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AI and Education: Impact of AI on Learning Outcomes in Higher Education

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ABSTRACT:
Integration of Artificial Intelligence (AI) and education sector has rapidly modernized teaching and learning process. This dynamic change, affecting all areas such as teaching pedagogy, teaching media and the skills has led to the emergence of new era commonly referred to as Education 4.0. This paper reviews the multifaceted influence of Artificial Intelligence on education, highlighting the shift towards personalized and customised approach, integrated learning environments and optimisation of learning platforms, In conclusion, mapping the AI powered Teaching pedagogy, Teaching media and the new age skill sets with the program learning outcomes is pertinent to the future of education 4.0.

Key Terms AIED Artificial Intelligence in education, Integrated Learning Environment, Learning outcome, Teaching pedagogy, Teaching media

INTRODUCTION

The interface of Artificial intelligence in the field of education sector has been rapid in the last decade, leading to modernisation of education. This dynamic change of AI on education has an omnidirectional impact on all areas, including purpose, content, methods, media, assessment, and evaluation. Along with this change, research publications on AIED (Artificial Intelligence education) have also risen rapidly. Most studies suggest the need for thematic diversification of AIED research as most of the studies focused on AI algorithms and technologies to education(Paek & Kim, 2021)

In recent years, scholars across the globe have highlighted the purpose of AI is to provide better learning environment. The learning environment should simulate student learning and support the applicability of the knowledge and be able to connect the social contacts autonomously(Dai & Ke, 2022)

With the rapid adoption of AI in education, the teaching platform is optimized and personalized to the needs of the students.AI has also triggered fundamental changes in the field of higher education in the areas of content, delivery, pedagogy, teaching methods and learning ecosystem etc (Zhang, 2023)

The research gap identified in the context of AI and education revolves around the need to further explore on how Artificial Intelligence (AI) can impact the learning outcomes, teaching pedagogy and teaching media in the context of Education 4.0.All these systemic changes in the field of education clearly indicates that higher education has reached a juncture where change is inevitable, and the traditional pedagogical methodologies are proving to be

inadequate. Understanding the deeper implications of emerging technologies on teaching pedagogy, student learning and the inevitable changes in the field of higher education is the way forward. Further, the influence of emerging technologies on higher education will help us focus on challenges and prepare for the AI revolution while providing students with necessary new age skills. Several studies support this claim (Adair, 2023; Dai & Ke, 2022; Shaping the Future of Learning: The Role of AI in Education 4.0 A P R I L 2 0 2 4, 2024) and state that Transition of the education sector in the era of AI needs an in-depth exploration. In this context the paper is organized as three sections. Section one examines higher education and the adoption of Artificial Intelligence (AI) , Section Two presents the need for AI literacy and lastly Section Three examines the pivotal aspects of AI powered learning outcomes , teaching pedagogy , teaching media and the new age skills.

RESEARCH METHODOLOGY.

This research paper employs a descriptive research methodology. The study draws upon a diverse array of sources including statistical reports, governmental documents, policies, related literature, and significant government websites. Additionally, the researchers' personal experiences as educators contribute valuable insights. Data extracted from these sources have been meticulously analysed to address the research question at hand.

HIGHER EDUCATION AND THE ADOPTION OF AI

Firstly, the research considers AI and education as the contextual background of the study. Two parallel strands of research have been assessed to capture the impact of AI on education. One is the evolutionary process, focuses on the current classroom practices, collaboration with teachers and diversifying technologies and other domains. The other is the revolutionary process, where there is serious discussion and deliberation to capture the essence of embedding technologies within the everyday lives, supporting cultures, practices, goals, and communities. Rapid rise and development of AI as technology is universalizing the application and the usage of AI in education(Fadel et al., 2019)

Adoption of AI by the higher education has been significantly high between 2014 and 2022. China surpassed US in the number of AIED publications(Crompton & Burke, 2023)

Most disciplines in AIED papers are from Computer Science and STEM(Zawacki-Richter et al., 2019) Global organisations like UNESCO, EU, OECD and many more have come up with policies on AI in education. Two schools of thoughts arise that also capture the transition of education in the AI era. Firstly, the transition of collective approach of education and secondly the Personalized and customized approach of education. Transformation of public education which is based on industrialization is transformed to personalized and customised content.

PERSONALIZATION AND CUSTOMIZATION IN THE CONTEXT OF EDUCATION

Integration of modern technology in higher education using personalized learning platforms has improvised and optimised the teaching methods. The intervention of AI has demonstrated change in effectiveness in the context of improving student performance and learning curve. Indeed, many interactive learning environment papers show considerable improvements in efficiency by demonstrating similar learning gains in reduced duration of time. (Yadav et al., 2022)

The results obtained confirmed the need for integration of AI in higher education. Future of education is poised to shift the teaching paradigm with the sustainable development and deployment of AI driven technologies at universities and schools. This deployment leads to discussion on the application, advantages and challenges in the

perview of teacher student learning, intelligent tutoring systems and automated personalized learning (Kamalov et al., 2023). For a sustainable multifaceted approach to education in the AI era, most of the Universities are considering AI literacy education as mandatory courses to enhance the understanding of AI.(Roll & Wylie, 2016)

NEED FOR AI LITERACY

AI literacy is needed for both students as well as teachers who need better personalized support that nurtures the interactive learning environments. The next question that arises will be: What are Interactive Learning Environments? Educational technology tools like learning management systems, games, simulations, intelligent tutoring systems and the emerging technologies such as generative AI, blockchain, metaverse and chatbots all form the interactive learning environment. All these have the potential to transform the ways people connect and collaborate with the environment. On the other hand, Interactive learning is a more firsthand, real-world process of relaying information in classrooms. Passive learning relies on listening to teachers lecture or rote memorization of information, figures, or equations. interactive learning is learning that requires student participation. This participation can come through class and small group discussions as well as through exploration of the interactive learning materials given in a digital classroom. Interactive learning materials are interactive resources designed to teach a specific learning outcome. They may comprise of a single or multiple pages that can contain any combination of text, images, audio, video - including screencasts, animations, self test questions and other interactive activities.

It is interesting to note that the interaction in the system can be between teacher and system, learner, and system or between teacher and student. The learning can be academic, informal, or work related. The efficiency and effectiveness of this interaction between the teachers, students, institution, and the industry forming an ecosystem purely depends on the AI literacy of all the stakeholders involved in the collaboration. The other three key components that must be included in every interactive learning technique is engagement, interaction, and feedback. All these three key components need to be woven to the learning outcomes of the course.

AI POWERED LEARNING OUTCOMES

With the rapid adoption of ILE's in the universities, the program objectives, goals, and practices of the various courses offered are also subject to change. The focus is to address these changes head on and provide support structures that are available in the current settings and practices. As education is a socio-cultural phenomenon (Wang, 2022) it is important to understand the learning outcomes of the course in the context of cultural traditions, practices and structures existing at the university. The focused outcome of this effort is bringing AI as technology in education and thereby assessing the changes to the learning outcomes of the course. The primary goal is to make a substantial impact on the student's educational experiences.

There is a serious argument that AIED should use the existing resources and not reinvent. Most of the ILE's develop their own content. The content needs to be adopted and adapted to integrate with the teaching pedagogy, teaching media, teaching practices, teaching mode, professional development, and with the learning outcomes expected of the course. Additionally, one context that is missing is the change it brings to the learning outcomes of the courses offered by the universities. Interesting questions arise in this context. Can existing resources through Massive Open Online Course (MOOC) be integrated with the Integrative Learning Environments and thereby with the learning outcomes of the course? MOOCs cater to the varied and fast changing educational landscape that can help Education policy 2020 (Malik & Hooda, 2023).Connecting bridges need to be established to provide the necessary support system. With each of these dimensions discussed as support systems, there is a pertinent need to examine teaching pedagogy, teaching media, teaching mode and learning outcomes mapped to professional development of the student. In this context there is an enormous potential to realign the learning outcomes to suit AI interface with education.

AI POWERED TEACHING PEDAGOGY

Teaching pedogogy in most simple terms is the way the teacher and the student work with the course content. The key idea for pedagogy is to diversify the pedagogy by varying the teaching methods, learning activities and the assessments. Pedagogical significance of students of higher education have been analysed and evaluated(Iasechko et al., n.d.).Integrating AI into teaching pedogogy has paved the way for innovation and invention of sophisticated tools for both content creation and teaching. Recent studies on AI powered teaching methods highlight how the teaching techniques are more accessible and show guidelines to use AI to implement evidence-based teaching strategies quickly and easily. (Mollick E & Mollick L, 2023)

Some of the strategies include:

"*Helping students understand difficult and abstract concepts through numerous examples; varied explanations and analogies that help students overcome common misconceptions; low-stakes tests that help students retrieve information and assess their knowledge"*

Large language models available as a resource can be used to quickly generate content teachers can use to implement these strategies. However, these need to be used with a word of caution. As they can enhance or cause confusion in the minds of the learners impacting teaching pedagogy. It is dependent on the teacher expertise as they need to assess the AI output and gauge where and how to implement or put in practice in each classroom.

Chatgpt and other Large Language models are already being used in the classrooms to teach new lessons, help with research, lesson planning and reduction of workload. This clearly indicates that AI tools are easily accessible and available for public conversation for both educators as well as students. It is interesting to note the initiative of Harvard metaLab AI pedagogy project that helps educators engage their students in conversation about the capabilities and limitations of AI. The assignments posted on the project can be customized by the educators to suit their pedagogical values and classroom needs including K12 and higher education(AI Pedagogy, 2023)

As AI powered teaching pedagogy is adapted and adopted by teachers, researchers and educators need to assess the benefits and limitations of using AI for pedagogical purposes. They come with come with their share of ethical, privacy and other challenges including decreased performance levels of students due to mobile phone addiction and access to solutions without the understanding of basic concepts(Khosravi et al., 2023)

Riding along the challenges the AI powered teaching pedagogy involves the integration of AI powered teaching media into educational practices to enhance the learning outcomes.

AI POWERED TEACHING MEDIA

AI enabled teaching media and tools have taken the spotlight in education. Traditional black boards are being replaced by AI powered teaching media and tools which is not just fashionable but are becoming necessities in higher educational institutions. These tools offer the opportunity to interact with the ideas, present their critical thinking skills for the class to see and learn. These are in the process of shaping the pedagogical approaches to emphasize visualizations and facilitate collaborative discussions in class. (Adair, 2023)

Substantial number learning environments are using AI powered and enabled teaching media to support teaching pedagogical approaches, assessments, and evaluation. For example, the educational institutions are using various AI platforms like Toddle AI, Scribe, Tango, Writer, LEAi and many more (At the time of authoring this paper) that helps teachers to create content, evaluate and personalize and refine the learning experiences. Some of the most common AI technology-based tools are personalized learning platforms, Intelligent tutoring systems, AI based gamification, AR, and VR applications. The usage of these AI tools and platforms brings in change in the skills sets required by the students. The AI era mandates new age skills which are outlined in the Education 4.0 framework. The AACSB article on How to evaluate Critical thinking in the age of AI encourages to use generative AI tools to enhance the

learning experiences. Institutions instead of curbing the use of the AI tools often over fears of plagarism need to consider it to improve the learning outcomes(Risvold, 2024)

AI POWERED SKILL SETS THAT REALIGN THE LEARNING OUTCOMES

AI in education has the potential to realign the learning outcomes by focusing on skill sets along with the subject domain knowledge(Chichekian & Benteux, 2022). The world economic forum report on AI in education refers to the teaching and learning of skills, abilities, values, and attitude for the future of education 4.0. Education 4.0 is an educational framework that integrates digital technologies to the learning process. Primarily aiming at enhancing flexibility, and acquisition of relevant skills in the 21st century(Guerrero-Quiñonez et al., 2023). This framework is comprehensive framework that outlines key transformations needed for the addressal of future needs and promote better learning outcomes. (Shaping the Future of Learning: The Role of AI in Education 4.0 A P R I L 2 0 2 4, 2024)

The skills outlined in the Education 4.0 framework table 1

TABLE 1
EDUCATION 4.0 FRAMEWORK

Content (built-in mechanisms for skills adaptation)	Experiences (Leveraging innovative pedagogies)
• Global Citizenship skills	• Personalized and Self-paced learning
• Innovation and creativity skills	• Accessible and inclusive learning
• Technology Skills	• Problem – based and collaborative learning
• Interpersonal Skills	• Lifelong and student driven learning

Source
World Economic Forum

Education 4.0, well connected with Interactive learning environments through smart learning environments plays a crucial role in emplowering learners with employability skills necessary to succeed in the rapidly evolving AI Era (Mekacher, 2022) The usage of ILE's induce the AI powered employability skills in the forefront. Meet the existing employability skill, gap the following eight skill sets need incorporation in teaching and learning. This incorporation is enabled by AI as technology interface. It is the collaboration of these skills sets with the human expertise and AI capabilities that brings in new possibilities to redefine the program learning outcomes. The program learning outcomes also need to go through the change in basic assumptions as the evolution AI powered employability skills set. This collaboration will hold the potential to enhance the learning outcomes to suit the future needs of AIED. Thus, Mapping the AI powered skills, abilities, values, and attitude with the program learning outcomes is pertinent to the future of education 4.0. This claim is supported by the results that indicate higher education, learning outcomes are attracting the attention of considerable number of researchers(Alotaibi & Alshehri, 2023)

In fact, globally, number of examples of leveraging AI to enhance the learning outcomes is presented as experimental solutions relating to countries such as China, Brazil, Kenya, South Africa.(Challenges and Opportunities for Sustainable Development Education Sector United Nations Educational, Scientific and Cultural Organization, 2019) However, all these initiatives and collaborations come with its own set of challenges of data privacy, equity, bias, digital literacy gap, transparency, accountability and displacement of traditional teaching roles and methods. Navigating through these challenges require balance of innovation and ethical responsibility. There are chances of aligning the learning outcomes with the optimisation of AI systems rather than AI driven learning pathways.

CONCLUSION

AI can revolutionize how courses are conceptualized, designed, delivered, and measured. The study has delved into the multifaceted impact of AI on education emphasising the shift towards personalized and customised learning approach, AI powered learning outcomes, AI powered teaching pedagogy, and the teaching media. Integrated learning environments play a very crucial role in personalizing learning experiences and enhance the teaching pedagogy. Enhancing the learning outcomes is a necessity and time sensitive requirement in the current AI driven education landscape. AI enabled teaching and learning systems can give teachers a better understanding regarding their students' learning abilities, learning styles and progress. This transformative impact of AI on education gives us a holistic understanding of this AI led educational revolution. With the increased adoption and adaptation of AI in education, it brings to education several challenges such as data privacy, equity, and bias that must not be overlooked. Striking a balance between innovation and ethical responsibility is paramount to ensure the effectiveness and sustainability of AI integration in education. Responsible use of AI with due ethical considerations adhered should allow continuous research and monitoring to ensure its effectiveness and sustainability. The invaluable role of AI in revolutionizing education cannot be understated. By offering personalized learning experiences, enhancing teaching pedagogy, and improving learning outcomes, AI has become an indispensable tool in higher education. Moving forward, continuous research, monitoring, and responsible use of AI will be essential to harness its full potential while addressing the challenges that accompany its implementation. Thus, Mapping the AI powered Teaching pedagogy, Teaching media and the new age skill sets with the program learning outcomes is pertinent to the future of education 4.0.

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