Exploring the possibility of integration of Artificial Intelligence in Competency Based Learning

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Abstract

Educational processes have been changed drastically during the few decades. From chalk and talk method to the use of emerging technologies significantly contributed to Teaching-learning process. These advancements have also changed the attitude and mindset of learner. Artificial intelligence has tremendous potential to revolutionize the learning process. Rapid advancements in artificial intelligence has made it imperative for the educators to include it in teaching-learning process. Artificial Intelligence based tools provides numerous benefits including making learning and learning environment more efficient and effective. This article presents the possibility to incorporate artificial intelligence in education particularly in Competency based learning. It also discusses the ways Artificial intelligence can be used in competency based learning and transform competency based learning. This paper is aligned with SDG4 goal.

Keywords*: Competency based Learning, Artificial Intelligence, teaching-learning, education, SDG4*

Introduction

Education has shifted from a memorized and standardized system to a more individualized and flexible approach. It is more personalized and technology oriented now. The considerable shift in the recent past is owing to the incorporation of Artificial intelligence into education. The education sector is experiencing a growing application of AI. Artificial Intelligence (AI) in education is revolutionizing the way students learn and how instructors teach. It presents both challenges and opportunities to classrooms, online systems, and education systems in general. The fusion of Artificial Intelligence (AI) with Competency-Based Education (CBE) is a revolutionary way of rethinking educational practices through a focus on personalized learning and mastery of skills. CBE is based on ensuring that students master competencies that are aligned with the needs of industries as opposed to finishing courses depending on the number of hours spent in class. It is a major shift inschool culture, structures, and pedagogy focused on ensuring that all students succeed and addressing the fundamental shortcomings of the traditional model.(Levine & Susan, 2019) The fundamental principles of an educational strategy that emphasises the learner's role are outlined by competency-based education. Additionally, the guiding principles encourage prompt, relevant assessment that provides actionable insights in addition to individualised, differentiated support. With educational systems being more and more aware of the necessity to create personalized learning experiences, AI's capacity to assess data, tailor content, and respond instantly places it in an essential role in student engagement and performance enhancement. (Rogel-Salazar, 2023)

The significance of integrating AI in CBE lies in its power to modify traditional pedagogical methods, fostering a more individualized approach to education. Educators can

employ AI tools to develop tailored learning pathways that address students' individual strengths and weaknesses, thereby fostering self-directed learning and enhancing mastery of critical skills. The partnership between AI and CBE offers a unique opportunity to improve learning outcomes and experiences for a variety of student populations as the educational landscape changes. Navigating the intricacies of AI adoption will require ongoing study and smart partnerships with tech companies, allowing institutions to optimise its potential while addressing obstacles and ethical considerations.

Historical Context:

Artificial Intelligence (AI) integration in the classroom has evolved alongside advancements in technology and pedagogical approaches, particularly within the framework of Competency-Based Education (CBE). Historically, education systems have emphasized time spent in a classroom over demonstrated mastery of skills. However, as the need for personalized learning and adaptability in educational environments increased, CBE emerged as a model focused on the acquisition of competencies that are directly aligned with industry standards and real-world applications. (*The Rise of Generative AI Usage in Competency-Based Education | by Dr J Rogel-Salazar | Medium*, n.d.)

In the early 21st century, the rise of AI technologies began to significantly influence educational practices. AI systems were initially employed for administrative tasks and basic assessments, but their potential to enhance learning experiences became evident as research demonstrated their ability to personalize educational content and provide adaptive feedback. (*Frontiers | Predicting Student Self-Efficacy in Muslim Societies Using Machine Learning Algorithms*, n.d.) This marked a pivotal shift in how educators viewed AI—transitioning from a tool of convenience to an essential component for enhancing learning pathways tailored to individual student needs. (Farasiyab, 2025) Concurrently, the increasing accessibility of competency-based education discourse underscored the need for self-regulation and active engagement in the process of learning. CBE focuses on mastery of skills and real-world learning experiences, it offered an ideal opportunity for AI to assist in the accomplishment of these objectives by promoting engagement and cooperation among learners. While the convergence of AI and CBE solved the problem of learning, it also ready students for the realities of the contemporary work environment by putting focus on industry-approved skills and competencies. As the educational environment is shaped ever more profoundly by technology, the place of AI in CBE history adds weight to the need for education practice to adapt to realize the potential of technology fully. Teachers are increasingly being called upon to equip themselves with the competencies to make optimum use of AI tools, that the revolutionary potential of AI can be implemented fully in creating personalized and efficient learning environments.

Potential Benefits of Integration into competency-based learning:

Integrating Artificial Intelligence (AI) into competency-based learning presents numerous advantages that can significantly enhance educational experiences and outcomes. It is beneficial in various ways. They are as follows-

Personalized Learning Experiences:

In Competency based learning, student's pathways reflect his unique needs, strengths, interest and pace. AI tools facilitate the creation of personalized learning paths by assessing students' individual strengths, weaknesses, and preferences. This tailored approach ensures that educational content and resources are customized to meet each learner's specific needs, thereby promoting a more effective and efficient learning process. For instance, AI-based applications can assess a student's basic knowledge and abilities with diagnostic tests before suggesting resources or modules that are specifically tailored to their ability level. This level of personalization not only engages students but also enables them to progress at their own pace, ultimately leading to improved learning outcomes.One of AI's remarkable facets in education is its ability to customise individual learningexperiences (Chen, Chen, and Lin, 2020).

Enhanced Engagement and Autonomy:

In competency based learning, there is no uniformity in learning pace. Learner's has varied pacing which results in deeper learning and engagement. The application of AI in education has been shown to improve student engagement by making learning experiences more relevant and adaptable to individual interests. Traditional learning systems tend to lose students' interest, but AI assists in developing content that appeals to learners, giving them a sense of ownership of their learning paths. Students are given the power to be proactive about their learning, using AI solutions to monitor their progress, define goals, and learn where they need improvement. With immediate feedback and analysis, learners are able to consider their success and improve upon it further over time. This increased use of AI tools in the modern learning environment has led to an increased attempt to foster a more active form of learning among students. There is sufficient empirical evidence that active engagement is strongly linked to high academic performance; this is why the tactical combination of AI-powered programs and pedagogical activities that encourage active participation seems to help to enhance the competency growth and make learning processes more interactive and more flexible to satisfy various needs of different students.

Increased Efficiency for Educators

Not only does AI integration assist students but also increases teachers' productivity greatly. AI software can perform standard administrative tasks like grading and creating feedback automatically, giving the instructor enough time to engage students in meaningful conversations. AI can aid in creating course materials, including writing rubrics, creating quiz questions, and preparing lesson plans, hence making the course design process much easier. This heightened effectiveness enables teachers to spend more time addressing higher-order learning targets and interacting with students at a more in-depth level.

Support for Inclusivity and Accessibility

The use of AI technologies promotes inclusivity by offering accommodations such as text-to-speech, closed captions, and simplified language. These features ensure that all students,

regardless of their learning needs or language barriers, can fully participate in educational activities. AI-powered language translation tools further break down communication barriers, creating a more equitable learning environment for diverse student populations.

Facilitating Continuous Improvement:

The potential of AI to drive continuous improvement in educational practices is significant. AI systems can analyze data on student engagement and performance, enabling educators to adapt their teaching strategies in real-time based on student needs. Additionally, qualitative research methods, such as interviews and surveys, can complement AI insights, providing a comprehensive understanding of factors that affect student engagement and competency development. This collective data can inform the creation of more adaptive learning models that prioritize inclusivity and responsiveness.

AI in Tutoring and Assessment:

One prominent case study involves the integration of artificial intelligence (AI) in thelanguage learning app Duolingo. This application utilizes AI as a tutoring and assessment resource within its subscription-only versions, showcasing how technology canenhance language acquisition through personalized feedback and adaptive learningpathways(Farasiyab, 2025). In addition to offering real-time assessments that enhance student engagement and retention, the AI-driven system customises tasks for each user, taking into account their unique strengths and weaknesses.

Academically, it is a radical change that has led to artificial intelligence (AI) in competency-based education (CBE). Empirical research indicates that AI systems have the capacity of personalization of the pedagogical experiences by the provision of specific materials to the learners in line with the skills and individual competencies. In an AI-enhanced learning environment, patterns of engagement among learners are been scanned continually, which gives students an upper hand to provide educators with another opportunity to intervene verklempt with special support at the very moment some students begin losing interest. Not only does this cycle of anticipatory intervention stimulate learner confidence and academic performance but also helps the instructors set their attention on emerging issues without becoming subject to small question becoming larger obstacles.

Increase Student Engagement and Performance:

Empirical research suggests that the implementation of AI-powered applications has potentials to affect academic performance positively, namely by increasing the engagement of students. By means of complex machine-learning algorithms, educational systems can optimize instructional material to be consumed by each unique learner and provide accurate, actionable feedback, hence significantly increasing not only test scores but also the general learning processes. As an illustration, a recent study shows that AI tools track the achievement of every learner, so instructors can analyze performance statistics and adjust the approach to instruction, thus, creating a more flexible learning environment.

Role-Playing Simulations:

Considering the idea of implementing AI into the educational practice, one must not disregard the associated difficulties. To begin with, digital divide is a problem which is very common and has complicated universal access to high-quality digital tools. Second, the excessive dependency on the AI may lead to ignoring the social component of the learning process that compensates the technological advancement. Third, school professionals (claiming the role of a teacher or any other instructional personnel) have to establish the appropriate proficiency in AI technologies, and this problem is strongly associated with the continuous professional growth. Fourth, the necessity to build equitable learning settings requires us to challenge algorithmic bias and create a curriculum that displays diverse range of views.

Obstacles and Concerns:

To guarantee successful implementation and moral application, educational institutions must manage a number of issues and concerns related to the integration of artificial intelligence (AI) in competency-based education (CBE).

As evidenced by the discussed salient benefits of application of AI in education, indeed, the benefits of applying AI in education are exciting but a number of barriers need to be observed before the promised benefits of AI can be achieved to full capacity. The most obvious means to this end include the digital divide, excessive dependence on technologies, and the following necessity of developing knowledge of AI technologies by educators. Fair learning environments also require direct consideration of issues such as algorithmic bias and the need to take into consideration different voices when designing curriculums.

Future Trends:

Academic sources point to the integration of Artificial Intelligence into the competency-based learning as having a disproportionate impact on education practice. Future trends indicate a more tactical use of AI systems to provide individualized learning, to adjust educational interventions on the fly and to strengthen learner motivation. As empirical research has already confirmed, competency-based assessments provide a solid base upon which learning effectiveness can be evaluated, and having the AI-led instructional design applied can enhance this diagnostic model by providing adaptive and focused instruction.

Ethical and Policy Considerations:

A number of issues arises when educational institutions of learning incorporate artificial intelligence in a competency-based learning environment. The policymakers and educators, in their turn, now promote the development of ethical principles that prioritize transparency, equitability, and privacy of data. The emergence of sound ethics frameworks and competence models at the same time has thus become a necessity in terms of how the sector is dealing with these technological advancements. In the future, the course of AI in the education field will not only depend on the development of technological tools but also on the extent to which the ethical sphere around which the technology itself is suspected to be acted upon, is competently trodden by the involved actors.

Strategic Partnerships and Resource Accessibility:

The spread of resource limits in the modern higher educational system further creates critical challenges to the general practice of highly sophisticated artificial intelligence (AI) technologies. By means of these collaborations, the institutions gain the chance to pool the resources and to access freely available large language models, thus allowing a more intuitive exploitation of the educational potential of AI.

Conclusion:

In conclusion, Artificial Intelligence with competency-based learning presents a transformative opportunity for the education sector. Teachers may design more individualised, effective, and efficient learning environments that meet the needs of each individual student by utilising AI's capabilities. The potential benefits include enhanced student engagement, improved academic performance, and the ability to adapt teaching strategies in real-time based on data-driven insights. The digital gap, the requirement that teachers become proficient in AI technology, and the significance of tackling algorithmic bias to guarantee equal learning environments are some of the obstacles that must be overcome for AI to be successfully implemented in education. As the educational models continues to emerge with technological advancements, it is essential for teachers and institutions to embrace AI thoughtfully and strategically, ensuring that it complements and enhances the learning experience while preparing students for the future and modern education system. This is related to Sustainable Development Goal 4 as it emphasizes the importance of inclusive and equitable quality education, highlighting the role of AI in achieving these objectives.

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