Investigating the Impact of Generative AI on Students and Educators: Evidence and Insights from the Literature

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ABSTRACT

Generative artificial intelligence (AI) has become one of the main concerns of knowledge workers due to its ability to mimic realistic human reasoning and creativity. However, this integration raises critical concerns about trust and ethics, which are crucial in shaping both the acceptance and effective utilisation of these technologies. There are many reports, articles and papers currently exploring the opportunities and challenges of LLMs in higher education from the perspective of students and educators. However, these papers often focus on specific contexts like in the UK, US or a particular institutions. In this paper, we examine the problems of generative AI in higher education from educator and student perspectives using scientometrics and text analysis to provide an overview of the research landscape, followed by a narrative review and thematic analysis of selected literature. Some findings of this work are: (1) Students and educators found different ways to use generative AI. Students focus more on using it as an assistant (revising and preparing for lectures, helping with homework) and educators as a content production assistant (writing lecture notes, personalising content). Commonalities are that both students and educators use generative AI as an accessibility aid, e.g., to rephrase sentences or explain concepts. (2) The main concerns of higher education regarding generative AI are equity in access, clarity of rules regarding usage, and job displacement.

CCS CONCEPTS

• **Applied computing** → **Education**; • **Computing methodologies** → **Natural language generation**.

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1 INTRODUCTION

Generative AI has become one of the main concerns of knowledge workers due to its ability to mimic realistic human reasoning and creativity. Higher education is one of the fields that has a lot to lose by ignoring those tools, due to its reliance on written work (in the form of essays and other take-home coursework) to assess students' mastery of specific learning outcomes. However, this integration raises critical concerns about trust and ethics, which are crucial in shaping both the acceptance and effective utilisation of these technologies. Although generative AI promises enhanced educational experiences through personalised and dynamic content generation, its burgeoning use in computer science classrooms requires a comprehensive understanding of the trustworthiness of these tools and the ethical implications they pose. It cannot be detected [5] and can pass exams [19, 20]; therefore, we need to figure out how it should be used to make our lives easier rather than harder.

The key findings of this work are: (1) Students and educators found different ways to use generative AI. Students focus more on using it as an assistant (revising and preparing for lectures, helping with homework), and educators as a content production assistant (writing lecture notes, personalising content). Commonalities are that both students and educators use generative AI as an accessibility aid, e.g., to rephrase sentences or explain concepts. (2) The main concerns of higher education regarding generative AI are equity in access, clarity of rules regarding usage, and job displacement/reasonable use (generative AI used as an aid/enhancer, not as a replacement).

2 RESEARCH OBJECTIVES

We aim to use the literature to appreciate the problems of the use of generative AI in higher education, more specifically across the axis of current use and current perspectives from the educator and the student perspective. Our research questions are as follows.

RQ1 How have students and educators been using generative AI?
RQ2 What are the main concerns and challenges that have been identified in the use of generative AI in higher education?

3 RELATED WORKS

Generative AI uses machine learning models to produce content that can be educational [17]. It can generate images using tools such as DALL-E and Midjourney [10], and produce text through platforms such as ChatGPT, Claude, and Llama2 [9]. Large language models are a type of generative AI technology, mostly based on the transformer neural architecture [21], used for complex natural language understanding and generation.

Historically, attempts to integrate AI and education have focused on content development (e.g., generation), content deployment (e.g., personalisation, accessibility) and content integration (e.g., gamification, grading) [23]. Generative AI has seen similar efforts, leading to much discussion about the disruption it brings to higher education [2, 15]. Notable uses of generative AI, and more

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specifically large language models, in education include quiz generation [6, 14, 18, 22], content simplification [7, 12], or even the simulation of teaching assistants to lend a more direct helping hand in the education of students [16].

4 METHODOLOGY

We employ a two-pronged approach to our analysis, using the tools of computational analysis of text inspired by the field of scientometrics to obtain an overview of the field, before producing a lightweight narrative review and thematic analysis to dig further into a smaller literature of interest, determined from our first analysis.

Computational. Computational analysis, a quantitative approach to studying research trends, can be applied to map the research landscape [11]. By computationally processing publications, we can identify patterns in sentiment [4] and uncover dominant topics [1].

Qualitative. A narrative review [8] of key publications in the field, guided by a lightweight thematic analysis approach [3], can reveal recurring themes and synthesise insights, offering a comprehensive understanding of the current state and trajectory of research. This approach provides a flexible framework for exploring a broad range of topics, from theoretical foundations to practical applications, uncovering patterns and connections that may not be immediately apparent.

5 INITIAL ANALYSIS

The initial step of our analysis can be seen in Figure 1. Using a set of queries, we observe 184 records of interest. Our subsequent filtering stages allow us to exclude most of them, allowing us to keep a smaller set of 40 research articles.

To allow us to gain insight into the main topics of the literature, we use a sentiment analysis model to produce a word cloud (illustrated in Figure 3) in which words are coloured based on the average sentiment of their context sentences. This shows us that ChatGPT is the main large language model of concern in those articles and that most of the literature in this corpus remains positive to neutral. Other words of interest are student and learning, showing the focus on those papers on the student experience rather than on the technology itself.

The word co-occurrence graph illustrated in Figure 2 reveals three distinct clusters of discourse within the analysed literature, highlighting key areas of focus and concern in the integration of generative AI in higher education. The green cluster, primarily focused on information literacy and AI acceptance, suggests a growing recognition of the need to equip students with the skills to navigate and critically evaluate AI-generated information. This aligns with the increasing use of AI tools by both students and educators for tasks such as research, writing, and content creation, as revealed in the literature addressing RQ1.

The blue cluster, highlighting the challenges around authorship and potential benefits, reflects the ongoing debate surrounding the ethical implications of AI in academic settings, particularly on issues of plagiarism and academic integrity. This directly addresses RQ2, highlighting the need for clear guidelines and policies regarding the appropriate use of AI in academic work.

Finally, the red cluster, centred on assessment design, indicates a growing awareness of the need to adapt assessment practices in light of AI's potential to automate tasks and generate content, posing challenges to traditional methods of evaluating student learning. This resonates with the concerns raised in the literature about the impact of AI on assessment validity and reliability, further emphasising the need for new assessment strategies that can effectively measure student learning in the context of easy-to-access AI.

6 FINDINGS FROM THE NARRATIVE REVIEW

Focusing on articles that contain a form of empirical evaluation, we reject 21 articles and reduce the size of our dataset from 40 to 19, to be analysed in our narrative review (as shown in Figure 4). We focus on educators' and students' perspectives on the use and challenges of generative AI. Each item is annotated with the number of articles that discuss them.

6.1 From the educator perspective

From the perspective of educators, the potential of generative AI to personalise education was a recurring theme, with five articles highlighting its ability to tailor feedback, learning experiences, and assistance to individual student needs. This personalisation could lead to more effective and engaging educational experiences. Four articles emphasised the growing importance of AI literacy and ethics in education. Preparing students for responsible AI use, including understanding its ethical implications and risks, is seen as crucial in an increasingly AI-driven world. Similarly, four articles discussed the need for ethical lesson design, calling for a balanced and reasoned approach to incorporating AI into teaching practices.

The potential of Generative AI as a creative educational tool was also noted, with three articles highlighting its ability to generate educational content and support innovative teaching methods. However, this potential was accompanied by a call from three articles for a renewed focus on critical thinking and holistic competencies in education, to ensure that students develop skills that complement AI capabilities. Two articles addressed the need to prepare students for the AI-driven workplace, reflecting a forward-looking approach to education that anticipates the evolving demands of future careers. Furthermore, two articles raised concerns about transparency in the use of AI in education, advocating for clarity and openness with respect to its role.

One article highlighted concerns about fairness and equity, warning that AI could inadvertently create unfair advantages for some students. Another article discussed the perceived inevitability of AI integration in education, underscoring the need to address its potential impact on social consciousness and responsibility. These concerns highlight the ethical considerations that must accompany the increasing use of AI in education.

6.2 From the student perspective

Students overwhelmingly expressed a keen interest in the integration and application of AI in education, with seven articles focusing on this topic. Four articles specifically questioned how to ethically and effectively incorporate AI into future practice, while five stressed the importance of a balanced and reasoned integration.

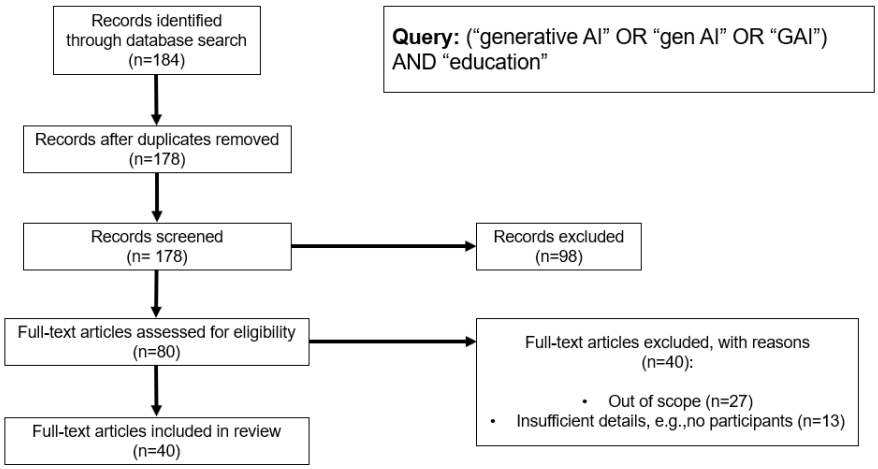

Figure 1: Literature search process

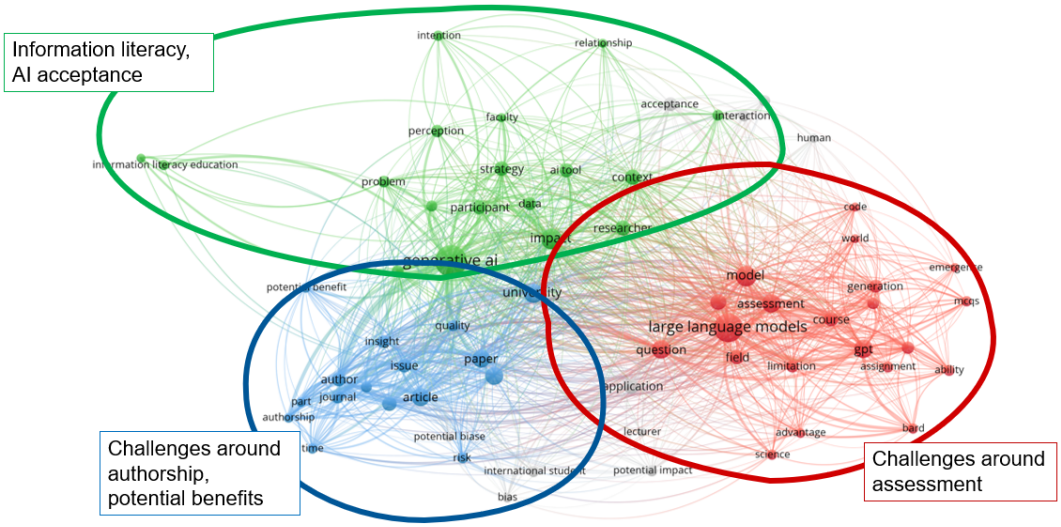

Figure 2: Co-occurrence graphs of key words in abstracts

This interest extended to practical applications, with two articles exploring AI's use in class preparation, homework, and projects.

Ethical and equity concerns were also prominent, being featured in five articles. These concerns ranged from the potential for chatbot language understanding to create inequities to the importance of understanding AI's ethical challenges. Two articles also expressed doubts about the accuracy of AI-generated learning materials, highlighting a need for caution and critical evaluation. Five articles discussed AI literacy and competency development, reflecting a student's desire to navigate the AI landscape effectively. This included a deeper understanding of academic integrity in relation to AI, cultivating critical thinking skills, and addressing concerns about possible job displacement due to AI advancements.

Confidence in technology emerged as a key factor for the acceptance and effective use of AI, discussed in three articles. This suggests that building trust in AI systems is essential for successful integration into education. Two articles highlighted concerns about content quality and misinformation, revealing that a significant proportion of students struggle to identify factual errors in AI-generated content. This underscores the importance of developing critical evaluation skills in conjunction with AI literacy.

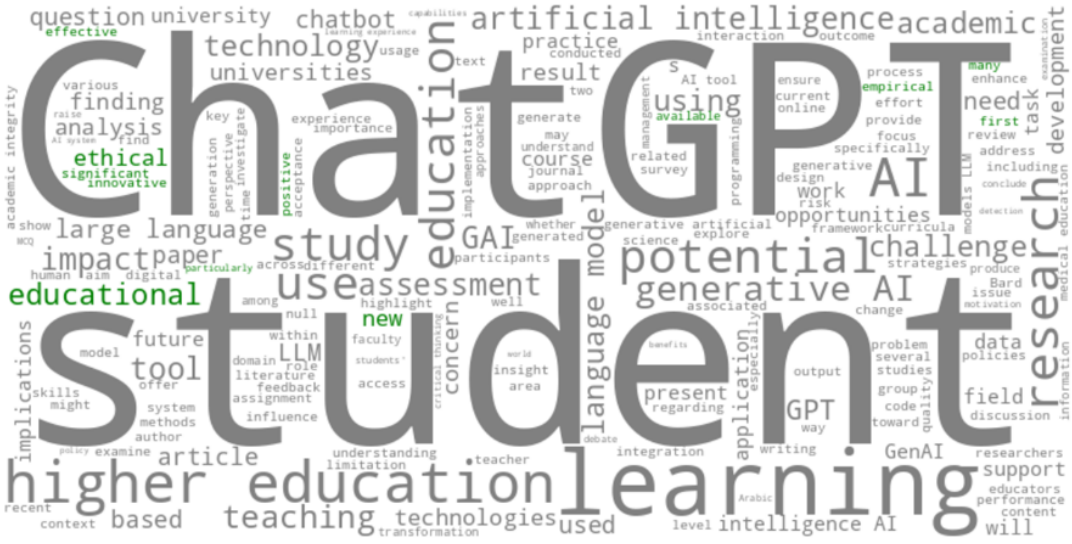

Figure 3: Word cloud of relevant words in abstracts. In green are words present in positive sentences, in red are words present in negative sentences, in gray are words present in mostly neutral sentences.

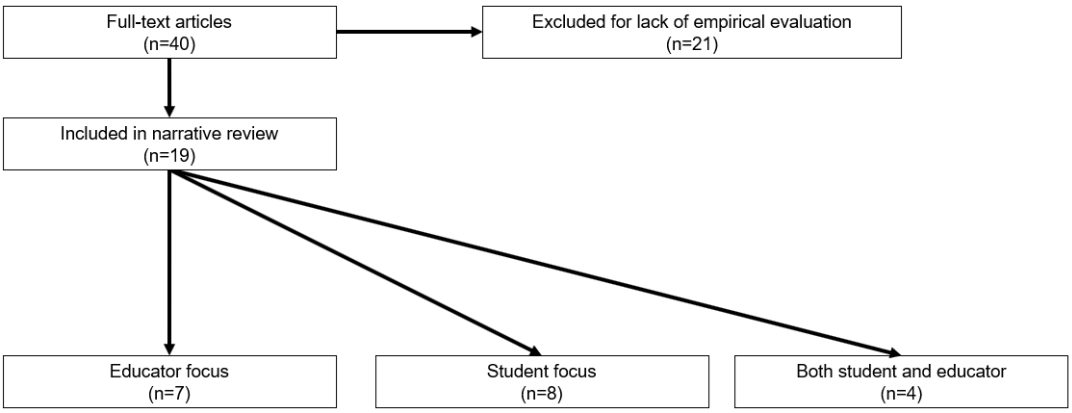

Figure 4: Literature search process

Finally, two articles explored AI's potential to personalise and assist learning, with one focusing on its ability to improve information access and the other on its potential to tailor education to individual needs. This demonstrates a recognition of AI's potential benefits, but also a need for further exploration and understanding of its practical implications.

6.3 Synthesis

We use SWOT analysis to capture the diverse impact of generative AI in higher education and also identify key trends, potential challenges and areas that need further research. The SWOT analysis below presents a holistic view of the current research landscape in the use of generative AI in higher education.

Strengths.

- Personalised feedback, learning, and assistance.
- Complementary role of AI in education.
- Use of AI for the generation of educational content.
- Improving information access.

Weaknesses.

- Potential for AI to create unfair advantages (inequality of access).
- Doubts about the accuracy of AI-generated content.
- Ethical challenges of using AI.
- Students struggle to spot factual errors in AI-generated content.

Opportunities.

- Teaching AI literacy and ethics.
- Teaching emphasis on critical thinking.
- Preparation of students for AI-driven workplaces.
- Transparency in AI's role in the design of teaching content.

- Balanced AI integration in learning activities.
- Use of AI for educational tasks

Threats.

- Concerns around job displacement.
- Overreliance on AI (deskilling).

Although both educators and students expressed a keen interest in the integration of AI into education, their specific concerns and priorities differed. Educators focused primarily on the ethical implications and practical applications of AI, emphasising the need for responsible implementation and pedagogical strategies. They were concerned with AI literacy, ethical lesson design, and preparing students for an AI-driven workplace. Additionally, educators recognised AI's potential for personalisation and content generation, viewing it as a tool to enhance teaching and learning.

In contrast, the students showed a more immediate interest in the practical applications of AI in their learning journey. They questioned how to ethically and effectively use AI in their studies, expressing curiosity about its role in tasks such as class preparation and homework. Concerns about equity and ethics were also prevalent, and students questioned the potential biases of AI-generated content and the need for transparency in its use. The students also expressed a desire to develop AI literacy and critical thinking skills to navigate an increasingly AI-infused world.

Both groups recognised the potential benefits of AI in education, such as personalisation and improved learning experiences. While they both appreciate the LLM technology, educators tended to focus on the broader implications and pedagogical strategies, whereas students were more concerned with the practical applications and ethical considerations that directly impact their learning. This contrast highlights the importance of considering both perspectives in developing effective and ethical AI integration strategies in education.

6.3.1 From the perspective of the revised Bloom taxonomy. An analysis of the literature through the lens of the revised Bloom Taxonomy [13] reveals a nuanced perspective on the role of AI in education. At the lower levels of the taxonomy (recalling and understanding), AI is viewed as a valuable tool for personalised learning and assistance, supporting students in recalling and comprehending information.

Going higher in Bloom's Taxonomy, towards the mid-level skills (Applying and Analysing), the literature highlights the importance of AI literacy and critical thinking. This suggests AI's potential role in assisting students in applying knowledge and analysing information, while also emphasising the need for students to develop their own critical thinking skills.

However, as we reach higher-order skills (evaluating and generating), a more cautious approach to AI integration emerges. The emphasis on ethical use and balanced integration in lesson design suggests that, while AI can support these higher-order skills, it should not replace or dominate the human element. The goal at this level is to empower students to critically evaluate information and create original work, while using AI as a supportive tool rather than a substitute for their own cognitive processes.

7 CONCLUSION

In conclusion, to answer our first research question, the integration of generative AI in higher education is already demonstrating a significant impact on both students and educators. Students are harnessing the power of AI to enhance their learning experience through various avenues, such as preparation for classes, revision of materials, and improved accessibility. Furthermore, generative AI is proving to be a valuable tool in completing homework and projects, showcasing its potential to streamline academic tasks and enhance productivity. For educators, generative AI is emerging as a versatile resource for content generation, providing personalised feedback, and streamlined event preparation.

In response to the second research question, ethical concerns surrounding the appropriate use of AI, along with the need to establish clear guidelines and provide adequate training for both staff and students, are pressing issues that require consideration. Ensuring equitable access to generative AI for all students is crucial, as disparities in access could exacerbate existing inequalities. The potential for over-reliance on AI-generated content and the importance of preparing students for an AI-driven workplace are also significant challenges that necessitate proactive solutions. To fully exploit the potential of generative AI in higher education, institutions must address these challenges head on and develop strategies that promote the responsible, ethical, and equitable use of this technology.

7.1 Recommendations and future work

Building upon the insights gleaned from the literature, this section presents a set of actionable recommendations aimed at guiding educators and institutions in navigating the integration of generative AI in higher education. These recommendations are rooted in the identified challenges and opportunities, aiming to foster responsible, ethical, and equitable use of AI.

(1) **Embrace personalisation:** Educators should explore and experiment with AI tools that facilitate personalised learning, aiming to create more effective and engaging educational experiences.
(2) **Prioritise AI literacy and ethics:** Educators must prioritise teaching students about AI literacy, ethics, and responsible use. This includes helping students understand the potential biases and limitations of AI, as well as its ethical implications and risks.
(3) **Design ethical lessons with balanced AI integration:** When incorporating AI into teaching practices, educators should adopt a balanced approach, by carefully considering the role of AI in different learning activities and ensuring that it complements, rather than replaces, human instruction and interaction.
(4) **Provide transparency in AI policies:** Educators should provide clear and unambiguous AI policies to students.
(5) **Cultivate critical thinking and holistic competencies:** Educators must focus on developing students' critical thinking, problem-solving, and creative skills.
(6) **Prepare students for the AI-Driven workplace:** Educators must equip students with the skills and knowledge needed to thrive in a workplace that uses AI.

Limitations and future work. This study is a work in progress in producing a large-scale, systematic analysis of the use of generative AI in higher education. Its insights are based on a lightweight narrative review and are therefore restricted in scope. In future work, we will expand the scope of the analysis and couple it with an empirical study in various universities in the United Kingdom and the United States, in order to validate our findings with a diverse population of students and educators.

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