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The Impact of Artificial Intelligence on Educational Transformation: Trends and Future Directions

Maimuna Khatun[1], Rafia Islam[2], Sobuz Kumar[3], Rashed Hossain[4], Lisa Mani[5*]

[1,2,3]Department of Management Information Systems, Begum Rokeya University, Rangpur, Bangladesh
[4]Department of Accounting and Information Systems. Faculty of Business Studies, University of Dhaka, Dhaka 1000, Dhaka, Bangladesh
[5*]Department of Business Administration, (Major in Finance and Banking), Shahjalal University of Science and Technology, Sylhet, Sylhet 3114, Bangladesh
Email: [1]khatunmaimuna987@gmail.com, [2]rafiyaislam73@gmail.com, [3]sobuzk721@gmail.com
[4]rashedhbs@gmail.com, [5]lisamoni00@gmail.com

Abstract

This study conducts a systematic review using the PRISMA framework to explore the intersection between escalation profounder perceptions and appreciative into AI technology interconnected education. The novelty of this research lies in its synthesis of AIEd research, highpoints designated AIEd technologies and applications, evaluations the proven and potential benefits for education, connections the gaps between AI technological innovations and educational applications and generates practical illustrations and inspirations for both technological experts that create AIEd technologies and educators who spearhead AI innovations in education. Using a PRISMA-based approach, this review systematically analyzed 175 articles across multiple databases being journal articles or full conference papers and a method section were included for data extraction and synthesis, focusing on AI's influence on personalized learning. This systematic review presents a comprehensive synthesis of recent scientific findings concerning the disruptive effects of artificial intelligence on the educational sector. Key findings reveal that AI enhances learning efficiency but raises ethical concerns regarding privacy and bias. Limitations include the variability of AI tools in different educational settings and the need for longitudinal studies to assess long-term impact. However, some risks are associated with artificial intelligence advancements such as safety, security, and privacy concerns. As a result, artificial intelligence technologies positively and negatively affect the education sector. Future of the study explores VR, AR, and MR being embraced with AI for learning tools, interdisciplinary and transdisciplinary research which is effective expansion revision of AI in education. Thus, AI in education approaches to encounter desires and potentials through AI technologies which will be excellent by the aware of trends in AIEd applications and future directions.

Keywords: Artificial Intelligence in Education (AIEd), Personalized Learning, AI-driven Educational Technologies, Adaptive Learning Systems AI Ethics, Intelligent Tutoring Systems, Educational Data Mining

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1. INTRODUCTION

AI has the prospective to revolutionize education, issues like algorithmic bias and privacy concerns must be properly addressed to guarantee fair execution and outcomes[1].A major gap that AI can successfully fill is the lack of ability of current educational systems to offer individualized learning experiences catered to each student's needs. The analysis of student data enables the modification of instructional strategies and content to enhance student engagement and improve learning outcomes, thereby improving personalized learning through AI systems. For example, the AI Student Success Analyst, which achieved 93% accuracy in forecasting student grades and retention rates, shows that AI systems can computerize grading and forecast student hazards. Provide tailored educational experiences, personalized learning, and student engagement; enhance AI tools significantly. Adaptive learning pathways are created by AI tools to ensuring content is significant and accessible to varied learners. Student interaction enhanced by AI-driven platforms through collaborative projects and peer-to-peer communication, leading to higher academic performance[2].

Study fills a gap in the body of knowledge about the use of AI in educational settings. Knowing each student's unique learning preferences allows teachers to modify their lesson plans and instructional materials, which improves student learning results. The study focusses how AI-driven automation to sustainable education may help students get ready for future sustainability concerns[3] . This link is important because it places of interest how education helps offer young people the information and abilities they need to add to a sustainable future. In order to guide the creation of individualized learning programs, the authors seek to gain insights regarding learning behaviors, statuses, and effects. The paper emphasizes the significance of personalized learning, which tailors teaching methods to each student's unique needs, thereby improving educational outcomes. AI is crucial to education for a number of reasons, including personalized learning. Intelligent tutoring systems, task automation, smart content, student engagement, artificial intelligence in exams, automatic grading systems, AI's educational benefits, chatbots and virtual assistants, all-inclusive education analytics that predict, all-inclusive access adaptive education, analyze student performance, identify areas of learning need, and provide quick feedback [4]. Education will be more and more impacted by artificial intelligence, as demonstrated by Catgut. Initial AI literateness is vital for improving various facets of child expansion including theory of mind capacities, inspired and emotional survey and cooperative review[5].

Through personalizing learning experiences, increasing administrative efficiency, and offering modern teaching tools, artificial intelligence (AI) is essential to transforming education. It facilitates virtual and in-person learning environments, increasing the efficiency and convenience of education. Artificial intelligence (AI)

integration in education is a developing field that has seen notable breakthroughs and a rise in usage in recent years[6]. AI in education has significantly advanced, transforming from basic computer technologies to humanoid robots and web-based chatbots, enhancing administrative and instructional functions. Time trend analysis reveals a consistent rise in the submission of AI in remote scholarship and online education, peaking in the last few years[7]. Technologisation in education has shifted focus from skill or trade learning to character formation, affecting teachers and teaching significantly.

Artificial Intelligence in education has an allowance of impending improvement for student engagement, delivering effective assessment and grading, forecasting student retention, and giving individualized training and advising[8]. Although AI tools can enhance some educational processes and are usually well-received by students, further research is needed to determine how these tools affect real learning results. All things considered, AI has the power to completely change learning settings, but research is still needed to determine its exact usefulness and the best ways to integrate it. The education underlines the impending of AI in education, emphasizing its transformative potential but also emphasizing the need for careful consideration of ethical and practical challenges[9]. As AI is used in education, ethical and privacy concerns must be considered.

This collaboration may need in long-term exhaustive research and development. Conforming to the paper highlights research gaps in AI-human interaction, technological integration, long-term effects, equity, and ethical considerations for responsible and productive AI use in education[10]. Although the usage of AI in education confirmations promise, research is requisite to guarantee that it is done so in an ethical and successful manner.[11]According to the Security of data, algorithmic bias, accountability, and the possible development of differences in education are among the ethical issues that arise up. However, the goal of the current research studies monitors the long-standing impacts of AI continuously student engagement and erudition are scarce which can concentrate on the ways that long-term AI use affects educational results and pathways.

RO1: To explore the part of artificial intelligence in education systems can effectively prepare students by intersection of AI technology and education.
RO2: To evaluate the most current advancement in artificial intelligence in education and assess the AI trends in education.

2. MATERIALS AND METHOD

The emergence of communication technologies, education is changing on a daily basis. Nowadays, the teaching-learning process calls more and more on new technologies, in particular artificial intelligence and its various subsets and techniques[12]. Here are some of the most interesting applications without going

into the details, because in what follows researchers would address the various aspects of AIED.

2.1. Artificial Intelligence

AI is the study of building technologies such as computers, that can reason, learn and performance in ways that would normally need mortal intellect or include data sets that are too big for humans to handgrip. Traditionally, the goals of AI research have included deduction, representation of expertise, preparing, acquiring, comprehension of natural language, vision, and automation aid. Artificial intelligence (AI) tools usually process enormous quantities of labeled training information to seek out associations and trends in this information, and subsequently use those trends to figure out future outcomes[13].

2.2. Artificial Intelligence in Education

AI provides the power to remake instructional and educational nears, address a few of the most prevalent issues encountered by educators today, and bring up the attainment[14]. However, significant technical breakthroughs inevitably bring with them a multitude of possibilities and contests that have so remote outpaced strategy conversations and controlling backgrounds. Artificial intelligence in educational institutions creates new challenges, chances, and potential for acquiring knowledge[15].

Artificial intelligence (AI) in education seemed to significantly advance teaching approaches through universal component ideas in numerical deduction, visualizing information, and knowledge research, as well as empirical evaluation[16]. Among the increasingly crucial objectives for artificial intelligence in education was to proposal individual support or advice according to every student's educational condition, preferences, or distinctive qualities. Better technologically improved instructional settings and tasks are now possible thanks to the application of AI in education. Notable used of AI technology for educational purposes include adaptive learning, distance learning, teacher feedback, self-grading, and other functions[17].

2.3. AI in Grading and Assessment Process for Education

Artificial intelligence (AI) had the probable to streamline the rating and impost route by providing students with immediate feedback while saving teachers time and exertion[18]. AI algorithms can examine student submissions and deliver responses based on predefined norms, supporting quick performance evaluations. AI-powered automated grading systems, which utilize machine learning and natural language dealing out techniques, are designed to assess student essays and offer real-time feedback and scores[19].

2.4. Environment using learning space, institution and culture

The term "learning and teaching environment" encompassed more than just a physical space, such as a classroom; it also included social, psychological, and conceptual contexts. In this framework, three factors—the learning space, institution, and culture—shape the implementation and organization of TAC. In an AI-driven Internet of Things (IoT) classroom, various educational devices collect, integrate, and analyze behavioral, environmental, and physical data[20]. This information had been communicated to teachers in real-time, enabling them to understand student behavior, predict learning outcomes, design lesson plans on-the-fly, and offer tailored support to each student. [21]In this regard emphasized the importance of a system-wide policy that integrated top-down reflections, which outline the goal line of AIED, with bottom-up reflections that encourage interdisciplinary group effort. This collaboration aims to transform principle into practice and vice versa, addressing teachers' ongoing needs and challenges. Stealth assessment, often associated with AIED evaluation, involves the continuous monitoring and assessment of students during their learning without disrupting their progress[22]. This approach allows instructors to more easily and spontaneously identify students' learning teething troubles, offer adaptive support and monitor the overall scholarship eminence of the class by gathering, analyzing, and documenting details and patterns in each student's learning journey insights that may have previously gone unnoticed.

2.5. Evaluation of AI in Education

AI applications were dynamic systems that learn through interactions with various agents, including teachers and their environment, resulting in improvements over time that can influence the behavior and outcomes of both teachers and AI[23]. Altogether realistic studies appraised demonstrated the affirmative impacts of AI performances on teaching. However, interviews and the appraisal paper revealed challenges and misunderstandings regarding AI in educational contexts. There is a necessity to establish a comprehensive estimation standard to measure the efficiency of AI in education. To confirm the rationality and dependability of such evaluations, a multidimensional exemplary should be implemented, incorporating factors such as techniques, informative proposal, domain knowledge and human considerations[24]. With the assimilation of artificial intelligence (AI) and educational data mining, it has become feasible to assess the effectiveness of teaching strategies while also continuously monitoring students' knowledge, progress, and learning environments.

2.6. Method

Analysis that this study employed a qualitative research methodology to collect in-depth information regarding population concentration levels. In addition,

secondary data were generated through a comprehensive review of existing literature [25]. According to Figure 1, A PRISMA-based method was employed to observe the impression of AI on education by searching through works authored by leading experts, credible journal articles, research reports, and trustworthy articles from reputable media outlets and websites. Figure 1 illustrates the use of databanks such as Google Scholar, DOAJ, SC Imago, Web of Science and Scopus for the literature review, incorporating both recent and historical sources. These resources were gathered through discussion and linked by connecting various facts. The study utilized data collection methods including research, interviews, and observation. The technical context highlights the limitations of existing technologies and explores emerging, flexible solutions. Organizational challenges focused on the firm's structure, readiness, and access to the required infrastructure for implementing artificial intelligence and its impact on education[26]. The environmental context of the study focused on the ethical and financial aspects of adopting and implementing artificial intelligence in education.

The inclusion criteria studies that clearly well-defines artificial intelligence in the education sector, are issued and written in English and are peer-reviewed with articles focusing on AI applications directly related to personalized learning, intelligent tutoring systems, AIFD. The exclusion criteria replacement entries across databases and never directly relate to educational contexts with focusing solely on technical AI development without application to education[27]. The PRISMA methodology certifies systematic data synthesis by documenting each step from identification and screening to final inclusion. This framework is permitted to map trends across AI applications such as the growing prominence of adaptive learning systems, catbots for student support and AI-driven assessment tools. The initial search brings in 400 articles and after removing duplicates and screening abstracts, 175 articles are included for full-text analysis. The full-text of articles are go through by the first author to corroborate that the articles are met all the criteria for inclusion in the review. Finally, an over-all of 175 articles that encountered the criteria are identified for the systematic review**.**

During the evaluation process of it continued relevant studies being identified via social media and Research Gate. Researcher also conducted a Google Scholar search using terms such as artificial intelligence, systematic review, and education, reviewing literature. Search term combinations included Artificial Intelligence and Education, AIED and Technologies, AIED and Applications. To meet the research objectives, strict selection criteria were applied in Figure 1.

Presentations were excluded from database sources, focusing instead on open access review and research articles published. Following the screening process, 2850 articles were retained, which is sufficient to fulfill the study's requirements[28].After analyzing the data, conclusions were drawn. The scope of the work reviewed in this study is illustrated in Figure 1.

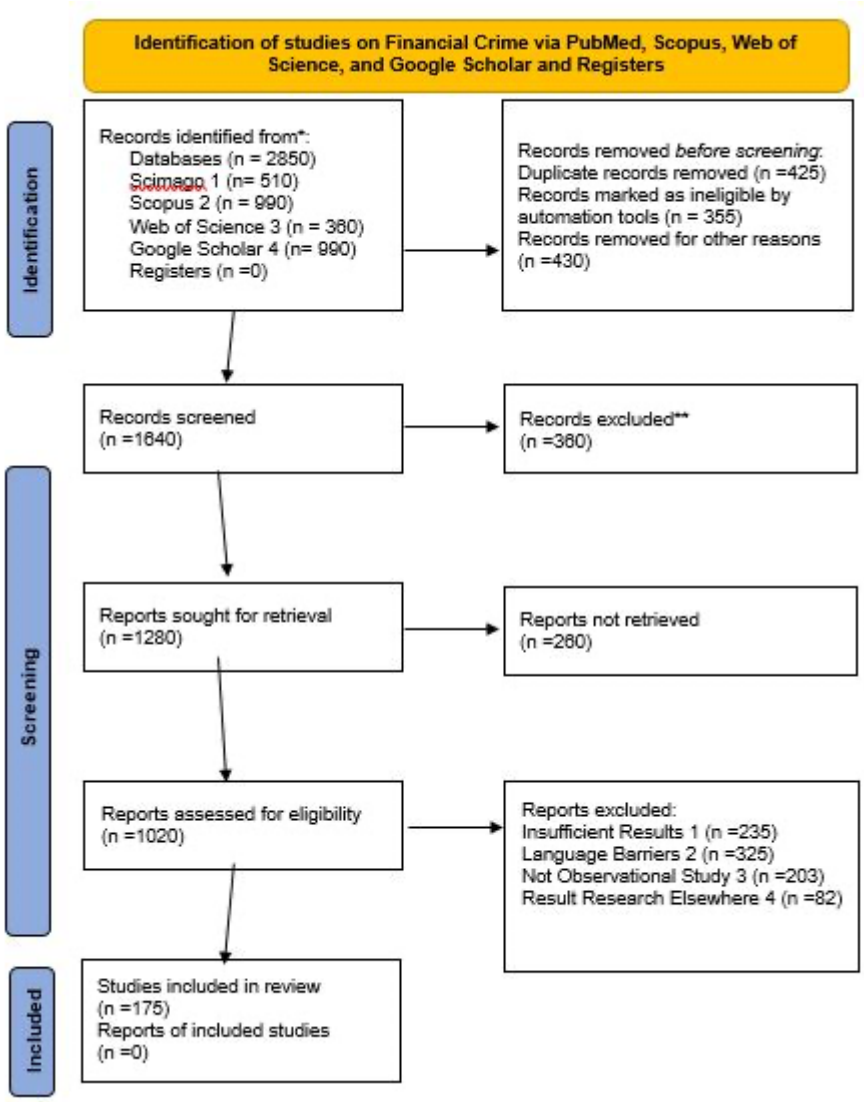

Figure 1. PRISMA Based Methodology

3. RESULTS AND DISCUSSION

Our findings highlight several practical applications of AI-driven educational tools across different educational settings, including K-12 education, higher education, and vocational training [29]. In real-world scenarios, AI tools can enhance student learning and administrative efficiency in the following ways:

3.1. K-12 Education: Adaptive Learning and Personalized Instruction

Personalized and adaptive learning is gradually redefining the K-12 education landscape[30]. It also found that the more they are exposed to personalized learning, the more significant is their cognitive development and achievement growth. Personalized learning is a relatively modern technique of making education more impactful and learner-centric. To do this, the teacher identifies each learner's strengths, weaknesses, desires, and skills. The comprehensive review of a student's cognitive prowess helps the teacher design the lesson appropriately so that the learner feels engaged and motivated to learn. Adaptive learning is an inclusive educational strategy that helps teachers identify each child's unique abilities and suit the content to help them achieve excellence[31]. Technology has made adaptive learning considerably easy for educational institutions. Instead of asking students to respond manually, a software does the complex calculations and provides the trainer with an accurate insight into a learner's capabilities and interests.

Table 1. Adaptive Learning and Personalized Instruction

Title	Description
Blended Learning Paves the Way	Blended learning refers to the combination of in-person teaching sessions and digital education tools, such as web conferences, simulations, eBooks, online science experiments, games, and more. Blended learning makes learning holistic since you can control or assist the learners even from a distance[32]. As learning becomes more immersive, learners feel more connected to your institution and grasp the true essence of the training programs.
Content Management System Holds the Key	Educational content management platforms manage content efficiently[33]. All you need to do is create an account and provide access keys to the students and teachers. Teachers may upload different types of content, including PDF, PPT, video, audio, eBook, documents, etc., and create a multi-content playlist.

Title	Description
Make Room for Guided Inquiry Design	**Start:** Here, the trainer introduces the broad concept before taking up a particular topic. For example, if you want to teach students about parts of speech, you may start with a brief idea of grammar. **Immerse:** After learners understand the basics, you can expose them to interesting facets of the topic. For instance, you may show your students an animated movie explaining the concept of parts of speech. **Explore:** Expose learners to various types of resources like eBooks, quizzes, audio, video, etc., to let them explore the concept in greater detail. **Formulate:** Here, learners prepare themselves to ask relevant questions about the topic they have learned. After framing the questions, they look for like-minded individuals with similar questions.

3.2. Higher Education: Intelligent Assessment and Administrative Automation

In universities, AI-based tools can streamline assessment by automatically grading assignments, especially in large courses. Natural language processing (NLP) technologies can assist in evaluating essays and providing feedback. Furthermore, AI can be used in predictive analytics to identify students at risk of dropping out, enabling early intervention. Universities can also leverage AI for course recommendation systems, helping students design personalized learning paths based on their interests and progress[34].

Table 2. Challenges in AI Integration: Teacher Training and Infrastructural Readiness

Concepts	Description
Technical difficulties	Schools nowadays use smartboards and other digital devices for teaching in classrooms[35]. However, smartboards and devices are prone to frequent technical glitches- a software glitch or a mysterious error message. It disrupts the flow of the class and causes frustration among teachers.
Lack of proper training & support	Due to a lack of training and support, teachers resist ICT integration in teaching[36]. When proper training regarding the use of educational technology isn't

Concepts	Description
	provided to teachers, they are more likely to postpone its use.
Poor internet connection	Poor internet connectivity is one of the major challenges of educational technology for teachers, especially in rural and semi-urban areas[37]. It costs a teacher a lot of time and effort to deal with frequent interruptions in connections.
Lack of adequate infrastructure	Integration of educational technology in the classroom requires basic infrastructure like electricity, internet connectivity, smartboards, computers, etc[38]. Unfortunately, a lot of educational institutions don't have this basic infrastructure in place due to limited funding, making it tough for teachers to make effective use of technology in classrooms.
Lack of flexibility	They customize the lessons according to a student's level of understanding and knowledge. This ensures a better learning outcome. However, edtech tools don't provide the same level of flexibility which makes teachers hesitant to use technology in classrooms.
Digital divide	Teachers are not able to use educational technology when students don't have access to digital devices like laptops, internet, etc. They are not able to complete their online assignments and other learning activities, leading to an adverse impact on their learning outcomes[39]. This deters teachers from adopting edtech tools for teaching.

3.3. Impact of AI in Education

This bar chart illustrated the key AI applications in education and their respective impact percentages. The chart highlights several applications like personalized learning, automated grading systems, intelligent tutoring systems, and others that are transforming the educational landscape[40].

AI-powered Administrative Tools: AI tools refer to software that uses artificial intelligence algorithms to address problems and perform specific tasks[41]. These tools are widely applicable across various sectors such as marketing, finance, healthcare, and education, where they enhance decision-making, automate tasks,

and enable data analysis obtainable by Figure 3. Utilizing AI for administrative tasks offers several benefits, including increased productivity and efficiency, faster and more accurate task execution compared to manual methods, and cost reduction.

Smart Campuses: Confirm that in today's rapidly evolving world, technology, especially artificial intelligence (AI), plays a crucial role in daily life and has a profound influence on educational environments[42]. "Smart Campuses" are technology-driven spaces designed to enhance the student experience, improve operational efficiency, and boost educational outcomes[43]. AI is reshaping college life by making it more intelligent, efficient, and responsive to the needs of modern students. The medium-level impact of the bar chat is reflected in the overall transformation of educational settings.

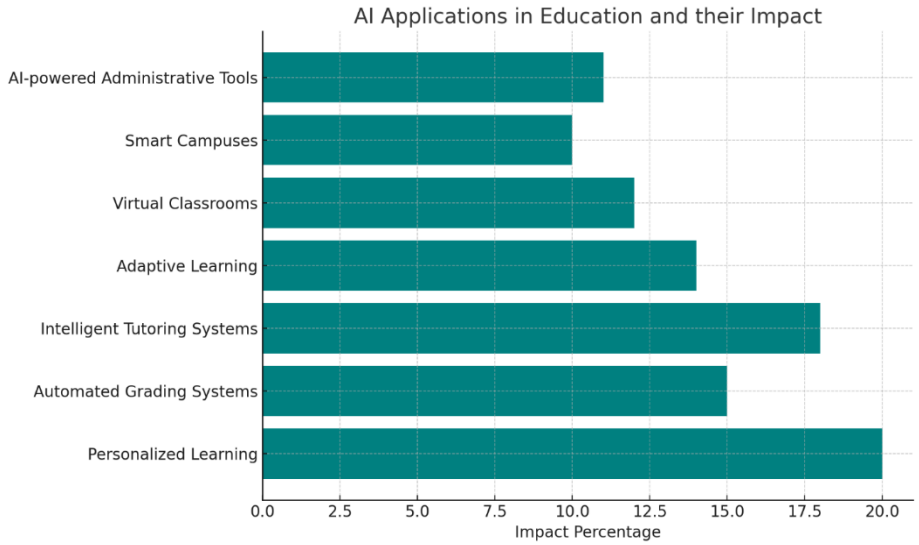

Figure 3. AI Applications in Education and their impact

Virtual Classrooms: The integration of AI into virtual classrooms is transforming the landscape of education by reshaping the teaching and learning experience[44]. By analyzing student data, AI algorithms can create personalized learning paths tailored to individual learning styles and paces. This leads to a more engaging and effective learning experience, enhancing both understanding and academic achievement. The intermediate impact of these bar chart advancements is reflected in the evolving dynamics of student interaction and success.

Adaptive Learning: In this point that adaptive learning systems can identify individual needs and strengths by analyzing data, such as learner interactions. Based

on this analysis, AI systems generate personalized learner profiles and adjust content delivery to optimize learning outcomes[45]. These systems can modify difficulty levels, deemed important for each learner, and offer targeted interventions to support their progress.

Intelligent Tutoring Systems: Teachers are often unable to provide the individualized attention each student requires, yet many students need additional support in certain subjects. AI-powered intelligent tutoring systems (ITS) offer a powerful solution[46]. The bar chart platforms presented by Figure 3, compared to ITS, adaptive learning (AL), and other large-scale applications, have the greatest impact, helping students better understand complex concepts and build confidence.

Automated Grading Systems: AI systems enhance fairness and consistency in grading by analyzing student response patterns and comparing them to predefined criteria, thereby reducing subjective biases[47]. By harnessing the transformative potential of AI, we can create a more inclusive, adaptable, and enriching learning environment for all. However, the impact of this chart approach, as indicated by the analysis in Figure 3, is somewhat lower compared to that of intelligent tutoring systems.

Personalized Learning: One of the most promising aspects of artificial intelligence is its ability to offer adaptive learning opportunities, which is central to personalized learning (PL)[48]. The goal of PL is to tailor education to each student's unique needs, interests, and strengths. Gifted students can take on additional challenges, while personalized learning paths enable all students to progress at their own pace. Among various AI applications in education, PL shows the highest impact, as indicated by bar chart conversation analysis showing in Figure 3, which is especially positive for AI in education (AIED).

3.4. The Functions of AI educational scenarios

Exemplified that a summation of the study's goal is to appraise the properties of artificial intelligence on education. An investigation of AI's solicitations demonstrates some of its effects on education[49]. Based on the conclusions from the publications that were examined, a more in-depth examination of the real impacts of AI on management, directions, and learning is presented in this part.

Table 3. The functions AI provides in educational scenarios.

Concepts	Description	Source
Education Administration	Education's ability to accomplish operational and executive tasks has been significantly impacted by AI application, in all of its forms and for a variety of purposes. The quality of organizational tasks and processes has improved, as have the efficacy and yield of educators in carrying out a multitude of administrative duties even though this field of academia was not at the core of many of the assessed papers.	[50]
Instruction	The usage of AI by instructors or in directives was another facet of education that this analysis focused on. The efficacy, efficiency, and caliber of the work produced by teachers have all increased. In this scenario, efficacy is determined by the suggested adoption and recall or the learning objectives achieved by the students or learners, whereas the quality and efficiency are determined through the distribution of pertinent gratified in accord with the program of study and the unique wants and functions of the pupils.	[51]
Learning	According to Figure 3, the study also encompasses the educational experiences of pupils, which have been significantly influenced by the implementation and utilization of artificial intelligence. In fact, information technology (ITS) promotes neural networks since, when students interact with the interaction agents that are an essential component of the system, they will be able to properly clarify their views in depth. It then practices the statistics congregated to expand the system's facility to modify literature to each student's prerequisites and skillfulness level.	[52]
Performance of Instructor and Student	Artificial intelligence (AI) systems are expected to effectively reduce the workload of educators in higher education as the number of pupils enlarges. With the use of AI technology, teachers can provide personalized content by analyzing the curriculum and course materials. AI systems can evaluate study data more effectively in tailored instruction and self-learning, which helps teachers design unique lesson plans for every student.	[53]

3.5. Techniques and Scenarios of AI Education

Apprehensed in the Figure 3 with the use of AI methods that this system may modify the curriculum and pace of instruction. AI increases the variety of instructional valuation techniques, the scientific landscape of the appraisal progression and the exactness of the estimate upshots. Computer vision-based artificial intelligence systems that can recognize and interpret photographs of handwritten documents can accomplish this[54].

Table 4. Techniques for scenarios of AIED.

Scenarios of AI Education	methods pertaining to artificial intelligence
Assessment of Students and Schools	Scholastic statistics, individualized instruction strategies, and customized instruction techniques.
Grading and evaluation of paper and exams	Visualization, detection of photos, and forecasting systems.
Personalized intelligent teaching	Artificial education systems, assessment data exploration or Probabilistic expertise intrusion.
Smart school	Systems related to listening and detection, facial and voice recognition, simulations.
Online and mobile remote education	Actual assessment, electronic tailored aids, and cutting-edge IT.

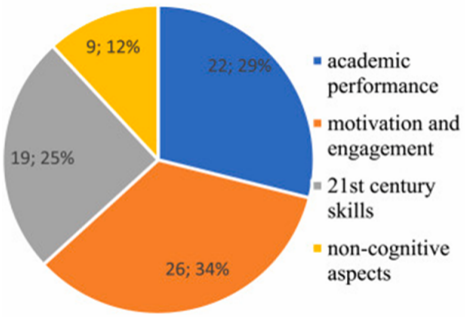

Figure 4. Student learning outcomes

3.6. The Application of AI in Education

Concerned that an accumulative quantity of research on artificial intelligence in education attentions on expending AI to sustenance tutoring, create smart campuses, and accomplish cognitive teaching, learning, and administration[55]. Customizable learning, face recognition, computer vision, and other artificial intelligence apparatuses are used in education to improve student erudition and

instructor productivity while bringing about a number of other advances in the area.

Table 5. The Application of AI in Education

App. Concepts	Description	Source
Adaptive learning	The application of info extraction, cognitive education networks, intelligence in learning, and immediate evaluation in personalized instruction is made possible by AI. This approach endeavors to integrate every facet of assessment, training, repetition, and comprehension into the adapted structure of learning to enhance students' learning.	[56]
Teaching Evaluation	The study's findings confirm how the artificial intelligence (AI) workout assessment system offers fresh approaches to the use and advancement of contemporary sports technology, as well as theoretical foundation and direction for the advancement of science instruction innovation.	[57]
Virtual Classroom	Build interactive labs and classrooms by assimilating physical and computer-generated spaces through the use of omnipresent multiplying technologies. Simultaneously, the virtual trial apparatus reduces resource usage and eliminates research hazards. Despite its stimulating qualities, learning science in virtual reality may cause learners to become cognitively overloaded and distracted, which would lead to worse learning outcomes.	[58]
Smart Campus	A teamwork model between managers and AI can categorize issues with the educational system's operation early on, realize more operative resource distribution, and significantly increase campus safety. The collection can also use computerized face recognition to obtain and return literature, verify identity using facial recognition data, and enable autonomous reserve obtaining and ascend within a book granting and exchange machine.	[59]
Intelligent Tutoring Robots	The educational usefulness of robots has gained increasing recognition as technology for robots has become more widely used. Tutoring robots come with a range of artificial intelligence (AI) technologies, including speech recognition, detection of emotions that interprets glances and tones, and bionic circuitry that can display beautiful	[60]

App. Concepts	Description	Source
	joint actions that mimic human movements and has human-like hearing, vision, conceiving, and speaking abilities.	

The roles and outcomes of AI applications in education sector

1) Improve Student Learning Outcomes : AI-powered tools increase learning consequences by personalizing the educational experience[61]. Through adaptive learning platforms and intelligent tutoring systems, students take delivery of custom-made gratified based on their abilities, development and predilections.
2) Predict Educational Results with Precision: AI algorithms can examine great datasets such as student performance archives, behavioral designs and engagement metrics to forecast future academic upshots with high exactitude. Predictive analytics enables educators to isolate at-risk students early and appliance interpolations proactively[62]. Schools and institutions can also expenditure these insights to elevate prospectuses and teaching line of attack.
3) Provide Immediate Remediation: AI-based stages proposition real-time opinion by identifying familiarity gaps as soon as taking place. This timely intercession confirms students stay on way, inhibiting small disputes from accelerating into major learning hurdles.
4) Facilitate Complex Concept Mastery : Intelligent tutoring systems and virtual labs support student's comprehension difficult notions by breaking them down into untroublesome steps[63]. These systems compromise personalized super vision, reproductions and cooperating learning experiences, countenancing students to master topics at their own pace.
5) Continuous Assessment: These platforms accumulate real-time data to track progress and isolate knowledge gaps, countenancing for timely interferences. Continuous assessments make sure that learners attain a deep understanding before advancing to more complex topics.

Rustic school's expression contests in fulfilling AI-based erudition apparatuses due to underprivileged internet substructure and nonexistence of teacher working out. Even when AI tools are manageable, there may be a lack of digital literateness among students and teachers, further preventive the helpfulness. The total of putting into practice for positioning AI technologies often entails substantial financial investment which can be a defy for educational institutions with imperfect financial plan. AI models accomplished on prejudiced datasets may disseminate categorizes, disadvantaging downgraded students. While AI can provision learning, over-reliance may boundary students' expansion of serious thoughtful and problem-solving skills.

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The current AIEd literature has looked at AI agents in the four primary subjects of learning, teaching, examination, and organization. It has also looked at seven different learning outcomes for teachers and students, as illustrated in Figure 5.

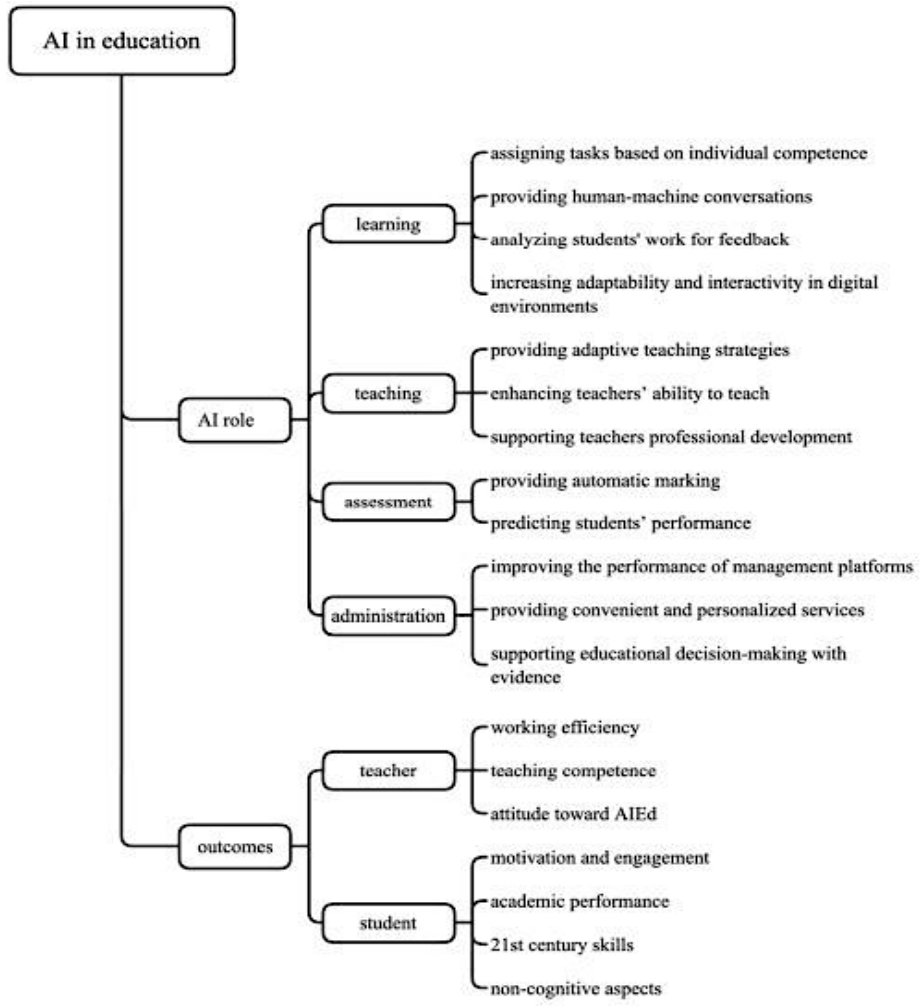

Figure 5. The roles and outcomes of AI applications in education

Applications of the technology include task obligation grounded on specific proficiency, human–machine dialogue, feedback analysis of student work, and ornamental tractability and participation in digital settings. Teaching: AIEd has been used to help instructors grow as educators, improve instructors' capacity to teach, and provide adaptive teaching methodologies giving by Figure 5. By offering autonomous grading and achievement prediction in the Figure 5, the technologies have been used to assist teachers in their exertion on measurement. The usage of

AIEd has improved the functionality of leadership systems, offered individualized, practical features (both academic and non-academic), and supported rational choices in education. The benefits of AIEd on pupil aftermaths, including in the Figure 5 academic achievement, non-cognitive components, enthusiasm and dedication, and 21st century abilities, have been assessed. Teacher practice and learning: Informed by the Figure 5 clinicians and executives alike can use these roles and outcomes to guide their approach to integrating AI into teaching and learning. They also serve as a representation of the field's current research focus.

4. CONCLUSION

The unique capabilities of AI in education can transform learning experiences by grafting students' unique learning styles and needs while also improving administrative processes within educational institutions and leading to a more productive teaching environment[64] .The effective implementation strategies for AI in education include providing adequate training for teachers and administrators to ensure they can effectively utilize AI tools, as well as ensuring equitable access to these technologies for all students. The integration of artificial intelligence (AI) in education has the potential to democratize access to education[65].AI can generate more equal educational opportunities for all students, regardless of their socioeconomic background, by cutting prices and removing traditional barrier. Intelligent Turing System may help educational institutions allocate resources more effectively. These systems help in making sure that resources are used efficiently, which reduces costs and improves educational outcomes. They do this by analyzing data and automating procedures. The challenges of integrating AI into education, including data privacy, algorithmic bias, and digital divide, emphasizing the need for responsible AI deployment and ethical guidelines. Overall results and conclusions show that while student learning is being improved by AIED-based environments, personalized learning is still in its experimental stages[66].

Through increased student engagement, administrative efficiency, and personalized instruction, artificial intelligence (AI) is greatly changing education. AI tools that accommodate different learning styles, such intelligent tutoring and adaptive learning systems, enlarge intellectual capacity and custody[67]. However, ethical, psychological, and pedagogical concerns have been raised in education by the integration of artificial intelligence. The implementation of the computing curricula has been discussed in this paper that is focusing on the intelligent systems area and also proposes that AI concepts are essential for effective teaching and ensuring that the necessary skills are required for the students. Ethical considerations of AI in education should be focused on Future research, including developing moral policy and ensuring student information security and privacy to move on trust and privacy. AI makes it easier to analyze data and provide real-time feedback, which helps teachers and students get better their methods[68].

Investigating the further uses of AI in education going forward is vital, as it has the capacity to boost interdisciplinary learning and accommodate a range of learning requirements. Particular suggestions for legislators and educators include creating frameworks for ethical AI, guaranteeing fair access to technology, and investigating how AI might be integrated with progressive technologies like virtual reality. The implementation of the computing curricula has been discussed in this paper that is focusing on the intelligent systems area and also proposes that AI concepts are essential for effective teaching and ensuring that the necessary skills are required for the students[69].Even though AI has a lot of potential to transform education, leveraging its benefits for both instructors and students requires tackling the related problems and ethical crisis. Future research should examine the application of AI in wide-ranging learning environments and its effects on educational equity and efficiency.

Developing tools that prioritize usability, AI ethics, and transparency will help mitigate issues related to data security and privacy[70]. Additionally, here is a nonexistence of comprehensive, theory-driven research on the effectiveness of AI-based educational tools in addressing students' diverse learning needs. More investigation, analysis, and evidence are necessary to evaluate the efficacy of AI learning technologies before they are widely implemented, using a thorough risk-benefit analysis. This research could also contribute to broader discussions on factors to consider when conducting transparent systematic reviews, particularly in the context of AIED. Most AI applications in online distance learning remain focused on technical aspects, often overlooking critical areas such as curriculum development, instructional design, and pedagogy[71]. This review article can enhance understanding of AI applications in the education sector. Consequently, school administrators, teachers, and students can benefit from these insights to better grasp and implement effective strategies for improving educational outcomes through AI integration.

A study determined the progression of AI presents exhilarating prospects for education through its widespread assortment of technologies, features, and capabilities. This work highlights the gaps in existing AIED literature reviews, which can ultimately benefit the field of AI in education. Enhancing these features can improve the quality of AI-related findings, providing the research community with deeper insights into AIED and supporting evidence-based practices and decision-making[72]. To create applications centered on human agency, it is essential to integrate theory and practice with technological processes.

According to, despite offering valuable insights and identifying impending research instructions for AI in education, this assessment has numerous limitations[73]. It excludes symposium chronicles, which may present more topical or uncompleted research due to their distinct assortment criteria and review developments, thus

narrowing the scope of the review. Additionally, implementing AI in education have need of considerable investments in technology substructure, support, and training, which can be costly. To optimize the benefits of AI for improving learning outcomes and student experiences, educational institutions must prioritize ethical considerations, ensure equitable access, avoid excessive reliance on technology, and manage costs and resources efficiently. Although artificial intelligence relies on human-generated data, there are currently no regulations governing its use or the ethical application of AI technologies[74].

Further research in this area is encouraged, as the development of policies and strategies will enable educational institutions to better leverage AI technologies and create student-centered online learning environments. Collaborative studies that explore the applications of AI with straight or unintended paraphernalia on learning upshots in existent educational contexts are crucial for maximizing AI's potential in education[75]. Additionally, with emerging technologies like VR, AR, and MR being assimilated with AI for learning tools, interdisciplinary and transdisciplinary research is necessary for the effective expansion, implementation, and study of AI in education, as recommended by experts[76]. AI in education grasps noteworthy probable for future development and innovation. The integration of AI in education offers great promise for enhancing student outcomes, fostering creativity, and preparing learners for future challenges[77]. By addressing current challenges, promoting inclusion, and ensuring the responsible use of AI, education can be transformed to come across the embryonic needs of a promptly shifting society.

REFERENCES

[1] Naga Santhosh Reddy Vootukuri and Jeevana Jyothi.V, "Harnessing the potential of AI applications in Education: Opportunities, challenges, and future directions," Magna Sci. Adv. Res. Rev., vol. 11, no. 2, pp. 405–410, Aug. 2024, doi: 10.30574/msarr.2024.11.2.0139.

[2] M. R. I. Bhuiyan, R. Hossain, M. Rashid, M. M. Islam, L. Mani, and M. N. U. Milon, "Gravitating the components, technologies, challenges, and government transforming strategies for a Smart Bangladesh: A PRISMA-based review," J. Gov. Regul., vol. 13, no. 3, pp. 177–188, 2024, doi: 10.22495/jgrv13i3art15.

[3] W. Strielkowski, V. Grebennikova, A. Lisovskiy, G. Rakhimova, and T. Vasileva, "AI -driven adaptive learning for sustainable educational transformation," Sustain. Dev., p. sd.3221, Oct. 2024, doi: 10.1002/sd.3221.

[4] R. Hossain, A.-A. Al- Amin, L. Mani, M. M. Islam, T. A. Poli, and M. N. U. Milon, "Exploring the Effectiveness of Social Media on Tourism Destination Marketing: An Empirical Study in a Developing Country,"

WSEAS Trans. Bus. Econ., vol. 21, pp. 1392–1408, May 2024, doi: 10.37394/23207.2024.21.114.

[5] M. Černý, "University Students' Conceptualisation of AI Literacy: Theory and Empirical Evidence," Soc. Sci., vol. 13, no. 3, p. 129, Feb. 2024, doi: 10.3390/socsci13030129.

[6] K. M. S. Uddin, M. R. I. Bhuiyan, and M. Hamid, "Perception towards the Acceptance of Digital Health Services among the People of Bangladesh," *WSEAS TRANSACTIONS ON BUSINESS AND ECONOMICS*, vol. 21, pp. 1557–1570, Jul. 2024, doi: 10.37394/23207.2024.21.127.

[7] K. Kavitha and V. P. Joshith, "The Transformative Trajectory of Artificial Intelligence in Education: The Two Decades of Bibliometric Retrospect," J. Educ. Technol. Syst., vol. 52, no. 3, pp. 376–405, Mar. 2024, doi: 10.1177/00472395241231815.

[8] Md. M. Rahman, Md. M. Islam, M. Khatun, S. Uddin, M. R. Faraji, and Md. H. Hasan, "Gravitating towards Information Society for Information Security in Information Systems: A Systematic PRISMA Based Review," Pak. J. Life Soc. Sci. PJLSS, vol. 22, no. 1, 2024, doi: 10.57239/PJLSS-2024-22.1.0089.

[9] T. A. Poli, "Mediating Role of Entrepreneurship Capability in Sustainable Performance and Women Entrepreneurship: An Evidence from a Developing Country," *Journal of Ecohumanism*, vol. 3, no. 3, pp. 2006–2019, Jul. 2024, doi: 10.62754/joe.v3i3.3553.

[10] C. F. Kurban and M. Şahin, "Contributions to Knowledge and Research," in The Impact of ChatGPT on Higher Education, Emerald Publishing Limited, 2024, pp. 181–193. doi: 10.1108/978-1-83797-647-820241010.

[11] A. Fedele, C. Punzi, and S. Tramacere, "The ALTAI checklist as a tool to assess ethical and legal implications for a trustworthy AI development in education," Comput. Law Secur. Rev., vol. 53, p. 105986, Jul. 2024, doi: 10.1016/j.clsr.2024.105986.

[12] M. R. Faraji, F. Shikder, Md. H. Hasan, Md. M. Islam, and U. K. Akter, "Examining the Role of Artificial Intelligence in Cyber Security (CS): A Systematic Review for Preventing Prospective Solutions in Financial Transactions," Int. J. Relig., vol. 5, no. 10, pp. 4766–4782, Jul. 2024, doi: 10.61707/7rfyma13.

[13] S. El Khediri et al., "Integration of artificial intelligence (AI) with sensor networks: Trends, challenges, and future directions," J. King Saud Univ. - Comput. Inf. Sci., vol. 36, no. 1, p. 101892, Jan. 2024, doi: 10.1016/j.jksuci.2023.101892.

[14] K. Kaur, Shilpa, and R. Jindal, "The ChatGPT revolution: Reshaping education through artificial intelligence," presented at the Recent Advancements In Communication, Computing, And Artificial Intelligence (RACCAI-2023), Mohali, India, 2024, p. 040023. doi: 10.1063/5.0221430.

[15] A. Abulibdeh, E. Zaidan, and R. Abulibdeh, "Navigating the confluence of artificial intelligence and education for sustainable development in the era

of industry 4.0: Challenges, opportunities, and ethical dimensions," J. Clean. Prod., vol. 437, p. 140527, Jan. 2024, doi: 10.1016/j.jclepro.2023.140527.

[16] V. Olari and R. Romeike, "Data-related concepts for artificial intelligence education in K-12," Comput. Educ. Open, vol. 7, p. 100196, Dec. 2024, doi: 10.1016/j.caeo.2024.100196.

[17] K. T. S. Al Harrasi, "Enhancing learner self-monitoring in self-assessment through the use of pedagogical resources," Cogent Soc. Sci., vol. 10, no. 1, p. 2334486, Dec. 2024, doi: 10.1080/23311886.2024.2334486.

[18] A. Jarvis, A. Ho, and G. Lim, "Impressing Artificial Intelligence: Automated Job Interview Training in Professional English Subjects," RELC J., p. 00336882241245449, Apr. 2024, doi: 10.1177/00336882241245449.

[19] M. Waly, "Artificial intelligence and Scientific Research," Sustain. Educ. Globe, vol. 2, no. 1, pp. 1–14, Jul. 2024, doi: 10.21608/seg.2024.269596.1001.

[20] K. Ahmad et al., "Data-Driven Artificial Intelligence in Education: A Comprehensive Review," IEEE Trans. Learn. Technol., vol. 17, pp. 12–31, 2024, doi: 10.1109/TLT.2023.3314610.

[21] L. H. Ho, "Implementing education reforms: a multiple case study of Vietnamese primary schools," 2024, doi: 10.5525/GLA.THESIS.84275.

[22] A. Hu, "Developing an AI-Based Psychometric System for Assessing Learning Difficulties and Adaptive System to Overcome: A Qualitative and Conceptual Framework," 2024, arXiv. doi: 10.48550/ARXIV.2403.06284.

[23] A. O. R. Vistorte, A. Deroncele-Acosta, J. L. M. Ayala, A. Barrasa, C. López-Granero, and M. Martí-González, "Integrating artificial intelligence to assess emotions in learning environments: a systematic literature review," Front. Psychol., vol. 15, p. 1387089, Jun. 2024, doi: 10.3389/fpsyg.2024.1387089.

[24] M. R. I. . Bhuiyan, M. R. . Faraji, M. . Rashid, M. K. . Bhuyan, R. . Hossain, and P. . Ghose, "Digital Transformation in SMEs Emerging Technological Tools and Technologies for Enhancing the SME's Strategies and Outcomes", *JoE*, vol. 3, no. 4, pp. 211–224, Jul. 2024, https://doi.org/10.62754/joe.v3i4.3594

[25] M. Mert-Karadas, M. S. Kovanci, S. Ocalan, F. Uslu-Sahan, and L. Ozdemir, "The tendency and affecting factors of nursing students' Xenophobia toward refugees from the perspective of ecological systems theory: A convergent parallel mixed method study," Nurse Educ. Pract., vol. 78, p. 104013, Jul. 2024, doi: 10.1016/j.nepr.2024.104013.

[26] M. R. I. Bhuiyan, "Examining the Digital Transformation and Digital Entrepreneurship: A PRISMA Based Systematic Review," Pakistan Journal of Life and Social Sciences (PJLSS), vol. 22, no. 1, 2024, doi: 10.57239/pjlss-2024-22.1.0077.

[27] K. Sperling, C.-J. Stenberg, C. McGrath, A. Åkerfeldt, F. Heintz, and L. Stenliden, "In search of artificial intelligence (AI) literacy in teacher

education: A scoping review," Comput. Educ. Open, vol. 6, p. 100169, Jun. 2024, doi: 10.1016/j.caeo.2024.100169.

[28] M. R. I. Bhuiyan, R. Hossain, M. Rashid, M. M. Islam, L. Mani, and M. N. U. Milon, "Gravitating the components, technologies, challenges, and government transforming strategies for a Smart Bangladesh: A PRISMA-based review," J. Gov. Regul., vol. 13, no. 3, pp. 177–188, 2024, doi: 10.22495/jgrv13i3art15.

[29] D. Wu, M. Chen, X. Chen, and X. Liu, "Analyzing K-12 AI education: A large language model study of classroom instruction on learning theories, pedagogy, tools, and AI literacy," Comput. Educ. Artif. Intell., vol. 7, p. 100295, Dec. 2024, doi: 10.1016/j.caeai.2024.100295.

[30] W. Strielkowski, V. Grebennikova, A. Lisovskiy, G. Rakhimova, and T. Vasileva, "AI -driven adaptive learning for sustainable educational transformation," Sustain. Dev., p. sd.3221, Oct. 2024, doi: 10.1002/sd.3221.

[31] M. R. I. Bhuiyan, Dr. K. M. S. Uddin, and M. N. U. Milon, "Prospective Areas of Digital Economy: An Empirical Study in Bangladesh," MDPI AG, Jul. 2023. Accessed: Oct. 23, 2024. [Online]. Available: http://dx.doi.org/10.20944/preprints202307.1652.v1

[32] P. He, J. C. Edwards, and Y. Schwarte, "Cultivating connectedness and elevating educational experiences for international students in blended learning: reflections from the pandemic era and key takeaways," J. Int. Educ. Bus., vol. 17, no. 2, pp. 193–209, May 2024, doi: 10.1108/JIEB-05-2023-0033.

[33] M. M. Rahman, M. R. I. Bhuiyan, and S. M. A. Alam, "The Empirical Study on the Impact of the COVID-19 on Small and Medium Enterprises (SMEs) in Bangladesh," *Journal of Information Systems and Informatics*, vol. 6, no. 1, pp. 527–547, Mar. 2024, doi: 10.51519/journalisi.v6i1.686.

[34] M. Shoaib, N. Sayed, J. Singh, J. Shafi, S. Khan, and F. Ali, "AI student success predictor: Enhancing personalized learning in campus management systems," Comput. Hum. Behav., vol. 158, p. 108301, Sep. 2024, doi: 10.1016/j.chb.2024.108301.

[35] M. R. Bhuiyan, Md. T. Islam, S. M. A. Alam, and N. Sumon, "Identifying Passengers Satisfaction in Transportation Quality: An Empirical Study in Bangladesh," *PMIS Review*, vol. 2, no. 1, 2023, doi: 10.56567/pmis.v2i1.10.

[36] M. K. Asamoah and Y. Oheneba-Sakyi, "Factors influencing the willingness, and reluctuance of lecturers to embrace learning management systems in two selected ghanaian universities," E-Learn. Digit. Media, vol. 21, no. 4, pp. 387–405, Jul. 2024, doi: 10.1177/20427530231156172.

[37] S. Jamil and G. Muschert, "The COVID-19 Pandemic and E-Learning: The Digital Divide and Educational Crises in Pakistan's Universities," Am. Behav. Sci., vol. 68, no. 9, pp. 1161–1179, Aug. 2024, doi: 10.1177/00027642231156779.

[38] M. Alihaji, X. Qian, M. K. Ramadhan, and S. A. Mike, "Integration of Use of Tablets into Teaching and Learning in Secondary School of Micheweni District in Zanzibar," SSRN Electron. J., 2024, doi: 10.2139/ssrn.4801706.

[39] M. R. I. Bhuiyan, M. W. Ullah, S. Ahmed, M. K. Bhuyan, T. Sultana, and A.- Amin, "Information Security for An Information Society for Accessing Secured Information: A PRISMA Based Systematic Review," *International Journal of Religion*, vol. 5, no. 11, pp. 932–946, Jun. 2024, doi: 10.61707/frfnr583.

[40] R. Sajja, Y. Sermet, M. Cikmaz, D. Cwiertny, and I. Demir, "Artificial Intelligence-Enabled Intelligent Assistant for Personalized and Adaptive Learning in Higher Education," Information, vol. 15, no. 10, p. 596, Sep. 2024, doi: 10.3390/info15100596.

[41] Z. Islam, M. R. I. Bhuiyan, T. A. Poli, R. Hossain, and L. Mani, "Gravitating towards Internet of Things: Prospective Applications, Challenges, and Solutions of Using IoT," *International Journal of Religion*, vol. 5, no. 2, pp. 436–451, Feb. 2024, doi: 10.61707/awg31130.

[42] A. Abulibdeh, E. Zaidan, and R. Abulibdeh, "Navigating the confluence of artificial intelligence and education for sustainable development in the era of industry 4.0: Challenges, opportunities, and ethical dimensions," J. Clean. Prod., vol. 437, p. 140527, Jan. 2024, doi: 10.1016/j.jclepro.2023.140527.

[43] M. Bellaj, A. Bendahmane, A. Younes, S. Boudra, and M. Ennakra, "A systematic review of smart campus technologies to improve students' educational experiences," in 2024 Mediterranean Smart Cities Conference (MSCC), Martil - Tetuan, Morocco: IEEE, May 2024, pp. 1–7. doi: 10.1109/MSCC62288.2024.10697051.

[44] M. S. Akter, M. R. I. Bhuiyan, S. Tabassum, S. M. A. Alam, M. N. U. Milon, and M. R. Hoque, "Factors Affecting Continuance Intention to Use E-wallet among University Students in Bangladesh," *International Journal of Engineering Trends and Technology*, vol. 71, no. 6, pp. 274–288, Jun. 2023, doi: 10.14445/22315381/ijett-v71i6p228.

[45] C. Halkiopoulos and E. Gkintoni, "Leveraging AI in E-Learning: Personalized Learning and Adaptive Assessment through Cognitive Neuropsychology—A Systematic Analysis," Electronics, vol. 13, no. 18, p. 3762, Sep. 2024, doi: 10.3390/electronics13183762.

[46] K. Rekha, K. Gopal, D. Satheeskumar, U. A. Anand, D. S. S. Doss, and S. Elayaperumal, "Ai-Powered Personalized Learning System Design: Student Engagement And Performance Tracking System," in 2024 4th International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India: IEEE, May 2024, pp. 1125–1130. doi: 10.1109/ICACITE60783.2024.10617155.

[47] M. R. I. Bhuiyan and M. S. Akter, "Assessing the Potential Usages of Blockchain to Transform Smart Bangladesh: A PRISMA Based Systematic Review," *Journal of Information Systems and Informatics*, vol. 6, no. 1, pp. 245–269, Mar. 2024, doi: 10.51519/journalisi.v6i1.659.

[48] R. Sajja, Y. Sermet, M. Cikmaz, D. Cwiertny, and I. Demir, "Artificial Intelligence-Enabled Intelligent Assistant for Personalized and Adaptive Learning in Higher Education," Information, vol. 15, no. 10, p. 596, Sep. 2024, doi: 10.3390/info15100596.

[49] A. Fedele, C. Punzi, and S. Tramacere, "The ALTAI checklist as a tool to assess ethical and legal implications for a trustworthy AI development in education," Comput. Law Secur. Rev., vol. 53, p. 105986, Jul. 2024, doi: 10.1016/j.clsr.2024.105986.

[50] E. Singh, P. Vasishta, and A. Singla, "AI-enhanced education: exploring the impact of AI literacy on generation Z's academic performance in Northern India," Qual. Assur. Educ., Aug. 2024, doi: 10.1108/QAE-02-2024-0037.

[51] A. Amin, M. R. I. Bhuiyan, R. Hossain, C. Molla, T. A. Poli, and M. N. U. Milon, "The adoption of Industry 4.0 technologies by using the technology organizational environment framework: The mediating role to manufacturing performance in a developing country," *Business Strategy & Development*, vol. 7, no. 2, Apr. 2024, doi: 10.1002/bsd2.363.

[52] A. Mahmud, A. H. Sarower, A. Sohel, M. Assaduzzaman, and T. Bhuiyan, "Adoption of ChatGPT by university students for academic purposes: Partial least square, artificial neural network, deep neural network and classification algorithms approach," Array, vol. 21, p. 100339, Mar. 2024, doi: 10.1016/j.array.2024.100339.

[53] K. Khanom, Md. T. Islam, A. A.-T. Hasan, S. M. Sumon, and M. R. I. Bhuiyan, "Worker Satisfaction in Health, Hygiene and Safety Measures Undertaken by the Readymade Garments Industry of Bangladesh: A Case Study on Gazipur," *Journal of Business Studies*, vol. 03, no. 01, pp. 93–105, 2022, doi: 10.58753/jbspust.3.1.2022.6.

[54] Y. Matsuzaka and R. Yashiro, "AI-Based Computer Vision Techniques and Expert Systems," AI, vol. 4, no. 1, pp. 289–302, Feb. 2023, doi: 10.3390/ai4010013.

[55] N. M. Boustani, D. Sidani, and Z. Boustany, "Leveraging ICT and Generative AI in Higher Education for Sustainable Development: The Case of a Lebanese Private University," Adm. Sci., vol. 14, no. 10, p. 251, Oct. 2024, doi: 10.3390/admsci14100251.

[56] C. Halkiopoulos and E. Gkintoni, "Leveraging AI in E-Learning: Personalized Learning and Adaptive Assessment through Cognitive Neuropsychology—A Systematic Analysis," Electronics, vol. 13, no. 18, p. 3762, Sep. 2024, doi: 10.3390/electronics13183762.

[57] N. Maiden, J. Lockerbie, K. Zachos, A. Wolf, and A. Brown, "Designing new digital tools to augment human creative thinking at work: An application in elite sports coaching," Expert Syst., vol. 40, no. 3, p. e13194, Mar. 2023, doi: 10.1111/exsy.13194.

[58] M. R. I. Bhuiyan, "The Challenges and Opportunities of Post-COVID Situation for Small and Medium Enterprises (SMEs) in Bangladesh," *PMIS Review*, vol. 2, no. 1, 2023, doi: 10.56567/pmis.v2i1.14.

[59] A. I. Jony and S. A. Hamim, "Empowering virtual collaboration: harnessing AI for enhanced teamwork in higher education," Educ. Technol. Q., vol. 2024, no. 3, pp. 337–359, Sep. 2024, doi: 10.55056/etq.746.

[60] E. Micheni, J. Machii, and J. Murumba, "The Role of Artificial Intelligence in Education," Open J. Inf. Technol., vol. 7, no. 1, pp. 43–54, Sep. 2024, doi: 10.32591/coas.ojit.0701.04043m.

[61] K. Rekha, K. Gopal, D. Satheeskumar, U. A. Anand, D. S. S. Doss, and S. Elayaperumal, "Ai-Powered Personalized Learning System Design: Student Engagement And Performance Tracking System," in 2024 4th International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India: IEEE, May 2024, pp. 1125–1130. doi: 10.1109/ICACITE60783.2024.10617155.

[62] M. Aljaafari, S. E. El-Deep, A. A. Abohany, and S. E. Sorour, "Integrating Innovation in Healthcare: The Evolution of 'CURA's' AI-Driven Virtual Wards for Enhanced Diabetes and Kidney Disease Monitoring," IEEE Access, vol. 12, pp. 126389–126414, 2024, doi: 10.1109/ACCESS.2024.3451369.

[63] M. R. Kabir, R. Hossain, A. Amin, M. M. Rahman, M. M. H. Sawon, and L. Mani, "Impact of E-Marketing on Book Purchase Tendencies: An Empirical Study on University Undergraduate Students," *Journal of Ecohumanism*, vol. 3, no. 3, pp. 612–631, Jun. 2024, doi: 10.62754/joe.v3i3.3388.

[64] S. Maqbool, H. M. I. Zafeer, P. Zeng, T. Mohammad, O. Khassawneh, and L. Wu, "The role of diverse leadership styles in teaching to sustain academic excellence at secondary level," Front. Psychol., vol. 13, p. 1096151, Jan. 2023, doi: 10.3389/fpsyg.2022.1096151.

[65] M. M. Rahman, M. M. Islam, M. Khatun, S. Uddin, M. R. Faraji, and M. H. Hasan, "Gravitating towards Information Society for Information Security in Information Systems: A Systematic PRISMA Based Review," *Pakistan Journal of Life and Social Sciences (PJLSS)*, vol. 22, no. 1, 2024, doi: 10.57239/pjlss-2024-22.1.0089.

[66] B. M. McLaren and H. A. Nguyen, "Digital learning games in artificial intelligence in education (AIED): a review," in Handbook of Artificial Intelligence in Education, B. Du Boulay, A. Mitrovic, and K. Yacef, Eds., Edward Elgar Publishing, 2023, pp. 440–484. doi: 10.4337/9781800375413.00032.

[67] A. P. Kujundziski and J. Bojadjiev, "Artificial Intelligence in Education: Transforming Learning Landscapes," in Advances in Educational Technologies and Instructional Design, M. Stevkovska, M. Klemenchich, and N. Kavaklı Ulutaş, Eds., IGI Global, 2024, pp. 1–54. doi: 10.4018/979-8-3693-4310-4.ch001.

[68] M. N. Mia, L. Mani, M. M. Rahman, M. N. U. Milon, and R. Hossain, "Gravitating towards Community Based Tourism (CBT): Community Empowerment and Reducing Poverty in Tourism Sector Development in

Bangladesh," *International Journal of Religion*, vol. 5, no. 6, pp. 848–864, May 2024, doi: 10.61707/e1zchv24.

[69] T. K. F. Chiu, Z. Ahmad, M. Ismailov, and I. T. Sanusi, "What are artificial intelligence literacy and competency? A comprehensive framework to support them," Comput. Educ. Open, vol. 6, p. 100171, Jun. 2024, doi: 10.1016/j.caeo.2024.100171.

[70] L. Mani, "Gravitating towards the Digital Economy: Opportunities and Challenges for Transforming Smart Bangladesh," *Pakistan Journal of Life and Social Sciences (PJLSS)*, vol. 22, no. 1, 2024, doi: 10.57239/pjlss-2024-22.1.00241.

[71] X. Weng, H. Ye, Y. Dai, and O. Ng, "Integrating Artificial Intelligence and Computational Thinking in Educational Contexts: A Systematic Review of Instructional Design and Student Learning Outcomes," J. Educ. Comput. Res., vol. 62, no. 6, pp. 1640–1670, Oct. 2024, doi: 10.1177/07356331241248686.

[72] A. Abulibdeh, E. Zaidan, and R. Abulibdeh, "Navigating the confluence of artificial intelligence and education for sustainable development in the era of industry 4.0: Challenges, opportunities, and ethical dimensions," J. Clean. Prod., vol. 437, p. 140527, Jan. 2024, doi: 10.1016/j.jclepro.2023.140527.

[73] H. A. Younis et al., "A Systematic Review and Meta-Analysis of Artificial Intelligence Tools in Medicine and Healthcare: Applications, Considerations, Limitations, Motivation and Challenges," Diagnostics, vol. 14, no. 1, p. 109, Jan. 2024, doi: 10.3390/diagnostics14010109.

[74] M. N. U. Milon, P. Ghose, T. C. Pinky, M. N. Tabassum, M. N. Hasan, and M. Khatun, "An in-depth PRISMA based review of cybercrime in a developing economy: Examining sector-wide impacts, legal frameworks, and emerging trends in the digital era," *Edelweiss Applied Science and Technology*, vol. 8, no. 4, pp. 2072–2093, Sep. 2024, doi: 10.55214/25768484.v8i4.1583.

[75] M. R. I. Bhuiyan, M. S. Akter, and S. Islam, "How does digital payment transform society as a cashless society? An empirical study in the developing economy," *Journal of Science and Technology Policy Management*, Jan. 2024, doi: 10.1108/jstpm-10-2023-0170. [76] M. Kayyali, "Future Possibilities and Challenges of AI in Education:," in Advances in Educational Technologies and Instructional Design, R. C. Sharma and A. Bozkurt, Eds., IGI Global, 2024, pp. 118–137. doi: 10.4018/979-8-3693-1351-0.ch006.

[77] R. AlAli and Y. Wardat, "Opportunities and Challenges of Integrating Generative Artificial Intelligence in Education," Int. J. Relig., vol. 5, no. 7, pp. 784–793, May 2024, doi: 10.61707/8y29gv34.