RETHINKING EDUCATION WITH ARTIFICIAL INTELLIGENCE: AN OVERVIEW

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Abstract

Artificial Intelligence in the field of education is an emerging interdisciplinary field of knowledge. As an upcoming trend, interactive learning environments and educational spaces are widely designed with tools and methods aided by Artificial Intelligence. School education is now exposed to new landscapes, that are driven by the growing possibilities progressively facilitated by applied research and innovations in Artificial Intelligence. What is interesting today is to note how the latest Artificial Intelligence technologies are bringing new ideas from cognitive science and neuro-sciences into education. As a consequence, the field of school education is becoming fertile with the new flow of ideas and enabling us to rethink traditional procedures and learning practices.

The current research article intends to study prospective changes Artificial Intelligence will bring along in redefining the school educational system. Further, considering the complexity adhered to in the system, the current research article considers only three broad categories for review; firstly, Curriculum, secondly, Learning – Teaching Methodologies, and thirdly, Assessment/Evaluation for continuous improvement and learning. The broad category identified is further investigated along with the underlying quality processes to reveal the hidden potential for excellence. This research article throws light into Artificial Intelligence assisted classrooms to take a step closer to understanding the ground-level realities. It also highlights perceptions and understands how the learner of today is different.

Index Words- Artificial Intelligence, school education, curriculum, Learning-Teaching Methodologies, Assessment, Evaluation

I. INTRODUCTION

Artificial Intelligence will showcase its application increased by 47.5% in education and learning by 2021, as suggested by a study published by eSchool News. Yet another report, published by Global Market Insights, Inc, in June 2021, the education market is expected to exceed USD 6 billion by 2024 and by USD 20 billion by 2027.

Figure 1: Artificial Intelligence market size, 2017-2028

Source: www.grandviewresearch.com
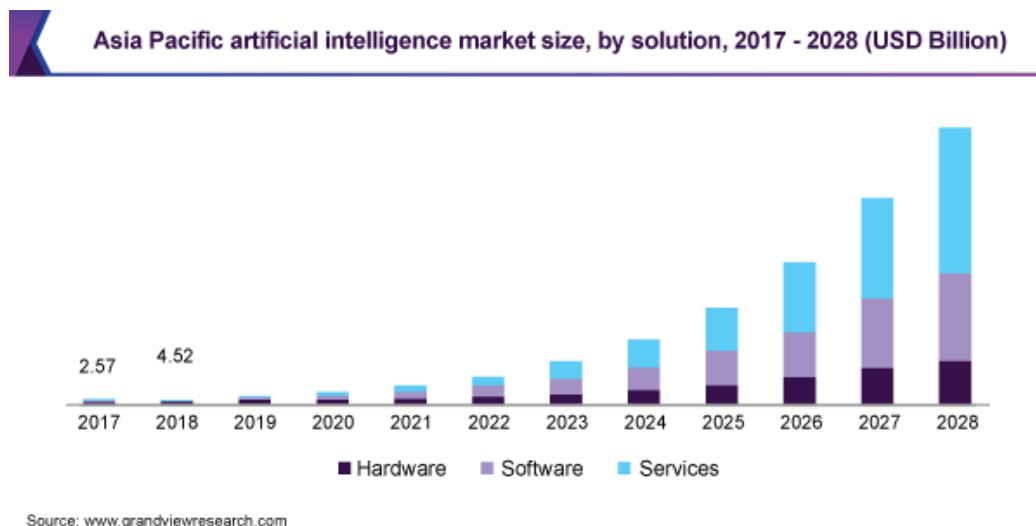
No wonder the world of school education is under drastic technical revolutionization. The impact is visible in all spheres, from smart classrooms to algorithms capable of tracking students' brain activities, facial expressions, academic progress, fitness, and many more parameters that can solve highly complicated problems within no time. It very strongly challenged the perceptions of educationalists to adapt and transform. And the same becomes much more relevant as we look forward to bringing up the 21st-century generation. How advisable is it anyways to expect 21st-century students to come out from 'traditional' classrooms? Here, the term 'traditional' definitely does not implies to put down or letting go of the values constituting our education system, rather, just redefining the prepositions to make them more relevant. For instance, the bond between the teacher and the students has always been of significant importance, and the matrix of the relationship between the two is evolving with time. The intervention of Artificial Intelligence will play a significant role in redefining this matrix, by helping better comprehend perspectives about the cognitive, emotional, and physical state of students. Thus, the assumed goals of Artificial Intelligence are expected to lead way beyond academics in school education.

The most desired gift of Artificial Intelligence to education is Augmented Intelligence. One of the sole purposes of quality education is to cater to the needs of the individual learner and enable personalized learning. Commencing with collecting and presenting data followed by historical and predictive analysis, in the context of excellence in school education, Artificial Intelligence has played a vital role, else it is beyond a human act.

Many companies are at work researching and inventing AI-driven tools. Nuance, a Massachusetts-based company makes speech recognition tools, and yet another one, Cognii makes AI-based products for K 12. Kidaptive's Adaptive Learning Platform (ALP) algorithms help improve learner engagement. In England, Blippar's product combines computer vision intelligence and augmented reality to create new ways of learning. And the list goes on with many more like Thinkster Math (New Jersey), Volley (San Francisco), Carnegie Learning (Pittsburgh), Quizlet, etc. It is not surprising to note how the Indian market is flooded with startups based on education technology, AI, Jungroo Learning, Embibe, Taghive, Learning Matters, Smartail, etc, to name a few.

No doubt AI-based technologies will play a fundamental role in catering to the challenges and requisites predicted and forecasted for 21st-century school education. This scenario has led school education to the phase of dynamic transformation.

Further, the article reviews how AI-assisted classrooms, facilitated by the education technology industry today, are throwing challenges and opportunities to capture the dynamism inherent in the 21st-century learner.

II. RESEARCH METHODOLOGY

This research article kindles scholarly discussions to unfold the impact of AI-assisted classrooms in schools.

The scope is limitless when we entail discussing how Artificial Intelligence is transforming school education. How so ever, in the present research article, the author has selected three primary domains to explore, namely; Curriculum, Learning-Teaching Methodologies, and Assessment and Evaluation. The research article further discusses the implications of Artificial Intelligence on the selected three primary domains:

- AI transforming the curriculum in the schools
- Al transforming learning – teaching methodologies in the schools
- Al transforming assessment and evaluation patterns in schools for continuous improvement

III. RESULTS AND FINDINGS

A. AI transforming the curriculum in the schools

John Dewey (1902), defines curriculum as "continuous reconstruction, moving from the child's present experience out into that represented by the organized bodies of truth that we call studies….". The report, Artificial Intelligence Research and Development Strategic Plan, released by US President Barack Obama in October 2016, states that "the walls between humans and AI systems are slowly beginning to erode, with AI systems augmenting and enhancing human capabilities. Fundamental research is needed to develop effective methods for human-AI interaction and collaboration" (U.S. National Science and Technology Council, 2016).

In the simplest of words, it could be stated as something meaningful 'the school intends to teach to the students. As we probe deeper, the statement becomes more and more complex in nature. With the growing diversity and dynamics inherent in school education, it is no less than a Hercules job to keep pace with a curriculum that is appropriate and relevant in all aspects. It requires the most perfect analysis and prediction of the forthcoming challenges and opportunities; only then will the purpose of education be met. It becomes all the more sensitive when we relate a country's economy with its education system.

It is true, AI cannot manage this on its own. It requires the human brain to conceptualize. But what is beyond the human brain is analyzing and predicting loads of data for meaningful and relevant interpretation. The insights interrogated from large data facilitate capturing the gaps and tasks that need to be accomplished to achieve intended goals. The approach has shifted from reactive to proactive.

AI has overcome the constraints of applicability; the focus is to develop a globally accepted framework of knowledge capable of equipping the next generation with the identified skills for tomorrow. The curriculum is no longer a mere document of 'what to teach it is now a procedure developed through systematically driven scientific processes.

AI is playing a crucial role in adapting the concepts like flipped classrooms and online learning to reality efficiently. This to an extent has impacted and addressed the issues of retention by improving accessibility. The curriculum is now for the learners, based on their requirements, availability, and style. AI-enabled tools have changed the thought process of conceiving the protocols for framing curriculum. Nevertheless, the efforts are directed to reach out to one and all irrespective of any boundaries. With the growth potential of the AI market, it is quite

expected that technology will further find its place at the grass root level in no time. The biggest challenge will be not technology but human minds to accept and adapt to the transformation.

B. AI transforming learning – teaching methodologies in the schools

Learning to teach has always been considered to be the most crucial part of any school education system. It involves processes of change and adaptation. In the simplest of words, if the curriculum is about 'what to teach, then learning teaching methodology is about 'how to teach. Therefore, it is the next important parameter leading toward quality school education. AI has drastically reformed this system, no wonder our classrooms do not look the same as decades ago now. AI has impacted everything from pedagogy to resource management. Soon AI will leave teachers with no job, other than teaching. It was beyond the reach of teachers to cater to the individual learning style and offer a personalized plan of teaching. AI has made it possible for teachers to look at their classrooms as individuals and not as a mass.

Virtual Reality and Augmented reality are tools of AI that have enabled educational potential by completely transforming the way students of the 21st-century learning. Who could imagine learning about history could be so fascinating, mathematical operations could come alive and science experiments could be so fun? With AI Learning teaching is no more about just uploading knowledge and skills.

AI has brought student teachers closer as the teacher now can better understand the behavioural pattern and adapt to address the gaps. The connection is not confined to the cognitive domain, AI has added social/emotional dimensions to it. In a study by IBM, a teaching assistant chatbot was developed. The students of Georgia Tech experimented. They failed to recognize one of their nine assistant teachers as a 'robot'. Furthermore, they found her 'too efficient to be human' and recommended them for a teaching award.

The scenario may not be as easy as perceived. It requires a lot of reconstruction at the foundation level itself, from infrastructure to competency building. But, at the same time, the fact of the matter is that AI has already made its way to classrooms, and now it is all about making the required adjustments to follow for desired outcomes. Reports by ASER 2020, indicate tools enabling AI-based learning are no more a constraint for even low-economy schools. The requirement is to equip our teachers with the skills they need to carry to demonstrate AI tools in classrooms. With AI, the classrooms are now full of questions. Are our teachers ready for such noisy classrooms? If, not, it's time to start thinking right from scratch and act.

C. AI transforming assessment and evaluation patterns in schools for continuous improvement

Assessment and evaluation of learning complete the learning cycle. Learning is a cyclic process and therefore does not end up with assessment and evaluation. It upgrades the level of learning. It, therefore, becomes important to emphasize the validation and reliability of the processes involved in the same. It may not be possible to work on the large volume of data that is required for a holistic meaningful assessment and evaluation of learning. Moreover, the priority of a teacher should be to work on patterns and insights rather than giving time to assemble and analyze data. As a teacher, one would always wish for a magic wand, that would help them 'know' their students better, and further suggest the best solution to help them achieve their goals.

The Intelligent Tutoring System (ITS), is one of the tools of AI applied intensively in the learning process. This application of AI supports features like personalized learning instructions along with personalized feedback without human intervention. The algorithm not only supports a quality learning environment but also helps teachers in the optimization of their time and capacities. With the intervention of ITS, teachers can be more focused on the ultimate desired goal of education, which is ensuring quality learning for all.

AI has given a new dimension to assessment and evaluation. It is process based and fed with loads of data. Certainly, it is a way forward for the learner to understand rather than putting a full stop. Assessments and evaluation are the keys to improvement, and AI tool (ITS), has enabled the same. Though the algorithms on which the assessments and evaluation are based are developed by the human brain and therefore bear all chances of being biased sometimes, then, that is where human intelligence and intervention may be helpful. And it is because of this reason, we support AI as an assistant and not a replacement.

IV. DISCUSSION

Before we start with any discussion on the perceptions related to how Artificial Intelligence is transforming school education, it may help to have a glance at the technical understanding of types of 'Artificial Intelligence. Well, it can be understood in terms of its capabilities and functionalities.

Figure 2: Types of Artificial Intelligence
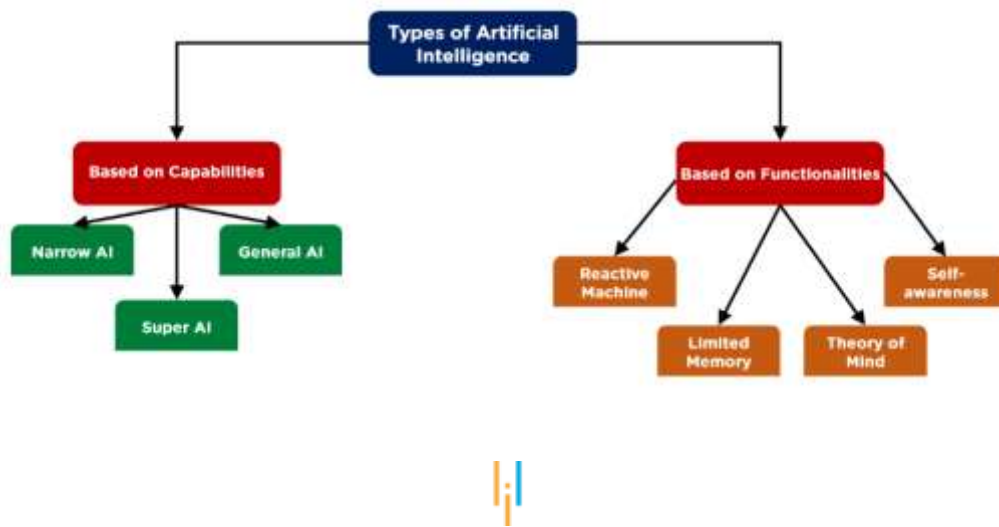
Source: Simplilearn (7 Types of Artificial Intelligence That You Should Know in 2022)

Based on the capabilities, three types of AI are suggested. namely; Narrow AI, General AI, and Super AI. Narrow AI is a weak AI and as the name suggests, can focus on one task at a time. Apple Siri, image recognition, IBM supercomputer, and google Translate are all commonly used tools and examples of Narrow AI. It has the limitation of performing outside its abilities. The AI tools deployed in school education use Narrow AI. The next type is General AI. General AI is considered to be a strong AI as it can perform any intellectual task just like a human. In an attempt to achieve General AI, Fujitsu built the K computer, one of the fastest supercomputers in the world. To simulate a single second of neural activity it took nearly 40 minutes. It is obvious, it will take some time for this technology to touch upon the classrooms in reality. Lastly, the third type is Super AI. It can surpass human intelligence. This certainly will be a turning point in human civilization. Based on its functionalities, AI can be categorized into four groups. Firstly, Reactive Machines, are the primary form of AI and do not store memory or use past experiences to accomplish future actions. IBM's Deep Blue- which defeated chess grandmaster Garry Kasparov is a reactive machine. The second type is, Limited Memory, and as the name suggests it uses past data to make the decision. It helps create tools for enhancing learning and teaching practices. The third type is the Theory of Mind. It is an advanced form of technology and can alter feelings and behaviour within an environment. It understands human emotions, sentiments, and thoughts. It is still not found completely explored. Kismet, a robot head made by the Massachusetts Institute of technology can mimic human emotions and is one of the best examples of the Theory of Mind AI. Lastly, Self-

awareness AI exists only hypothetically. This AI will not only be able to interpret emotions and feelings but also have its own beliefs and needs. Well, history says, this is just the beginning of the new era of AI, and the best is yet to come.

No apprehensions when we say that we are rapidly progressing in the vicinity of Artificial Intelligence globally. The industrial trends show the market size of AI in the education sector exceeded USD 1 billion in 2020. There are estimations that the same would further grow at a CAGR (compound annual growth rate) of over 40% between 2021 and 2027. The revenue of AI in education solutions across Canada surpassed 70% of the total revenue share in 2020. The trend is expected to grow with the furthermore rising demand for Intelligent Tutoring systems (ITS) in the coming years. In India, the regional industry size from the cloud deployment segment is pegged to record a CAGR) Compound annual growth rate) of approximately 60% through 2027. This data across the globe is self-indicative of the acceptance of AI in schools. It is quite obvious to note how AI has impacted the classrooms and helped touch the hidden corners.

The classrooms are changing …. probably today, a few decades back could be seen as an era of pedagogical dark ages. Not to blame the teachers or schools for that matter, but those times lacked provisions that could help schools and teachers look at learning beyond textbooks and confined boundaries**.** Clark in his book, *Artificial Intelligence for Learning*, states that "AI can result in accelerating and reducing the cost of learning–even basic skills such as reading, writing, and arithmetic–on a global scale. It will make past improvements in pedagogy look like rounding errors."

One fact that cannot be ignored in the matter is that the algorithms are human creations, which in turn, does leave room for biased consensus. The debate on AI-led versus AI- assisted schools has already begun. On one hand, in countries like India, where AI is being more than welcomed as an effective tool in classrooms, on the other hand, in countries like China, the most primitive users of AI, are now finding AI stressful. The parents, students, and teachers hold different opinions when analyzing the facts related to the efficacy of the application of AI in school education. Will AI replace teachers in classrooms? Well, the author feels the more important question is, how is AI transforming our school education today? And what is it that we can expect following this transformation? There may or may not be an answer to whether AI will ever replace teachers in the classroom but sure if we are well informed of the coming up challenges along with this technological transformation, it will certainly help on way forward.

AI has certainly paved the way for new-age education which is flexible, personalized, and meaningful. It has captured the universe in one camera and made learning as fun as never before. In a real sense it has placed the learner in the centre, now learning is for the learner and by the learner, the teacher plays the role of a mentor. As AI can cater to diverse groups, more and more diverse nature of learners will be benefitted. The pedagogy approach has attained new heights of excellence during the technology boom in this era. There is all the possibility that instead of being dumped as 'useless' they will now find just the right match for themselves. It is quite expected to have a skilled generation with diverse competencies as the journey with AI has just begun.

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