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Benefits and Ethical Implications of Using Generative AI in PhD Students' Research Activities

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Abstract. Higher education is going through a phase of constant transformation, especially in the use of generative AI by its students from the most varied study cycles. This has brought several benefits, but also ethical implications, particularly in research activities. Thus, with the development of the research we intend to obtain answers to the following research question: What are the benefits and ethical implications of using generative AI in the research activities of doctoral students? To answer this question, we conducted exploratory and descriptive research, as we explored the use of AI and described its impact on the research activities of doctoral students at a university in Mozambique. As a data collection tool, we applied a questionnaire survey to all the students in the two postgraduate courses at the respective university. A total of 117 students from both courses responded to the study, 61 of which were validated, which shows that the response rate was more than half, at 52.16% of the total sample. The results show that there are several benefits, but also ethical implications that must be considered in the research activities of doctoral students and which are crucial to guarantee the quality, transparency, and fairness of the teaching-learning process.

Keywords: Academic research · Artificial intelligence · Ethics · Higher education · Regulation

1 Introduction

The evolution of generative AI has changed the landscape in higher education, creating new opportunities for research, academic writing, and learning. The application raises central ethical questions, such as the originality of the content produced, the visibility of these tools, and the degree of critical thinking that students develop. The lack of concrete measures to address these issues can put academic integrity at risk, which makes an in-depth analysis of the ethical ramifications of AI in the university environment fundamental. This research seeks to understand these implications with a particular focus on the importance of the appropriate, controlled, and responsible use of AI in higher education.

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Specifically, the research aims to answer the following question: What are the benefits and ethical implications of using generative AI in the research activities of doctoral students? To answer this question, we conducted exploratory and descriptive research, exploring the use of AI and describing its impact on the research activities of doctoral students at a university in Mozambique.

This research is structured in five sections: In the introduction, we make a general approach to the study and a brief contextualization and we also identify some methodological aspects; In the literature section we present a discussion on the ethical implications surrounding the generative use of AI in teaching-learning processes; In the methodology section we present and characterize the main methodological options that allowed us to conduct the scientific work; In the results section we discuss the data obtained through the questionnaire survey applied to the students; Finally, in the conclusions section, we summarize the main findings of the study, highlighting their relevance and implications.

2 Ethical Implications of Using generative AI

Generative AI is increasingly in education by various actors (students, teachers, staff, and directors of educational institutions). Therefore, considering the importance of AI in education highlighted in the literature [1–7], it becomes evident that all educational actors must be prepared for the new era of the digital society we find ourselves in (Web 4.0).

At the moment, the greatest concern seems to lie with the use of generative AI by students, since there is emerging literature [8–11] that points to the misuse of these technologies by these actors, focusing more on the ethical aspects of their use.

There are several ethical implications of using generative AI in higher education, among which we highlight the following:

- Academic integrity: The use of ChatGPT can result in significant challenges to academic integrity, such as plagiarism and redefinition of authorship in academic work [12, 13]. It also [14] discusses the importance of emphasizing academic integrity and the risks of plagiarism associated with the use of tools such as ChatGPT. The literature highlights that ChatGPT can potentially facilitate plagiarism, fraud, and academic dishonesty among students, particularly in assessment practices [6, 15–17]. At the moment, there are already several concerns about the responsibility of authorship of scientific articles generated by AI [18]. So it will be essential to create clear policies on academic conduct and the use of advanced plagiarism detection software that can identify AI-generated texts [19];
- Assessment issues: The use of AI can negatively impact assessment methods, making it difficult to be accurate when measuring students' abilities, as algorithms can perpetuate existing biases [20, 21];
- Data protection: There are concerns regarding the security and privacy of student data, especially about the access and use of personal information by AI-based systems [21, 22]. It also [14] addresses concerns about privacy and responsibility in the use of AI, emphasizing the importance of protecting student data. Chatbots can involve handling sensitive student data, raising significant privacy-related challenges. The

need to follow data protection regulations is emphasized, as data should only be used for educational purposes and stored securely [19];
- Algorithmic bias: According to [19] chatbots that learn from diverse data can perpetuate social prejudices if there is no oversight. [23] Highlights events such as the UK's GCSE and A-Level grades controversy, where algorithms favored independent schools over state-funded schools;
- Expertise and authority: Generative AI models don't have the domain-specific knowledge that teachers and experts have. Relying on these models alone may not fully meet the expectations and needs of students seeking the expertise of highly qualified professionals [14];
- Misinformation: A risk associated with the use of ChatGPT is the generation of incorrect or misleading information, known as the "hallucination" problem. This can lead to an erosion of trust in the information presented in education [24, 25]. There is concern about the accuracy of the information generated, with the risk of teachers and students relying on falsified data [19]. [26] shows that a high percentage of references generated by chatbots can be inauthentic or inaccurate, bringing ethical risks to the use of AI-generated materials. Additionally, the potential misuse of ChatGPT for malicious purposes, such as generating fake and biased news and propaganda, is also a concern [6];
- Human-computer interaction: Excessive use of AI-generated content can result in addiction, undermining human interactions and the development of practical skills among students [27]. [19] Also considers that the excessive use of chatbots can impact autonomy and affect students' confidence, making them more dependent on AI. [18], in the same vein, is concerned about students' over-reliance on AI tools and the impact this has on learning and academic morale.

Considering the various implications that generative AI presents for the education system, its application must be ethical and balanced. An inadequate approach can undermine academic honesty, data privacy, and the overall learning experience. Therefore, laws, policies, and oversight systems must be implemented. On the other hand, if harnessed properly, AI can help improve educational processes by supporting teaching and personalizing learning. Therefore, the consideration of how education should be transformed rests on the willingness to adopt and integrate AI systems and tools, rather than presenting a negative aspect towards them.

3 Methodology

With the development of the research, we intend to obtain answers to the research question we initially formulated: What are the benefits and ethical implications of using generative AI in PhD students' research activities? To answer this question, we conducted exploratory and descriptive research, as we explored the use of AI and described its impact on the research activities of doctoral students at a university in Mozambique.

As a data collection tool, we administered a questionnaire survey to all the students in the two doctoral courses at the respective universities. The questionnaire has both closed-ended and open-ended questions, which shows that it is a mixed instrument (quantitative

and qualitative). The survey was administered using Google Forms, and the link was sent to all the doctoral students.

A total of 117 students from both courses responded to the survey, 61 of which were validated, which shows that the response rate was more than half, at 52.16% of the total sample.

The following table shows the relationship between the total number of individuals surveyed and the socio-economic variables (gender, age group, doctoral course, and year attended).

Table 1. Relationship between the total number of individuals surveyed and the socio-economic variables

Variables	n	%	Total n	Total %
Gender				
Male	52	85.20	61	100.00
Female	9	14.80		
Age group				
Under 25	0	0.00	61	100.00
25 to 29 years old	0	0.00		
30 to 34 years old	5	8.2		
35 to 39 years old	16	26.2		
40 years or older	40	65.6		
Doctoral course				
Doctoral course 1	28	45.9	61	100.00
Doctoral course 2	33	54.1		
Year attended				
1st year	20	32.8	61	100.00
2nd year	16	26.2		
3rd year	25	41.00		

As far as the analysis process is concerned, the quantitative data was analyzed using descriptive statistics (percentages) to identify trends and cross-reference independent variables with some of the most pertinent questions. For the qualitative data, a content analysis was carried out to identify patterns in the responses on challenges and ethics.

Regarding ethical issues, it should be noted that the research took into account the application of informed consent for participation in the study. The anonymity and confidentiality of the data were also guaranteed, as well as compliance with the institution's ethical guidelines.

In addition to applying the questionnaire survey to students, it should also be noted that a literature review was carried out on the ethical implications of the generative

use of AI in teaching and learning processes. The literature review was carried out using the following set of criteria (keywords): (i) Type of documents: scientific articles; (ii) Language: English; (iii) Keywords: "ethical implications of AI in higher education"; "challenges of AI in higher education"; "generative AI in scientific research"; "generative AI in academic activities" (iv) Bibliometric databases: Google Scholar, Scielo and B-on; (v) Period: last five years. Whenever duplicate articles were found, only one was considered and the other was excluded outright. In addition to formulating the review question and search criteria, the literature review took into account the selection and evaluation of studies, data extraction, and the analysis, interpretation, and presentation of the results.

4 Discussion of Results

In this section, we present and discuss the results of the questionnaire survey on the ethical and regulatory challenges related to the use of AI by PhD students in their research activities.

The results show the following regarding the level of familiarity with AI tools: 1.60% do not know anything; 8.20% acknowledge having advanced knowledge (ability to customize or develop solutions with AI); 39.30% acknowledge having basic knowledge (limited and casual use); and 50.80% assume they have intermediate knowledge (frequent and functional use). This means that practically all the respondents (98.40%) have knowledge of AI, and 59.00% even assume that they make frequent use of this type of tool in their research practices.

The students also assume that they regularly use AI tools in the context of their research, namely the following:

- ChatGPT or similar (e.g. Bing Chat, Claude): 83.60%;
- Data analysis software (e.g. SPSS, R with AI libraries, Python with packages such as Scikit-learn): 29.50%;
- Textual and grammatical revision tools (e.g. Grammarly, LanguageTool): 26.20%;
- Image or graphic generators (e.g. DALL-E, MidJourney, Canva with AI): 11.50%;
- Bibliographic review tools (e.g. Zotero, Mendeley with integrated AI): 45.90%;
- Virtual code assistants (e.g. Copilot, Tabnine): 16.40%.

This data confirms previous data on students' use of generative AI, as it appears that this type of tool is common and frequent. However, tools for generating images and graphics were less popular (11.50%), which may indicate that they are less applicable at the research level.

In the course of the study, it was possible to identify several benefits and ethical implications of using AI in the research activities of students in the two doctoral courses. It should be noted that these implications are studied together since, due to the amount of data obtained in the questionnaire, the sample is not large enough to study the two courses separately. The results will therefore be presented and discussed together to simplify the whole process and make the research easier to read and understand.

4.1 Ethical Implications

Since the research is particularly focused on the ethical implications of generative AI in the realization of students' investigative activities, below we will address some of these implications that we feel are important for the discussion.

Data generated by AI: 62.10% of students admit that they have already identified incorrect results generated by AI tools; 10.30% say they were unable to identify incorrect data in the various responses; 27.60% say they do not know whether the information produced is incorrect or not. These results mean that most students can distinguish reliable information from that which raises doubts, however, almost a third still do not know how to make this distinction, which leads us to reflect on the urgency of training students in the area of AI. The production of incorrect or misleading information is known as the "hallucination" problem. This can lead to an erosion of trust in the information presented in education [24, 25]. There is concern about the accuracy of the information generated, with the risk of teachers and students relying on falsified data [19]. It is, in fact, dangerous, at all levels, when content produced by AI tools is used without understanding whether or not it is reliable.

Regarding the use of AI, 24.10% believe that it should always be explicitly mentioned in academic publications; 44.80% believe that its use should only be highlighted in relevant cases; 24.10% disregard the option of making this reference as long as it does not affect the originality of the academic work; 6.90% of respondents say they have no opinion on the subject. This means that almost two-thirds of respondents believe that, at the very least, some type of reference should be made to the use of AI in academic work, which demonstrates students' willingness to use generative AI in their research activities. However, most respondents (55.20%) believe that the current regulations on the use of AI in their institution are not sufficient at all, which may reveal some concern on the part of students. It is important to note that 20.70% of respondents did not know how to answer, which demonstrates a lack of knowledge on the subject. The remaining respondents (24.10%) believe that there is sufficient regulation in the institution, so it will not be necessary to implement or create new standards to regulate AI in higher education.

Finally, most students (86.20%) believe that AI tools should offer greater transparency in how results are generated, which brings us to the importance of ensuring academic integrity. For example, the use of ChatGPT can result in significant challenges to academic integrity, such as plagiarism and redefinition of authorship in academic work [12, 13].

This issue brings us back to the reliability of information and the levels of trustworthiness that we also address in the literature, especially since relying solely on these models may not fully meet the expectations and needs of students who seek the expertise of highly qualified professionals [14].

In short, some ethical implications of using generative AI in the scientific context are evident, especially regarding the accuracy of information, transparency, and regulation. Although 62.10% of students identify errors in the results generated, 27.60% do not know how to evaluate them, highlighting the need for training, which points to the need for education in this area. In addition, 68.90% support mentioning the use of AI in publications, and 55.20% consider that current regulations in the institution are

currently insufficient to face this new era in education. The majority (86.20%) demand more transparency in the processes of generating results, reinforcing the importance of reliability and responsible use of AI in academic research.

4.2 Benefits

In addition to the ethical implications of using generative AI for research activities, respondents have identified some benefits that we feel are important to address.

Generative AI saves time in research activities: 51.70% consider that AI does save a lot of time in various activities; 41.40% consider that it saves some time; Only 6.90% consider that this type of technology does not save time in carrying out the various tasks. This data shows that the vast majority (93.10%) believe that AI saves time in carrying out various activities, which is why they use some of the tools identified above. This data seems to be in line with what is mentioned in the literature by [16, 24, 28], where one of the main benefits of generative AI is precisely the saving of time on routine tasks.

Activities benefiting from AI automation: > = 50.00%: Writing and proofreading (drafting articles and linguistic revision), bibliographic revision and organization (bibliographic revision, citation and summary of texts, automatic updating of bibliographies), information search (search for up-to-date information, search for references, bibliographic searches); Activities with intermediate benefit (30.00%–49.00%): Data analysis and interpretation (data analysis, support for decision-making, statistical analysis), consultation and hypothesis generation (consultation of hypotheses, generation of ideas), translation and adaptation of texts (translation of scientific documents and texts); Activities with the lowest perceived benefit (< 30.00%): Automation of operational tasks (repetitive tasks, structuring of papers, application of original references), applied research and innovation (research into feasibility models for the digital migration project), identification and attribution of authorship (identification of the author of a scientific work).

Based on the data presented, it is possible to conclude that generative AI has a significant impact on the development of investigative activities, especially in saving time and automating tasks. The most of respondents (93.10%) believe that AI contributes to carrying out activities more efficiently. This data reinforces the idea that AI is changing the way research is carried out, being especially useful in optimizing repetitive tasks and improving the quality and speed of scientific production.

5 Conclusions

The research results show that doctoral students' research activities must consider several benefits and ethical implications, which are crucial to guarantee the quality, transparency, and fairness of the teaching-learning process.

Ethical Implications
The ethical implications of using generative AI in students' research activities essentially involve the accuracy of information, transparency in the use of these tools, and the need for adequate regulation. The generation of incorrect data can compromise the reliability

of research work, making it essential that students develop skills to assess the reliability of information. Furthermore, there seems to be a debate in the scientific context about the obligation to mention the use of AI in academic productions, reflecting concerns about originality and scientific integrity. The lack of clear guidelines in institutions also raises several questions about the responsible use of technology, highlighting the need for more effective regulations and greater transparency in the processes of generating results.

Benefits

The use of generative AI in scientific research has several significant benefits, particularly in terms of saving time, with most students recognizing its usefulness in this respect. The areas most benefited seem to include writing and reviewing texts, bibliographic organization, and searching for information, reflecting the automation of tasks essential to the completion of the scientific production process. Data analysis, hypothesis creation, and translation also show significant gains, albeit on a smaller scale. However, the more operational tasks, such as structuring papers, applied research, and identifying authorship, have a more limited impact. These results show that AI is changing the way academic research is carried out, promoting greater efficiency and allowing researchers to focus on other things, such as more in-depth and innovative analysis.

Generative AI is indeed very interesting from the point of view of the potential it can offer students in the development of their investigative activities, however, it is also important to emphasize that the use of these tools must be done in a controlled manner, without dependence and always taking into account the confirmation of the information produced in it. Ethical issues are crucial to guaranteeing reliable, safe, and trustworthy research that is truly useful to the scientific community.

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