

Artificial Intelligence and Scientific Research: Between Opportunities for Development and the Constraints of Ethical Responsibility

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Abstract:

Artificial intelligence has become a pivotal tool in contemporary scientific research, as it contributes to data analysis, accelerates knowledge acquisition, and supports scientific decision-making while preserving the researcher's creative role.

This study aims to explore how artificial intelligence technologies can be employed to advance scientific research without compromising ethical and legal standards. Practical applications were presented, such as the Typeset.io program and the University of Oxford course for developing academic writing skills, which demonstrated improvement in research and writing skills when artificial intelligence was integrated within clear ethical frameworks.

The findings indicate that the prudent and balanced use of artificial intelligence enhances the quality of scientific research and develops researchers' skills without replacing human creative thinking, while emphasizing the need to establish clear regulatory frameworks and train researchers in responsible use to ensure the production of reliable and sustainable scientific knowledge.

Keywords: Artificial Intelligence; Scientific Research ; Scientific Ethics ; Research Quality; Practical Applications.

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INTRODUCTION

The contemporary world is undergoing rapid transformations imposed by the digital revolution and the immense development of information and communication technologies. The explosion of data and the growing expansion of computational capabilities have led to the emergence of artificial intelligence technologies as one of the most significant manifestations of scientific and technological transformation in the twenty-first century. Artificial intelligence is no longer merely a specialized technical field; rather, it has become a central tool that has reshaped methods of work and knowledge production across various sectors, foremost among them the field of scientific research.

Artificial intelligence refers to a set of computer systems capable of simulating certain human cognitive abilities, such as learning, analysis, inference, and decision-making, through data analysis and interaction with the surrounding environment with a degree of autonomy in order to achieve specific objectives. These technologies have contributed to reducing research time, facilitating access to knowledge, analyzing vast quantities of data, and supporting scientific forecasting and evidence-based decision-making, which has made them an active element in the development of contemporary research practice.

The importance of artificial intelligence is reflected in its ability to enhance researchers' efficiency, broaden the horizons of scientific collaboration, and accelerate discoveries in sensitive fields such as health, education, and the social sciences. However, this rapid development also raises fundamental questions concerning the limits of reliance on intelligent systems and the extent to which their use is compatible with the ethical and legal principles governing research work, especially in light of the risks of algorithmic bias, lack of transparency, and issues of scientific responsibility.

On this basis, the problem addressed by this article revolves around the following question:

Research Problem:

To what extent can artificial intelligence technologies be employed in scientific research in a way that achieves effective knowledge development

without compromising ethical and legal standards or diminishing the creative role of the researcher?

Hypothesis:

The study assumes that the prudent use of artificial intelligence, based on a conscious balance between human capabilities and the potential of intelligent systems within a clear ethical and legal framework, can contribute to the development of scientific research and enhance the quality of its outputs rather than replace the researcher's central role.

The importance of this study lies in highlighting the transformations brought about by artificial intelligence in research practice, analyzing its ethical and legal dimensions, and attempting to build a balanced conception of the relationship between the researcher and intelligent systems in a way that ensures the responsible and sustainable use of these technologies in the production of scientific knowledge.

Accordingly, all the issues raised above have been addressed through the following sections:

- Section One: Artificial Intelligence and Its Impact on Scientific Research.
- Section Two: Artificial Intelligence and the Ethics of Scientific Research.
- Section Three: The Limits of Cooperation Between the Researcher and Artificial Intelligence in Scientific Research.

1. Artificial Intelligence and Its Impact on Scientific Research

The rapid pace of technological development has led to the emergence of artificial intelligence as a modern tool that has contributed to bringing about a noticeable transformation in the field of scientific research. This requires a deeper understanding of the impact of artificial intelligence on scientific research and an examination of its importance, applications, and future prospects in this field.

1.1 The Importance of Artificial Intelligence in the Field of Scientific Research:

Scientific research, as it is commonly understood, consists of organized steps carried out by human beings using scientific research

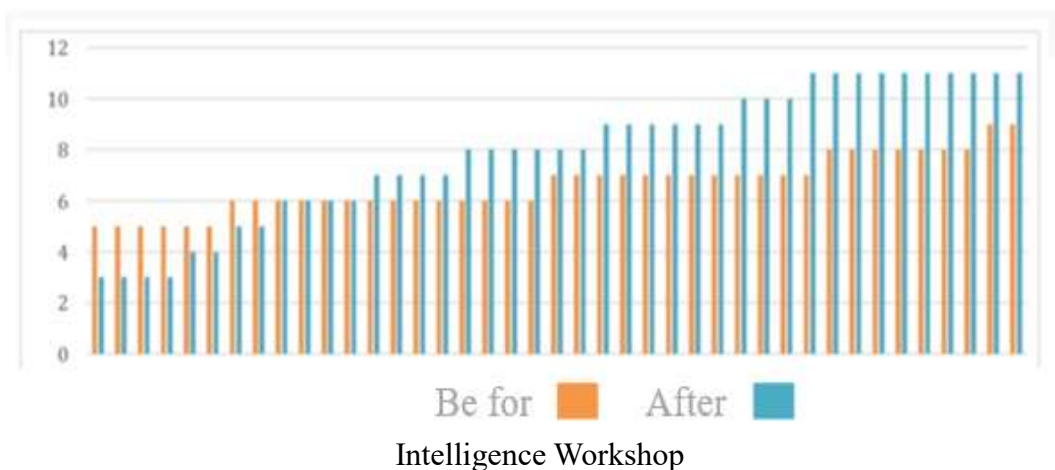
methods, based on the rules of the scientific method, in their effort to increase control over their environment, discover its phenomena, and seek to identify the relationships among these phenomena. There are many roles performed by artificial intelligence, which it provides in the form of tools that contribute to developing researchers' scientific research skills, while also contributing to the advancement of scientific research itself. From this perspective, many studies have called for identifying the role of artificial intelligence in supporting knowledge processes that, in turn, support the processes and methods of knowledge integration¹.

This was confirmed by a published study on the effectiveness of using artificial intelligence programs in developing scientific research skills, conducted by the researchers Shatha Omar Hassan Al-Rashidi and Lina Ahmed Al-Farrani from King Fahd bin Abdulaziz University. They carried out a field study on postgraduate students by measuring the success rate of the artificial intelligence program Typeset.io and the extent of its effectiveness in developing scientific research skills among this group of learners.

The study reached important findings confirming that this intelligent program actually helped develop the skills of postgraduate students, which in turn demonstrated the positive aspects of the impact of using artificial intelligence in assisting researchers in scientific research. The study also emphasized the need to move toward the use of artificial intelligence applications in scientific research because of the tools they provide, which facilitate the researcher's work and advance scientific research in general².

Figure (1) illustrates the researchers' experiment on a group of students in a workshop through which the study and the students' scores before and after using an artificial intelligence program were presented. The study found that the students' scores were lower before using the artificial intelligence program, and then increased after using the artificial intelligence program referred to in the study as Typeset.io.

Fig.1. Scores of the Research Participants Before and After the Artificial



Source: Shatha Omar Hassan Al-Rashidi and Lina Ahmed Al-Farrani, “The Effectiveness of Using the Artificial Intelligence Program TYPESET.IO in Developing Scientific Research Skills and the Attitudes of Postgraduate Students Toward It,” *Innovations Journal for Human and Social Studies*, Vol. 2, Special Issue, 2024, p. 15.

1.2 Leading Artificial Intelligence Applications in Scientific Research:

There are also some leading applications in scientific research that are based on artificial intelligence, including the following³:

- **Text analysis and automatic summarization:** Artificial intelligence is used to analyze large scientific texts and summarize them, which helps save time and effort.
- **Data mining:** Artificial intelligence helps extract patterns and trends from large datasets that are difficult to analyze manually, especially in fields such as molecular biology and the social sciences.
- **Automatic classification of scientific research:** Artificial intelligence is used to classify articles and scientific studies into specific fields based on their content.
- **Predicting future research trends:** Artificial intelligence algorithms are used to analyze databases of previous research in order to identify future trends in a particular field, such as biological sciences or physics.
- **Assisting researchers in scientific writing:** Artificial intelligence tools help in drafting research manuscripts or improving language and style, especially for researchers writing in a language other than their native one.

– **Accelerating scientific review processes:** Artificial intelligence systems make it possible to evaluate scientific research before it is submitted for publication by analyzing the quality of texts and the extent of their compliance with scientific standards.

From the above, it can be said that artificial intelligence has become a fundamental factor in contemporary scientific research because of its ability to bring about a qualitative leap in the tools and outcomes of scientific research. However, this process must observe ethical and legal boundaries in order to preserve the integrity of scientific research, protect researchers' rights from any infringement, and regulate practices in the academic field according to frameworks and laws that ensure the proper use of artificial intelligence technologies in scientific research.

1.3 Future Expectations for the Role of Artificial Intelligence in Scientific Research:

Experts expect that the role of artificial intelligence in scientific research will expand significantly in the future, reshape traditional research methods, and open new horizons for scientific innovation. Here, some future expectations for the role of artificial intelligence in scientific research will be presented⁴:

– **Accelerating major scientific discoveries:** It is expected that artificial intelligence technologies will help uncover unknown patterns and relationships in data that require deep analysis. These technologies may contribute to accelerating major discoveries in fields such as medicine, physics, and other sciences.

– **Automating research and laboratory experiments:** The future of artificial intelligence in research includes the automation of experimental processes entirely through intelligent robots supported by artificial intelligence. In scientific laboratories, robots will become capable of conducting routine laboratory experiments, analyzing results in real time, and dynamically adjusting experiments based on the results.

– **Data-driven scientific research based on big data:** With the increasing volume of data in all scientific disciplines, artificial intelligence will become an essential tool for dealing with big data. More advanced

algorithms are expected to be developed for analyzing big data, helping to discover complex relationships among variables that humans cannot easily detect.

– **Artificial intelligence as a tool for generating hypotheses:** The future of artificial intelligence in scientific research may include its ability to generate new research hypotheses. Artificial intelligence will be able to propose unfamiliar or unexpected research paths based on a comprehensive analysis of previous studies and current data. This will guide scientists and researchers toward exploring previously unknown areas or reconsidering old hypotheses through new research methods.

– **Improving collaborative and interactive research:** Artificial intelligence is expected to enhance collaboration among researchers around the world through research platforms based on artificial intelligence. Such systems can facilitate the exchange of data and ideas and provide recommendations based on the automatic analysis of joint research. Researchers will be able to collaborate across geographical borders, increasing the speed of scientific progress and making it easier for researchers and scientists to work on large research projects.

– Artificial intelligence technologies may function as an intelligent platform that provides researchers with recommendations regarding the best scientific papers or helps direct them toward new and promising research trends.

All these expectations regarding the role of artificial intelligence technologies in the field of scientific research, along with many other major expectations, indicate the coming of a scientific revolution in the future in the field of scientific research. They also point to the necessity of establishing a strategy to ensure that artificial intelligence technologies are directed in a way that prevents scientific bias as well as unethical conclusions in scientific research.

2. Artificial Intelligence and the Ethics of Scientific Research

Among the guidelines for using artificial intelligence technologies in scientific research is the recognition that they have legal and ethical limits

in their use, in order to protect the research community from methodological deviations and from any penalties or problems that may arise, especially in the field of scientific research and the ethics of scientific research in general.

2.1 The Legal and Ethical Limits of the Use of Artificial Intelligence in Scientific Research:

We will address both the legal limits and the ethical limits as follows:

2.1.1 The Legal Limits of the Use of Artificial Intelligence in Scientific Research:

Technological development, when not harmonized with the law, can create a gap between the theoretical and applied legal framework, resulting in the obstruction of technical progress and the emergence of harmful negative practices. Among the most important and successful practices that create harmony between them are the following: ⁵

- Enacting new laws to keep pace with technical development in the field of artificial intelligence without negatively affecting processes of development, research, and innovation. These rules should also emphasize the importance of observing ethical and legal controls in design and programming processes carried out by means of artificial intelligence or on behalf of a person so that it operates automatically, even if human review of the process by that person is absent at the time of its execution.
- Ensuring that regulation begins with relevant legislative frameworks and that those responsible are familiar with the laws and with the aspects of the technical process in general.
- Keeping legislation aligned with technical development so that they move side by side, instead of waiting for the outputs of the technical process and then becoming preoccupied with debating the application of legal rules to those outputs.

2.1.2 The Ethical Limits of the Use of Artificial Intelligence in Scientific Research:

The use of artificial intelligence tools and technologies in general must be based on a set of ethical principles and laws that define the broad limits for the various users of this intelligent revolution. Educational

institutions must also commit to the principles of the ethics and laws governing the use of artificial intelligence by carrying out a set of tasks⁶:

- Preparing, reviewing, and updating artificial intelligence ethics by working to revise ethical guidelines periodically or whenever necessary in order to address any changes or future developments.
- Establishing a plan that adopts artificial intelligence ethics by preparing plans that support quality through the ethics of artificial intelligence and by providing continuous guidance to the entities concerned within the scope of application in order to facilitate the adoption of these ethical principles.
- Providing advice on artificial intelligence ethics to support the entities included within the scope of application in complying with these principles and to answer any inquiries or consultations related to the ethics of artificial intelligence.

What can be said is that the use of artificial intelligence applications and technologies in educational institutions must have an ethical and legal foundation, with dimensions that are reflected in their internal environment and also in the external environment of these educational institutions. In this way, the fundamental objectives pursued by these institutions can be achieved.

2.2 The Role of Artificial Intelligence in Developing the Ethics of Scientific Research:

The subject of artificial intelligence is considered one of the most prominent areas of academic literature in the twenty-first century, due to the growing research interest in modern technologies and the spread of technology and innovation that accompany them. This has, in turn, led to the necessity of establishing ethical standards for scientific research in this field. Accordingly, companies specializing in the design of artificial intelligence technologies, such as Google, have begun to announce their policies and their commitment to all ethical standards, affirming that their artificial intelligence products must achieve the following ethical objectives⁷:

- To be beneficial to society.

- To be built and tested for safety.
- To be accountable to the people affected.
- To incorporate principles of privacy by design.
- To uphold high standards of scientific excellence.
- To ensure that the primary purpose and potential use of the technology and application are assessed in relation to the extent to which the solution may be linked to harmful use or adaptable to it.
- To consider nature and uniqueness, by determining whether the technological techniques provided are unique or generally available.
- To consider scope, by determining whether the use of this technology will have a significant or limited impact.
- To consider the nature of the implementing company's involvement, by examining whether the provided technology is intended for general purposes, whether it integrates tools for clients, or whether it develops customized solutions for specific cases.

The company also states that it will not participate in the implementation of programs and applications that involve the following ethical violations⁸:

- Technologies that cause, or are likely to cause, overall harm, which is referred to as a safety restriction. This means imposing safety constraints whenever there is a real or potential physical risk of harm; accordingly, such technologies will not be designed unless it is believed that the benefits substantially outweigh the risks.
- Weapons or other technologies whose primary purpose or implementation is to cause injury to persons or directly facilitate their injury.
- Technologies that collect or use information for surveillance in ways that violate internationally accepted standards.
- Technologies whose purpose conflicts with widely accepted principles of international law and human rights.

Accordingly, it can be concluded that artificial intelligence also has a role in developing the ethics of scientific research, and that the study of ethics is no longer merely a theoretical field. Rather, it has evolved into a practical and applied field that international institutions specializing in

artificial intelligence seek to promote, raise awareness about, and regard as a necessary charter governing the various technological services provided by those companies.

2.3 General Principles for the Use of Artificial Intelligence Technologies in Scientific Research:

There is a set of principles that should be taken into consideration regarding the use of artificial intelligence technologies in scientific research, and it is recommended that they be followed as follows⁹:

- **Justice and fairness:** All activities related to artificial intelligence in the field of scientific research must be fair and equitable and must not affect any users or other groups of users in different ways. Specialized experts from educational institutions should also participate in creating these activities, with their participation being direct in the processes of design, selection, and all decisions related to the production of artificial intelligence systems. Each stage of implementation should also be preceded by training activities.
- **Inclusiveness and non-bias:** Artificial intelligence systems must work in a way that enables everyone to use them, meaning that these systems should be accessible and understandable to all regardless of race, gender, religion, orientation, or cultural differences.
- **Transparency:** Users must know where and when artificial intelligence systems are being used and must understand what these systems do and how they do it. On the other hand, when artificial intelligence systems are used in making decisions that affect individuals' professions and lives, those affected must understand how these decisions are made and how artificial intelligence systems affect them specifically. In addition, artificial intelligence programs must be transparent, meaning that their processes, algorithms, and decision-making procedures should be understandable and interpretable to the greatest extent possible.
- **Accountability and responsibility:** Those who design and develop artificial intelligence systems must be responsible for how these systems operate. The owners of all processes involved in creating artificial

intelligence applications, the processes they support, the outcomes they produce, and the effects of those processes and outcomes on users and society must also be clearly identified. In addition, those responsible for these programs must bear responsibility for the behavior and impact of the artificial intelligence systems they create or deploy. This includes openness to criticism, addressing problems, and being accountable for any harm caused by this technology.

- **Privacy:** Respecting user privacy and protecting sensitive data is of utmost importance. Therefore, artificial intelligence systems must respect privacy, meaning that users should not be expected to share data about themselves or allow it to be collected unless they are assured that their privacy is protected. Users who have access to such data, or the right to use artificial intelligence systems containing that data, must also be trained in how to protect data privacy.

- **Reliability:** The operation of artificial intelligence systems must be trustworthy and must achieve the intended purposes. Accordingly, training related to artificial intelligence should demonstrate that these systems are designed to operate within a clearly defined set of information and that it is possible to verify that they behave as intended under actual operating conditions. Personnel must also be able to identify blind spots and biases in artificial intelligence systems, and they should therefore be trained on how to detect and correct any unintended behaviors that may arise.

- **Open collaboration:** Encouraging open collaboration and knowledge sharing within the artificial intelligence community embodies best practices, fosters a culture of sharing expertise, and contributes to finding solutions and treatments for ethical issues collectively. Therefore, artificial intelligence professionals should collaborate openly with experts, researchers, policymakers, and other stakeholders in order to develop and implement ethical artificial intelligence solutions.

In addition to these, there are many other principles, such as human-centered design, legal and regulatory compliance, impact assessment at various stages, and interpretability, among others.

3. The Limits of Cooperation between the Researcher and Artificial Intelligence in Scientific Research

With the growing expansion of the use of artificial intelligence technologies within the academic sphere, cooperation between the researcher and intelligent systems has become an established reality that imposes itself at various stages of scientific research. However, reliance on these systems raises questions about the limits of this cooperation and the extent of its impact on the independence of the researcher and on scientific research itself. From this emerges the need to define a balanced framework that ensures benefit from the capabilities of artificial intelligence while preserving the essential human element in the production of knowledge.

3.1 Balancing the Human Mind and Artificial Intelligence:

At times, the researcher overlooks the limits of artificial intelligence and deals with it in an unconsidered manner. This calls us to reflect on the nature of the dialectical relationship between the human being and the machine, in an attempt to draw boundaries that make it possible to establish a future in which the machine interacts with the human being in order to produce balanced scientific knowledge¹⁰.

The dialectical nature of the researcher's relationship with artificial intelligence lies in the continuous and increasing interaction between them. In this relationship, the original party is the human being, with creative capacities and original productions that constitute the training data for the algorithm and its fundamental inputs. Meanwhile, artificial intelligence models, with their enormous computational capacities, represent the other, derivative party. From their ongoing interaction there emerges a synthesis that transcends the limits of each of them. Just as the human being develops artificial intelligence, the latter reshapes the human being's understanding of self and capacity, creating a state of continuous and mutual growth that leads to new and advanced levels of awareness and ability¹¹.

The relationship between the researcher and artificial intelligence raises real problems concerning the boundaries of this interaction. The human being who interacts with intelligent systems does not always realize that he or she is the essential, original, and stronger party in this relationship,

nor does he or she treat artificial intelligence as a tool that sharpens abilities and creativity. Rather, it is sometimes treated as a convenient and rapid substitute that performs tasks on one's behalf. This leads to the human being's absolute dependence on the machine without questioning it, producing repetitive robotic outputs devoid of spirit and renewal, and filled instead with misinformation, repetition, and hallucination¹².

The concept of ethical artificial intelligence emerges from concerns generated by artificial intelligence systems based on machine learning that are supplied with distorted data, a matter that can lead to biased views and the spread of rumors, false news, prejudiced judgments, and erroneous decisions that affect our lives. In response to this negative situation, scientific institutions such as Stanford University and the Massachusetts Institute of Technology have established research centers for human-centered artificial intelligence, which values and takes into account human and ethical dimensions so that technology may reflect the depth of human intelligence and enhance human capacities rather than replace them. In other words, it should have a positive effect by addressing long-term goals, accelerating scientific discoveries, and supporting creativity and innovation while taking human values into consideration in software and applications¹³.

Stanford University offers examples of the intersection of different sciences with artificial intelligence, such as its intersection with neuroscience and the integration of the study of machine intelligence with research aimed at understanding the human self. It also works on employing ideas from artificial intelligence to create neural network models that make it possible to understand the human brain and human behavior, while using insights from neuroscience and cognitive science to improve the human capacity to solve problems in artificial intelligence. On the other hand, medical departments seek to use artificial intelligence to overcome the spread of misunderstanding and misinformation about diseases through the collaboration of artificial intelligence experts. Alongside them are other experts from diverse backgrounds such as psychology, social communication, pathology, medicine, and nursing, all working to provide a genuinely human-centered form of artificial intelligence, with the

expectation of expanding participation to include people who represent the real world in all its categories¹⁴.

3.2 Strategies for Balancing the Researcher and Artificial Intelligence:

In order to address the ethical issues related to responsibility in the use of artificial intelligence in scientific research, and to achieve a balance between human effort and artificial intelligence, the following strategies are proposed¹⁵:

- **Developing an ethical framework:** Academic institutions should establish a clear ethical framework regulating the use of artificial intelligence in research. This includes setting clear policies on how data are collected, protected, and used. It has become illogical to prohibit the use of artificial intelligence tools altogether, as this may push researchers to use them secretly. Therefore, the use of artificial intelligence tools should be incorporated, but in an organized manner.

- **Providing training and awareness opportunities for researchers regarding the ethics of using artificial intelligence:** Such training can help researchers identify potential ethical issues and deal with them effectively. Training should not be limited only to research ethics; it should also increase researchers' awareness of how to use artificial intelligence tools within the boundaries of ethical integrity.

- **Increasing research that highlights artificial intelligence and human intelligence:** Attention should be focused on the differences between them and on how to distinguish the way in which the research was produced.

- **Establishing committees to examine this issue:** Researchers should be required to provide an explanation of the role of artificial intelligence and the tools and methods they relied upon in completing the research in question. Usually, educational institutions focus their committees on the human aspect of the ethics of data collection and do not address the ethical aspect of using artificial intelligence tools in research procedures. Therefore, it is proposed that the scope of the work of research ethics committees be expanded to include the uses of artificial intelligence, or that special committees be established for this purpose.

It should be noted that caution must be exercised when using artificial intelligence tools in scientific research. Researchers should avoid excessive reliance on mathematical algorithms in their scientific studies and should focus more on reviewing results and evaluating them critically rather than accepting them as absolute facts. Accordingly, educational institutions should promote a culture of the optimal and responsible use of artificial intelligence tools through reliance on principles of use.

3.3 The University of Oxford Model for Integrating Artificial Intelligence into the Improvement of Academic Writing Skills:

In recent years, generative artificial intelligence tools have become widespread in universities, creating major opportunities to enhance research and academic writing skills while at the same time raising important ethical challenges. The experience of the University of Oxford in designing the course *AI for Academic Writing Skills* for students enrolled in master's programs in the medical sciences represents a practical model of how to achieve this balance between benefiting from artificial intelligence and preserving the ethical standards of scientific research. In its project, the University of Oxford developed a comprehensive half-day introductory course for new students, and the course included the following¹⁶:

- A preliminary assessment of the level of confidence in academic writing and in the use of artificial intelligence tools, which helps tailor the training according to students' needs.
- Interactive practical training through the integration of ChatGPT-4 within the university's virtual environment, Canvas, in order to ensure fair access for all students, while providing clear guidance on credibility, plagiarism, and information verification.
- Group activities involving the writing of an essay outline and a short introduction using artificial intelligence, followed by discussion of the results and review of potential problems such as errors or bias in the generated information.
- A post-training assessment, the results of which showed a significant improvement in students' confidence in academic writing, rising from 49 percent before the training to 85 percent afterward, as well as in their ability

to use artificial intelligence tools effectively and ethically, reaching 70 percent after the training, along with a reduction in anxiety about plagiarism and excessive dependence on the tool.

The study concluded with a set of recommendations as follows:

- Teaching students to use the tools critically by strengthening skills of evaluation and information verification and avoiding blind dependence on artificial intelligence.
- Providing clear ethical guidelines by specifying when and how the tools may be used and ensuring the student's intellectual contribution in all academic work.
- Maintaining a balance between technological benefit and academic integrity by using artificial intelligence as a supportive tool rather than as a substitute for personal thinking and analysis.
- Providing practical and interactive training through hands-on practice that increases students' confidence and reduces hesitation associated with ethical violation or fear of surveillance.

It can be said that the experience of the University of Oxford constitutes a clear model showing that scientific research can benefit from artificial intelligence tools in an ethical and effective manner if clear guiding frameworks, practical training, and continuous evaluation are established. This reinforces the idea that artificial intelligence is not a threat to academic standards, but rather a tool for strengthening them, provided that the fundamental values of scientific research are respected, such as integrity, transparency, and the researcher's genuine contribution.

CONCLUSION:

The study showed that the use of artificial intelligence in scientific research can achieve effective knowledge development when it is employed in a balanced and responsible manner, while respecting ethical and legal frameworks. It was emphasized that artificial intelligence does not replace the researcher; rather, it enhances the researcher's creative capacities and accelerates access to knowledge and the analysis of large datasets, which leads to improving the quality of scientific research and its outcomes.

The study also concluded with a set of recommendations:

- Adopting clear ethical and legal frameworks for the use of artificial intelligence in scientific research.
- Training researchers in the critical and responsible use of artificial intelligence tools.
- Encouraging cooperation between researchers and intelligent systems in order to enhance innovation while preserving academic integrity.
- Monitoring data and algorithmic bias to ensure reliable and transparent results.
- Integrating artificial intelligence as a supportive tool rather than a substitute for human thinking and analysis.

In conclusion, the prudent use of artificial intelligence opens new horizons for scientific research while preserving human values and academic standards. This makes the relationship between the researcher and artificial intelligence complementary, positively influencing the quality of scientific knowledge.

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