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Opportunities and Challenges of AI in Education

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ABSTRACT The emergence of AI is one of the recent trends that has affected several spheres of education. The use of artificial intelligence can change the way teaching and learning take place, as well as the way assessments and educational processes are managed. It looks like personalised systems and tutorships are among those that tend to be talked about. Besides, automated evaluation and predictive analytics are among the possible applications of AI. It may increase efficiency, but it is likely to become less accessible to all students. In my view, there are many opportunities available, but it is not clear whether they depend on a particular implementation. Some regard it as revolutionary, while others pay less attention to it. However, there are challenges to using AI in education. The first obvious issue is ethical considerations. Privacy concerns should be addressed due to the vast amounts of data required. Bias in algorithm design may lead to discrimination against certain social groups. There are inequalities in access among students. The use of AI in learning may decrease face-to-face interaction. I am not sure if these issues are directly connected, but they are definitely worth mentioning. The reviewed paper explores both opportunities and challenges in the application of AI in education. This paper reviews the recent literature, considers applications, examines the advantages and disadvantages, and provides recommendations for responsible implementation. It appears that artificial intelligence can be of great assistance in enhancing efficiency and effectiveness, but its proper use requires consideration of ethical, technological, and sociological issues, as well as learning methods. This section gets pretty complicated when you consider all these factors together. Some concepts appear to be more related to each other than shown here.

Keywords: Artificial Intelligence, Digital System, Educational Technology, Educational Analytics, Intelligent Tutoring System, Personalized Learning.

1. INTRODUCTION

Artificial intelligence can be described as the imitation of normal human intelligence operations by machines; the study of a set of technologies that help machines, such as computers, to imitate and respond with human traits of reasoning, perception, problem-solving, learning, decision-making, and response [36]. Advances in machine learning, deep learning, computer vision, natural language processing, and several other sub-fields are helping to boost the application of artificial intelligence to many sectors of industry [37][38][97]. Technology advancement is one of the key factors that is revolutionizing the education sector. The inception of e-learning platforms, virtual classrooms, and education applications has given a conducive environment for the utilization of Artificial Intelligence [39][40][96]. Most educational institutions worldwide are now using AI-powered tools for teaching and learning processes[95]. The COVID-19 pandemic reinforced the trends of digital transformation in education and raised the demand for intelligent systems that can manage remote and hybrid education [35]. This article gives an overview of how artificial intelligence is being adopted in education and looks at some of the challenges and opportunities in applying AI in education, for both policymakers, educators, students, and technology creators [41] [42][94].

2. EVOLUTION OF AI IN EDUCATION

AI application in education dates back to the 1960s, with researchers building a CAI (Computer-Assisted Instruction) system. The initial CAI software dealt with programmed instruction and rule-based tutorial systems [1][93]. The trend can be classified into four stages as shown in Fig 1.

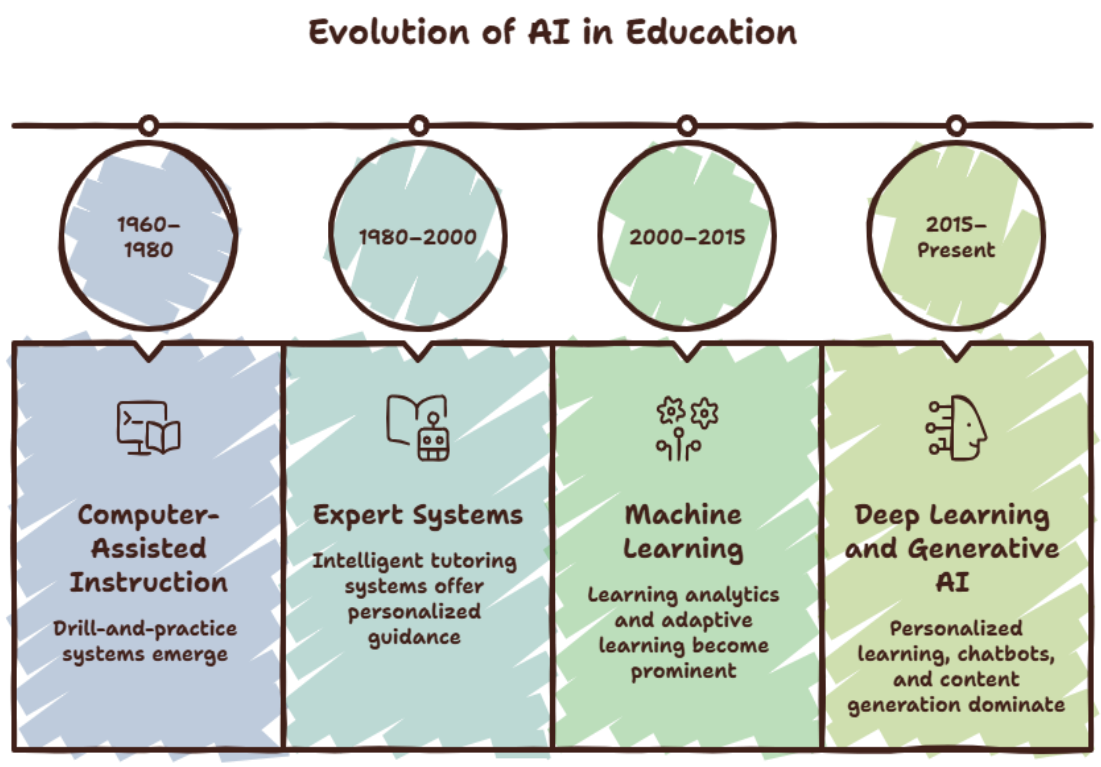

Fig 1: Evolution of AI in Education

3. DIFFERENT AI TOOLS IN EDUCATION

3.1 Chatbots - Automated software applications that simulate human dialogue to address user inquiries. They utilize artificial intelligence, machine learning, and natural language processing to offer assistance and respond to common questions[95] [11][2][34]

3.2 Voice Assistant - This artificial intelligence technology shares characteristics with virtual mentors [96] [43] [44]. However, Voice Assistant primarily depends on voice functionality as the main medium for interaction and communication [45][92]. Voice assistants utilize AI through cloud computing and are capable of conversing with users in natural language. Additionally, Voice Assistant is among the most well-known and utilized AI technologies across diverse sectors, including education [97][12][4][32].

Voice Assistants facilitate engagement with diverse educational resources without the need for direct communication with an instructor. As such, the learning environment is available at any point in time and space. This makes it possible for learners to conduct their lessons independently, thus reducing the fear of uncertainty due to a lack of a teacher or tutor, since the voice assistant can relay all information through voice alone. The use of AI technology by voice assistants shares similarities with the application of AI by virtual tutors [98][12]

3.3 Visual & Design Tools - Tools used to enhance the visual appeal of designs and products. This helps in creating appealing designs [11][33][91].

3.4 Lesson Planning & Content Development Tools - Tools used by educators to plan and develop content for lessons depending on the curriculum and methodology of teaching [99][11][3][90].

3.5 Quizzes/Tests Generators - These are tools used to create customized quizzes/tests in order to test learners in an entertaining way. The grading generator enables you to select the number of each question type you wish to include in the exam [100][46][89]. You can choose questions from various formats, including multiple choice, numerical answer, short answer, and others[101]s[11] [31]

4. OPPORTUNITIES OF AI IN EDUCATION

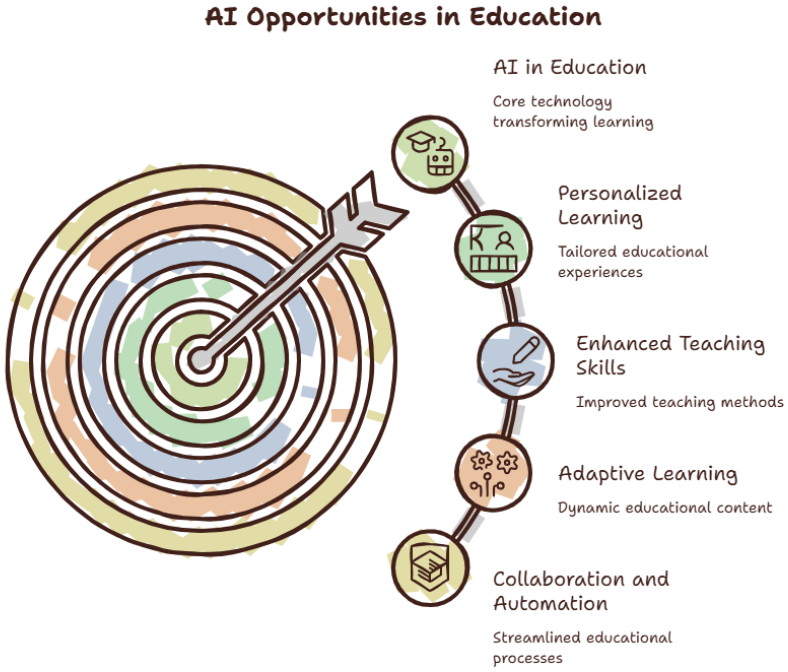

Fig 2:- Opportunities generated due to the use of AI

4.1 Personalized Learning

Personalization in education offers a lot of potential for AI [102][47]. Traditional schooling has difficulty keeping up with the varied learning styles and capacities of all students. An AI system will take into consideration a student's progress and tailor the learning materials to their needs, as per Figure 2[103][88].AI can really enhance personalized learning by giving teachers access to a variety of tools and resources. This support helps them craft unique learning experiences tailored to each student. Plus, AI has the potential to truly enrich the overall experience for students[104] [48][50][87]. Personalized education can be greatly enhanced by AI, which has great potential to give teachers different tools that can allow them to personalize each lesson. In addition to this, AI can be used to provide a more enhanced learning experience for the students[105] [4] [5] [49][86]. Opportunities of AI in education are presented in Fig 2.

4.2Enhance teaching skills

The use of different resources and tools by AI in education gives a lot of potential for enhancing the skills of teachers because they will get assistance from different tools that are powered by AI. For example, assessment tools provided by AI have great potential to provide teachers with valuable feedback concerning the performance of their learners [106][51][85]. Teachers will be able to personalize their lessons, as AI can help personalize the learning process and provide lessons that are based on the specific needs of the student [107][6] [4] [52][84].

4.3 Adaptability of the Education Process

AI offers an opportunity to develop a personalized process of education tailored to each individual student [53] [83][108]. An adaptive system of learning utilizes algorithms of AI to adjust the level of complexity of educational content and match it with students' skills and abilities [110][30] [54][55]. Through using AI for educational purposes, teachers would be able to provide better education that would result in a better learning experience for students [109][4][7][56][57].

4.4 Improvement of Cooperation between Teachers

In recent years, applications of AI to skill acquisition programs and assessment systems have become quite popular [82][111]. With further advancement of such solutions provided by AI, it will be possible for it to overcome the limitations in education and provide additional possibilities to both schools and teachers[112] [7][8] [29][58]

4.5 Automated Routine Task

Robotic Process Automation (RPA) is not an example of how robots will become educators in the classroom.[113] It must be stressed that the essence of automation lies in making processes better, not in replacing them[114] [28][81]. Automation does not make things complicated – it makes them easier. Simply put, robotic process automation (RPA) is yet another technology used to facilitate the creation of productive workflows by using algorithms and software robots (Bots) that can do their job without requiring any human intervention[115][117] [80]. Algorithms are present in all digital devices to some degree. When it comes to automated software in special education, an algorithm may be viewed as a series of precise instruction that guides device actions or data processing processes [116] [7] [9][59**].**

4.6 Lifelong Learning and Professional Development

The term lifelong learning means that an individual should be constantly interested in discovering new facts, acquiring new skills, and perspectives throughout their life experience[118] [27][60]. The contemporary world is very dynamic as artificial intelligence changes every field imaginable, from work to education. Hence, it is crucially important to develop continuously [119][11][10][61].

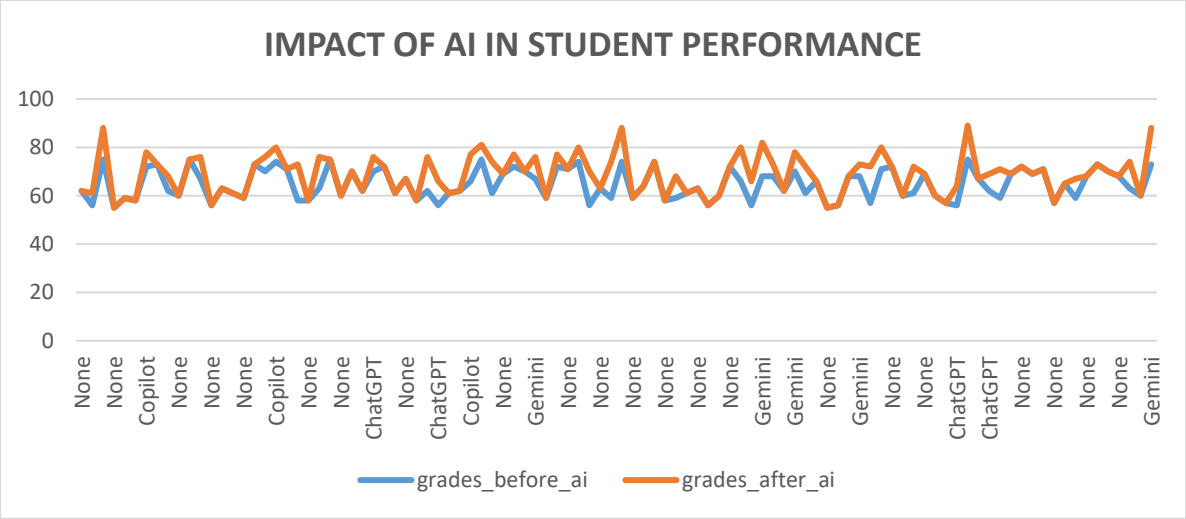

Fig 3: Impact of AI Tools in Student Performance [kaggel Dataset is used**]**

4.7 Course is globally available - This artificial intelligence technology has found extensive application across multiple domains, particularly in education. In simple terms, users or students of Global Courses have the ability to search for and enroll in online courses from around the globe.[120] The course platform is capable of suggesting courses based on your interests and preferences, derived from the keywords you have previously input[123] [125][12].

4.8 Assessment is Automatic - Artificial Intelligence is extensively utilized for the purposes of online automatic evaluation and question correction.[121]. The incorporation of such features simplifies the process for educators and tutors in preparing and administering quizzes and tests efficiently and effectively. Educators and tutors are no longer required to create and grade questions by hand. The incorporation of such features simplifies the process for educators and tutors in preparing and administering quizzes and tests efficiently and effectively. Educators and tutors are no longer required to create and grade questions by hand[122] [124][12]. The impact of AI on student performance is shown in Fig 3.

5. CHALLENGES FOR THE USE OF AI IN EDUCATION

5.1 Privacy Risks Associated with AI Usage in Educational Settings

AI applications in educational institutions collect plenty of data from students.[126] As a result, privacy protection becomes an imperative issue rather than an optional one [128][127][62]. One cannot ignore the potential risks of data collection and storage to prevent abuses and ensure the appropriate use of personal information [130][129] [26, 63]. The misuse of personal data is especially dangerous when people provide too many details on online platforms, and not all tech service providers can comply with existing regulations.[132][131] [64]. After all, it is necessary to acknowledge that AI technologies require the use of personal data.[134][133]. Consequently, strict policies and effective measures become an absolute necessity. [136][135].

5.2 Emotionless

The teaching and learning process goes beyond academic success and percentage rates[138][137]. AI may be helpful in the learning of factual knowledge; however, it cannot replace human teachers[140][139][66]. Automated analysis may assess test scores, although it will be unable to understand all the causes for achieving poor results because the reason for low ratings may simply be the lack of opportunities to study rather than skills[141][67][69]. Also, there is always a risk that some biases may influence the automatic evaluation system[142][68][70]. In any case, whatever the development and improvements of these technologies, they cannot understand the complicated process of learning that involves emotional aspects of the learner[143][7][14][25][71**].**

5.3 Technical Issues:

There are several issues associated with the integration of AI into teacher education programs [145][144][72]. For example, AI-based solutions require significant computing power, which may be absent in some educational environments [146][4][15][73].

5.4 Cultural Obstacles:

There may be cultural barriers in the domain of teacher training for AI [148][147]. For example, some teachers and trainers will oppose the use of AI in teaching environments, seeing it as a challenge to their professional autonomy [149][4][16][23].

5.5 Disruption in Technology

According to the research done on AI, it has many uses; however, at the same time, it is a disruptive technology that can widen the gaps even further, as marginalized and disadvantaged groups have less access to education based on AI technologies [150][17] [7][24][74].

5.6 Addiction to Technology

Historically, attending school required children to set aside their smartphones and tablets to engage with their traditional textbooks [152][151] [75]. The integration of technology into every classroom has made it difficult for children to envision a future without such devices [18] [7][20] [21]. Daily screen time due to AI use is shown in Fig 4.

5.7 Ethical and Social Implications

Bringing AI into teacher education isn't just a technical step—it kicks up plenty of ethical and social debates[154][153][76]. AI collects tons of information about both students and teachers, and folks are rightfully concerned about data security. In the humanities department, for example, they look at students' essay quality to measure performance [4] [19][77][155].

5.8 Autonomy and Surveillance

Regarding issues of autonomy and surveillance, complications may arise rapidly [156][157]. The use of AI solutions in education may result in excessive monitoring [159][158][78]. Thus, there is a high risk of using

personal information in ways no one anticipated, which will put pressure on students' autonomy and independence. This is why it is essential to find a proper balance between leveraging all the advantages offered by AI and protecting privacy rights and students' independence, as shown in fig. 4 [160] [6] [22] [79].

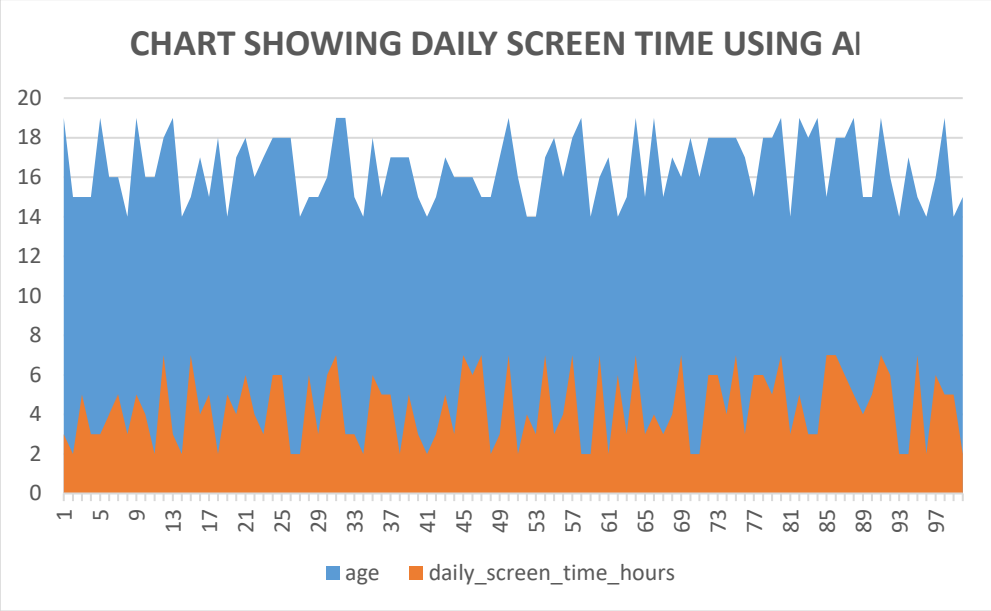

Fig 4:- Daily Screen Time due to use of AI [Kaggle dataset is used]

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