University of Zawia Journal of Educational and Psychological Sciences (UZJEPS)
Volume 15, Issue 1, 2026, pp 88-99, ISSN 3078-2899

Artificial Intelligence in Higher Education and Its Transformative Role in Educational Technologies and Learning Systems

Akram Klella

English Department, Faculty of Education Abu Aisi , University of Zawiya, Zawiya, Libya

Corresponding author email: Akram Klella | a.klella@zu.edu.ly

Received: 01-04-2026 | Accepted: 20-04-2026 | Available online: 30-06-2026 | DOI:10.26629/uzjeps.2026.05

ABSTRACT

Artificial intelligence (AI) has emerged as a transformative force in higher education, reshaping the development and application of educational technologies. This paper examines the evolution of educational technologies and explores how AI-driven systems are influencing teaching, learning, and institutional practices in contemporary universities. Drawing on recent literature and current technological developments, the study discusses the integration of AI-based tools such as intelligent tutoring systems, adaptive learning platforms, predictive analytics, and virtual learning assistants. These technologies enable personalized learning experiences, improve instructional efficiency, and support data-informed decision-making in educational environments. At the same time, the paper highlights several challenges associated with AI adoption in higher education, including ethical concerns, data privacy, algorithmic bias, and the need for appropriate regulatory frameworks. The study also considers the evolving role of educators in AI-enhanced classrooms and the importance of developing digital competencies among both instructors and students. The findings suggest that while AI offers significant opportunities to enhance learning outcomes and institutional effectiveness, its successful integration requires careful policy development, ethical oversight, and pedagogical alignment. The paper concludes that AI will play an essential role in shaping the future of higher education, particularly in the development of intelligent, personalized, and data-driven educational systems.

Keywords: Artificial intelligence, Educational Technologies, Technological Developments, Higher Education, Educational Systems.

الذكاء الاصطناعي في التعليم العالي ودوره التحويلي في التقنيات التعليمية وأنظمة التعلم

أكرم الشيباني كليلة

قسم اللغة الإنجليزية، كلية التربية ابوعيسي، جامعة الزاوية، الزاوية، ليبيا

*المؤلف المراسل: أكرم كليله a.klella@zu.edu.ly

استقبلت: 1-04-2026م | قبلت: 20-04-2026م| متوفرة على الانترنت | 30-06-2026م |

ملخـــــص البحـــــث

برز الذكاء الاصطناعي كقوة تحويلية في التعليم العالي، حيث أعاد تشكيل تطوير التقنيات التعليمية وتطبيقها. تتناول هذه الورقة تطور التقنيات التعليمية وتستكشف كيفية تأثير الأنظمة المدعومة بالذكاء الاصطناعي في عمليات التدريس والتعلم والممارسات المؤسسية في الجامعات المعاصرة. واستنادًا إلى الأدبيات الحديثة والتطورات التكنولوجية الراهنة، تناقش الدراسة دمج الأدوات القائمة على الذكاء الاصطناعي مثل أنظمة التدريس الذكية، ومنصات التعلم التكيفي، والتحليلات التنبؤية، والمساعدين الافتراضيين للتعلم. تُمكّن هذه التقنيات من توفير تجارب تعلم مخصصة، وتحسين كفاءة التدريس، ودعم اتخاذ القرارات المستندة إلى البيانات في البيئات التعليمية. وفي الوقت نفسه، تسلط الورقة الضوء على عدد من التحديات المرتبطة

"Articles published in *Univ Zawia J Educ Psychol Sci* are licensed under a Creative Commons Attribution-Non-Commercial 4.0 International License."

بتبني الذكاء الاصطناعي في التعليم العالي، بما في ذلك القضايا الأخلاقية، وخصوصية البيانات، والتحيز الخوارزمي، والحاجة إلى أطر تنظيمية مناسبة. كما تتناول الدراسة الدور المتطور للمعلمين في الفصول الدراسية المعززة بالذكاء الاصطناعي، وأهمية تنمية الكفاءات الرقمية لدى كل من المعلمين والطلاب. و بالرغم من أن الذكاء الاصطناعي يوفر فرصًا كبيرة لتعزيز مخرجات التعلم وفعالية المؤسسات التعليمية، فإن دمجه الناجح يتطلب تطوير سياسات مدروسة، وإشرافًا أخلاقيًا، ومواءمة تربوية فعالة. وتخلص الورقة إلى أن الذكاء الاصطناعي سيؤدي دورًا أساسيًا في تشكيل مستقبل التعليم العالي، لا سيما في تطوير أنظمة تعليمية ذكية، مخصصة، وقائمة على البيانات.

الكلمات الدالة: الذكاء الاصطناعي، التقنيات التعليمية، التطورات التكنولوجية، التعليم العالي، النظم التعليمية.

1. Introduction to Educational Technologies

Emergent technologies are reshaping the education landscape, altering the way we interact with subjects, learning material, and instructors, and providing a platform that will change the way we receive educational content throughout our lifetimes. Furthermore, they will augment the role of traditional college instruction and could potentially shift the value proposition of obtaining a higher education degree. By comparing specifications across courses, structures are then built highlighting the degree to which the technology tool is utilized in each of the course categories. AI tools' inclusiveness and active adoption usage inside and out of the classroom, preference of type and teaching aspects it could support, and types of resources used are among the unique contributions of this research. Challenging issues with novel AI techniques offer a quick fix in short-term academic settings, especially in terms of instructional augmentation. As a long-term substitute, an early capability for the use of intelligent systems can be career-altering to students. On one hand, teachers would provide better experiences for their students by exploring these AI learning tools, and thus, increasing the likelihood of success in their career endeavors. On the other hand, students would be encouraged to be more client-centered, with AI-supported instructors giving skillful attention to their career paths.

Before discussing how AI is shaping the future of college education, we need to situate its potential within the larger context of educational technologies, a term that has made its way into the literary and other academic conversations since the 1960s. Various technologies have been employed to make teaching and learning more efficient. They include games, instructional television, programmed instruction, open educational resources, and web-based e-learning technologies. While each technological innovation performs different functions and relies on social and cognitive theories to enhance learning, in general, the interest in educational technologies has focused on how to automate the more uninteresting aspects of teaching and learning so that students and teachers can pursue more engaging intellectual activities. The field has evolved to the point where it sometimes relies on teaching methods that have the unfortunate consequence of emphasizing machine learning at the expense of exploring explanations of complex phenomena.

The integration of AI into college education is as transformative as previous waves of educational innovation. The evolution of college education has been marked by pivotal technological developments that have fundamentally shaped its formation, the printing press, the blackboard, and the computer are good examples of these changes (Okunlaya et al., 2022, pp. 1870–1872). Educational theorists may date these changes somewhat differently (such as

the shift from in loco parentis supervision to a more familial, or "new technology-friendly," academic estrangement model), or they may organize these changes under different educational research themes (pedagogical, curricular, or institutional models). However, these canonical moments and processes of educational innovation are emblematic of the increasing investment in technology and its impact on educational life.

This paper investigates how AI is changing these canonical moments or accepted educational practices upon which college education has been reconstructed, destabilized, or re-invented. The use of artificial intelligence is significant because it directly structures important parts of the authoritative and administrative functions of the university (admissions, scheduling, advising, grading and assessment), as well as the curriculum, the pattern of student interactions, and the rhythm of academic work (Abouzied, 2026, p. 94). For example, through automated college research, learning management systems, customized or adaptive online learning systems, photo grading, educational Chatbots, algorithms-scheduled courses, and assisted learners / learners (successful to obtain progress reports). It also has a relatively short innovation cycle, facilitated by the "big data" collected by learning analytics.

2. Historical Overview of Educational Technologies

Educational technologies have undergone a rapid change and are now influencing the future of education like they never did before. It was assumed that books would disappear, filmstrips and gramophones would "supplant" them in classrooms. This prediction was not confirmed, yet filmstrips, radio, educational television, and instructional television have assumed roles in education over the years.

Educational media did not ultimately "replace" schools either, as Nobel Prize-winning economist Herbert Simon predicted. As developments in educational technologies continue, some experts believe that the current stage of Internet development will pave the way for an important and transformed future for educational technologies. As online education difficulties and problems that hinder or impede the successful use of the technology, the educational process has come full circle (Reich, 2020, p. 316). In response to educational needs on the part of both education consumers and providers, institutions of higher learning are designing educational products that combine established educational methods and the online environment. These products are helping to overcome obstacles and realigning online education with basic learning principles. At the front are schools like Stanford University, with partnerships such as Stanford Online and the National Science Foundation.

Even in the period before the digital era, the potential of educational technologies has been long recognized. From games and tests to audiovisual presentations, technology was recognized for its ability to enhance and support teaching-learning through problem solving and critical thinking (Haleem et al., 2022, p. 281). The arrival of computers in schools and their popularization as a tool for learning has deepened an increasingly urgent discussion on the relation between technology and education, as many educational software used presented a productivity perspective that overvalued the technical aspects of knowing and the instrumental side of education (Klella, 2024, p. 469). The in-depth investigation of these initial perspectives unraveled a series of contradictions in the relationship between technology and education, and

learning, disregarding the characteristics of learning and teaching and the specific pedagogies that contemplated educational content.

The first Learning Management System (LMS) emerged in the 1980s, but online education didn't gain traction until the 21st century. Factors like distance learning acceptance, internet advancement, and improved pedagogical models contributed to this. The pandemic further accelerated the shift from in-person to online education, prompting schools to adapt quickly.

3. The Rise of Artificial Intelligence in Education

Developing machines that can comprehend the world and operate efficiently within it is a challenging and ambitious endeavor. Nevertheless, over the past decade, the AI field has made remarkable advancements, causing significant changes in various industries. Speech and image recognition software have become part of everyday life through platforms like Siri and Google, while companies such as Netflix and Amazon utilize machine learning to customize their products for better customer service (Xu et al., 2021, p. 12). Consequently, modern consumers have grown accustomed to the advantages of these technologies, leading to the perception of inevitable progress in AI and its applications. However, Klella and Mrghem (2024, 441) stated that if until now AI's impact on the world has seemed confined to consumer-oriented uses, it is unlikely to remain that way for much longer, since AI tools in education can enhance personalized learning experiences, improve teaching and learning understanding, and increase access to quality education.

Although AI is increasingly being utilized in various areas of society, such as transportation, industry, and healthcare, applications in college education have also significantly contributed to improving the quality and efficiency of education. We can grasp the recent development of AI technology in the field of education through the frame of technological design space presented. The design space has grown to accommodate a wide range of applications and solutions (Saaida, 2023, p. 31). The design space is organized around three major areas; learning, teaching, and education, with each divided into separate dimensions. Taking a relatively recent snapshot, we see that the technological affordances cluster around sixteen major solution areas that have also been differentiated along six main dimensions: Action, Data Collection, Content Area, Learners, Learning, and Planning Support.

4. Benefits and Challenges of AI Integration in Higher Education

Assessing AI application in higher education to draw implications about the future of AI in college education by outlining the capabilities of AI applied in higher education, specifically in classrooms. The benefit-accounting is based on the insights from the integration of Intelligent Tutoring Systems (ITS) in education, the long-existing component of education built based on AI, predominantly machine learning for 70 years. AI application that directly concerns students' learning does not necessarily lead to success in education; the design of effective technology is nontrivial. Fine-grained concepts in deeper learning are emphasized.

Constructing AI that helps teachers increase teaching performance is itself difficult and is relatively new, especially for AI-based teaching assistant for professors in large college classes not taught by professors. Efficient communication is key. Self-driving AI technologies displace the jobs of drivers and pilots (Liu et al., 2022, p. 6). Countering that harmful outcome alone is hard, so suggesting that education policy is conducive to introducing AI into college classrooms

to be a test bed to improve AI performance, as college teaching especially is still relatively free from the challenge of AI that directly replaces human professional roles. The AI technologies used in personalized e-learning platforms are evolving to accommodate these preferences. Trybe is an advanced intelligent tutoring system that supports a semi-formal e-learning commitment model, dynamic exchange of knowledge between members of the community, and tightly coupled learning activities. Track design and intelligent course promotion (Gligorea et al., 2023, p. 21). It learns about Track users and their learning interests over time and provides an e-learning community with an intelligent network learning manager that helps learners progress through access to courses, supplements, and mentors using intelligent personalized learning environments. The impact of artificial intelligence on ethics in teaching and learning in higher education is a consistent topic of debate. Relevant technologies include personalized tutoring, formative feedback, support for conversations and reflective practices, mixed reality learning experiences, and academic gaming applications.

5. Ethical Considerations in AI-Driven Education

Ethical Considerations of Analytics in Higher Education provided the importance of student data privacy in a rapidly evolving environment of innovative educational tools and platforms. Public discussions worldwide about commercial uses of big data in diverse marketplaces suggest considerable public concern about the potential use of student data. Hence, clearly articulating ethical guidelines and legal permissions about privacy and the use of student data (Hakimi et al., 2021, p. 714). Conversely, it might restrain the development of innovative tools for personalized AI-based learning through universities. Technology-mediated education offers both potential and a formidable challenge to the dream of personalizing education for large numbers of people.

Due to their ability to learn from patterns in data, ML models risk inheriting and even amplifying human biases. AI-based systems can pick up on the biases in the historical data upon which those algorithms are trained. Biased decisions in college admissions can have long-term consequences for prospective students as well as post-secondary institutions. With increasingly greater proportions of college-aged citizens being unable to access quality higher education, and the role that higher education plays in determining students' career trajectories, it is important to understand how historical bias affects the college admissions process (Schwartz et al., 2022, p. 41). For example, are certain underrepresented demographic groups placed at a systematic disadvantage in obtaining post-secondary opportunities, and are they systematically under matched to less selective institutions? The use of algorithms within college admissions has the potential to accelerate the biases in the college admissions process.

6. Case Studies of AI Implementation in Higher Education

As artificial intelligence and machine learning technologies evolve and proliferate, practical applications in higher education are quickly developing. These technologies are particularly useful when it comes to supporting instructor workflows and improving student engagement at scale. Fortunately, many of these technologies are not yet perfectly refined, which allows for instructor and institutional impact (Almusaed et al., 2023, p. 13). Additionally, recent collaborations between colleges, universities, and tech companies specializing in AI-driven

elements have and will continue to result in more effective, efficient, and personalized outcomes.

However, one factor that could inhibit the implementation of AI-generated content is the policies developed by federal regulators on the use of intellectual property. There is general concern that without intervention, the policies offering protections will not be implemented soon enough to requisition companies already making use of AI to develop their own educational materials. In the area of AI in higher education, great strides are being made to improve models of adaptive learning. For instance, the California Community College system and the Online Education initiative have both contracted with Kit Digital for its platform, which utilizes AI pattern recognition, machine learning, and algorithmic forecasting to greatly improve engagement with media and text-based materials typically used in courses in this area.

Discussions and instructions delivered by virtual teaching assistants are now quite common in some online learning environments. These teaching assistants have personality-rich characters, help mediate student-teacher discourses, and supervise the students, helping students manage their work schedules and remind them when assignments are due (Hilderbrand et al., 2024, pp. 641-642). Possess informal conversation skills through capable fulfilling evaluative duties and creating dialogue-based ideas. In the future, these characters, working as virtual teaching assistants, could benefit both online and offline learning environments.

7. Future Trends and Innovations in Educational Technologies

AI has been recognized as a 21st-century disruptive technology and is developing rapidly. In the United States, China, and around the world, the increasing level of investment in AI highlights the high stakes, and potentially high, beneficial achievements, for the nation's economy, society, political leadership, and national security. AI promises to affect critical areas of society, education, healthcare, transportation, energy, defense, and the environment (Gligorea et al., 2023, p. 21). For education, numerous experts, already in 1983 and 2002, report the potential of AI-driven adaptive learning. AI's transformative impact on education and the labor market has been described. Hence, the primary focus of AI-based educational technology innovation is, and has been, the targeted enhancement of learning and teaching in K-16 schools, colleges, and universities.

The use of analytics presents unique opportunities to engage and support our most vulnerable students. When predictive analytics are used to identify learning problems early, students can be better prepared to understand the underlying problem, take action to address the problem, have time to make needed changes, and can be emotionally better prepared to take action (Yağcı, 2022, p. 15). The faculty can act as learning guides rather than learning judges. Further, the use of predictive analytic tools is not disciplining faculty members for the low grades they give or repressing or intimidating the faculty members; it is helping the faculty do the job more efficiently by focusing their energy and their students' energy at the right time. Support can be put in place for success at the time an intervention has the highest likelihood of success for the student. Predictive analytics identify at-risk students, alerting faculty and support services. This includes freshmen, sophomores, and transitioning juniors and seniors. Case reviews lead to understanding patterns. Focus on key indicators, not all data. Prompt referral to advisors is vital.

8. The Role of Educators in the AI-Enhanced Classroom

Critics argue against training professors for AI-enhanced classrooms, claiming experienced professors who have taught for years cannot be taught these methods. They suggest asking these faculty members about their teaching experiences instead (Wernerfelt et al., 2022, p. 114). While some upset may be justified due to AI potentially replacing instructors, decision-makers increasingly rely on data derived from AI software. The $154.6 billion market for data and analytics is projected to grow at 12.4% annually through 2020, relying heavily on AI algorithms.

As the nature of education and society continues to change, so too must teacher training and professional development. The traditional preparation activities, such as the student teaching practicum, for veteran educators are no longer comprehensive or adequate. AI and machine learning, in particular, offer educational technologies the ability to automate both labor-intensive and judgment-based functions in the classroom. This includes micro-sessions that surface relevant evidence from ongoing practice to inform programming and supports (Ben Geloune, 2024, p. 19). AI can also support the development of educators' own technology skills, promote school integrated and team-based professional development, create new opportunities for mentorship, and build new feedback loops that can improve practice. Effective uses of AI in several large, diverse urban districts can inform and shape teacher preparation programs as well as the development of student curricula. These can then guide the integration of AI applications in other urban settings.

One challenge we face is preparing teachers for new roles in meeting emerging needs. They must understand teaching with AI, develop computer science skills, and attend to the well-being of support animals. Training should cross content areas to avoid the gap from the 1980s.

8.1 Collaborative Learning Environments and AI

Traditionally, collaborative learning tools were limited to course management systems (CMS). These systems automate communication tasks, but many faculties only use them for information transmission. Students' internet usage and technology skills are increasing. Collaborative learning requires instructor commitment. Research suggests that learning is enhanced when students work together (Troussas et al., 2023, p. 57). This analysis argues for embracing technology that fosters collaboration and finding interdisciplinary solutions for integrating technology in the classroom. Deep, meaningful learning improves when students work closely with higher-order thinking strategies. Analyzing the effectiveness of educational technology leads to new ways of exploring technology. Instructions must go beyond practice and transmission of knowledge. Best instructional practice and thoughtful technology application involve transforming knowledge and utilizing emerging tools like social networks.

8.2 Virtual Reality and Simulations

Immersive classroom features, sometimes called Augmented Reality (AR) or Mixed Reality (MR), are a type of technology that merges the real world with the computer-generated world Donally (2022, p. 13) stated that this type of technology makes AR/MR more interactive and allows the user to interact with both the physical and virtual worlds simultaneously.

With VR, teachers can take students on virtual field trips worldwide. This helps introduce students to places they can't visit. VR supports experiential learning at all grade levels. It helps students visualize ideas like the solar system, the Great Wall of China, and ecosystem acidity. VR is also used in vocational training for hands-on technical learning. Since AR/MR technology interacts with the real world in a unique way, teachers have the ability to create spellbinding learning experiences that help students visualize concepts that were once considered too complex of an idea to understand. With the help of AR, teachers can bring in 3D models into the classroom without needing to use VR. Such a feature is now being used in medical schools where students are now using AR to explore human anatomy in detail without the need to dissect a real human body.

9. The Impact of AI on Students' Success and Retention

Given the potential benefits of technology for student success and the efficiency of interventions for at-risk students, there is interest in exploring how knowledge can address barriers to success. Traditionally, this knowledge has been held by human experts, but they are not always accessible and can be costly. Machine learning and AI could supplement human experts to enhance student success. AI-driven approaches have the potential to change interactions among faculty, administrators, and support personnel in achieving specific student outcomes. The use of machine learning in education has multiple advantages. Predictive models analyze student performance to determine key factors for success, guiding policy decisions (Yağcı, 2022, p. 12). These models also help inform course instruction, college strategy, and student services. By optimizing resource allocation, colleges can address student needs regardless of budget. However, using AI in education requires unique policy trade-offs. The application of artificial intelligence can contribute to future progress in higher education.

Early warning systems (EWS) are gaining attention as more student data is collected. EWS recognizes behavioral patterns of at-risk students using historical data. Data sources include quizzes, grades, emails, library, and residence hall records (Marshall, 2024, p. 6). Critics argue against predictive surveillance, as it changes the student-teacher dynamic. The ethical concern is balancing surveillance with the potential of understanding students' intentions.

10. Global Perspectives on AI in Higher Education

Although the topic of artificial intelligence is among the most provocative issues of our day, this report and the other six in this series make it crystal clear that global institutions, organizations, public leaders, and educators are devoting surprisingly little attention to AI, especially AI in education. The focus appears to be much more on practical technology rather than the fundamental issues like ethics, equality, diversity, and educational quality (Schiff, 2022, 529). Current attention seems quite limited when we consider the enormous significance of these complex policy topics. There is a common tendency to avoid facing these critical AI issues and letting them emerge and evolve by themselves. For years, many educational technology experts have assumed, often unconsciously without realizing the harsh reality, that technology will open the doors to the future. The global perspective on in higher education is diverse. Over 53 countries have policies promoting AI applications, but few have mapped worldwide AI strategies. Many strategies focus on building the AI workforce and improving education for economic growth. However, skills data-related policies are less prominent than

in health or welfare. Some countries prefer informal and innovative AI solutions by entrepreneurs.

It is important to identify the differences in order to create faculty development programs and address the concerns, especially with new technology. As stated by the Association of American Colleges and Universities (AACU), faculty are especially interested in finding faculty members to serve as mentors to develop teaching methods, new technology tools and guidelines for using these technologies, creating useful learning outcomes, integrating course content, research and creative activity, and strategies for tracking the learning outcomes (Carvalho & Santos, 2022, p. 11). Differences between institutional leaders' and faculty's technology adoption emerge. Faculty are conservative and skeptical of innovation, while deans are more likely to integrate technology into academic planning. Engaging faculty as mentors during technology development is essential.

11. Funding and Investment in Educational Technologies

The field of educational technology has grown due to technological advancements, making education more inclusive and individualized. This has attracted mainstream investors, particularly in MOOCs (Massive Open Online Courses). University-powered inventions have stimulated investments in education technology, mainly in innovative teaching and learning tools. The issue with investments at research universities is that the innovation is not yet close to commercialization (Brantnell & Baraldi, 2022, p. 14). However, when it does reach that stage, it becomes more attractive as a potential company. Unlike a typical start-up, the university has already done a lot of the work, reducing the investment risk for the private sector. Advancements in information systems, AI, and intelligent technologies improve education and promote lifelong learning, personal skills, talent utilization, and social progress.

Venture capital firms and incubators are funding startups in education and technology. In 2016, U.S. ed tech firms received $1 billion in venture funding, the highest it's been in five years. More startups are emerging, raising concerns of another dot-com boom. Traditional educational institutions face risks that could lead to their decline (Lerner & Nanda, 2020, p. 239). Limited access to credit may decrease demand for traditional colleges. For-profit institutions and distance learning options are forcing institutions to lower tuition and improve services to stay competitive.

12. Regulatory Frameworks and Policies for AI in Education

As AI becomes increasingly important in many facets of our lives, there are significant societal, technical, and moral issues to consider. One key issue is the lack of regulation, oversight, or standardization around the development and use of AI in educational and other settings. A lack of regulation or oversight can lead to negative consequences for software users and society. De Almeida et al. (2021, p. 516) stated that we will need educational software product development standards, ethical guidelines, and processes to certify products that meet standards and guidelines in order to ensure the creation of educational software that is effective, transparent, and unbiased. If these are not developed, the market may eventually create an environment where it is impossible for any startup or non-tech company to enter the industry to provide relevant and informative products. Only an industry-led effort to define, regulate, and enshrine quality, ethical guidelines, transparency, and liability policies will prevent this from occurring.

The proliferation of online learning platforms has provided educational institutions with a great deal of data on their students. Due to business models which monetize this data, vendors such as collect and analyze data from web logs, assignments, form submissions, quiz results, in a variety of formats. Data from other sources are often shared with educational institutions in order to improve class analytics (Liu et al.2020, p. 9). Popular starting points are student enrollments, demographic information, major and year, often followed by grade point averages for registered courses. Additionally, Hmouma (2024, p. 476) concluded that including information about students' personal attributes such as age and gender have shown positive effects in predicting academic performance.

13. Conclusion and Future Directions

The emergence of technology at the core of almost every field of work, research, and innovation, combined with technological developments in tools and platforms for learning (such as intelligent courseware, smart tutoring systems, personalized learning platforms, intelligent agents, robots, and so on), suggest that the opportunities and impacts for AI in education may be profound, and not just at some point in the future but in the relatively near and immediate future.

There are a number of practical implications for research, practice, policy, and future technology development in the areas of higher education, AI, and personalized and platform-based learning; Educational technology innovation has been ongoing for millennia. Our intelligent ancestors (evolution-wise) trafficked in what could be considered early forms of educational technologies, which only roughly in the last millennium have grown into recognizable specializations; modern instructional design showed the importance of aligning the teaching methods to the teacher and the goals of the class, provided the first analysis of individual differences, and established guidelines in pedagogy to ensure transfer of learning; and Learning analytics, machine learning, and more recently AI and AI sub-domains have the potential to play significant roles in educational technology over the next decade. AI's potential arises from its distinctive qualities relative to previous forms of educational technologies.

A robust research agenda on AI's impact on higher education is needed. This requires external determinations through research, monitoring of technology development, and collective engagement from policymakers, technologists, and thought leaders. Transparency, knowledge, and efforts to address barriers are necessary for incorporating AI solutions into learning contexts. Colleges and universities must balance deployment speed with understanding of impacts on students, teachers, privacy, and accountability. A thoughtful dialogue is needed for responsive policy dialogues on platform and AI-based personalized learning systems.

14. References

1. Abouzied, A. S. (2026). *Alternative assessment in the educational process*. *International Journal of Peer-Reviewed Multidisciplinary Research, 2*(1), 90–111. https://ijprmr.com/index.php/ijprmr/article/view/17

2. Almusaed, A., Almssad, A., Yitmen, I., & Homod, R. Z. (2023). Enhancing student engagement: Harnessing AIED's power in hybrid education: A review analysis. *Education Sciences, 13*(12), 1216. https://doi.org/10.3390/educsci13121216

3. Ben Geloune, R. (2024). *Predictive accuracy of performance in knowledge work: Comparison of human judgment, regression and artificial intelligence models*. https://doi.org/10.2139/ssrn.4693870

4. Brantnell, A., & Baraldi, E. (2022). Understanding the roles and involvement of technology transfer offices in the commercialization of university research. *Technovation, 116*, 102492. https://doi.org/10.1016/j.technovation.2022.102492

5. Carvalho, A. R., & Santos, C. (2022). Developing peer mentors' collaborative and metacognitive skills with a technology-enhanced peer learning program. *Computers and Education Open, 3*, 100080. https://doi.org/10.1016/j.caeo.2022.100080

6. De Almeida, P. G. R., dos Santos, C. D., & Farias, J. S. (2021). Artificial intelligence regulation: A framework for governance. *Ethics and Information Technology, 23*(3), 505–525. https://doi.org/10.1007/s10676-021-09593-z

7. Donally, J. (2022). *The immersive classroom: Create customized learning experiences with AR/VR*. International Society for Technology in Education.

8. Gligorea, I., Cioca, M., Oancea, R., Gorski, A. T., Gorski, H., & Tudorache, P. (2023). Adaptive learning using artificial intelligence in e-learning: A literature review. *Education Sciences, 13*(12), 1216. https://doi.org/10.3390/educsci13121216

9. Hakimi, L., Eynon, R., & Murphy, V. A. (2021). The ethics of using digital trace data in education: A thematic review of the research landscape. *Review of Educational Research, 91*(5), 671–717. https://doi.org/10.3102/00346543211020116

10. Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers, 3*, 275–285. https://doi.org/10.1016/j.susoc.2022.05.004

11. Hilderbrand, R., Romershausen, S., & Lee, N. (2024). Emotion in games. In *Encyclopedia of computer graphics and games* (pp. 641–642). Springer. https://doi.org/10.1007/978-3-030-33865-9

12. Hmouma, M. A. (2024). Exploring Libyan EFL undergraduates' attitudes towards AI-driven English learning applications. *University of Zawia Journal of Educational and Psychological Sciences, 13*(2), 473–486.

13. Klella, A. S. (2024). *Accessibility and inclusivity in digital language education*. *University of Zawia Journal of Educational and Psychological Sciences, 13*(2). https://journals.zu.edu.ly/index.php/UZJEPS/article/view/1063

14. Klella, A. S. A., & Mrghem, Z. M. O. (2024). Artificial intelligence and human cognition: A systematic review of thought provocation through AI ChatGPT prompts. *ATRAS Journal, 5*(3), 432–444. https://doi.org/10.70091/atras/ai.27

15. Lerner, J., & Nanda, R. (2020). Venture capital's role in financing innovation: What we know and how much we still need to learn. *Journal of Economic Perspectives, 34*(3), 237–261. https://doi.org/10.1257/jep.34.3.237

16. Liu, Y., Chen, L., & Yao, Z. (2022). The application of artificial intelligence assistant to deep learning in teachers' teaching and students' learning processes. *Frontiers in Psychology, 13*, 929175. https://doi.org/10.3389/fpsyg.2022.929175

17. Liu, Z. Y., Lomovtseva, N., & Korobeynikova, E. (2020). Online learning platforms: Reconstructing modern higher education. *International Journal of Emerging Technologies in Learning, 15*(13), 4–21. https://doi.org/10.3991/ijet.v15i13.14645

18. Marshall, D. T. (2024). Student attendance patterns as actionable early warning indicators of high school graduation outcomes: Findings from an urban alternative charter school. *Urban Science, 8*(1), 12. https://doi.org/10.3390/urbansci8010012

19. Okunlaya, R. O., Syed Abdullah, N., & Alias, R. A. (2022). Artificial intelligence (AI) library services innovative conceptual framework for the digital transformation of university education. *Library Hi Tech*. https://doi.org/10.1108/LHT-07-2021-0242

20. Reich, J. (2020). *Failure to disrupt: Why technology alone can't transform education*. Harvard University Press. https://doi.org/10.4159/9780674249664

21. Saaida, M. B. (2023). AI-driven transformations in higher education: Opportunities and challenges. *International Journal of Educational Research Studies, 5*(1), 29–36. https://doi.org/10.32996/ijers.2023.5.1.4

22. Schiff, D. (2022). Education for AI, not AI for education: The role of education and ethics in national AI policy strategies. *International Journal of Artificial Intelligence in Education, 32*(3), 527–563. https://doi.org/10.1007/s40593-021-00270-2

23. Schwartz, R., Vassilev, A., Greene, K., Perine, L., Burt, A., & Hall, P. (2022). *Towards a standard for identifying and managing bias in artificial intelligence* (NIST Special Publication 1270). National Institute of Standards and Technology. https://doi.org/10.6028/NIST.SP.1270

24. Troussas, C., Giannakas, F., Sgouropoulou, C., & Voyiatzis, I. (2023). Collaborative activities recommendation based on students' collaborative learning styles using ANN and WSM. *Interactive Learning Environments, 31*(1), 54–67. https://doi.org/10.1080/10494820.2020.1769693

25. Wernerfelt, N., Tuchman, A., Shapiro, B., & Moakler, R. (2022). *Estimating the value of offsite data to advertisers on Meta* (Working Paper No. 114). Becker Friedman Institute for Economics. https://bfi.uchicago.edu

26. Xu, Y., Liu, X., Cao, X., Huang, C., Liu, E., Qian, S., et al. (2021). Artificial intelligence: A powerful paradigm for scientific research. *The Innovation, 2*(4), 100179. https://doi.org/10.1016/j.xinn.2021.100179

27. Yağcı, M. (2022). Educational data mining: Prediction of students' academic performance using machine learning algorithms. *Smart Learning Environments, 9*(1), 11. https://doi.org/10.1186/s40561-022-00192-z