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THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN EDUCATION: OPPORTUNITIES AND CHALLENGES

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ABSTRACT

Objective: To explore the current and potential role of Artificial Intelligence (AI) in the educational sector, addressing its benefits and potential challenges.

Method: A comprehensive review of the existing literature and applications of AI in various fields, with a specific focus on its implications for education.

Results: AI has seamlessly integrated into various aspects of our daily lives, from automated systems in vehicles to personalized online advertisements. In the realm of education, AI promises to enhance the teaching and learning experience. It aims to supplement, not replace, educators by making the learning process more engaging and efficient. AI systems can provide feedback on student performance, highlighting areas of improvement, and ensuring inclusivity for students with special needs or language barriers. Additionally, AI can automate many administrative tasks, allowing educators more time for lesson planning and instructional improvement.

Conclusions: While AI presents numerous advantages for the educational sector, its integration should be approached with caution. Both educators and students need preparation for this technological shift to maximize its benefits and mitigate potential challenges.

Implications: The onus is on governments, educational institutions, and related organizations to facilitate the smooth integration of AI in education. Proper training and awareness are essential to ensure that AI is utilized responsibly and effectively in educational settings.

Keywords: Artificial Intelligence, Education, Inclusivity, Automation, Teaching Enhancement.



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Introduction

Artificial Intelligence has been around for many years but most people still consider it as a concept that belongs in the realm of science fiction novels and films. What most people seem not to know or understand however is that AI has been a part of science, technology and our lives for quite some time now and it is nowhere as advanced or dangerous as novels and films would have us believe (Pickover, 2019).

AI is all around us. It is being used to make our lives easier without us even knowing it. Some form of artificial intelligence is being used in a wide variety of applications; from automated parking assistance systems found in many modern cars to the personalized ads that we get on social media or when browsing the web in general. In other words, AI is here to make our lives easier and not enslave us or make us obsolete. (Burgess, 2021).

Since AI is being used in many fields, it goes without saying that it is also making its way to education. Artificial intelligence applications can change the way lessons are being taught and educator - student interactions in the near future. Does this mean that we are heading to a future where teachers will be replaced by computers or even robots? That's definitely not the case.

AI vs Machine learning

Although pretty much everyone has heard of the term "artificial intelligence", a lot of people simply don't know its definition and they usually confuse it with "machine learning". In other words, people don't exactly know what makes a certain machine or application "intelligent". To put it simply, with Artificial Intelligence scientists try to help machines "mimic" the way human intelligence works. In layman's terms, an "intelligent" machine can learn from its mistakes, it can refine the way it works in order to become more efficient and it can pick the best solution for a problem. The machine isn't self-aware; it can just work efficiently without the need for constant human interference and oversight. (Mitchell, 2019).

On the other hand, machine learning is a type of Artificial Intelligence and it is used to collect and process data faster than the human brain can. It is used mainly for analyzing so called "big data" and more specifically, to pinpoint patterns and anomalies (Jones, 2020).



AI and Education

Upon hearing the phrase “AI teaching” or “implementation of artificial intelligence in education”, one could easily think that in the future teachers and educators in general will be replaced by technology. However, the truth is different. As is the case with all AI applications, scientists don’t try to find a way to eliminate the human factor; they are trying to aid both educators and students. In other terms, AI applications for education will help make the teaching and learning process more efficient and accessible to all students. They will help educators make the most of their time both inside and outside the classroom and they also intend to change the way students access information. Although AI is slowly finding its way to classrooms, we are still pretty far away from the time when it will become the norm, when it will transform the way educators teach and students learn. This chapter aims to explore the ways in which Artificial Intelligence can help education and even transform it completely so that parents, educators and students alike will not be hesitant or even fearful when those changes come.

Some examples of AI applications in education

It has already been established that Artificial Intelligence will not replace teachers with robots any time soon; so, just how can it help educators and students in the future? Below are some examples of the ways Artificial Intelligence will be used in education once it finds its way to classrooms in the not so distant future.

Administrative work

It is widely believed that teachers just teach. This couldn’t be further from the truth. Unfortunately, apart from their teaching duties, teachers also have to do administrative work in the schools they work in. They have, for example, to update attendance records and notify parents in case some of their students have been absent. They also have to register new students during the enrollment period. This is just an example of the very time-consuming administrative work that teachers have to do on an almost daily basis. The time they spend doing this work could be better spent preparing for next day’s lessons or attending seminars. Artificial Intelligence applications that will take the burden of administrative work from educators by automating it are just around the corner so that teachers will be able to completely devote themselves to what they have been trained and hired for: teaching (Fadel & al., 2019).

Grading papers

When they are home, teachers don’t just study for next day’s lessons, they also grade papers and correct homework and / or exercises. Artificial Intelligence can help with that too. In fact, it has been doing so for a long time: multiple choice tests in standardized exams have been graded and corrected by “intelligent” machines for years. In the near future, AI will be able to “read”, correct and grade essays and answers to “open questions”, even if they have been hand-written. Furthermore, AI apps may even alert the educator to specific patterns regarding the graded papers. The teacher will know for example if some of their students cheated while the app will also be able to “deduce” how well the students understood the questions and the material that corresponded to them. They could even be able to pinpoint what certain students didn’t quite understand (Arora, 2022).



Personalized learning

It is a well known fact that each student learns in his or her own way and pace. Ideally, teachers should try to adapt their teaching to individually fit all of their students' particular needs, however that is simply impossible in a classroom of 25 or even 30 students. This is why several companies are currently developing teaching and testing platforms that will provide students with personalized learning. Specially designed AI will be used to provide students with challenges that will be perfectly tailored to their needs and level of understanding; this AI will also be able to identify gaps in the students' knowledge and to determine whether or not they are ready to advance to a new topic or chapter. Those applications could, in the distant future, become so sophisticated that they will be able to "read" student's faces and define just how easy or hard they find their challenges in order to adjust them accordingly and notify the teacher if the student is struggling. It goes without saying that the teacher will be a vital part of this new procedure. The aim of those AI platforms and applications is to help students in the same class work together and to ensure that no one gets left behind. The teacher will always be there to provide support and help when needed and his job will still be teaching students new material once they are all ready to advance (Arora, 2022).

Increasing accessibility

Learning in a traditional classroom can be very difficult for students with special needs – mainly students who are completely deaf or have other hearing problems – and immigrant students who have just moved to a new country and are not very familiar with the language spoken in the classroom. Fortunately, Artificial Intelligence can solve that problem. Augmented reality AI applications can translate in real time what the teacher and the other students are saying and provide subtitles, making learning accessible to everyone.

Remote teaching

If the Covid-19 pandemic has taught us anything it is that students can find themselves away from their school for a long time due to an illness or other reasons. Furthermore, there are even today children that live in remote areas and thus have limited access to education. AI can be a great help in those situations. AI teaching platforms can help students who can't physically access their schools or classrooms learn and not stay behind, academically, compared to other students. Teachers specialized in remote teaching and learning will provide support and will ensure that there will be no knowledge gaps in students who are forced to study remotely for a short or longer – even indefinite – period of time.

Customized textbooks

Digital learning is becoming the new norm, especially after the nearly two years that students and teachers spent away from their classrooms due to the COVID-19 pandemic. Traditional textbooks are being digitized and thus AI can and will be used to "tinker" with them. AI can tweak the textbooks in order to adjust them to each student's needs and learning style, it will even be able to generate study and teaching guides or break down the subject matter in smaller units in order to help teachers teach it more efficiently and students to understand it better. Furthermore, once textbooks are digitized, AI can keep their content up to date constantly and automatically. Finally, AI can generate visual aids to make the teaching and learning processes more fun and efficient as well.





Enriching a teacher's knowledge

It's a well-known fact that the world is in a constant state of change. New advancements, changes and discoveries are taking place every day in every scientific discipline. This means that a teacher can't rely on the knowledge that he/she accumulated while studying in a college or university. An educator should always be up to date on what he or she is teaching and while this used to be very difficult, the internet has made it a lot easier because it put knowledge at our fingertips. Artificial Intelligence will make it even easier as it will be able to determine what teachers already know and how to improve that knowledge.

Improved tutoring

Tutoring applications and digital platforms aiming to help students with subjects they find themselves struggling in are nothing new but Artificial Intelligence will make them even better. AI will soon be able to modify the tutoring material to match each student's knowledge level, abilities and learning style. Furthermore, specially designed chatbots will be on hand to provide additional information, should the student ask for it, or to answer any questions that they may have (Cameron, 2019).

Constructive criticism

Artificial intelligence can also be used as a true neutral arbiter that will evaluate a student's or teacher's work. The aim of those AI applications is not to judge or grade, but to provide constructive criticism that will help students and teachers alike improve themselves. This criticism will be very important because it will not be affected by the evaluator's feelings, likes and dislikes. It will be the most "clinical", analytical and "honest" evaluation possible because it will be carried out by a machine or application specifically designed for this task.

Making students more accepting of trial and error

Trial and error is, for better or worse, an important and even essential part of the learning process, a lot of students however find it very intimidating. No one wants to try and fail in front of their teacher and fellow students. Teaching platforms and applications powered by artificial intelligence can create an environment in which students will feel safe to try, make mistakes and learn from those mistakes. In a digital or virtual environment, students can make mistakes without worrying about being chastised or ridiculed by other students or even their teachers.

Better data harvesting and analysis

If there is one thing that Artificial Intelligence systems excel at is gathering and analyzing big data. AI systems specially designed for universities and colleges will be able to collect and analyze student data and provide each student with personalized suggestions regarding the courses they should take in order to achieve their goals as fast and efficiently as possible. They will even be able to predict how long it will take for a student to graduate.

Changing the way we find information

Although you may not know it, Artificial Intelligence has been changing the way you interact with information for several years now. Thanks to AI, Amazon can offer you items that you might want to buy, Netflix suggests which show you should watch next and Google customizes its search results in order to provide you with the exact answer to your search query. In the future, Artificial Intelligence will make the search for information by either students or teachers much more efficient and streamlined. In other words, it will be able to provide educators and students with the exact information they need exactly when they need it.



Making schools run more efficiently

Data gathering and analysis are the strong feature of just about any AI system. In the future, Artificial Intelligence systems will be able to gather data regarding a school's management and planning and they will provide efficient solutions to a host of problems and questions. They will be, for example, able to make the best plan of action in case of an evacuation due to a fire or an earthquake. AI systems will even be able to predict a school's need for teaching material, food etc., and help the school's management board or commission better plan how to spend their budget. In other words, AI will help schools save both time and money (Churi, 2022).

The above are just some examples of how Artificial Intelligence could drastically change education in the coming years or decades. The first takeaway is that AI will make life for teachers and students alike much easier. Teachers especially will have more time to invest on improving their knowledge and teaching skills since they will be essentially free from tedious administrative work and other time-consuming tasks such as correcting and grading tests and papers. That is a blessing for students and educators alike.

It is obvious that the educator's role in the classroom will not disappear – at least not in all cases – but it will change significantly. The teacher will no longer be the all-knowing authority who provides students with knowledge but a facilitator who will be by the students' side in order to provide help while they are working with their AI powered education systems and platforms. The teacher will also be there to answer students' questions in a more direct and "human" matter in order to ensure that everyone will have completely understood what the AI systems tried to teach.

It should be noted however that in some cases the teacher's role may be significantly reduced or it could even disappear completely. In the distant future, remote learning apps powered by AI could become so powerful that no interaction with a human teacher will be needed for support or for answering questions (Zimmerman, 2018).

How to start implementing AI

Artificial Intelligence can help with the teaching process and it can even transform it almost completely, but does that mean that AI solutions should find their way into classrooms as soon as possible? The answer to that question is simple: no. The implementation of AI systems in education is a paradigm shift and as such, it should happen gradually and not suddenly. All parties involved in education, from teachers and students to managers and administrators, need to be prepared for AI before it finds its way in schools and colleges.

The following is a presentation of how that revolutionary transition could happen in a smooth way that will not create frictions and problems.

- **Identify problems and possible AI solutions**

Artificial Intelligence is not and will never be the solution to all problems. Before even beginning to contemplate the implementation of AI systems, a teacher or school should identify problems that AI could help with. Once those problems are identified, the correct AI solutions need to be chosen. To put it simply, the problems need to be determined in order for the right tools to fix them to be chosen.

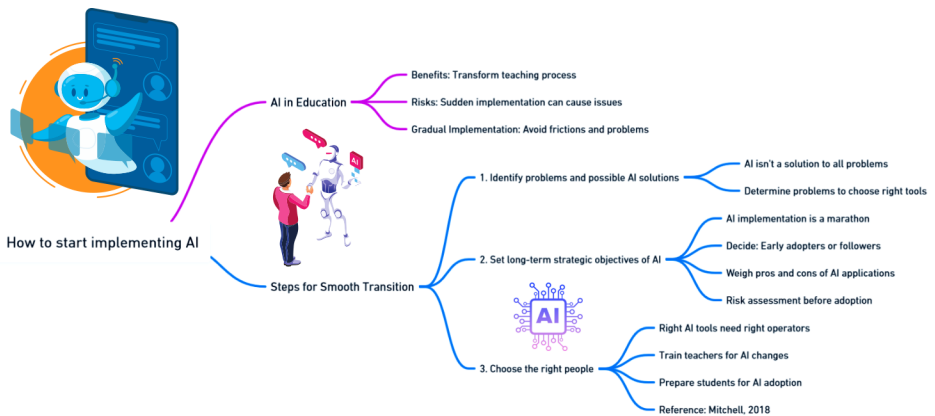


• Set long-term strategic objectives of AI

Artificial Intelligence implementation in education or any other field for that matter is not a sprint; it's a marathon. Most of the applications described above are in a stage of development that could be described as early at best, which means that there are a lot of imperfections that should be ironed out. This means that schools and teachers need to first decide whether they will be early adopters or followers. To put it in other terms, they need to weigh the pros and the cons and decide which AI applications they feel are ready for implementation and which need more work and adopt accordingly. Adopting a technology in its infancy stage can have some benefits, but it could end up being very costly in the long-run, which is why careful planning and risk assessment is necessary before adopting any AI application.

• Choose the right people

Choosing the right AI tools and solutions is not enough because they will be practically useless without the right people "operating" them. The implementation of AI in the classroom will change the teacher's place and role within it, which is why teachers need to be probably trained and prepared for the changes that AI will bring. It goes without saying that once teachers are prepared, they should pave the way for AI's implementation by making students aware of the changes so that they won't hesitate to adopt them once the time comes (Mitchell, 2018).





Existing AI-Based Solutions in Education

Full implementation of Artificial Intelligence in classrooms and schools may be years away, but there are already some AI education applications that have already been developed or that are very close to being completed. What follows is a short presentation of some of those apps in order to provide a better understanding of the current AI solutions for education.

• **CTI.** This company specializes in the creation of smart content for teachers and students. One of their completed products is called Cram101 and it is an app that is able to analyze textbooks and other educational material in order to create texts containing only vital information for students and teachers based on their needs. In other words, it is an application that basically creates notes automatically, thus saving for students and teachers a lot of valuable time.

• **Brainly.** It is rather a unique case because it is not an application but a social network. This social network is meant to be used by students who want to get in contact with other students from all over the world and discuss their homework and other issues related to their school life. In other words, it aims to help students gain and exchange knowledge. It should be noted that the network uses Machine Learning, in order to filter spam and other inappropriate content and to provide personalized content and search results to each user.

• **Carnegie Learning.** This is a system that aims to create custom educational material in order to make the teaching process more fun and efficient. Furthermore, it can also analyze student's behavior – by collecting and analyzing data regarding the flow and rate of their keystrokes, for example – in order to better inform educators about the progress and aspect that they may find particularly difficult.

• **Querium.** It is an application that is powered by AI in order to create custom STEM tutoring lessons for high school and college students. By analyzing the answers of the students and the amount of time they spend in their tutoring sessions, Querium can provide teachers with vital information regarding their learning style and it can help pinpoint areas in need of improvement.

• **Century Tech:** This learning platform uses cognitive neuroscience and data analytics in order to create personalized learning plans for students, thus reducing the amount of time teachers need to plan for their lessons. The AI used by the platform can measure a student's progress, it can find gaps in their knowledge and it can even provide personalized study tips and suggestions as well as constructive feedback. It can also provide teachers with access to resources that will allow them to reduce the time they spend planning, grading and managing homework (Cameron, 2019).

AI and human society

It goes without saying that Artificial Intelligence systems are very complex and as such they require a lot of resources in order to be developed and implemented. Furthermore, Artificial Intelligence is expected to be the next revolution that will make our lives a lot easier. For those reasons, it should be accessible to everyone and people should be ready to accept the changes that AI will bring to their lives. Policy makers, market players and governments are working together in order to pave the way for the AI revolution and to ensure that everyone, regardless of age or gender, will enjoy its benefits.



The above is also true for the implementation of Artificial Intelligence in education. UNESCO along with the Government of the People's Republic of China, organized the "International Conference on Artificial Intelligence and Education" in Beijing and its main theme was "Planning Education in the AI Era: Lead the Leap". The main aim of this international conference was the identification of the system-wide changes or the paradigm shift that AI will bring to education. This led to the Beijing Consensus which is essentially the very first document to offer recommendations on the best ways to implement AI technologies for SDG4-Education 2030.

According to the Beijing Consensus, UNESCO should develop guidelines and resources that will support the capacity-building of education policy-makers and the integration of AI skills into ICT competency frameworks. It also points out that UNESCO should adopt a holistic approach to reinforcing international cooperation in the field of AI and education (UNESCO, 2019).

Conclusion

Artificial Intelligence has already entered our lives and it is evolving and becoming better every day. In a few years from now, it will be a vital part of our lives and it goes without saying that it will find its way to education as well. Artificial Intelligence systems and other applications will start finding their way to classrooms in the not so distant future. Their aim will not be to replace the teacher with a computer and a robot, but to help make the learning process more fun and efficient.

Furthermore, those systems will be able to inform teachers on the knowledge gaps and other problems that their students may be facing with their lessons and homework, in order for them to adjust their teaching accordingly. Also, education will become more inclusive thanks to AI, since students with special needs or students who do not speak the same language as the teacher and the other students, will be able to attend school as equals. Finally, AI will automate a lot of teachers' out of classroom work which means that they will have more time to prepare for their lessons and improve their teaching style and methods.

It goes without saying that AI shouldn't and most likely won't be suddenly implemented in education. Teachers as well as students should be prepared for the changes that AI will bring so that they will be ready to work and deal with them once they happen. It is up to governments, schools and other organizations to pave the way for the implementation of AI in education.

AI is a technology that can be used for the benefit of people or it can be used for destructive purposes. AI has offered a lot of advantages to us but we should not forget that it can be used in the wrong way and cause a lot of problems. With AI we need to exercise our intelligence and our sensitivity in order for us to make the best use of AI.



References

Arora, V. (2022). *Artificial Intelligence in Schools: A Guide for Teachers, Administrators, and Technology Leaders* (1st ed.). Routledge.

Burgess, M. (2021). *Artificial Intelligence: How Machine Learning Will Shape the Next Decade* (WIRED Guides). Random House.

Cameron, R. (2019). *A.I. - 101: A Primer on Using Artificial Intelligence in Education*. Exceedly Press.

Churi, P., Joshi, S., Elhoseny, M., & Omrane, A. (2022). *Artificial Intelligence in Higher Education, A Practical Approach*. CRC Press.

Fadel, C., Holmes, W., & Bialik, M. (2019). *Artificial Intelligence In Education: Promises and Implications for Teaching and Learning*. The Center for Curriculum Redesign.

Mitchell, M. (2019). *Artificial Intelligence: A Guide for Thinking Humans*. Pelican Books.

Jones, H. (2020). *Machine Learning, An Essential Guide to Machine Learning for Beginners Who Want to Understand Applications, Artificial Intelligence, Data Mining, Big Data and More* (Audible Version).

Pickover, C.-A. (2019). *Artificial Intelligence*. Sterling Publishing Co., Inc.

UNESCO. (2019). *Artificial intelligence in education*. Retrieved from <https://en.unesco.org/artificial-intelligence/education>

Zimmerman, M. (2018). *Teaching AI: Exploring New Frontiers for Learning*. International Society for Technology in Education.