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Leveraging Artificial Intelligence for an inclusive and diversified curriculum

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Abstract

Curriculum is a vital instrument in education; it shapes what and how students learn, what teachers teach, and the expectations of education policymakers. This paper examines the critical role of artificial intelligence (AI) in designing curriculum that meet the challenges of the 21st century and address the evolving needs of students and society. Leveraging AI in curriculum development offers a transformative approach, enhancing teaching methodologies, producing personalized and inclusive learning experiences, and improving educational administrative efficiencies. Major AI technologies such as machine learning, natural language processing, deep learning, expert systems, machine vision, and data analytics are instrumental in creating adaptive and personalized learning systems, intelligent tutoring systems, and comprehensive education management information systems. These technologies bring innovations, facilitate personalized education, timely interventions for at-risk students, data-driven decision-making, and make curriculum more inclusive, efficient and accessible for all students no matter the background and social stratifications. Despite many benefits of AI in education, challenges remain, including the need for scalable and dynamic curriculum designs that maintain high content quality. As a result, there is a need to invest in AI technologies and educators' training to leverage these tools to create a more responsive and effective learning environment.

Keywords: Leveraging; Artificial Intelligence; Curriculum; Education

1. Introduction

Curriculum is usually one of the biggest concerns in education. What kind of courses should we offer students? Instructional professionals worry about the decisions they should take regarding the teaching strategies and subjects. Parents are curious about the lessons their children will learn. What kinds of materials learners will be using in class worries them as well? Curriculum seems to be quite important since they define what teachers are going to teach and, hence, what students will learn (Antara, 2023). Actually, "curriculum" is also somewhat tightly correlated with the learning results, or outcomes. Therefore, "curriculum" as used generally covers a wide range of topics, including teaching, learning, testing, administrative, hidden, and curriculum difficulties. As the foundation of educational systems, curricula are significant in encouraging creativity. As such, it is becoming clear that bridging the gap between out-of-date teaching approaches and the changing demands of modern students depends on curriculum innovation. Encouragement of a progressive dialogue about the interaction between technology, such as artificial intelligence (AI), and education, considering variables that are independent (threats) and dependent variables (opportunities), will help

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to achieve innovation and notable changes in modern curriculum frameworks and learning environments (Chen *et al.,* 2021).

Since its creation at the 1956 Dartmouth Conference, artificial intelligence (AI) has kept attracting the interest of numerous sectors equally. AI is among the few technical innovations in recent times that have been as divisive. Although artificial intelligence has been around for almost 60 years, it remained a fringe technology until recently due to broad changes in recent years (referred to as "the big leap," involving the abundance of data, practical access to computing power, and developments in machine learning) (Madhurjya, 2022).

The UNESCO International Bureau of Education (2018) and Abdelaziz (2023) define artificial intelligence (AI) as the idea and development of computer systems that can perform activities that usually require human intelligence. Characterized by machine learning algorithms, neural networks, and natural language processing, artificial intelligence (AI) offers a sophisticated technical paradigm that replics human intelligence processes. Artificial intelligence promises to transform learning opportunities within the educational framework. It is important to recognize the dual character of AI's influence as the conversation on the junction between artificial intelligence and education picks steam: it presents both possibilities and hazards (Holmes *et al.,* 2022). Recognized as fundamental drivers of innovation and expansion across sectors, including education, machine learning (ML) and artificial intelligence (AI) have encountered slowly growing recognition across the education technology sector (Madhurjya, 2022).

There has been an ongoing discussion on the significant uses of AI in education and most especially in designing and developing a curriculum. However, curriculum designers and developers are also craving a completely new process of creating learning content and developing lesson programs that allow inclusivity and a high sense of diversification among all learners. Sequel to this rapid demand and development, this paper examined various ways in which the benefits of AI can be integrated into curriculum development in order to create inclusive and diversified curriculum.

2. Material and methods

2.1. Sources of Information

The key sources of information used in this review included online academic databases, educational organization reports, research journals, and previous literature reviews.

2.2. Database Search

A comprehensive search of academic databases such as ERIC, Education Source, and Google Scholar was conducted to identify relevant literature published between 2010 to 2022. Key search terms used either singly or in combination included "artificial intelligence", "curriculum development", "personalized learning", "inclusive education", and "adaptive learning". Only peer-reviewed articles, reports, and reviews written in English were considered for this review.

2.3. Selection of Literature

The database search yielded over 250 results that were screened based on their relevance determined by analyzing titles and abstracts. A total of 50 sources that directly discussed the role of AI in curriculum development for inclusive and personalized learning were selected for a detailed review. The reference lists of relevant articles and reviews were also manually searched to identify any additional sources.

2.4. Educational Reports

Educational technology reports and policy documents published by leading organizations such as UNESCO, OECD, and World Bank were also reviewed to incorporate perspectives from practitioners and policymakers. Their reports provided valuable insights on how AI is currently being leveraged to address challenges in education systems worldwide.

2.5. Previous Reviews

Previous systematic and scoping reviews focusing on AI and education published in highly-ranked journals further expanded the literature. By analyzing their search strategies and synthesizing findings, this review ensured comprehensive coverage of the research landscape.

2.6. Analysis and Synthesis

The selected literature was thoroughly analyzed to identify key themes around how AI can enhance curriculum development practices. Relevant information on technologies, pedagogical approaches, benefits, limitations and recommendations discussed in these sources was then systematically organized and synthesized in a narrative format. Direct quotations and paraphrasing were used to represent different perspectives.

2.7. Evaluation of Sources

The quality and credibility of various sources were evaluated based on aspects such as the year and type of publication, methodology, sample size, author and publisher credentials. More emphasis was given to findings of empirical research and reviews published in last five years in peer-reviewed academic journals. Information from all sources was triangulated to draw evidence-based conclusions.

3. Results and discussion

3.1. Concept of Curriculum

The word "curriculum" comes from the Latin word "*currere*", which means "to run or to run a course". That is, a course of study, which contains a body of subject matter approved for teaching by society in schools. In another word, curriculum is described as a "structured series of learning outcomes". It therefore tries to see curriculum as an "input" which results in a certain "output". Another definition says, curriculum is "an organized set of formal educational or training intentions". Curriculum is a "deliberate, systematic and planned attempt undertaken by the school to modify or change the behaviors of the citizens of a particular society" (Chiu *et al.,* 2020).

While the definition of "curriculum" could differ based on its context, in essence, it is "a plan for learning" (van den Akker, 2010). In other words, it is a set of guidelines for what students should learn and what should be taught through the education system. Stoll *et al.* (2006) adopt a stricter definition, where curriculum refers to the materials or documents used for teaching and learning, such as textbooks or instructional materials. Conversely, Saavedra and Steele (2012) consider curriculum in a broader sense, including issues that would have an explicit impact on how the curriculum is designed and realised, such as teaching methodology, class size, learning hours allocation, learning objectives, assessment and examination practices.

3.2. Concept of Artificial Intelligence

Artificial intelligence (AI) represents a cutting-edge technological frontier that emulates human intelligence through machine learning algorithms, neural networks, and natural language processing (NLP). Artificial intelligence (AI) has become a powerful tool in educational management, transforming the learning environment through improved learning processes, enhanced student results, and administrative task simplification. A fundamental part of the fourth educational revolution, artificial intelligence (AI) is a main driver of technological advancement, changing economies and cultures all around (Richter *et al.,* 2019).

AI is the study of intelligent computers and software able of reasoning, learning, knowledge acquisition, communication, manipulation, and environmental perception. Verma (2018) claims that although founded in computer science, artificial intelligence is mostly focused on building intelligent systems that duplicate human actions like reasoning, language processing, perception, vision recognition, and spatial processing. Ocana *et al.* (2019) submitted that AI is marking a major turning point in technological evolution because it uses enormous volumes of data and computational capability to replicate various human intellectual abilities.

Incorporating AI into educational settings marks a paradigm shift and presents previously unheard-of improvements in administrative effectiveness and learning. As artificial intelligence (AI) gets more and more ingrained in educational institutions, its effects on student involvement, individualized learning, and resource optimization are significant and exciting a future where technology will be crucial in producing a more flexible and efficient learning environment. Unquestionably, artificial intelligence (AI) is a transforming agent influencing many facets of human life; educational management stands to be especially benefited. Researchers and academics have investigated the many uses of artificial intelligence in education, therefore stressing its complex influence (Kolodn, 2017). Natural language processing, machine learning, machine vision, expert systems, automated facial recognition, deep learning, and robotics are among the main AI technologies that have clearly changed educational approaches and dimensions.

Table 1 Major AI Technologies in Education

Challenge	AI Solution	Benefits
Demographic changes and diversity	Personalized learning systems	Adapts to individual student needs and backgrounds
Policy changes and standardized testing	AI-powered assessment tools	Efficient grading, comprehensive evaluation
Emerging technologies integration	Adaptive learning platforms	Incorporates new tech, enhances digital literacy
Globalization impacts	AI-enhanced language learning tools	Supports multilingual education, cultural awareness
Refugee and immigration issues	AI-driven customized curricula	Addresses diverse educational backgrounds
Scalability and content quality	AI-powered content generation and curation	Maintains quality while scaling to large student populations

3.2.1. Natural Language Processing (NLP)

Natural Language Processing (NLP), which focuses on simulating human natural language patterns, sits at the intersection of AI and linguistic communication. Using natural languages—both written and spoken—this technology enables interactions with intelligent systems. Kolodny (2017) stresses the need of including NLP into several uses, including oral dictation of numbers and signs on talking calculators that let For those with vision problems, hearing loss, and motor issues, NLP opens doors to knowledge and promotes autonomous discussions. Common services that demonstrate the useful applications of NLP are chat bots and Google Translate, which give multilingual access to material. In the classroom, NLP provides improved language acquisition, spelling and grammar checkers, and multilingual assistance. AI-driven NLP and machine learning-based writing helpers offer chances to enhance the act of writing by offering suggestions for development and corrective comments.

3.2.2. Machine Learning (ML)

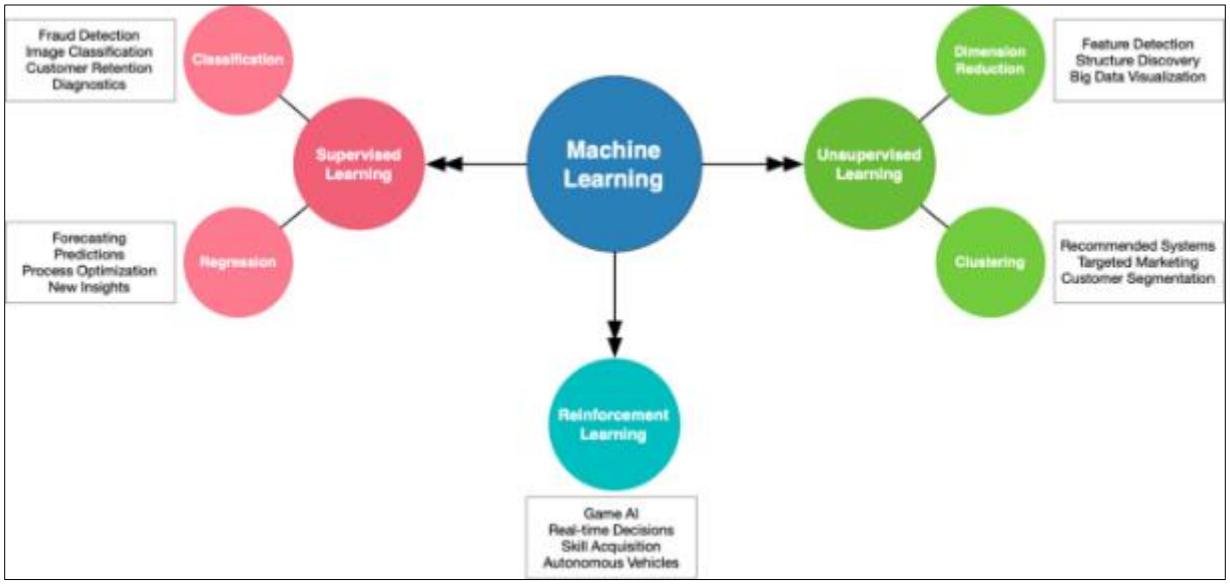

Figure 1 The types of machine learning algorithms

The leading artificial intelligence (AI) tool is machine learning (ML), which covers fundamental elements such as algorithms, application programming interfaces (APIs), development and training toolkits, data, and computational capability as per Chen (2019). ML's dynamic application using current data maximizes its predictive analysis capabilities. As depicted in the figure 1, ML has six main types - supervised learning, unsupervised learning, reinforcement learning, classification, clustering, and dimensional reduction. Supervised learning is applied for tasks

like image classification, customer retention, and medical diagnosis. Unsupervised learning techniques like dimensional reduction and clustering are used to derive patterns from unlabeled data. Reinforcement learning is employed for applications involving classification, feature detection, and reduction. Regression analysis helps in forecasting, gaining new insights and optimizing processes. Clustering aids in tasks such as dimension reduction and targeted marketing. Dimensional reduction simplifies high-dimensional data.

Goksel and Bozkurt (2019) emphasize how machine learning maximizes course material selection in education by means of content suppliers and applies feedback and scoring systems for assignment grading, plagiarism detection, and student development evaluation. Integration with natural language processing (NLP) improves programs like text-to-speech and language translation. As shown effectively by Google Translate, ML provides students access to a plethora of internet resources by automating input and feedback based on geographic location, browsing history, and user preferences, transforming information retrieval. Including machine learning in teaching strategies not only simplifies handling administrative tasks like course material selection and assignment grading, but it also improves the learning environment by providing customized content suggestions based on student profiles and transforming data extraction for scholarly use through techniques such as dimensional reduction and clustering.

3.2.3. Machine Vision (MV)

Within the field of AI, machine vision (MV) is a fundamental technology sometimes referred to as computer vision. Richter *et al.* (2019) claim that machine vision helps software identify trends, make predictions, and adapt found patterns to unanticipated events. Using cameras and computers for activities including recognition, tracking, object measuring, and image processing, this highly fast, precise, accurate technology replicates human visual perception. Machine vision finds uses in video surveillance, facial recognition, biometric face scanning, autonomous driving, medical image analysis, and archaeology (Chen, 2019). Machine vision is rather helpful in the classroom, for duties include tracking student facial expressions, documenting attendance, and seeing indicators of confusion, so enhancing the learning environment and offering focused help to each student.

3.2.4. Expert System (ES)

Expert systems (ES) are a fundamental component of artificial intelligence because they allow computer software to reproduce human knowledge in a given field, enabling problem-solving using a well-maintained knowledge base. Nwigbo and Madhu (2016) draw attention to how expert systems—especially intelligent tutoring systems—are used in education. These systems consider students' past knowledge and skills, therefore providing tailored learning experiences like those of a skilled teacher. Embedded with expert systems, AI-driven career coaches offer unique recommendations to each student combining previous information, circumstances, geographical preferences, talents, and job criteria (Khare *et al.,* 2018). Personalized learning and career advice rely heavily on the incorporation of expert systems into instructional systems, allowing for a customized and flexible educational experience that meets learners' various requirements and goals.

3.2.5. Automated Facial Recognition (FR)

For attendance marking in educational environments, machine vision easily combines with automated face recognition (FR) (Richter *et al.,* 2019). By simplifying the attendance process and hence removing the necessity for hand-held cross-checking, FR systems maximize class time for both teachers and students. Cameras with machine vision features provide a smart layer of surveillance for tracking motions and student facial expressions during courses and tests (Chen, 2019). In addition to simplifying administrative tasks and chores, this integration helps to maximize teaching time, hence creating an environment fit for concentrated and successful learning.

3.2.6. Deep Learning (DL)

Deep learning (DL), a complex aspect of machine learning mostly used in pattern recognition and classification applications with large datasets, is a synonym for deep neural networks. Chen (2019) emphasizes DL's ability to let virtual assistants recognize and understand videos, images, sound, and speech as well as images. In terms of education, DL significantly increases the effectiveness of online learning because adaptive learning tools customize materials to fit specific student requirements. This promotes individualized learning opportunities and gives pupils a means to get extra tutoring help, thereby improving the whole educational process. Deep learning's inclusion in online learning environments has transforming power because it provides tailored learning experiences and supports the function of technology in meeting specific learning requirements.

3.2.7. Robotics

Considered as the design, building, operation, and use of robots, robotics is a complex field of science and technology. The definition of the Robot Institute of America emphasizes the reprogrammable, multifarious character of robots, ability to perform several jobs by means of controlled motions and sensory abilities similar to human environmental perception (Odoh, 2018) In the classroom, robots—best shown by Avatarion's technology linked to Microsoft Azure IoT Hub—offer synchronous instruction to absent pupils. A tablet-operated robot allows students in homes or hospitals to actively participate in the learning process through full video and audio links. This creative solution closes the gap for pupils who miss class, therefore changing the dynamics of traditional learning. Including robotics in the curriculum has significant implications for inclusiveness because it allows absent students to actively participate in the learning process. This technical development creates a more interactive and easily available learning environment.

3.3. Critical Challenges in Curriculum Development in USA

The curriculum and teaching in the United States of America have attracted a lot of attention. Still, various problems, including substantial population changes, legislative changes, globalization, new technology, and questions about refugees and immigration, remain difficult for the schools, instructors, and curriculum designers (Murphy, 2015). This segment explores the issues to curriculum and instruction in U.S. public schools and analyzes both these issues as they affect teachers, teacher educators, policymakers, and other practitioners and battle to overcome them.

3.3.1. Demographic Changes

There has been a notable cultural change in American public education, with most pupils not being White as it was in the past (The National Center for Education Statistics - NCES, 2015). The educational system has traditionally struggled to teach non-White, poverty-affected, or non-native English speakers; hence, this demographic change has caused difficulties for it as well. The decline in white student enrollment has exacerbated this mismatch even further, since the percentage of white students at American institutions dropped from 61% in 2000 to 49.7% in 2014 (NCES, 2016). A mostly homogeneous white teaching staff is needed to meet these obstacles and educate a varied student group. For today's varied students—who need thorough programs encompassing guidance and counseling, character education, on-campus medical and social services, a full-time social worker, and multicultural education—traditional instruction is no longer successful. There are two main problems: the difficulty of bilingual classrooms and the need for more teachers of color. To meet these demands, more varied teaching forces—including highly educated bilingual education teachers and English language learners—must be recruited. Schools today have to equip their pupils to engage in a more diverse society and cooperate in more varied workplaces. Programs for teacher preparation must produce culturally relevant curricula and equip teachers to present them in ways that fit their backgrounds, thereby boosting participation among all students. Curricula and instruction should emphasize teaching strategies using best practices and a wide spectrum of knowledge and skills reflecting the students' diverse cultural backgrounds (Hoffmann, 2017).

3.3.2. Policy Changes

Curriculum and teaching are substantially affected by changes in educational policies. Teachers and students must equip themselves for future professions by means of Common Core State Standards (CCSS) and 21st-century skills. In a time when standardized tests define school performance, it is imperative to let pupils be creative and apply technology to complement abilities. Other helpful laws include the American Recovery and Reinvestment Act (ARRA) and the No Child Left Behind Act (NCLB) (Alismail & McGuire, 2015). By establishing high criteria for student success and monitoring student performance with accurate exams, standards-based reform seeks to make curriculum and instruction richer and more challenging (David, 2011). Schools that neglect to raise exam results risk major repercussions, which forces teachers to focus on test materials. Federal requirements have driven dozens of states to embrace test-based teacher evaluation systems. Standardized testing could, however, have unanticipated results. While teachers focus on high-stakes assessments, Valli and Buese (2007) contend that standardized tests can only evaluate a certain section of the curriculum, and the efficacy of these criteria depends on how well students have attained them.

3.3.3. Emerging New Technologies

Since students today are tech-savvy, devouring fast-paced and addictive content, emerging technologies seriously jeopardize education. The evolution of educational technologies is redefining our ideas of learning, underscoring government pressure, and shifting from teacher-centered to learner-centered strategies. According to Nager (2013), major obstacles hinder efficient application of technology on a broad basis in K–12 education. Using technology effectively in their classrooms presents several difficulties for teachers and educators: some experienced teachers prefer current methods; some schools push teachers to include technology in their syllabi without providing proper training; and some view technological experimentation as outside their job descriptions (Harven, 2013). A third

difficulty is not creating tailored learning. Researchers note a discrepancy between the tools accessible to provide tailored, unique education and the idea of delivery of such training. Beyond the always shifting effects of technology, a responsive curriculum responds to changes in society and student learning demands (Aydin, 2013). This implies thinking about ideas such as allowing more "white space" to adapt courses depending on different teaching and evaluation strategies. Globally, e-learning is a fast-growing type of learning, so teachers should give their pupils the chance to investigate and gather knowledge so that they can acquire various abilities. Technology can equip pupils to "learn how to learn" so they may obtain material from many online resources. By means of technology instruments in the classroom, students have the chance to participate in the actual world, enhancing their knowledge and fostering innovative abilities. If we want kids to succeed as future innovators, education must change its teaching style (Alismail and McGuire, 2015).

3.3.4. Globalization

Globalization has had a major effect on social structures and human lives, including education. Globalization is becoming more and more acknowledged and overcomes regional restrictions (The Marzano Center, 2017).). Living in a foreign country, about 200 million people globally; over a third go from underdeveloped to developed nations, and another third from one developed nation to another (Herrera, 2022). A major result of globalization, the extraordinary migration to the developed nations presents major difficulties for teachers and educators. One of the top nations in this regard worldwide, the United States is a receiving country. The importance of culturally sensitive pedagogies is great because many teachers lack experience with globalization and diversity. These shortcomings also make globalized and varied educational environments more challenging for staff, students, parents, and communities; some instructors, as a result, leave these environments. Teachers who want to stop this must be aware of their students' ethnic identities, cultural practices, values, and beliefs, as well as their variations. Zhao (2010) recommended that teachers, educators, policymakers, and communities should be better prepared to meet the challenges of globalization and grow internationally competitive entrepreneurs through curriculum innovation.

3.3.5. Refugee and Immigration Issues

Today, the United States resettles more refugees, immigrants and students of color than any other country in the world. This has revealed flaws in educational institutions and created a more varied classroom setting. School systems have to make sure educational settings are ready to teach every student, thereby guaranteeing that kids from many ethnic and cultural backgrounds get a first-rate education. The size of programs and the rising diversity of relocated immigrants and refugees present significant difficulties for service providers (Capps *et al.,* 2015). Many times put in foreign learning environments, immigrant and refugee kids are adjusting to new academic settings and cultures. Many times, they flee a violent history and are assigned teachers with inadequate backgrounds in handling such problems. Many student groups—including financial and linguistic barriers—have difficulties, but it is important to understand that many of them have to fight cultural disparities. Service providers have to make sure that every student gets a quality education while also attending to the financial and language challenges these groups experience (Cooper, 2014).

3.4. Leveraging Artificial Intelligence for an Inclusive and Diversified Curriculum

Sustainable Development Goal 4 aims to ensure inclusive and fair quality education and advance opportunities for lifetime learning for all. It underlines equal chances for learning for everyone all their lifetime. Equal and inclusive access to education is guaranteed by means of artificial intelligence technologies. According to the conceptual model for integrating AI into sustainable development, AI covers technical, organizational and processing aspects. For the technical aspects, AI provides access to suitable educational opportunities for underprivileged people and communities, persons with disabilities, refugees, those out of the classroom, and those living in remote areas.

Telepresence robots, for example, allow students with special needs to attend classes at home or in a hospital, or they maintain learning continuity during crises or emergencies. This helps to enable widespread accessibility and inclusion of a variety of students into the learning process (Montebello, 2017). For the organizational aspects, data analytics, natural language processing, and machine learning algorithms examined student interactions and performance to dynamically modify the curriculum and guide curricular changes (Baker & Smith, 2019). For the processing aspects, intelligent teaching systems with instantaneous feedback and support for learners have been created using natural language processing.

Collaborative learning can be advanced with AI. Computer-supported collaborative learning's most revolutionary feature is found in cases whereby students are not physically in the same place. It allows students to choose when and where they want to study. In terms of computer-supported collaborative learning, online asynchronous discussion groups are rather important. According to the conceptual model, AI systems would monitor asynchronous discussion

groups using machine learning and shallow text processing under the processing aspects, therefore providing teachers with information about learners' conversations and support for encouraging learners' involvement and learning.

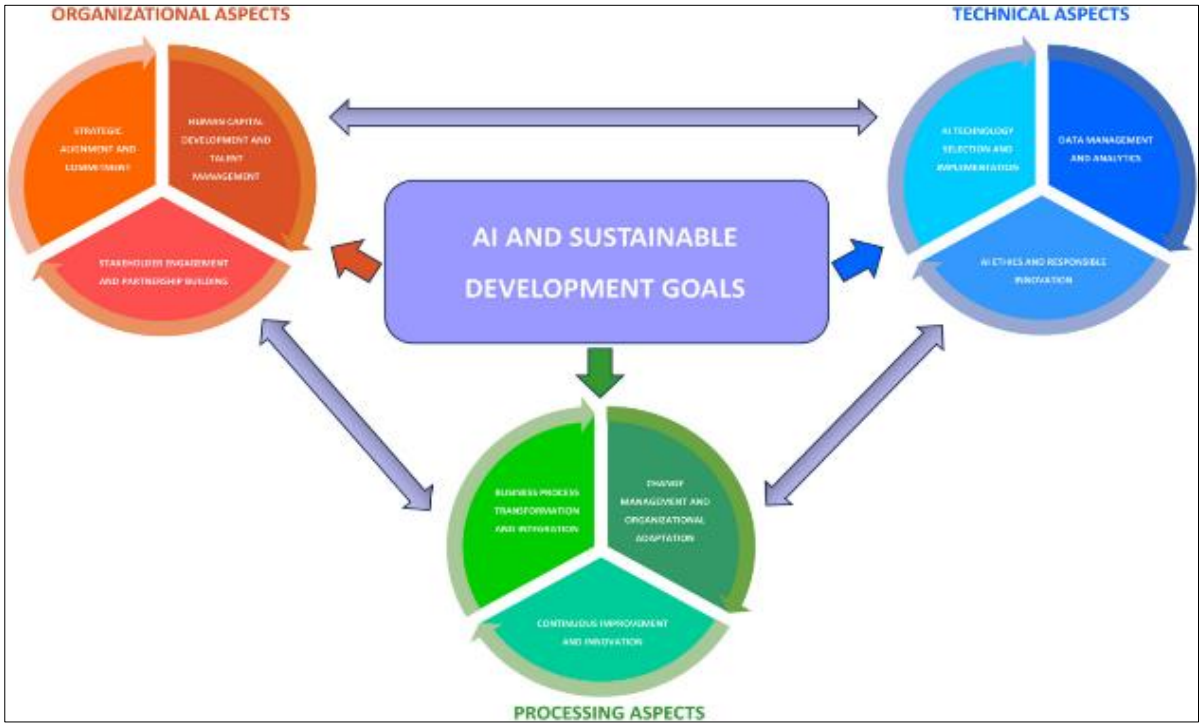

Figure 2 Conceptual Model For Integrating Ai Into Sustainable Development.
https://onlinelibrary.wiley.com/doi/10.1002/sd.2773

Furthermore, AI can help create a better professional environment for teachers to work more on students with difficulties and thereby enhance personalize learning. Under the organizational aspects in the conceptual model, in which they operate, thereby enhancing personalized learning. In classroom environments, teachers spend a lot of time on routine and administrative chores, including assigning homework and repeatedly answering often-asked questions over and over (Nye, 2015). By allowing a virtual teaching assistant to cover the teacher's regular responsibilities under the technical aspects, a dual-teacher model frees up teachers' time and helps them to concentrate on student supervision and one-tone communication. Already, teachers are collaborating with artificial intelligence aides for the best results for their students.

According to (Schittek *et al.,* 2021), using digital and artificial intelligence technologies, the discipline of Computer Assisted Learning (CAL) generates alternatives to help students´ learning processes. AI can assist in mapping each student's unique learning plans and trajectories, their strengths and limitations, subjects costing more and readily absorbed or understood, and learning preferences and activities. With the assistance of their teachers and schools, artificial intelligence can personalize learning and increase possibilities for pupils by means of algorithms guiding them over several curriculum routes. As proven in recent studies, intelligent tutoring systems are among the new technical opportunities to increase educational learning in underdeveloped nations (Nye, 2015). Furthermore, given the enormous time invested in evaluating examinations and homework, artificial intelligence (AI) as an evaluation tool can be used to learn how a teacher evaluates and so liberate the teacher's time. Multiple choice examinations are just one use for artificial intelligence; another is essay evaluation.

Based on AI back-propagation ideas, Somasundaram *et al.* (2020) suggested an original educational program model customizing curriculum aspects (prerequisites, content, expected outputs) to satisfy labor market need. Pattanshetti *et al.* (2018) improve targeted distribution by using Natural Language Processing (NLP) methods to produce knowledge graphs of Open Educational Resources (OERs), which helps to disseminate material. Applications of artificial intelligence in curriculum building have been documented in the field of intelligent tutoring systems, which used AI and significantly helped to provide customized training fit to individual learning styles (Zhang & Li, 2021). Automated grading systems, a manifestation of artificial intelligence in education, show accuracy similar to human graders, according to Ecker *et al.* (2018), therefore promoting grading consistency and time efficiency.

According to Rojas and García-Peñalvo (2022), data analysis helps AI identify at-risk pupils, hence allowing timely and focused treatments. He discovered that predictive analytics can enable teachers to guarantee preventive action and see possible dropout threats or failure rates. According to Chen *et al.* (2021), personalized learning, a main result of AI integration, improves general learning results and raises student involvement. To create tailored learning paths, AI-driven systems examine individual student strengths, shortcomings, and learning styles.

More importantly, an effective educational system is built on the Education Management Information System (EMIS), a structured collection of information and documentation tools gathering, storing, processing, analyzing, and distributing data for the management and planning of education. EMIS is extensively used by education officials and managers at the regional, local, and school levels, as well as for the creation of national data. Many schools center their data-driven decision-making (DDDM) application on student achievement assessment data. The mass data gathered from EMIS enables artificial intelligence systems to make data-driven judgments intended to improve the quality of school education (Sharma, 2018).

According to Xie *et al.* (2019), well-designed and efficient EMIS allows all stakeholders in education to have access to useful information for handling and operating an education system more efficiently, developing reasonable and cost-effective plans, formulating responsive policies, and monitoring and evaluating educational outcomes. AI-enhanced EMIS would have a far greater ability to automatically evaluate the data and create data dashboards at both the national and school levels in nations where data are complete, reliable, routinely gathered, and able to be aggregated and disaggregated for proper educational management.

The integration of AI into curriculum development and implementation offers many advantages like scalability, efficiency, and personalizing capabilities. Personalizing guarantees that educational opportunities are catered to the demands of each student, enhancing involvement and results (Xie *et al.,* 2019). This technology has the capacity to simplify the curriculum design process, and lets teachers concentrate on teaching methodology instead of administrative chores (Johnson *et al.,* 2017). Furthermore, easily scalable to fit a lot of students, AI-assisted solutions help to make education more inclusive, accessible and affordable (Zawacki-Richter *et al.,* 2019).

Table 2 Challenges and AI Solutions in Curriculum Development

Challenge	**AI Solution**	**Benefits**
Demographic changes and diversity	Personalized learning systems	Adapts to individual student needs and backgrounds
Policy changes and standardized testing	AI-powered assessment tools	Efficient grading, comprehensive evaluation
Emerging technologies integration	Adaptive learning platforms	Incorporates new tech, enhances digital literacy
Globalization impacts	AI-enhanced language learning tools	Supports multilingual education, cultural awareness
Refugee and immigration issues	AI-driven customized curricula	Addresses diverse educational backgrounds
Scalability and content quality	AI-powered content generation and curation	Maintains quality while scaling to large student populations

However, personalized educational systems still have a great difficulty in terms of scalability since present solutions could sacrifice content quality because of scalability problems (Rojas-López *et al.,* 2022). A scalable and dynamic curriculum-building strategy is required that fits individual learner needs, integrates pertinent knowledge areas, and demands low maintenance efforts. Including AI in curriculum development marks a new era of customized education that fits individual needs and labor market requirements. Maintaining high content quality that are relevant while ensuring that educational systems can dynamically change depends on addressing scaling challenges, therefore guaranteeing continuous success (Zhang *et al.,* 2020).

4. Conclusion

Education is crucial in preparing future workforces for AI-readiness. This involves bridging the AI skills gap by rethinking the content and methods used to deliver instruction at all levels. The need to define 'AI competencies' goes

beyond basic ICT competencies, focusing on skills that enable learners to identify and solve problems using computing techniques, methods, and technologies. AI in curriculum development and implementation has the potential to revolutionize education by offering personalized learning experiences, addressing diverse student needs, and enhancing engagement and learning outcomes. AI-driven innovations in educational management streamline administrative tasks and optimize resource allocation, allowing teachers to focus on instruction and student interaction. Implementing AI tools like automated grading systems, machine vision for attendance tracking, and natural language processing for language learning assistance significantly reduces administrative burden on educators, improving the overall educational experience.

AI-enhanced Education Management Information Systems (EMIS) provide valuable insights through data-driven decision-making, aiding in the formulation of responsive policies and continuous improvement of educational outcomes. However, addressing potential issues related to scalability and content quality is crucial. Ensuring AI-assisted educational systems maintain high-quality, relevant content while adapting to a large and diverse student population is a significant challenge. Continual research and development are necessary to create scalable, dynamic curriculum models that balance individualization with broad accessibility. By addressing these challenges, AI can play a pivotal role in creating a more flexible, efficient, and inclusive educational system, preparing students to thrive in an increasingly complex and interconnected world.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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