George and Sevak *Research and Practice in Technology Enhanced Learning* (2026) 21:19
https://doi.org/10.58459/rptel.2026.21019

Research and Practice in Technology Enhanced Learning

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Artificial intelligence in higher education: Opportunities and concerns

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Abstract

This qualitative study investigates the opportunities and concerns regarding the integration of artificial intelligence (AI) in higher education. Through in-depth interviews with students, faculty, parents, administrators, policymakers, and employers, the research explores the complex landscape of AI adoption in colleges and universities. Thematic analysis reveals shared anxieties about equity and inclusion, the preservation of human interaction in teaching, potential job displacement, the ethical implications of AI, technical capabilities and resource requirements, the impact on educational quality and student outcomes, and the alignment of AI education with workforce demands. The findings underscore the need for a collaborative and transparent approach to AI integration that addresses stakeholder concerns and prioritizes ethical considerations, pedagogical effectiveness, and societal values.

Keywords: Artificial intelligence, Higher education, Stakeholder perspectives, Ethical concerns, Policy implications

Introduction

Artificial intelligence (AI) has emerged as a transformative force, reshaping various sectors of society, including healthcare, finance, and education (Chatterjee & Bhattacharjee, 2020; Torres & George, 2023; Zawacki-Richter et al., 2019). In the realm of higher education, the adoption of AI has gained significant attention as colleges and universities worldwide explore its potential to enhance curricula and streamline administrative processes (Popenici & Kerr, 2017; Yang & Evans, 2019). However, the integration of AI in educational settings has also raised concerns among key stakeholders, highlighting the need for a nuanced and comprehensive understanding of the challenges and opportunities associated with this technological shift (George & Wooden, 2023; Zawacki-Richter et al., 2019).

The sustainable adoption of AI in higher education requires a thorough examination of the perspectives held by various stakeholders, including students, faculty, administrators, and policymakers. Previous studies have emphasized the importance of considering the ethical, pedagogical, and societal implications of AI in educational contexts and these primarily speculated based on available literature in related areas (George & Wooden, 2023; Zawacki-Richter et al., 2019). There remains a gap in the scholarly literature regarding a comprehensive, multi-stakeholder analysis of the concerns and aspirations surrounding AI adoption in higher education based on primary data.

This study aims to address this gap by conducting an in-depth, qualitative investigation of the viewpoints held by key stakeholders in higher education concerning the increased prominence of AI. The primary objectives of this research are threefold: (1) to uncover the sentiments of students, faculty, administrators, employers, and policymakers regarding the role and influence of AI in shaping the educational landscape and preparing the workforce for the future; (2) to identify common themes, concerns, and opportunities that emerge from the multi-stakeholder analysis; and (3) to develop a set of recommendations for the sustainable adoption of AI in higher education, addressing issues of equity, privacy, ethics, and pedagogical effectiveness.

The research questions are stated below:

1. What are the primary concerns of key stakeholders (students, faculty, parents, administrators, policymakers, and employers) regarding the increasing integration of AI in higher education?
2. What are the perceived opportunities and challenges associated with AI adoption in higher education from a multi-stakeholder perspective?
3. How can higher education institutions address the identified concerns and leverage the potential benefits of AI in a way that aligns with ethical, pedagogical, and societal values?

Literature review

AI in higher education

George and Wooden (2023) charted out the blueprint for an AI-centered university system: while this is still a futuristic idea, the article is seminal in the sense that it identifies the different sub-systems and network of relationships of the upcoming AI-centered universities. These authors call for the need for empirical research to fully understand the current practices, challenges, and opportunities of AI in higher education. Crompton and Burke (2023) analyzed 138 articles from 2016 to 2022, which could provide a starting point for understanding of the current state of smart technologies in higher education. The deployment of AI in higher education has far-reaching implications, presenting both

unprecedented opportunities and significant challenges (George & Wooden, 2023). Its potential to personalize learning, automate administrative tasks, and enhance research capability is undeniable. However, the very technology that holds such promise also evokes concerns over privacy, equity, pedagogical effectiveness, and the nature of education itself (Akinwalere & Ivanov, 2022; Chan & Hu, 2023; Tundrea, 2020).

Liang et al. (2023) conducted a systematic review and bibliographic analysis of the roles and research foci of AI in language education, and Shukla et al. (2019) focused their longitudinal bibliometric analysis on 30 years of using AI in Engineering. These studies provide a more nuanced understanding of how AI is being used in different educational contexts. Concerns expressed by the authors include equity, human elements of teaching, job automation, ethical deployment, technical capabilities, and resource requirements. AI has the potential to address challenges in learning, such as improving the transfer of knowledge, dispelling misconceptions, and promoting critical thinking skills among students (Perera & Lankathilaka, 2023). However, there are also concerns about its use in assessments and the potential for academic dishonesty, integrity, and malpractices (Ifelebuegu, 2023).

Stakeholder perceptions

Stakeholders in higher education—students, faculty, administrators, and society at large—are confronted with the task of navigating this new landscape (Zawacki-Richter et al., 2019). They are faced with questions about how to ensure ethical use of AI (Köbis & Mehner, 2021; Zeide, 2019), how to maintain the interpersonal aspect of education (Abendschein et al., 2021; Siau & Wang, 2018), and how to address potential biases in AI algorithms (Baker & Hawn, 2022; Ouyang et al., 2022), among others. The disparities in digital infrastructure and the digital divide also present formidable barriers to the equitable implementation of AI in higher education (Celik, 2023; García-Martín & García-Sánchez, 2022; Luttrell et al., 2020).

It seems like stakeholders recognize the potential of AI to transform teaching and learning but also emphasize the importance of addressing ethical concerns and ensuring that AI is used responsibly and equitably. The European Union (EU) has highlighted ethical concerns and implications of AI, emphasized privacy protection, surveillance, and non-discrimination as primary areas of interest, and provided guidelines on how trustworthy AI should be (Akgun & Greenhow, 2022). The nature of intelligence, how to balance the interests of individuals and the general public, how to deal with moral conundrums, and how automation will affect the labor market are just a few of the fundamental concerns surrounding AI that cannot be fully addressed by technology alone. These issues necessitate interdisciplinary methods and human agency (Fahad Mon et al., 2023).

Ethical concerns

There is an overall consensus on concerns about the ethical implications of integrating AI in educational settings (Akgun & Greenhow, 2022; Cockburn et al., 2019; Holmes et al., 2023; Nguyen et al., 2023; Popenici & Kerr, 2017). These concerns include the potential for AI to perpetuate biases and inequalities, the need for transparency and accountability in AI systems, and the ethical implications of using AI for assessment and decision-making. However, stakeholders also recognize the potential benefits of AI in education, such as personalized learning and increased efficiency in administrative tasks. To address these concerns, researchers and organizations have developed resources and frameworks for ethical AI in education, including guidance on governance and stewardship, human-centered design, and the incorporation of ethical principles into AI systems (Nguyen et al., 2023).

Methodology

Participants and context

The participants included 12 university professors from different social science academic disciplines, chosen for their varied qualifications and professional backgrounds. A total of 40 students were interviewed, comprising eight master's degree students, two doctoral students, and three non-degree certificate program enrollees, with 16 being part-time learners. These students were drawn using a snowball sampling method from the first-, second-, and third-degree network contacts of the first author via LinkedIn. Parents of these students were also contacted and were interviewed. The study further included seven individuals holding administrative leadership positions in higher education, such as department chairs, deans, provosts, or vice presidents, as well as three state-level government officials responsible for education policy and 11 corporate representatives working in human resources or hiring for entry-level roles. These individuals too were sourced via LinkedIn connections. All interviews were conducted individually, either online or in-person.

Data collection

In-depth interviews were conducted with all participants during February to April 2023 based on mutual convenience. A set of guiding questions was prepared based on the study's objectives and information gathered from scholarly literature, social media, traditional news magazines, and the researchers' learned common sense. This iterative process ensured the questions were clear, relevant, and captured the nuances of stakeholder perspectives. These questions were kept open-ended and flexible to facilitate a preliminary investigation. In-person interviews were conducted with each participant, lasting

approximately 30 to 45 minutes per session. Since the questions were open-ended and the objective was to elicit authentic responses, a standardized interview protocol was not strictly enforced.

Informed consent was obtained from all participants, and the data was stored securely with strict confidentiality. The interview questions are presented in Appendix 1.

Data analysis

All interviews were transcribed using speech-to-text converters and analyzed using the NVivo qualitative analysis tool (Hilal & Alabri, 2013). NVivo assisted in identifying recurring themes and patterns in the responses by employing natural language processing (NLP) techniques. Sentiment analysis was performed using NVivo's built-in feature, which determined the positive, negative, and neutral sentiments expressed by each group of stakeholders. The algorithms used, while generally accepted in the scholarly community as valid, are not open source. It helped to identify and quantify positive, negative, and neutral sentiments within the interview transcripts, providing insights into the emotional undertones of stakeholder perspectives. Additional analysis was conducted using online tools such as MonkeyLearn. The analysis provided insights into the sentiments conveyed by the different stakeholder groups, facilitating the identification of common concerns and patterns. Visual data representations were also generated, simplifying the interpretation and presentation of the findings. Best practice guidelines given about drawing and verifying conclusions in Miles et al. (2013) were used to structure the qualitative analysis process, organization of results, and conclusions.

The thematic analysis process we employed aligns with established guidelines for qualitative research (Braun & Clarke, 2006). This included how we familiarized ourselves with the data, generated initial codes, searched for themes, reviewed and refined themes, and ultimately defined and named the themes presented in the findings. Our analysis was informed by an inductive, data-driven approach, with codes and themes emerging through an iterative process of close reading, constant comparison, and team discussion, focusing on capturing the most salient and recurring patterns across the stakeholder interviews. To enhance the credibility of our analysis, we employed several strategies commonly used in qualitative research (Lincoln & Guba, 1985), including investigator triangulation, peer debriefing, negative case analysis, and thick description.

Excerpts from the post hoc coding scheme demonstrating how the interview data were analyzed are provided below in Table 1.

The research findings are presented below in an aggregated and anonymized manner to maintain participant confidentiality.

Table 1 Representation of the coding scheme employed

Code	Definition	Illustrative Quotes
Equity/Inclusion	"Concerns about AI exacerbating existing inequalities in access to and outcomes of education."	"AI may widen existing inequalities if groups have unequal access to AI tools." (Policymaker)
Human Interaction	"Value of human connection and personalized support in education; fear of AI replacing it."	"AI could streamline tasks…But I'm afraid it might also reduce human interaction in the classroom." (Instructor)
Job Impact	"Concerns about job displacement and the need for future-ready skills in an AI-influenced world."	"I worry how AI will impact my future job prospects." (Student)
Ethical Use	"Focus on responsible AI development and implementation, including bias mitigation, transparency, and privacy."	"As educators, it's our responsibility to ensure AI use in higher-ed is ethical and protects student data." (Instructor)
Technical Capacity	"Concerns about institutions' readiness to adopt AI, including costs, infrastructure, and expertise."	"We're concerned about the costs of implementing AI and whether institutions have the resources and expertise to integrate it effectively." (Policymaker)
Educational Quality	"Impact of AI on teaching and learning, including concerns about maintaining academic rigor and student outcomes."	"We're concerned ai may reduce education quality if used to replace instructors or human interaction." (Policymaker)
Workforce Alignment	"Need for higher education to prepare students for the changing demands of an AI-driven job market."	"Institutions need to better align learning with industry needs to ensure job preparedness." (Employer)

Findings

In the following sections, we will present the key themes each major stakeholder group has referred to, while they were providing their responses. The quotes from the interviews are provided in Appendix II.

Key themes

In Table 2, the key themes of concerns for each stakeholder group, along with top six sub-themes are summarized:

Shared themes

There were several common concerns about using AI in higher education that are shared by various stakeholders, including students, professors, parents, education policymakers, college administrators, and employers.

Table 2 Key concerns of each stakeholder group regarding the implication of AI in higher education

Stakeholder Group	Themes
Instructors	1. Perpetuation of bias and discrimination
	2. Loss of human interaction
	3. Displacement of educator roles
	4. Ethical uncertainties
	5. Technical limitations
	6. Implementation costs
Students	1. Loss of personalization
	2. Perpetuation of biases
	3. Overreliance on technology
	4. Impact on job prospects
	5. Data privacy issues
	6. Technical limitations
Parents	1. Financial burdens
	2. Declining educational quality
	3. Data privacy risks
	4. Perpetuation of biases
	5. Impact on career prospects
	6. Ethical transparency
Policymakers	1. Equity and inclusion
	2. Preserving academic quality
	3. Ethical deployment
	4. Costs and expertise
	5. Pedagogical impacts
	6. Student outcomes
Higher-Ed Administrators	1. Implementation costs
	2. Data privacy risks
	3. Faculty skepticism
	4. Pedagogical impacts
	5. Equity and inclusion
	6. Ethical implications
Employers	1. Skills gaps
	2. Overdependence on technology
	3. Perpetuation of biases
	4. Misalignment with industry needs
	5. Lagging behind workforce changes
	6. Ethical implications

1. Equity and Inclusion: Instructors, students, parents, policymakers, and higher-ed administrators expressed concerns that AI tools could exacerbate existing inequities in higher education, such as by favoring students from privileged backgrounds or perpetuating biases against marginalized groups. There is a fear that AI systems may widen existing educational inequalities if access to AI tools is uneven or if biases are built into algorithms.

2. Human Elements of Teaching: Instructors, parents, policymakers, and higher-ed administrators worry that AI tools will replace human teachers, leading to a loss of the

personal touch and human connection that is essential for learning. A predominant apprehension among all stakeholder groups was that deploying AI systems in educational settings could diminish invaluable interpersonal interactions between students and faculty, as well as peer socialization opportunities.

3. Job Automation and Displacement: Instructors, students, parents, and employers raised concerns about AI potentially automating jobs in higher education, leading to job losses for faculty and staff. There is uncertainty about how AI adoption in higher education may affect future career prospects, emphasizing the need for graduates to possess relevant skills and competencies to thrive in an AI-driven job market.

4. Ethical Deployment and Implications: Most stakeholder groups, including instructors, policymakers, higher-ed administrators, and employers, emphasized the need for responsible and ethical deployment of AI in higher education. Stakeholders consistently expressed ethical reservations, ranging from ingrained algorithmic biases to deficiencies in transparency and accountability mechanisms. There is concern that AI tools could be used in unethical ways, such as to discriminate against students or to invade their privacy.

5. Technical Capabilities and Resource Requirements: Instructors, policymakers, higher-ed administrators, and employers expressed apprehension about the budgetary constraints and lack of capabilities to effectively integrate AI technologies in higher education institutions. There is concern that institutions may not have the technical capabilities to effectively implement and use AI tools, and that the cost of implementing and using AI tools will be prohibitive for many institutions.

6. Educational Quality and Student Outcomes: Instructors, parents, policymakers, and higher-ed administrators shared concerns about the potential decline in educational quality due to overreliance on AI and the displacement of human interaction and personalized learning. Some worried that overdependence on AI may hinder the development of foundational competencies like critical analysis, problem-solving, and communication, thus reducing educational quality and outcomes.

7. Alignment with Workforce Demands: Students, parents, and employers raised concerns about how AI adoption in higher education may affect future career prospects, emphasizing the need for graduates to possess relevant skills and competencies to thrive in an AI-driven job market. Concerns also emerged about the alignment of AI-enabled curricula with dynamic workforce demands, as higher education strives to adequately equip students for evolving professional environments.

Constructive multi-stakeholder dialogues on these complex issues will be imperative as higher education charts an optimal course for leveraging AI's opportunities while upholding its academic mission and values. Addressing these common concerns will require a comprehensive and collaborative approach to ensure that the adoption of AI in higher education benefits all stakeholders while minimizing potential risks and drawbacks.

Table 3 Top keywords from the interview transcripts, according to relevance.

Word	Count	Relevance
Higher Education	60	1
Use of AI	40	0.76
Student	38	0.58
AI System	18	0.36
Education	16	0.30
Potential	12	0.25
Technology	12	0.24
Institution	10	0.22
Impact of AI	7	0.21

Top keywords

Table 3 presents the top 9 words that appear most frequently in the interview transcripts, along with their respective counts and relevance scores.

The term "higher education" emerges as the most prevalent, occurring 60 times and holding a relevance score of 1. "Use of AI" follows closely, with 40 occurrences and a relevance of 0.76. Other notable keywords include "student" (38 counts, 0.58 relevance), "AI system" (18 counts, 0.36 relevance), and "education" (16 counts, 0.3 relevance). The words "potential," "technology," "institution," and "impact of AI" also feature prominently, with relevance scores ranging from 0.25 to 0.21. These findings highlight the central themes and focal points of the discussions surrounding the adoption of AI in higher education institutions.

Sentiment analysis: Relative pessimism vs. optimism

The sentiment analysis revealed nuanced stakeholder attitudes regarding the integration of artificial intelligence (AI) technologies in higher education. Students predominantly expressed optimistic perspectives, with 75% conveying that AI could enhance learning experiences via personalization, accessibility, and career preparation. Professors held mixed views – approximately half voiced concerns about academic integrity and faculty displacement, while others recognized AI's potential to augment instruction. Parents also showed divided opinions, with some emphasizing possible benefits and others worrying about detrimental impacts on their children's education and privacy.

Education policymakers conveyed cautious optimism, as 70% acknowledged AI's capacity to increase equity and learning gains but also called for addressing ethical issues. College administrators registered the greatest positivity, with 80% highlighting AI's ability to boost efficiency, reduce costs, and improve student outcomes. Employers exhibited measured hopefulness – 60% saw value in AI for workforce development but emphasized the continued need for human skills like critical thinking.

Overall sentiment was found to be positive (Confidence = 92.2%). AI was predominantly perceived as a potent catalyst for transformation in higher education, with the capacity to address intricate challenges, enrich learning experiences, and augment administrative efficiency. It was regarded as a tool that enhanced our capabilities to automate mundane tasks, streamline operations, and make predictions, among other functionalities. The analysis indicates a willingness to leverage AI's opportunities, tempered by concerns about ethical challenges and preserving foundational human capabilities.

Discussion

The integration of AI in higher education presents both challenges and opportunities for the future. By addressing the concerns of stakeholders, investing in ethical and responsible AI deployment, and embracing a transformative vision for education, institutions can harness the power of AI to create a more equitable, engaging, and effective learning experience for all. The insights gleaned from this study provide a roadmap for navigating the complexities of AI integration and charting a course towards a future where technology and humanity coexist in harmony to advance the frontiers of knowledge and discovery.

Looking forward, it is not hard to envision a landscape where AI technologies are seamlessly integrated into the fabric of teaching, learning, and administrative processes. This integration will not only enhance the efficiency and effectiveness of educational delivery but also enable personalized learning experiences that cater to the unique needs and aspirations of each student. However, the path to this future is not without challenges, as evidenced by the concerns raised by various stakeholders in this study. The apprehensions surrounding equity, human interaction, job displacement, ethical deployment, technical capabilities, and resource requirements are not merely hypothetical but rather grounded in the current realities of the higher education sector.

While remaining enthused about the hope of glory that AI might bring, we should also be mindful of negative potentials of AI in higher education:

1. The potential for AI tools to widen the achievement gap: If AI tools are not implemented fairly and equitably, they could widen the achievement gap between students from different socioeconomic backgrounds. For example, students from wealthy families may have access to better AI tools than students from poor families, which could give them an unfair advantage.
2. The potential for AI tools to lead to bias and discrimination: AI tools are not immune to bias and discrimination. If AI tools are not developed and used responsibly, they could perpetuate existing biases and discrimination against marginalized groups. For example, AI tools used for admissions or financial aid decisions could discriminate against students from certain racial or ethnic groups.

3. The potential for AI tools to reduce the quality of education: If AI tools are used in a way that reduces the amount of human interaction in the learning process, they could reduce the quality of education. For example, if AI tools are used to replace human teachers, students may not receive the same level of personalized attention and support.
4. The potential for AI tools to lead to job losses: AI tools could automate a number of jobs in higher education, such as admissions counselors, financial aid officers, and registrars. This could lead to job losses for faculty and staff and could make it difficult for institutions to recruit and retain top talent.

To avert these, responsible AI practices are necessary, which involve improving transparency in algorithms and addressing biases in the data used to train AI models (Werder et al., 2022). The use of AI in higher education also necessitates careful planning and discussions about its impact on teaching and research practices, including issues such as data collection and ownership, intellectual property, data security, and the rights and privacy of all stakeholders. Establishing ethical governance frameworks for AI is crucial to prevent misuse and unintended consequences (Taeihagh, 2021).

Implications

The implications of this study are far-reaching and profound. Firstly, it underscores the need for a collaborative and inclusive approach to AI integration in higher education. Institutions must engage in meaningful dialogues with students, faculty, administrators, policymakers, and industry partners to co-create a shared vision for the future of education that harnesses the potential of AI while mitigating its risks.

Secondly, the study highlights the importance of ethical and responsible AI deployment in higher education. As institutions increasingly rely on AI systems to make decisions that impact student outcomes, it is crucial to establish robust ethical frameworks and governance mechanisms to ensure transparency, accountability, and fairness.

Thirdly, the findings of this study underscore the need for significant investments in digital infrastructure, professional development, and research to support the effective integration of AI in higher education. Institutions must prioritize the development of AI-enabled tools and platforms that are accessible, user-friendly, and adaptable to the diverse needs of learners and educators.

Finally, the study implies that the future of higher education is not just about technological innovation but also about social and cultural transformation. As AI reshapes the landscape of teaching and learning, institutions must remain committed to their core values of fostering critical inquiry, promoting social justice, and preparing students for lifelong learning and civic engagement.

Conclusion

The integration of artificial intelligence in higher education presents a complex array of challenges and opportunities that require careful consideration and strategic planning. This study, through its comprehensive analysis of the concerns and sentiments expressed by key stakeholders, provides a valuable framework for navigating the ethical, pedagogical, and societal implications of AI adoption in colleges and universities. It provides a valuable roadmap for policymakers, educational practitioners, and technological developers as they navigate the complexities of AI integration in higher education. By embracing a comprehensive, multi-stakeholder approach that prioritizes transparency, accountability, and inclusivity, we can harness the power of AI to transform education for the better and prepare students for success in an increasingly AI-driven world.

The findings underscore the need for a nuanced and collaborative approach to AI integration that prioritizes transparency, accountability, and inclusivity. As institutions seek to harness the potential of AI to enhance personalized learning, streamline administrative processes, and prepare students for the future workforce, they must also remain vigilant in addressing the concerns raised by stakeholders. Central to these concerns are issues of equity, the preservation of human interaction and creativity, the displacement of jobs, and the ethical deployment of AI technologies. To mitigate these risks, institutions must invest in the development of AI systems that are transparent, auditable, and aligned with the values of fairness and inclusivity. This requires a commitment to ongoing research, interdisciplinary collaboration, and open dialogue with industry partners and the public sector to examine the long-term social, ethical, and pedagogical implications of AI (Huang et al., 2021).

Continued use of AI in higher education demands a fundamental shift in the role of educators and the conception of education itself. As AI automates certain tasks and processes, educators will need to evolve from being mere transmitters of knowledge to becoming facilitators of learning experiences that cultivate creativity, critical thinking, and emotional intelligence. This transformation will necessitate a reimagining of curricula, pedagogical approaches, and assessment methods to ensure that students are equipped with the skills and competencies needed to thrive in an AI-driven world (George & Wooden, 2023). Successful AI integration will depend on the willingness of institutions to engage in open and inclusive dialogue with all stakeholders. By working together to address the challenges and opportunities presented by AI, we can ensure that its adoption serves to enhance the quality, accessibility, and equity of education while upholding the fundamental values that lie at the heart of higher learning.

The implications of this study are far-reaching. It underscores the need for significant investments in digital infrastructure, professional development, and research to support the effective integration of AI in higher education. It also highlights the importance of

developing robust ethical frameworks and governance mechanisms to guide the responsible deployment of AI technologies (George & Wooden, 2023). As the future labor market becomes increasingly shaped by AI, higher education institutions must adapt and reconsider educational pathways to prepare students for success (Aguilar & George, 2021). This will require a proactive and strategic approach that embraces interdisciplinary collaboration, industry partnerships, and a commitment to lifelong learning.

Appendix I

Open Ended Questions that Guided the In-Depth Interview

General Questions (for all stakeholders):

- What are your overall thoughts on the use of AI in higher education?
- What do you see as the potential benefits of AI in higher education?
- What concerns do you have about the use of AI in higher education?
- How do you think AI will impact the role of instructors/students/administrators/etc.?
- What ethical considerations do you think are important when using AI in higher education?

Instructor-Specific Questions:

- How do you think AI will impact your teaching practices?
- Are you concerned about the potential for AI to replace some aspects of your job?
- How can AI be used to enhance personalized learning while maintaining the quality of education?
- What support would you need to effectively integrate AI into your teaching?

Student-Specific Questions:

- How do you think AI will impact your learning experience?
- Are you concerned about the potential for AI to perpetuate biases or discrimination?
- How do you feel about the use of AI for assessment purposes?
- What skills do you think will be important for students to have in an AI-driven world?

Parent-Specific Questions:

- What are your primary concerns about the use of AI in your child's education?

- How do you think AI will impact the cost of higher education?
- Are you concerned about the potential for AI to negatively impact your child's job prospects?
- What role do you think parents should play in the integration of AI in higher education?

Policymaker-Specific Questions:

- How can we ensure that AI is used ethically and responsibly in higher education?
- What policies are needed to promote equity and inclusion in the context of AI in higher education?
- How can we ensure that AI is used to enhance, rather than replace, human interaction in education?
- What research is needed to better understand the impact of AI on student outcomes?

Administrator-Specific Questions:

- How are you planning to integrate AI into your institution's operations?
- What are your primary concerns about the implementation of AI?
- How are you addressing the concerns of faculty and staff about the use of AI?
- What steps are you taking to ensure that AI is used ethically and responsibly?

Employer-Specific Questions:

- How do you think AI will impact the skills that are needed in the workforce?
- What role do you see higher education institutions playing in preparing students for an AI-driven world?
- Are you concerned about the potential for AI to perpetuate biases in hiring and promotion decisions?
- What advice would you give to higher education institutions about the integration of AI?

Appendix II

Stakeholder Concerns: Interview Transcripts

Representative direct quotes from interviews with instructors:

"I'm concerned that AI systems could perpetuate discrimination that already exists in education. We need to make sure we're using AI responsibly and ethically."

"Using AI in higher-ed is exciting, but I worry it could lead to professors losing their jobs and a drop in education quality overall."

"AI could streamline tasks and improve efficiency. But I'm afraid it might also reduce human interaction in the classroom, which could hurt personalized learning."

"As educators, it's our responsibility to ensure AI use in higher-ed is ethical and protects student data. We have to address these issues proactively."

"AI is incredibly powerful but it's not the solution for every problem. We need to remember its limitations and use it along with other approaches."

"Implementing AI in higher-ed can be complex and expensive. We have to carefully weigh the costs and benefits before jumping in."

"AI enables personalized learning, but we must make sure it doesn't take a one-size-fits-all approach that ignores individual differences."

"AI should enhance human intelligence in the classroom, not replace it. We need a balance between tech and human interaction."

"We must ensure AI doesn't reinforce inequality but promotes equitable educational opportunities for all."

"AI can automate routine tasks, allowing teachers to focus on complex, creative work. But we can't let it replace human connection in teaching."

Representative direct quotes from interviews with students:

"I'm worried AI will lead to less personalized learning and less one-on-one time with professors. I don't want to rely on technology too much."

"As a student from an underrepresented group, I worry AI may perpetuate unfair biases and discrimination, limiting my opportunities."

"I'm concerned AI will reduce my ability to think critically and creatively and make me overly reliant on technology."

"I worry how AI will impact my future job prospects - will certain jobs or skills become obsolete due to automation?"

"I'm concerned about how my data will be collected and used by AI systems - will it be misused or mishandled?"

"While AI could be useful, I worry it may not always be accurate or reliable. Glitches could negatively impact my learning."

"I fear AI may widen inequality gaps and make it harder for disadvantaged students like me."

"As a student with a disability, I worry AI systems won't be accessible or accommodating enough for me."

"I'm worried AI will reduce the emphasis on communication and collaboration - skills crucial for work and life."

"I have ethical concerns about using AI in higher-ed. Will it lead to less transparency and accountability?"

"I fear AI may diminish human connections and empathy in education - less chance for meaningful student-instructor interactions."

"As a student, I don't want to feel constantly surveilled and monitored by AI - it may erode my privacy."

"I worry AI grading may not fully capture the complexity of my work, leading to unfair evaluations."

"I want human feedback and interaction - crucial for my growth. I don't want AI to replace that."

"I'm concerned AI may stifle creativity and limit diversity of ideas and perspectives."

"I worry students like me from disadvantaged backgrounds will have less access to AI technology and resources."

"I'm worried AI may reinforce harmful stereotypes and biases, leading to discrimination."

"I fear AI may devalue certain academic fields, deeming them less relevant or useful."

"I have ethical concerns about how AI may be used for plagiarism detection or monitoring - it may violate student privacy and academic freedom."

Representative direct quotes from interviews with parents:

"I worry about the cost of AI in higher-ed - will it lead to increased tuition fees that I have to pay as a parent?"

"As a parent, I'm concerned AI may reduce education quality, especially if it replaces human instructors and interactions."

"I don't want my child's data collected and misused by AI systems."

"I worry AI could lead to unfair treatment or unequal opportunities for my child due to biases and discrimination."

"I'm concerned about how AI will impact my child's future job prospects - will certain jobs become obsolete due to automation?"

"As a parent, I want to know AI is being used responsibly and transparently in higher-ed."

"I don't want AI leading to a one-size-fits-all approach that could hinder my child's individual growth."

"I worry AI may enable academic dishonesty like cheating and plagiarism."

"I'm concerned AI may widen digital divides if students can't afford the tech."

"As a parent, I want human emotional support and mentorship for my child, not just AI."

"I worry AI grading won't accurately reflect my child's abilities and potential."

"As a parent, I'm concerned reliance on AI may reduce human accountability and responsibility."

"I don't want AI to replace creativity and critical thinking - I don't want my child overly reliant on tech."

"I worry AI may reduce diversity and inclusivity, unable to understand all student experiences."

"I don't want AI surveillance invading my child's privacy and restricting their freedom."

"As a parent, I value human interaction skills - I don't want AI replacing that."

"I'm concerned AI may limit exposure to diverse ideas and perspectives."

"As a parent, I don't want AI prioritizing STEM over humanities and social sciences."

Representative direct quotes from interviews with policymakers:

"We worry AI may widen existing inequalities if groups have unequal access to AI tools or if biases exist."

"We're concerned AI may reduce education quality if used to replace instructors or human interaction."

"As policymakers, we must consider the ethical implications of using AI, including privacy, data security, and responsible use."

"We're concerned about the costs of implementing AI and whether institutions have the resources and expertise to integrate it effectively."

"We must consider the pedagogical implications of AI and whether changes in teaching methods are needed."

"We want to understand AI's impact on student outcomes like achievement, critical thinking, and career readiness."

"Policies must prioritize AI that enhances learning for all, not perpetuates inequities."

"We recognize AI's potential to improve accessibility and inclusion, especially for students with disabilities."

"We must encourage responsible AI use, including ongoing evaluation of its impact."

"We must address AI potentially perpetuating biases and discrimination in processes like admissions."

"AI can enhance learning but not replace human connections. Policies should reflect this."

"We will ensure institutions have support to integrate AI into teaching and students have relevant skills."

"Policies must consider AI's impact on the future job market and prepare students accordingly."

"While we encourage AI innovation in higher-ed, student outcomes must be the priority."

"We must balance AI's benefits with privacy concerns and protect student data."

"We must consider AI's impact on educators' roles and ensure it supports teaching."

"We support AI research and development but want benefits to be accessible to all students."

"Responsible AI use could help address challenges like retention and graduation rates."

Representative direct quotes from interviews with higher-ed administrators:

"We're concerned about the costs of implementing AI and whether we have the expertise to integrate it effectively."

"We must protect student data from misuse and ensure AI aligns with our ethics and values."

"We need to work with faculty to address their AI concerns and ensure it supports our mission."

"We must consider AI's impact on teaching practices and if pedagogical changes are needed."

"We must ensure AI doesn't worsen inequality and all students can access AI tools."

"As admins, we're committed to addressing AI's ethical issues like privacy and responsible use."

"AI can enhance learning but not replace human interaction and support."

"We need to train faculty and staff to effectively incorporate AI into their practices."

"AI may not be a one-size-fits-all solution - we need a nuanced approach."

"We must weigh AI's long-term costs/benefits and alignment with priorities."

"We'll engage students, faculty, and staff for transparent and accountable AI use."

"AI isn't a panacea - it should complement other evidence-based practices."

"AI integration requires industry partnerships to leverage advancements."

"We must ensure inclusive, accessible AI tools for students with disabilities."

"As admins, we'll be transparent about student data collection/protection with AI."

"We recognize AI's potential to transform higher-ed delivery and will explore integration."

"We'll invest in research to understand AI's impact and identify best practices."

"As admins, we must ensure AI supports our mission, values, and commitment to excellence."

Representative direct quotes from interviews with employers:

"We're worried over-reliance on tech may hinder students' critical thinking and problem-solving - skills they need to succeed."

"While AI is valuable, we're concerned it may not adequately prepare students with relevant job skills."

"AI systems may perpetuate biases if the training data is biased - very worrying."

"Institutions need to better align learning with industry needs to ensure job preparedness."

"Institutions may not keep pace with the changing job market, leaving students ill-prepared."

"Ethical considerations like privacy are critical with AI use - institutions must take this seriously."

"We want graduates with strong soft skills like communication, collaboration, and leadership."

"Creativity and innovation are valued - over-reliance on AI could stifle this."

"A well-rounded education with diverse perspectives is crucial for workforce success."

"We need adaptable graduates who can quickly learn new skills - rigid curriculums may not prepare them adequately."

"Collaboration and teamwork are essential - institutions should prioritize opportunities to develop these."

"We want engaged, passionate graduates - rote learning may not foster this."

"I worry over-reliance on AI may hinder critical thinking - crucial for career success."

"I value diversity and inclusion - biased AI systems may limit the talent pool."

"Tech should enhance, not replace, human collaboration - over-reliance on AI is worrying."

"As an employer, I value creativity and innovation - standardized AI curriculums may stifle this."

"Students need to be well-rounded and exposed to diverse perspectives to succeed globally."

"I need adaptable graduates who can quickly learn new skills – AI's one-size-fits-all approach is concerning."

"I believe in ethical AI use – I'm worried institutions can't handle the risks and privacy concerns."

Abbreviations
AI: Artificial intelligence; EU: European Union; NLP: Natural language processing.

Authors' contributions
The authors are responsible for the whole manuscript. The authors read and approved the final manuscript.

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Funding
Not applicable.

Availability of data and materials
Not applicable.

Declarations

Competing interests
The authors declare that they have no competing interests.

Received: 13 October 2023 Accepted: 5 March 2025
Published online: 1 January 2026 (Online First: 9 July 2025)

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