

Artificial Intelligence in Higher Education: Benefits and Risks

A Review Research

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1. Objectives:

The review research is prepared to make the higher education institutions aware of the benefits and risks, the implementation strategy required, and a detailed roadmap needed, and to finally conclude the report with some recommendations. A systematic review and outcomes provide unique findings with an up-to-date information of artificial intelligence (AI) in higher education (HE).

2. Method:

As the debate and discussions are rapidly growing about the implementation of AI in Higher Education Institutions (HEIs.) as well as in other sectors. Then, I have conceived a systematic review and research of the topics and progress at the present time. I have surveyed much literature and prepared a review research report in a systematic way covering an introduction about AI, implementation strategies, benefits of using AI, limitations and challenges, and finally concluded the article with some recommendations.

3. Introduction:

The term "artificial intelligence" was coined by the father of artificial intelligence, John McCarthy, an American computer scientist. Between 1850 and 1956, it is "The science and engineering of making intelligent machines, especially intelligent computer programs," and in another term, artificial intelligence is concerned with the design of intelligence in an artificial device.

Artificial intelligence (AI) is a vast branch of computer science.

AI is an intermediate between Mathematics and Computer Science.

Data is directly proportional to AI.

Therefore, artificial intelligence can be applied to any field of academia. Data and AI can be used in any sector to digitally change their values by making a smart decision. Through AI we can uncover valuable insights from the existing data. Only a set of data is not sufficient for AI; we need a set of real and reliable data to get the best possible outcomes for future planning and the fruitful outcomes.

Artificial Intelligence (AI) is rapidly getting accepted in an effective transformation in any sector including education.

AI application should be evaluated based on its appropriateness, transparency, accuracy, reliability, safety, fairness, non-discrimination, privacy, security, and adherence to human values [8].

As artificial intelligence (AI) continues to become a burgeoning trend within higher education, Hanover Research provides insight into several use cases, benefits, and challenges of leveraging AI in a postsecondary education setting [5].

According to Hanover Research; one of the most common forms of AI impacting higher education is generative AI. This is defined as AI that can learn from existing content to generate new, realistic content based on supplied data without repeating it. Generative AI can create new media and language, such as images, video, music, speech, text, and software code. Today’s generative AI responds to natural language prompts rather than a traditional programming language. One recent example of generative AI is ChatGPT, a conversational model that can answer simple questions as well as craft essays, describe art, and have conversations with the user. Generative AI can augment and create written content; answer questions; manipulate text based on a suggested tone; summarize and simplify text; create, translate, and explain software code; and enhance chatbot performance [5].

Many countries, including Canada, the United States, India, South Korea, China, Singapore, Finland and the United Kingdom, have embraced artificial intelligence in education to enhance personalized learning, administrative efficiency, and educational research. These countries leverage AI technologies to innovate teaching methods and improve student outcomes across various educational levels [4].

According to various international reports, Artificial Intelligence in Education (AIED) is one of the emerging fields in education technology.

AI on education, has both opportunities and challenges.

According to recommendations by office of the educational technology, U.S. Department of Education, in this report seek to engage teachers, educational leaders, policy makers, researchers, and educational technology innovators and providers as they work together on pressing policy issues that arise as Artificial Intelligence (AI) is used in education [6].

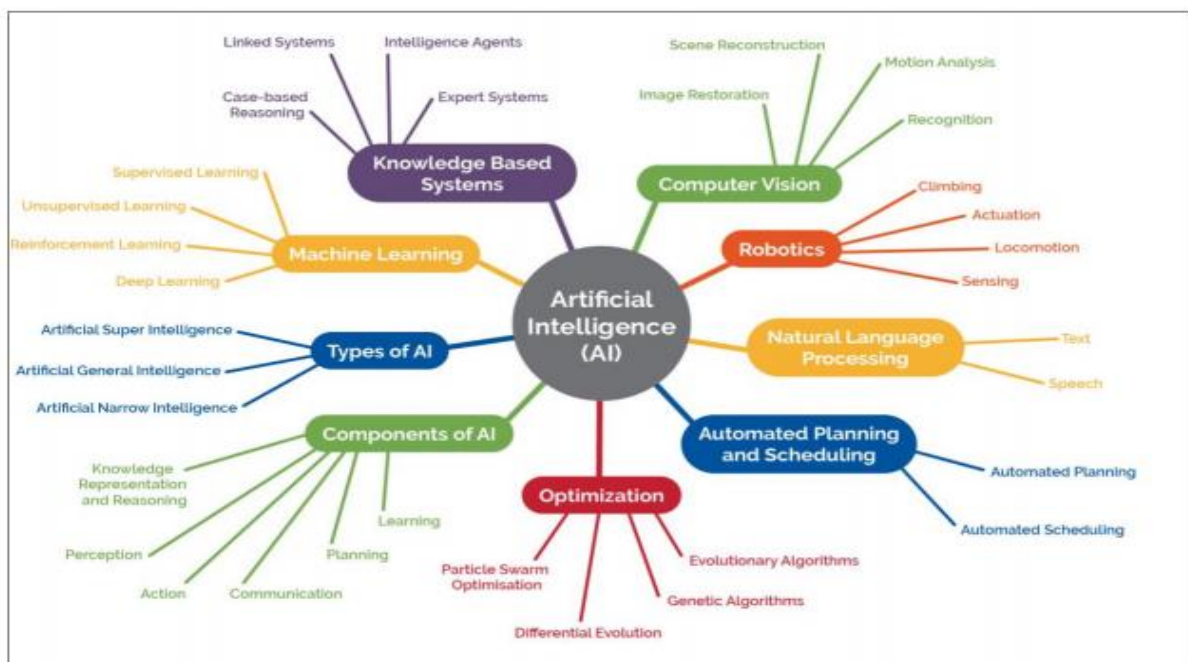


Figure 1: Components, types, and subfields of AI based on Regona et al (2022).⁷

AI is not one thing but an umbrella term for a growing set of modeling capabilities, as visualized in Figure 1 above.

In general, AI also includes:

AI ----- A subset of AI ----- Machine Learning (ML) ----- A subset of ML ----- Deep Learning/Neural Network

Machine learning (ML) and deep learning (DL) can be used to identify patterns and relationships within large datasets that may not be readily apparent to human researchers. With additional computing power, algorithms have become more complex and have enabled the more popular AI techniques such as machine learning and deep learning. Predictive AI is a type of machine learning algorithm that analyses data and forecasts future events or results. Machine learning (ML) and deep learning (DL) can be used to identify patterns and relationships within large datasets that may not be readily apparent to human researchers. Machine learning uses algorithms to identify patterns within data, and those patterns are then used to create a data model that can make predictions. With increased data and experience, the results of machine learning are more accurate—much like how humans improve with more practice” (Microsoft, no date, para. 1). Algorithms are an essential aspect of AI; there is no AI without them. With additional computing power, algorithms have become more complex and have enabled the more popular AI techniques such as machine learning and deep learning. A team of researchers in Malaysia and Oman applied a set of machine learning algorithms based on students’ cumulative GPA, attendance, and grades from the first exam as well as pre-requisite courses as a way to create a monitoring tool for academic progress (Khan et al., 2021). Finally, deep learning (DL), a type of ML that requires less data, can process more data resources and often produce more accurate results than other ML techniques (Chui, Kamalnath and McCarthy, 2020). Generative AI uses advanced deep learning methods, like neural networks, to generate human-like content [1].

The role of technology is not only in equipping students with information and communications technology (ICT) skills but also in achieving quality education, free from the constraints of location and time, and to encourage curiosity, creativity and collaboration. Quality education is not only a fundamental human right but is also directly linked to the financial prosperity of citizens and nations. Artificial intelligence (AI) promises important benefits for education, such as personalised learning according to the preferences of each student, helping them learn at their own pace and control iterations to improve their mastery of the topic. Therefore, university leaders believe that one benefit of AI in the future will be its ability to “assess students, provide feedback and generate and test scientific hypotheses at least as well as humans can” (Alexander et al., 2019).

In addition to BI tools that collect, process, and analyze large amounts of data to support decision-making, AI can also play a role data governance.

4. Implementation strategy for artificial intelligence (AI) in higher education institutions

Implementation strategy for artificial intelligence (AI) in higher education institutions may involve identifying specific needs within the system, choosing appropriate AI technologies, generating awareness and empowerment among faculty, scientific staff, and students, and finally integrating AI tools into curriculum and academic administrative processes, personalized learning, and student support, regularly evaluating their effectiveness, and addressing ethical considerations and ensuring data privacy. Apart from that, AI is already

getting frequently used in research and data science. Experts in this field will definitely take the responsibility of how and why.

Therefore, in HEIs, there must be an initiative to train professionals to work directly or indirectly in AI to refine their skills and to take advantage of AI, as this is a most challenging field of mathematics and computer science. We can apply AI in learning, teaching, and assessment in a range of ways but with some risks and challenges.

The integration of AI into higher education involves considerations of both a technical and organizational nature. These include hardware resources, software requirements, data management strategies, personnel and skills, and security and privacy concerns. The impact of AI on higher education is already being felt strongly in the way that HEIs are governed and managed. Data can be used in AI tools that support learning and teaching processes; it can similarly inform governance and management processes and procedures, potentially making them more effective and efficient. Looking ahead, it can be expected that traditional approaches to higher education will be challenged by AI, possibly leading to some of the following outcomes: 1) HEIs will create policies and guidelines on the use of AI in teaching, learning and assessment, 2) Modes of assessment will be rethought to integrate AI or identify alternative assessments, 3) The student experience will be enhanced through AI tools, the use of chatbots will proliferate in higher education, and more generative AI tools will be trained to assist students in their learning, 4) Roles in HEIs will change alongside a shift in the expectation of leaders, staff, and faculty, 5) Data-informed decision-making will become more prominent in HEIs that have a robust data architecture, 6) Research in higher education will add to knowledge about aspects of AI that are currently underexamined, and AI ethics training will be commonplace, 7) Many more courses on AI will be available, not only those training AI specialists but others that provide more general education on AI, ethics, and other aspects, 7) Educating the general public about AI will become part of HEIs' community engagement mission. AI can help reduce bias in decision-making by reducing humans' subjective interpretation of data, but AI also scales bias. AI is built on data, and if the data itself is skewed, it can have negative consequences for the AI system. And, in the absence of a broader range of engineers and researchers, AI products might result in the proliferation of bias on a large scale. It is also necessary to ensure that higher education quality assurance processes are updated and that they include AI ethics [1].

5. Responsibly Integrating AI into Higher Education

As per [1], AI is expected to bring about profound changes for the higher education sector, presenting numerous opportunities as well as serious and urgent challenges that must be addressed in the transition towards AI-driven systems. The Practical Guide to Responsibly Integrating AI into Higher Education are described through following major points: 1) Build internal capacity, 2) Develop a policy framework for AI, 3) Innovate in pedagogy and skills training, 4) Promote AI research and application, 5) Mobilize knowledge and communities around AI and, 6) Improve gender equality for AI and higher education. The document [1] is very nicely written on AI. The viewers can read the detailed document.

As artificial intelligence becomes more common in our daily lives, its effect on education calls for both enthusiasm and caution. Supporters believe that AI offers great opportunities for personalized learning, making administrative tasks easier and bringing new ways to teach. However, there are still worries about privacy, fairness and the possibility of replacing traditional teaching jobs [4].

We have discussed well below about benefits and limitations and challenges while adapting AI in higher education sector.

6. The benefits of using AI in higher education

6.1. Personalized learning: One of the most compelling advantages of incorporating AI into higher education is its ability to offer personalized learning experiences. AI algorithms can analyze students' learning patterns, identifying their strengths and weaknesses and then using a data-driven approach to enable educators to tailor instruction to individual student needs, ultimately improving their academic outcomes. Adaptive learning platforms use AI to recommend specific resources or activities based on a student's progress, providing a unique and engaging learning path for everyone [2].

Personalized learning: AI enables personalized learning by tailoring educational content to meet the unique needs of each student. Through adaptive learning technologies, artificial intelligence can analyze a student's strengths, weaknesses, learning pace and preferences. This data allows AI systems to provide customized lesson plans and resources, ensuring that students receive instruction that is best suited to their individual learning styles. As a result, students can progress at their own pace, which helps to improve understanding and retention of material [4].

Immersive learning experiences: Artificial intelligence has the potential to create immersive learning experiences that engage students in ways traditional methods cannot. Technologies such as virtual reality (VR) and augmented reality (AR) powered by AI can simulate real-world scenarios and complex concepts, making learning more interactive and enjoyable. For instance, students can explore historical sites, conduct virtual science experiments or practice language skills with AI-driven avatars, providing a hands-on learning experience that enhances comprehension and retention [4].

Improved student engagement and motivation: AI creating immersive learning experiences also can result in boosting student engagement and motivation by making learning more interactive and personalized. Gamified learning platforms, powered by AI, incorporate game elements such as rewards, challenges and leaderboards to make learning fun and competitive. Additionally, artificial intelligence can provide instant feedback and support, helping students stay motivated and focused on their learning goals. By addressing individual needs and offering real-time assistance, AI helps maintain student interest and encourages active participation [4].

6.2. Integrated learning and intelligent tutoring system: AI-driven intelligent tutoring systems offer personalized guidance and support to students, mimicking one-on-one tutoring. These systems use data analytics to understand a student's learning progress and provide targeted feedback and recommendations. They can identify knowledge gaps, suggest relevant resources and adjust the difficulty level of tasks to match the student's abilities. By offering tailored support and continuous assessment, artificial intelligence helps students achieve their learning objectives more effectively [4].

6.3. Continuous evaluation and improvement in the long run: AI facilitates continuous evaluation and improvement by providing real-time insights into student learning performance and learning outcomes. Through data analytics, AI can track student

progress, identify trends and highlight areas for improvement. Educators can use this information to refine teaching strategies, develop personalized interventions and ensure that learning objectives are being met. Continuous evaluation enables a proactive approach to education, where adjustments can be made promptly to enhance the learning experience and outcomes [4].

- 6.4. Raising academic standards and educational quality:** The integration of AI in education has the potential to raise academic standards and improve the overall quality of education. Artificial intelligence can help ensure consistency and accuracy in grading, provide access to high-quality resources and support educators in delivering effective instruction. By leveraging AI technologies, educational institutions can offer a more rigorous and comprehensive curriculum that meets the evolving needs of students. AI can facilitate collaborative learning environments, where students and educators can share knowledge and resources, fostering a culture of continuous learning and improvement. The advantages of AI in education are manifold, ranging from personalized and immersive learning experiences to cost-effective and high-quality education. As AI continues to evolve, its role in transforming education will become increasingly significant, offering new opportunities for students and educators alike [4].
- 6.5. Enhanced efficiency:** AI-powered tools can streamline administrative tasks, such as grading, scheduling, and even student admissions. Automating these processes allows educators to allocate more time and energy to actual teaching and mentoring, fostering a more productive and engaging learning environment [2].
Cost-effective learning: AI can make education more cost-effective by automating administrative tasks and providing scalable learning solutions. For example, artificial intelligence can handle routine tasks such as grading assignments, scheduling and managing student records, freeing up time for educators to focus on teaching. Additionally, AI-powered educational platforms can reach a large number of students with minimal additional cost, making high-quality education accessible to a broader audience. This scalability helps reduce the overall cost of education and ensures that more students can benefit from quality learning experiences [4].
- 6.6. Data-driven decision-making:** AI in higher education offers the potential to make data-driven decisions at the institutional level. By analyzing large datasets, universities can identify trends, measure the effectiveness of teaching methods, and make informed decisions about resource allocation and program development [2].
- 6.7. Accessibility and inclusivity:** AI can also play a pivotal role in making higher education more accessible and inclusive. It can help create content that's more accessible to students with disabilities, such as providing automatic transcription or generating alternative formats of course materials. Additionally, language translation features and speech recognition tools can aid international students and non-native English speakers, further promoting diversity and inclusivity [2].
- 6.8. Academic Guidance:** AI can assist in course selection, degree planning, and career advising based on a student's interests, goals, and academic performance [5].

7. The limitations and challenges of adapting to AI

- 7.1. Implementation costs:** Adopting AI technologies can be expensive, both in terms of initial investment and ongoing maintenance. Educational institutions often need to allocate significant resources to integrate AI effectively, which can be challenging for smaller colleges or universities with limited budgets. Additionally, if integrating AI directly into the educational experience, Universities must consider the cost burden to individual students. If lower income students can't afford to subscribe to AI technology to support their learning, another layer of inequity could become more apparent as AI tools become more common among higher-income students [2].
- 7.2. Faculty training and acceptance:** Faculty members may face a learning curve when incorporating AI into their teaching methods. This can lead to resistance, as educators may be hesitant to adapt to new technologies in fear that AI will replace their roles. Being clear about its anticipated application and providing comprehensive training and support for faculty is crucial in overcoming this obstacle [2].
- 7.3. Ethical concerns:** The use of AI in higher education raises ethical questions about the potential for algorithmic bias and discrimination. AI systems must be designed and monitored carefully to ensure fairness, equity, and transparency. Institutions need to establish ethical guidelines and regularly audit AI systems to mitigate these concerns [2].
- 7.4. Data Privacy Concerns:** One of the primary disadvantages of AI in education is the issue of data privacy. AI systems often require vast amounts of personal data to function effectively, including students' academic records, behavioural data and even biometric information. This extensive data collection raises significant concerns about how this information is stored, used and protected. Inadequate safeguards can lead to data breaches, exposing sensitive student information to unauthorized parties and potentially resulting in identity theft or other forms of misuse. Ensuring robust data privacy measures and compliance with regulations is key to protecting students' information [4].
- 7.5. Dependence on Technology:** Another major concern is the growing dependence on technology that AI in education fosters. As educational institutions increasingly rely on AI-driven tools for teaching, assessment and administrative tasks, there is a risk of becoming overly dependent on these technologies. This dependence can lead to significant disruptions in the event of technical failures or cyber-attacks. Furthermore, it may also diminish the development of critical thinking and problem-solving skills among students, as they may become accustomed to AI systems providing answers and solutions [4].
- 7.6. Lack of Human Touch/Dehumanized Learning Experience:** The lack of human touch is a critical disadvantage of AI in education, leading to a dehumanized learning experience. Traditional education relies heavily on human interaction, with teachers providing not only academic instruction but also emotional support and mentorship. AI systems, while efficient, cannot replicate the empathy, understanding and personal connection that human educators offer. This absence of human elements can affect students' social and emotional development, as well as their overall engagement and motivation in the learning process [4].

- 7.7. Risk of Cheating:** AI in education also raises the risk of cheating. Advanced AI tools can be exploited by students to find ways to bypass academic integrity measures. For instance, AI-powered plagiarism detection systems may themselves be outsmarted by sophisticated AI-generated content that mimics genuine student work. Additionally, AI-based tutoring systems and automated assessments might be manipulated to provide undue assistance, undermining the fairness and integrity of academic evaluations. Schools and institutions must continuously adapt and update their AI tools to mitigate these risks [4].
- 7.8. Teacher Job Displacement:** Lastly, the rise of AI in education brings the concern of teacher job displacement. As AI systems take on more roles traditionally filled by educators, there is a fear that teachers may become obsolete. Automated grading, AI-driven tutoring, and administrative tasks handled by AI could reduce the need for human teachers, leading to job losses and a devaluation of the teaching profession. While AI can certainly support and enhance educational practices, it is essential to balance its implementation to ensure that teachers remain integral to the educational process, providing the human touch that technology cannot replace [4].

8. How to successfully implement and use AI in education

Successfully using AI in education requires careful planning, teacher training, good infrastructure and constant evaluation. Higher education institutions need to set clear goals for how they want to use AI, whether it's for improving personalized learning, making administrative tasks more efficient or engaging students better. By setting measurable objectives and aligning them with the school's mission, administrators can ensure that AI initiatives are purposeful and focused. Investing in teacher training and professional development is essential. Teachers need to learn how to use AI tools effectively and understand how AI can enhance traditional teaching methods. As AI is constantly evolving, it is essential that teachers stay updated with the latest AI advancements and teaching strategies through ongoing professional development programs. Schools must have the right technology in place to support AI. Schools should also use flexible AI platforms that can grow and adapt to changing needs. Regular evaluation and feedback from students and teachers are crucial for assessing the impact of AI and making necessary improvements, ensuring that AI tools enhance the educational experience for everyone [4].

9. The future of AI in education

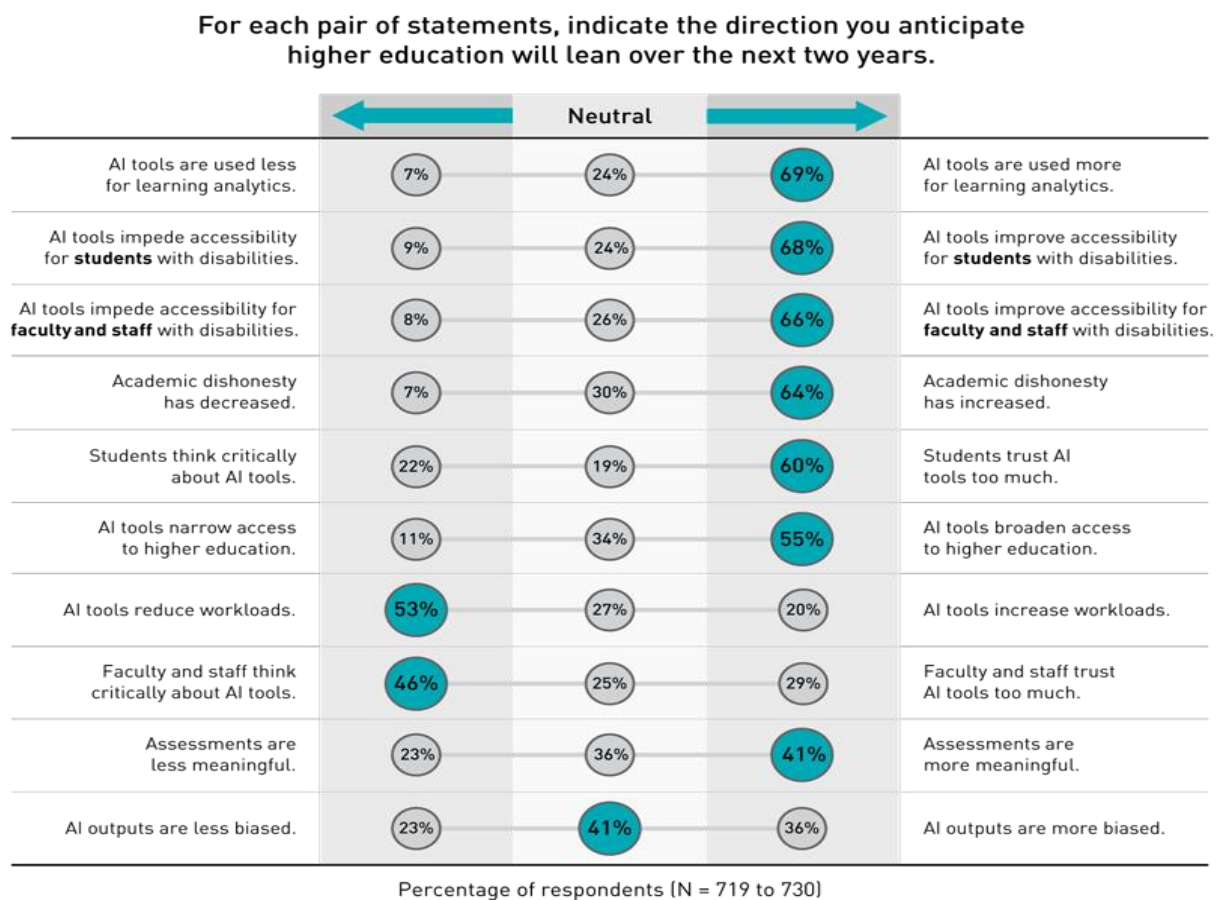
The future of artificial intelligence in education is promising, thanks to advancements in technology and a better understanding of how AI can improve learning. Personalized learning is a key area, where adaptive learning systems and intelligent tutoring systems create customized learning experiences for students. These systems adjust to each student's strengths and weaknesses, making learning more effective. AI is also set to revolutionize administrative tasks in education. Automated grading systems can save teachers a lot of time, especially in subjects like math and coding. AI can also streamline tasks like enrolment, scheduling and record-keeping, allowing educators to focus more on teaching. Additionally, AI can enhance student engagement with interactive content and gamified educational software, making learning more enjoyable. AI can support teachers and promote accessibility and inclusion. AI-powered professional development tools can recommend resources and training tailored to teachers' needs and interests, fostering continuous professional growth. Classroom management tools can help teachers monitor student engagement, providing

valuable insights. Assistive technologies, such as speech-to-text applications for hearing-impaired students and text-to-speech for visually impaired students, along with real-time language translation services, can make education more accessible to diverse student populations. While the potential benefits of AI in education are vast, it is crucial to address ethical considerations and challenges. Ensuring that artificial intelligence systems are free from bias and provide fair opportunities for all students is essential [4].

In addition to pros and cons of AI, a following survey report showing acceptance of AI in percentage on some parameters:

The higher education community is still looking for common ground on how AI should and should not be used for learning and work [9].

Figure 2. Respondents' Predictions about the Impacts of AI on Higher Education by 2026 [9].



10. Conclusion:

The integration of AI in education presents profound benefits, such as personalized learning and improved efficiency. However, it introduces risks like data privacy concerns and potential biases. Balancing technological innovation with ethical considerations is crucial to harness the full potential of AI for the betterment of education [3].

The future of artificial intelligence in education is bright, with the potential to transform the way higher education institutions teach and learn. AI has the potential to transform education and many other industries and revolutionize how we interact with technology. AI can improve the accuracy and speed of tasks, reducing the risk of human error. However, ensuring the responsible development of AI involves addressing ethical concerns and ensuring accountability and trust. AI systems need to be designed with human oversight and control

and it's essential to address the ethical and practical challenges to ensure that AI benefits all stakeholders in the educational ecosystem [4].

Hanover provides **KEY FINDINGS**: 1) AI integration in higher education is anticipated to have both positive and negative impacts. Applied with forethought, AI tools can enable personalized learning and foster critical thinking, transform educators from knowledge transmitters to guides, and provide interactive learning environments that can improve student engagement and performance. 2) Despite the likely permanence of AI in the higher education industry, concerns have arisen about the reliability and ethical implications of AI in an education setting, as generative AI systems can lack context and accuracy. The absence of regulations around AI usage at many institutions potentially encourages misuse, with some students exploiting these tools. Addressing these concerns, ensuring ethical usage, improving accuracy, and establishing clear guidelines are crucial steps toward harnessing the full potential of AI in higher education. 3) Rather than implementing outright AI bans, institutions can offer guidelines and training to faculty and allow them to determine whether and how to integrate AI into their classrooms and assignments. At some institutions, faculty are assigning in-class writing, handwritten papers, group work, and oral exams to replace take home exams and essays and to ensure that student work is original. Universities like Auburn University and the University of Mississippi are offering training and workshops on AI. Some institutions, like Vanderbilt University, are disabling Turnitin's AI detection tool due to concerns regarding accuracy, sustainability, and privacy concerns. Faculty members are also engaging students proactively in conversations about the ethical use of AI, developing syllabi statements to inform their use, and guiding in-class reflections about key takeaways [5].

11. Recommendation:

Based on the review research, the researcher recommends that despite the pros and cons of AI, the AI may be adapted by the higher education institutions with a clear vision, mission, and goal and with a very clear roadmap and guidelines with special emphasis on how to avoid misuse of AI and also ensure proper ethical consideration and data privacy.

12. Acknowledgement:

I have been self-guided to prepare this review research paper based on various news and events coming across.

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