hypothesis is confirmed.

The findings that are related to the first hypothesis have a connection with the literature. The researcher found that AI helps with grammar and spelling which was mentioned by the Writing Center (2020). The latter explained that AI has the ability to help authors correct spelling and grammatical errors. As for accuracy and methodology, the investigator found that AI can aid students in them. In the literature, it is claimed that it is the case. For example, Golan et al. (2023) think that AI permits writers to focus on the content rather than the writing mechanics. Also, Khalifa and Albadawy (2024) think that AI can structure an academic work. This leads to an accurate research which follows an appropriate scientific methodology.

On the other hand, the second hypothesis's findings also relate to the literature. Pertaining to unintentional plagiarism, Hwang et al. (2023) claim LLMs incorporate information from published works without providing a proper citation. This leads to an unintentional plagiarism from writers. In the context of unreliable data and inexistant resources, Hwang et al. (2023) also believe that that AI "hallucinates". The essence of this is that it provides false information. Thus, unreliable data and inexistant resources. In addition, Currie (2023) states that ChatGPT has the ability of creating fabricated study results. Finally, Livberber & Ayvaz (2023) mention that AI tools are mere machines that cannot achieve human intelligence to make objective analyses and interpretations. Therefore, information provided by AI can be invalid.

One can consider the awareness of students and teachers about the possible ways AI can improve academic writing and the ethical issues in the studied context as a positive aspect. However, it should be noted that students do not have the required critical thinking which permits them to responsibly use AI in their writing tasks (figure 2.7). In a way, a threat to academic integrity is present. Students propose the idea that universities establish ethical guidelines for a responsible use as well as investing in AI-

detectors. While only one teacher supports this idea, the other teachers believe that workshops should be organized to raise awareness about the responsible use of AI. It should be mentioned, however, that despite the realization of these suggestions, the risk will still stand. Many students may feel lazy or simply do not have time. Thus, they would seek AI to complete their academic writing tasks as soon as possible and may not even bother to revise the generated piece of text. In such situations, the main concern that is raised is “how can teachers/reviewers be sure of an irresponsible use of AI?”

## **2.8 Conclusion**

This chapter dealt with the analysis of the ways in which AI may help Tlemcen science PhD students in their academic writing tasks as well as the ethical considerations that lie within such use. This was achieved through a questionnaire handed to Tlemcen science PhD students and through interviews conducted with teachers to get distinct insights. The mixed-method approach that returns qualitative and quantitative data were aligned with the research hypotheses which were presented in this work.

# **General Conclusion**

The continuous development of Artificial Intelligence (AI) puts pressure on the leading figures of the various domains to find ways to regulate it. The field of academic writing is no exception as it relies on AI for many tasks. Because Algeria is a non-English speaking country, doctoral scientific students tend to rely on AI tools to facilitate and/or complete their English academic writing tasks. In this sense, one can notice the cruciality of understanding how AI can be appropriately used by students. Conversely, it is important to raise their awareness about the ethical risks that are taken.

The present dissertation was divided into two chapters. The first chapter dealt with the theoretical aspect of the study. This was achieved by a comprehensive review of the literature which previously studied areas related to this topic. The second topic was dedicated to the impact of AI on academic writing in the case of Tlemcen science PhD students.

The second chapter actively contributed to the research. Its design was based on a mixed-method approach that included a questionnaire handed to Tlemcen science PhD students and an interview that was conducted with teachers. The first research objective was to find in which ways may AI help these students in their academic writing. Results from the collected data showed that it helps them to improve their writing in terms of grammar, spelling, accuracy and methodology. Ergo, the first hypothesis was confirmed. While focusing on the positive aspect of this topic, one must consider its drawbacks. In this context, the second objective aimed at looking at the ethical issues that may arise from using AI tools in academic writing. The findings showed that the main ethical issues that arise from this are unintentional plagiarism, unreliable data, inexistent resources, and lack of validity. The second hypothesis is, thus, confirmed.

By studying the usefulness of AI in academic writing and considering its ethical implications, this research was an attempt to help provide a middle-ground that allows effective and responsible use of AI. In fact, the findings can contribute in the regulation of Artificial Intelligence in the context of academic writing. Moreover, the understanding of the described situation allows universities, teachers and students to ensure an appropriate utilization of such technology. Nevertheless, it should be noted that these findings are not absolute. Ergo, researchers are to make more extensive

studies to keep up with the development of these technologies and provide appropriate descriptions that allow proper regulations.

The present study was an attempt to describe the current situation that Tlemcen science PhD students are in when it comes to the use of AI in their academic writing. In a scientific research, honesty is a must. In this regard, this research faced some limitations. The first limitation was the absence of Artificial Intelligence as a field of study in Tlemcen University. If the target population solely consists of students of this field, the findings can be more technical and accurate. This is due to their familiarity with how the different AI tools work. Similarly, teachers of this field can provide better responses concerning this study. Another limitation was the unavailability of a budgeting that allows the researcher to use AI detectors to inspect their reliability from firsthand. The investigator only knew that they were unreliable from the opinion of an interviewed teacher and the literature review. The ultimate limitation concerned the unwillingness of students to provide a sample from their academic writing without the use of AI vs with the use of AI for comparison. This would have allowed the researcher to see how AI benefited and/or affected their writing.

This research can be extended to one that is more useful by building on its findings. The latter displays the various positive aspects of using AI in academic writing as well as its negative aspects. Future research can lead to the design of AI tools that are specifically trained to improve academic writing in terms of grammar, spelling, accuracy, and methodology. However, it is crucial that this AI gets trained well enough not to violate academic integrity. In a similar context, future research can work on developing a reliable program that detects AI-generated texts. On the other hand, institutions and universities can use the findings of this research to establish specific ethical guidelines that are to be respected by students. Additionally, workshops and courses can be designed upon the findings of this study to benefit students as much as possible. All of the suggestions mentioned minimize the risks of breaching academic integrity and maximize academic honesty.

As a conclusion, Artificial Intelligence is a powerful tool that is capable of enhancing one's academic writing in many ways. Tlemcen PhD science students should

be aware of how to honestly use it to avoid any infringement of academic ethics. Their critical thinking is of a paramount importance when it comes to incorporating AI tools within their research so that they ensure that their ideas, thoughts, and arguments are properly conveyed.

# **Bibliography**

- Abgaryan, H., Asatryan, S., & Matevosyan, A. (2023). Revolutionary Changes In Higher Education With Artificial Intelligence. *Main Issues of Pedagogy and Psychology, 10*, 76–86. <https://doi.org/10.24234/miopap.v10i1.454>
- Academic writing style*. (n.d.). University of Portsmouth. Retrieved 3 April 2024, from <https://www.port.ac.uk/student-life/help-and-advice/study-skills/written-assignments/academic-writing-style>
- Academic writing tips: How to write like a real academic* (2019). Oxbridge Editing. <https://www.oxbridgeediting.co.uk/blog/academic-writing-tips-how-to-write-like-a-real-academic/>
- Adiyaman University, Akkaya, A., Adnan Menderes University Educational Faculty, & Aydın, G. (2018). Views of Academicians on Traits of Academic Writing. *Educational Policy Analysis and Strategic Research, 13*(2), 128–160. <https://doi.org/10.29329/epasr.2018.143.7>
- Ali Khalaf, M. (2024). Aigiarism: The New Form of Plagiarism in the Era of Artificial Intelligence. *Sultan Qaboos University*. <https://doi.org/10.13140/RG.2.2.26972.16003>
- Alred, G. J., Brusaw, C. T., & Oliu, W. E. (2015). *The Handbook of Technical Writing*. Bedford/St. Martin's.
- Anyoha, R. (2017, August 28). The History of Artificial Intelligence. *Science in the News*. <https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/>
- Artificial Intelligence (AI) Coined at Dartmouth | Dartmouth*. (n.d.). Dartmouth. <https://home.dartmouth.edu/about/artificial-intelligence-ai-coined-dartmouth>
- Axtell, K., Chaffin, A. J., Aberasturi, S., Paone, T., & Maddux, C. (2008). Writing for

- Publication: An Analysis of 591 Articles in Five Journals Dealing with Information Technology in Education. *Computers in the Schools*, 24(1–2), 93–104. [https://doi.org/10.1300/J025v24n01\\_07](https://doi.org/10.1300/J025v24n01_07)
- Balel, Y. (2023). The Role of Artificial Intelligence in Academic Paper Writing and Its Potential as a Co-Author: Letter to the Editor. *European Journal of Therapeutics*, 29(4), Article 4. <https://doi.org/10.58600/eurjther1691>
- Bartram, J. (2023). *Library: Writing academically: Academic style*. University of Hull. <https://libguides.hull.ac.uk/writing/style>
- Bhandari, P. (2021). *Ethical Considerations in Research | Types & Examples*. <https://www.scribbr.com/methodology/research-ethics/>
- Birhane, A., Kasirzadeh, A., Leslie, D., & Wachter, S. (2023). Science in the age of large language models | Nature Reviews Physics. *Nature Reviews Physics*, 5(5), 277–280. <https://doi.org/10.1038/s42254-023-00581-4>
- Boddington, P. (2023). *AI Ethics: A Textbook*. Springer Nature.
- Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgement of Taste*. Harvard University Press.
- Carini, A. (2002). *Nine Basic Ways to Improve Your Style in Academic Writing | Student Learning Center*. <https://slc.berkeley.edu/writing-worksheets-and-other-writing-resources/nine-basic-ways-improve-your-style-academic-writing>
- Cleveland State University. *From Academic to Professional Writing*. (n.d.). <https://www.csuohio.edu/writing-center/from-academic-professional-writing>
- Clief, J. (2024). *AI in academia: Redefining the future of education – The Flagler College Gargoyle*. <https://gargoyle.flagler.edu/2024/03/ai-in-academia->

redefining-the-future-of-education/

Cohan, W. (2023). *Opinion | AI is learning from stolen intellectual property. It needs to stop.* Washington Post.

<https://www.washingtonpost.com/opinions/2023/10/19/ai-large-language-writers-stealing/>

Cooperman, S. R., & Brandão, R. A. (2024). AI assistance with scientific writing: Possibilities, pitfalls, and ethical considerations. *Foot & Ankle Surgery: Techniques, Reports & Cases*, 4(1), 100350.

<https://doi.org/10.1016/j.fastrc.2023.100350>

Currie, G. M. (2023). Academic integrity and Artificial Intelligence: Is ChatGPT hype, hero or heresy? *Seminars in Nuclear Medicine*, 53(5), 719–730.

<https://doi.org/10.1053/j.semnuclmed.2023.04.008>

Daminova, E. R., Tarasova, V. V., & Kirpichnikova, A. A. (2017). *Academic Writing as a Key Component of Academic Literacy*. 10.

Dergaa, I., Chamari, K., Zmijewski, P., & Ben Saad, H. (2023). From human writing to Artificial Intelligence generated text: Examining the prospects and potential threats of ChatGPT in academic writing. *Biology of Sport*, 40(2), 615–622.

<https://doi.org/10.5114/biol sport.2023.125623>

Desaire, H., Chua, A. E., Isom, M., Jarosova, R., & Hua, D. (2023). Distinguishing academic science writing from humans or ChatGPT with over 99% accuracy using off-the-shelf machine learning tools. *Cell Reports Physical Science*, 4(6).

<https://doi.org/10.1016/j.xcrp.2023.101426>

Educative. *What is perplexity in NLP?* (n.d.). Retrieved 16 April 2024, from

<https://www.educative.io/answers/what-is-perplexity-in-nlp>

Edwards, B. (2023). *Why AI detectors think the US Constitution was written by AI.*

Ars Technica. <https://arstechnica.com/information-technology/2023/07/why-ai-detectors-think-the-us-constitution-was-written-by-ai/>

Ellis, S. (n.d.). *Academic style.* [https://students.unimelb.edu.au/academic-](https://students.unimelb.edu.au/academic-skills/resources/reading,-writing-and-referencing/writing-effectively/academic-style)

[skills/resources/reading,-writing-and-referencing/writing-effectively/academic-style](https://students.unimelb.edu.au/academic-skills/resources/reading,-writing-and-referencing/writing-effectively/academic-style)

Enago. *The Ethics of Academic Writing: Avoiding plagiarism and maintaining the*

*integrity.* (2023). <https://www.enago.com/thesis-editing/blog/the-ethics-of-academic-writing>

European Commission (2018). Communication From the Commission To the

European Parliament, The European Council, The Council, The European

Economic And Social Committee And The Committee of The Regions

Artificial Intelligence for Europe [https://eur-lex.europa.eu/legal-](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A237%3AFIN)

[content/EN/TXT/?uri=COM%3A2018%3A237%3AFIN](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A237%3AFIN)

Fang, Z. (2021). *What is Academic Writing? (And Other Burning Questions About It).*

<https://www.routledge.com/blog/article/what-is-academic-writing-and-other-burning-questions-about-it>

French, A. (2019). Academic writing as identity-work in higher education: Forming a

‘professional writing in higher education habitus.’ *Studies in Higher Education,*

45(8), 1605–1617. <https://doi.org/10.1080/03075079.2019.1572735>

Gao, C. A., Howard, F. M., Markov, N. S., Dyer, E. C., Ramesh, S., Luo, Y., &

Pearson, A. T. (2022). *Comparing scientific abstracts generated by ChatGPT*

*to original abstracts using an Artificial Intelligence output detector, plagiarism detector, and blinded human reviewers.*

<https://doi.org/10.1101/2022.12.23.521610>

*Generative AI in Academic Writing – The Writing Center • University of North Carolina at Chapel Hill.* (2023). The Writing Center.

<https://writingcenter.unc.edu/tips-and-tools/generative-ai-in-academic-writing/>

Golan, R., Reddy, R., Muthigi, A., & Ramasamy, R. (2023). *Artificial intelligence in academic writing: A paradigm-shifting technological advance.* 20(6).

<https://doi.org/10.1038/s41585-023-00746-x>.

Gold, E. (2023, April 10). *The History of Artificial Intelligence from the 1950s to Today.* freeCodeCamp.Org. <https://www.freecodecamp.org/news/the-history-of-ai/>

Guleria, A., Krishan, K., Sharma, V., & Kanchan, T. (2023). ChatGPT: Ethical concerns and challenges in academics and research. *The Journal of Infection in Developing Countries*, 17(09), Article 09. <https://doi.org/10.3855/jidc.18738>

Guo, Y. (2024). *Navigating the AI revolution in higher education: A call to action.*

HEPI. <https://www.hepi.ac.uk/2024/01/05/navigating-the-ai-revolution-in-higher-education-a-call-to-action/>

Henke, C. (2012). Methods and Techniques of Research and Academic Writing. In M.

Middeke, T. Müller, C. Wald, & H. Zapf (Eds.), *English and American Studies*

(pp. 499–507). J.B. Metzler. [http://link.springer.com/10.1007/978-3-476-](http://link.springer.com/10.1007/978-3-476-00406-2_38)

[00406-2\\_38](http://link.springer.com/10.1007/978-3-476-00406-2_38)

High-Level Expert Group on Artificial Intelligence. (2018). *A definition of AI.*

[https://ec.europa.eu/futurium/en/system/files/ged/ai\\_hleg\\_definition\\_of\\_ai\\_18\\_december\\_1.pdf](https://ec.europa.eu/futurium/en/system/files/ged/ai_hleg_definition_of_ai_18_december_1.pdf)

History.com Editors. *Deep Blue defeats Garry Kasparov in chess match*. (2021).

History. <https://www.history.com/this-day-in-history/deep-blue-defeats-garry-kasparov-in-chess-match>

Hosseini, M., Rasmussen, L., & Resnik, D. (2023). *Using AI to write scholarly publications*.

<https://www.tandfonline.com/doi/epdf/10.1080/08989621.2023.2168535?needAccess=true>

Hwang, S. I., Lim, J. S., Lee, R. W., Matsui, Y., Iguchi, T., Hiraki, T., & Ahn, H.

(2023). Is ChatGPT a “Fire of Prometheus” for Non-Native English-Speaking Researchers in Academic Writing? *Korean Journal of Radiology*, 24(10), 952. <https://doi.org/10.3348/kjr.2023.0773>

Hyland, K. (2002). Authority and invisibility- authorial identity in academic writing.

*Journal of Pragmatics*, 34(8), 1091–1112.

Hyland, K. (2012). Welcome to the machine: Thoughts on writing for publication.

*Journal of Second Language Teaching and Research*, 1(1), 58–68.

IBM. (n.d.). *What Is Natural Language Processing? | IBM*. Retrieved 12 April 2024,

from <https://www.ibm.com/topics/natural-language-processing>

Khalifa, M., & Albadawy, M. (2024). Using Artificial Intelligence in academic

writing and research: An essential productivity tool. *Computer Methods and Programs in Biomedicine Update*, 5, 100–145.

<https://doi.org/10.1016/j.cmpbup.2024.100145>

Khalil, M., & Er, E. (2023). *Will ChatGPT get you caught? Rethinking of Plagiarism Detection* (arXiv:2302.04335). arXiv.

<https://doi.org/10.48550/arXiv.2302.04335>

Labaree, R. V. (n.d.). *Research Guides: Organizing Your Social Sciences Research Paper: Academic Writing Style* [Research Guide]. Retrieved 15 February 2024, from <https://libguides.usc.edu/writingguide/academicwriting>

Lee, J. Y. (2023). Can an Artificial Intelligence chatbot be the author of a scholarly article? *Journal of Educational Evaluation for Health Professions*, 20, 6.

<https://doi.org/10.3352/jeehp.2023.20.6>

Lee, M., Liang, P., & Yang, Q. (2022). CoAuthor: Designing a Human-AI Collaborative Writing Dataset for Exploring Language Model Capabilities. *CHI Conference on Human Factors in Computing Systems*, 1–19.

<https://doi.org/10.1145/3491102.3502030>

Liang, W., Yuksekgonul, M., Mao, Y., Wu, E., & Zou, J. (2023). *GPT detectors are biased against non-native English writers* (arXiv:2304.02819). arXiv.

<http://arxiv.org/abs/2304.02819>

Lin, Z. (in press). Techniques for supercharging academic writing with generative AI. *Nature Biomedical Engineering*.

<https://arxiv.org/ftp/arxiv/papers/2310/2310.17143.pdf>

Livberber, T., & Ayvaz, S. (2023). The impact of Artificial Intelligence in academia: Views of Turkish academics on ChatGPT. *Heliyon*, 9 (9).

<https://doi.org/10.1016/j.heliyon.2023.e19688>

Codecademy. *LLM Data Security Best Practices*. (n.d.).

<https://www.codecademy.com/article/llm-data-security-best-practices>

Macintyre, R. (2017). The Use of Personal Pronouns in the Writing of Argumentative Essays by EFL Writers. *RELC Journal*, 50.

<https://doi.org/10.1177/0033688217730139>

Mainzer, K. (2020). *Artificial intelligence—When do machines take over?* Springer Berlin Heidelberg. <https://doi.org/10.1007/978-3-662-59717-0>

Malik, A. R., Yuni, P., Kusubakti, A., I Wayan, N., Sri, S., Arisa, D., & Marzuki. (2023). *Exploring Artificial Intelligence in Academic Essay: Higher Education Student's Perspective*. 5. <https://doi.org/10.1016/j.ijedro.2023.100296>

Merritt, R. (2022, March 25). *What Is a Transformer Model?* NVIDIA Blog.

<https://blogs.nvidia.com/blog/what-is-a-transformer-model/>

McCarthy, J., Minsky, M. L., Rochester, N., & Shannon, C. E. (1955). A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence. *AI Magazine*, 27(4), 12. <https://doi.org/10.1609/aimag.v27i4.1904>

Mohammad Karimi, E. (2023). Teachers' reflections on academic dishonesty in EFL students' writings in the era of Artificial Intelligence. *Journal of Applied Learning and Teaching*, 6(2), Article 2.

<https://doi.org/10.37074/jalt.2023.6.2.10>

Mudaliar, A. (2024a). ChatGPT Accused of Privacy Violations by Italian Watchdog.

*Spiceworks Inc.* [https://www.spiceworks.com/tech/artificial-](https://www.spiceworks.com/tech/artificial-intelligence/news/chatgpt-accused-of-privacy-violations-italian-watchdog/)

[intelligence/news/chatgpt-accused-of-privacy-violations-italian-watchdog/](https://www.spiceworks.com/tech/artificial-intelligence/news/chatgpt-accused-of-privacy-violations-italian-watchdog/)

Mudaliar, A. (2024b). ChatGPT Leaks Sensitive Data—Spiceworks. *Spiceworks Inc.*

<https://www.spiceworks.com/tech/artificial-intelligence/news/chatgpt-leaks->

sensitive-user-data-openai-suspects-hack/

Narayanaswamy, C. S. (2023). Can We Write a Research Paper Using Artificial Intelligence? *Journal of Oral and Maxillofacial Surgery*, 81(5), 524–526.

<https://doi.org/10.1016/j.joms.2023.01.011>

Oshima, A., & Hogue, A. (2007). *Introduction to Academic Writing* (3rd ed.). Pearson Education.

*Plagiarism* / *University of Oxford*. (n.d.). Retrieved 17 February 2024, from

<https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism>

*Quoting, Paraphrasing, & Summarizing* / *UAGC Writing Center*. (n.d.). University of Arizona. Retrieved 5 June 2024, from [https://writingcenter.uagc.edu/quoting-](https://writingcenter.uagc.edu/quoting-paraphrasing-summarizing)

[paraphrasing-summarizing](https://writingcenter.uagc.edu/quoting-paraphrasing-summarizing)

Sadasivan, V. S., Kumar, A., Balasubramanian, S., Wang, W., & Feizi, S. (2024). *Can AI-Generated Text be Reliably Detected?* (arXiv:2303.11156). arXiv.

<https://doi.org/10.48550/arXiv.2303.11156>

Salcido, N. (2024). *Arizona State University collaboration with OpenAI charts the future of AI in higher education. Media Relations and Strategic*

*Communications*. [https://newsroom.asu.edu/press-release/arizona-state-](https://newsroom.asu.edu/press-release/arizona-state-university-collaboration-openai-charts-future-ai-higher-education)

[university-collaboration-openai-charts-future-ai-higher-education](https://newsroom.asu.edu/press-release/arizona-state-university-collaboration-openai-charts-future-ai-higher-education)

Shaw, C. (2013). Hundreds of open access journals accept fake science paper. *The*

*Guardian*. [https://www.theguardian.com/higher-education-](https://www.theguardian.com/higher-education-network/2013/oct/04/open-access-journals-fake-paper)

[network/2013/oct/04/open-access-journals-fake-paper](https://www.theguardian.com/higher-education-network/2013/oct/04/open-access-journals-fake-paper)

Shoja, M. M., Ridder, J. M. M. V. de, Rajput, V., Shoja, M. M., Ridder, J. M. M. V. de, & Rajput, V. (2023). The Emerging Role of Generative Artificial

Intelligence in Medical Education, Research, and Practice. *Cureus*, 15(6).

<https://doi.org/10.7759/cureus.40883>

The Learning Center. *10 Features of Academic Writing Style*. (n.d.).

[https://www.jcu.edu.au/\\_data/assets/pdf\\_file/0009/992628/10-Features-of-Academic-Writing-Style.pdf](https://www.jcu.edu.au/_data/assets/pdf_file/0009/992628/10-Features-of-Academic-Writing-Style.pdf)

The Writing Center. *Hedges: Softening Claims in Academic Writing*. (2020).

<https://writingcenter.gmu.edu/writing-resources/research-based-writing/hedges-softening-claims-in-academic-writing>

Theodorou, M. (2022, August 29). *Academic Writing Strategies: Our Top 10 Tips*.

<https://www.careeraddict.com/strategies-academic-writing>

Turing, A. (n.d.). *Computing Machinery and Intelligence* (Vol. 59). Mind.

University of Luxembourg. (2023). *Academic skills & learning resources handouts*.

University of Luxembourg.

[https://www.uni.lu/wpcontent/uploads/sites/9/2023/07/Academicskills\\_Plagiari smguide\\_v.2\\_EN.pdf](https://www.uni.lu/wpcontent/uploads/sites/9/2023/07/Academicskills_Plagiari smguide_v.2_EN.pdf)

University of Technology Sydney. *How to write in an academic style*. (2021).

<https://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-language/how-write-academic-style>

University of North Carolina Writing Center. (2023). Generative AI in academic

writing. *Generative AI in Academic Writing*. <https://writingcenter.unc.edu/tips-and-tools/generative-ai-in-academic-writing/>

Vetter, M. A., Lucia, B., Jiang, J., & Othman, M. (2024). Towards a framework for local interrogation of AI ethics: A case study on text generators, academic

integrity, and composing with ChatGPT. *Computers and Composition*, 71, 102831.

<https://doi.org/10.1016/j.compcom.2024.102831>

*What is a large language model (LLM)?* (n.d.). Cloudflare. Retrieved 14 April 2024,

from <https://www.cloudflare.com/learning/ai/what-is-large-language-model/>

Young, L. (2023). *2024: AI Revolution in Higher Education*. Berwick Partners (an

Odgers Berndtson Company). [https://berwickpartners.co.uk/insights/2024-ai-](https://berwickpartners.co.uk/insights/2024-ai-revolution-in-higher-education/)

[revolution-in-higher-education/](https://berwickpartners.co.uk/insights/2024-ai-revolution-in-higher-education/)

Yin, Robert K. (2003). *Case Study Research: Design and Methods*.

Zendy. *Ethical Considerations in Academic Research—Zendy*. (2023).

[https://zendy.io/blog/dissecting-the-key-ethical-considerations-in-academic-](https://zendy.io/blog/dissecting-the-key-ethical-considerations-in-academic-research)

[research](https://zendy.io/blog/dissecting-the-key-ethical-considerations-in-academic-research)

# **Appendices**

## Appendix A: Tlemcen Science PhD Students' Questionnaire (English version)

### The Impact of AI on Academic Writing: Case of Doctoral Science students of Tlemcen

Dear student,

Thank you for participating in this study. This questionnaire is designated to doctoral students of Tlemcen with the aim of gathering information about how the use of Artificial Intelligence (AI) impacts their English academic writing. You are kindly invited to answer the following questions which will remain anonymous and confidential.

#### Section one: Respondent's profile

- 1- Gender: Male  Female
- 2- Age: \_\_\_\_\_
- 3- Field of study: \_\_\_\_\_
- 4- Doctoral year: 1<sup>st</sup> year  2<sup>nd</sup> year  3<sup>rd</sup> year  4<sup>th</sup> year

#### Section two: Students' background information about Artificial Intelligence

- 5- Do you think AI is helpful for your academic writing?  
Yes  No
- 6- If yes, then why?
- 7- How much do you know the available AI tools?  
No knowledge  Moderate knowledge  Strong knowledge
- 8- What AI tools do you use?  
ChatGPT  Copilot  Poe  Elicit  Quillbot  Google Translate   
Paper digest  Other
- 9- How often do you use AI tools?  
Never  Rarely  Occasionally  Often  Always
- 10- What is/are the purpose(s) behind your use of AI?
- 11- Did you face any issues when using an AI tool?

Yes  No

12- If yes, what were they?

Section three: Ethical considerations

13- Do you think the use of AI causes concern about ethical matters?

Yes  No

14- If yes, then why?

15- How confident are you in your ability to critically evaluate and incorporate AI-generated suggestions into your academic writing?

Very confident  Confident  Neutral  Somehow confident  Not confident

16- Do you think that AI-generated text should be attributed?

Yes  No

17- If yes, then why?

18- If not, then why?

19- Do you think universities should provide clear ethical guidelines for the integration of AI tools in academic writing?

Yes  No

20- If yes, then how?

21- Which ethical considerations do you believe are most significant when using AI in academic writing?

Thank you for your time and participation.

## Appendix B: Tlemcen Science PhD Students' Questionnaire (French version)

### Questionnaire

#### L'Impact de l'IA sur l'Écriture Académique : Cas des Étudiants en Sciences Doctorales de Tlemcen

Cher étudiant,

Merci de participer à cette étude. Ce questionnaire est destiné aux étudiants en doctorat de Tlemcen dans le but de collecter des informations sur l'impact de l'intelligence artificielle (IA) sur leur écriture académique en Anglais. Vous êtes cordialement invité à répondre aux questions suivantes, qui resteront anonymes et confidentielles.

#### Section 1: Profil du répondant

- 1- Sexe : Masculin  Féminin
- 2- Âge : \_\_\_\_\_
- 3- Domaine d'études : \_\_\_\_\_
- 4- Année doctorale : 1ère année  2ème année  3ème année  4ème année

#### Section 2: Informations de base des étudiants sur l'Intelligence Artificielle

- 5- Pensez-vous que l'IA est utile pour votre écriture académique ?  
Oui  Non
- 6- Si oui, pourquoi ?
- 7- Quelle est votre connaissance des outils d'IA disponibles ?  
Aucune connaissance  Connaissance modérée  Connaissance approfondie
- 8- Quels outils d'IA utilisez-vous ? ChatGPT  Copilot  Poe  Elicit   
Quillbot  Google Translate  Paper digest  Autre
- 9- À quelle fréquence utilisez-vous les outils d'IA ?  
Jamais  Rarement  Occasionnellement  Souvent  Toujours

- 10- Quel(s) est/sont le(s) but(s) de votre utilisation de l'IA ?
- 11- Avez-vous rencontré des problèmes en utilisant un outil d'IA ?  
Oui  Non
- 12- Si oui, quels étaient-ils ?

### Section 3: Considérations éthiques

- 13- Pensez-vous que l'utilisation de l'IA soulève des préoccupations éthiques ? Oui  
 Non
- 14- Si oui, pourquoi ?
- 15- Quelle est votre confiance dans votre capacité à évaluer de manière critique et à intégrer les suggestions générées par l'IA dans votre écriture académique?  
Très confiant  Confiant  Neutre  Peu confiant  Pas confiant
- 16- Pensez-vous que le texte généré par l'IA doit être attribué ?  
Oui  Non
- 17- Si oui, pourquoi ?
- 18- Si non, pourquoi ?
- 19- Pensez-vous que les universités devraient fournir des directives éthiques claires pour l'intégration des outils d'IA dans l'écriture académique ?  
Oui  Non
- 20- Si oui, comment ?
- 21- Quelles considérations éthiques vous semblent les plus importantes lors de l'utilisation de l'IA dans l'écriture académique ?

## **Appendix C: Interview for Teachers' Insights (English version)**

### **Interview**

#### Section one: Background Information

- 1- How long have you been teaching PhD students?

#### Section two: Supervisors' general observations

- 1- What are your general observations about the writing skills of PhD students?

#### Section three: Understanding Artificial Intelligence in academic writing

- 1- How familiar are you with Artificial Intelligence tools used in academic writing?
- 2- Have you observed PhD science students using AI tools for their writing tasks?
- 3- What are your thoughts on the potential benefits of AI tools in improving academic writing skills?

#### Section four: Ethical considerations

- 1- What ethical issues do you think may arise from the use of AI in academic writing?
- 2- How do you address these ethical concerns in your teaching or advising of PhD science students?

#### Section five: Future implications

- 1- How can educators and institutions prepare students to responsibly use AI tools in their academic work?

## **Appendix D: Interview for Teachers' Insights (French version)**

### **Interview**

#### Section 1 : Informations de base

- 1- Depuis combien de temps enseignez-vous aux étudiants en doctorat ?

#### Section 2 : Observations générales des encadrants

- 2- Quelles sont vos observations générales sur les compétences en écriture des étudiants en doctorat ?

#### Section 3 : Comprendre l'Intelligence Artificielle dans l'écriture académique

- 3- Quelle est votre familiarité avec les outils d'intelligence artificielle utilisés dans l'écriture académique ?
- 4- Avez-vous observé des étudiants en sciences de doctorat utilisant des outils d'IA pour leurs tâches d'écriture ?
- 5- Que pensez-vous des avantages potentiels des outils d'IA pour améliorer les compétences en écriture académique ?

#### Section 4 : Considérations éthiques

- 6- Quels problèmes éthiques pensez-vous pourraient surgir de l'utilisation de l'IA dans l'écriture académique ?
- 7- Comment abordez-vous ces préoccupations éthiques dans votre enseignement ou votre conseil auprès des étudiants en sciences de doctorat ?

#### Section 5 : Implications futures

- 8- Comment les éducateurs et les institutions peuvent-ils préparer les étudiants à utiliser de manière responsable les outils d'IA dans leur travail académique ?

## Summary

This research work is a description of the impact of Artificial Intelligence on Academic Writing in the case of PhD science students. Two objectives were set including identifying the potential benefits of Artificial Intelligence in the students' academic writing and the ethical issues that may arise. To attain these objectives, the researcher used a mixed-method approach that consisted of a questionnaire for students and a structured interview conducted with teachers. After analyzing the data, Artificial Intelligence proved to be helpful with grammar, spelling, accuracy, and methodology. Oppositely, it raised ethical concerns about unintentional plagiarism, unreliable data, inexistent resources, and lack of validity. These results were relied on to suggest recommendations that can address these issues.

**Keywords:** academic writing, Artificial Intelligence, academic ethics, science PhD students.

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## Résumé

Ce travail de recherche décrit l'impact de l'Intelligence Artificielle sur l'écriture académique dans le cas des étudiants en doctorat en sciences. Deux objectifs ont été fixés : identifier les bénéfices potentiels de l'Intelligence Artificielle dans l'écriture académique des étudiants et les problèmes éthiques qui peuvent en surgir. Pour atteindre ces objectifs, le chercheur a utilisé une approche de recherche à méthodes mixtes consistant en un questionnaire pour les étudiants et un entretien structuré avec les enseignants. Après analyse des données, l'Intelligence Artificielle s'est avérée utile pour la grammaire, l'orthographe, la précision et la méthodologie. En revanche, elle a soulevé des préoccupations éthiques concernant le plagiat involontaire, les données non fiables, les ressources inexistantes et le manque de validité. Ces résultats ont été utilisés pour formuler des recommandations visant à résoudre ces problèmes.

**Mots-clés :** écriture académique, Intelligence Artificielle, éthique académique, étudiants en doctorat en sciences.

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## ملخص

يصف هذا العمل البحثي تأثير الذكاء الاصطناعي على الكتابة الأكاديمية في حالة طلاب الدكتوراه في العلوم. تم تحديد هدفين: تحديد الفوائد المحتملة للذكاء الاصطناعي في الكتابة الأكاديمية للطلاب والمشاكل الأخلاقية التي قد تنشأ. لتحقيق هذه الأهداف، استخدم الباحث بحثاً مختلطاً الأساليب يتكون من استبيان للطلاب ومقابلة منظمة مع الأساتذة. بعد تحليل البيانات، تبين أن الذكاء الاصطناعي مفيد في النحو والإملاء والدقة والمنهجية. على العكس من ذلك، أثار مخاوف أخلاقية بشأن الانتحال غير المقصود، والبيانات غير الموثوقة، والمصادر غير الموجودة، ونقص المصداقية. تم الاعتماد على هذه النتائج لاقتراح توصيات يمكن أن تعالج هذه القضايا.

الكلمات المفتاحية: الكتابة الأكاديمية، الذكاء الاصطناعي، الأخلاقيات الأكاديمية، طلاب الدكتوراه في العلوم.

