THE HISTORY OF PEDAGOGY AS A PARADIGM SHIFT: THE ROLE OF AI AT THE CURRENT STAGE

A HISTÓRIA DA PEDAGOGIA COMO UMA MUDANÇA DE PARADIGMA: O PAPEL DA INTELIGÊNCIA ARTIFICIAL NA FASE ATUAL

Nataliia Bakhmat
ORCID 0000-0001-6248-8468
Kamianets-Podilskyi Ivan Ohiienko National University
Kamianets-Podilskyi, Ukraine
bahger.teacher@gmail.com

Iryna Barbashova
ORCID 0000-0002-7410-4115
Bohdan Khmelnytsky Melitopol State Pedagogical University
Zaporizhzha, Ukraine
i.a.barbashova@gmail.com

Sergii Mamychenko
ORCID 0000-0003-4088-4659
State Institution "Luhansk Taras Shevchenko National University"
Poltava, Ukraine
Mamychenko@ukr.net

Margaryta Ponomarova
ORCID 0009-0002-0190-5402
Kyiv National Economic University
Kyiv, Ukraine
margarita.ponomarova@gmail.com

Dmytro Mozulenko
ORCID 0000-0002-0428-9265
National University Zaporizhzhia Polytechnic
Zaporizhzhia, Ukraine
mozul@ukr.net

Abstract. The work represents an attempt to comprehend the evolution of approaches to pedagogy as a paradigm shift, that is, the introduction of the concept of a philosophical paradigm of education into scientific circulation. The appropriateness of this concept is substantiated through the possibility of using the concept of a paradigm in relation to education, through the “dilution” of the concepts of paradigm, methodology and model, through comparison with the concepts of the sociological and pedagogical paradigm of education. Particular attention in the study is paid to the consideration of the role of artificial intelligence at the current stage of education development, as the basis for another paradigm shift, generating corresponding potentials and challenges.

Keywords: pedagogy, education, paradigm shift, AI.

Resumo. Este trabalho representa uma tentativa de compreender a evolução das abordagens à pedagogia como uma mudança de paradigma, ou seja, a introdução do conceito de paradigma filosófico da educação na circulação científica. A pertinência desse conceito é fundamentada pela possibilidade de se utilizar a noção de paradigma em relação à educação, por meio do "afrouxamento" dos conceitos de paradigma, metodologia e modelo, e pela comparação com os conceitos de paradigma sociológico e pedagógico da educação. A pesquisa dedica especial atenção à consideração do papel da inteligência artificial no estágio atual de desenvolvimento educacional, como base para uma nova mudança de paradigma, gerando potenciais e desafios correspondentes.

Palavras-chave: pedagogia, educação, mudança de paradigma, inteligência artificial (IA).

1. INTRODUCTION

The education environment is undergoing a significant transformation, driven by the confluence of two major forces: the need to produce human capital and the rise of artificial intelligence (AI). Historically, higher education institutions have served as information centers, teaching students to be effective professionals, critical thinkers, and society contributors.

However, the relentless pace of technological progress, particularly in the field of artificial intelligence, is changing traditional educational paradigms.

The necessity to create human capital and the growth of artificial intelligence both have an influence on educational advancement. Institutions have historically acted as information hubs, but the COVID-19 pandemic has accelerated this transformation, propelling the education sector into the digital age. Online learning systems have become crucial instruments for maintaining continuity. However, the emergence of AI as a revolutionary force is transforming higher education. AI's capacity to analyze data, spot trends, and learn adaptively allows for unsurpassed instructional customisation. Models like ChatGPT may engage students in nuanced conversations, provide tailored feedback, and automate tasks such as grading. AI's potential brings up new opportunities for learning and innovation (Anjali & Sreerekha, 2024).

Researchers and educators can use artificial intelligence tools and methods to assess complex patterns and relationships among diverse variables (e.g., learner backgrounds, behaviors, learning contexts, and outcomes) in order to generate inferences and predictions for supporting learners, as well as characterize learners at various scales.

AI has a vast range of capabilities, each adding to its multifaceted nature. In specifically, Intelligence Augmentation (IA) is a human-centered approach in which AI collaborates with humans to improve cognitive function and decision-making. It facilitates teaching and learning activities through pattern recognition and automation. However, AI has limitations and risks, such as potential bias and inaccurate results. Regular inspections of AI models, algorithms, and data quality are essential to ensure their safe usage in education. While AI integration enables natural interactions and individualized learning experiences, human judgment and control are required to navigate the complexities of AI-enabled educational environments. Thus, human monitoring and intervention are necessary for optimal AI use in education.

Furthermore, in a paradigm change, artificial intelligence in education (AIEd) professionals are increasingly addressing issues of diversity, equality, and inclusion (DEI) in these initiatives. For example, there is a rising awareness of algorithmic bias, which means that algorithms and automated systems can reproduce or worsen unfair or prejudiced outcomes. Similarly, statistically based results might be deceptive or exclude learners who do not fit into the "average" or majority demographics (Roscoe et al., 2022). Another problem is the potential of students' social skills being underdeveloped as a result of less interpersonal communication throughout the learning process and a lack of resources for building emotional intelligence.

To cope with these challenges and at the same time use the whole potential of AI in education, it is expedient to trace the evolution of pedagogy as a history of paradigm shifts. Such research would allow revealing factors contributing or impeding the effectiveness of education, with appropriate "extrapolation" on AI-driven educational landscape.

2. THEORETICAL FRAMEWORK

Change appears to be a constant in education. Looking for linkages between changes allows one to better comprehend and execute change in second language teaching. The notion of paradigm shift provides one method for establishing such linkages. Back in 2001, Jacobs and Farrell outlined eight shifts that corresponded to the educational paradigm shift toward communicative language instruction. These eight improvements include learner autonomy, cooperative learning, curricular integration, an emphasis on meaning, diversity, thinking skills, alternative evaluation, and instructors as co-learners.

Irez and Han (2011) presume that Thomas Kuhn's description of scientific revolutions gives one viable method to examine the nature of large-scale educational changes and the complexity of the process. At the same time, change is a tough process since any significant educational reform requires changes in organizational structures, communications, resource

allocation, practices, beliefs, and attitudes (Souza, 2024; Wazlawick & Wazlawick, 2024). To make the transition easier, a new curriculum should be implemented first. The emphasis of new curriculum includes the Structure of Science emphasis, which emphasizes and conveys signals about how science operates intellectually in its evolution. The new curriculum aims to improve students' grasp of the nature and status of scientific knowledge, the relationship between evidence and theory, the significance of models in describing natural occurrences, the subjective character of research, and so on.

Unlike the previous curriculum, which emphasized everyday coping, the new curriculum focuses on the limits of science in dealing with practical issues. The new curriculum also emphasizes the development of scientific process skills rather than memorizing scientific products or material, as was the case in the old curriculum (Irez and Han, 2011). AI improves learning by promoting the application of prior and present experiences in new contexts and scenarios, such as problem solving, reasoning, and so on, hence having a substantial influence on curricular systems. AI-based curriculum that tailors learning to individual student requirements (Ejjami, 2024).

The convenience of GenAI, such as its simplicity of use, enormous volume of information, and perceived difficulty in correct detection (Guo et al. 2023), has increased its use among university students, prompting institutions to investigate methods to integrate GenAI into learning and teaching. GenAI, like other disruptive technologies such as Big Data and 3D printing, has divided opinion (Farhi et al. 2023). Some feel that this new disruptive technology can be a beneficial tool for improving learning outcomes, particularly for students' academic writing and critical thinking abilities.

Kohnke et al. (2023) experimented with the technology and made ideas for how ChatGPT might be utilized in language teaching and learning, such as establishing simulated speaking settings and producing self-test quizzes for students. In the context of computer science education, MacNeil et al. (2022) investigated the feasibility of utilizing GenAI to explain code to students.

The current scenario represents a new paradigm shift in which individuals may utilize the most powerful equipment to connect the virtual and actual worlds. Tripathi (2024) argues that awareness is critical to AI's success since it can be used to assess the efficiency of community teaching support production and improve connection with MOOC participants. Today, communicologists are working hard to establish a new model of education based on AI in many areas of the world, and as a result, this topic demands extensive research, particularly at the conceptual level - philosophy of education.

3. METHODOLOGY

The subject of the research is a polyparadigmatic approach to modern strategies for the development of education. The methodological basis of the research is a systemic, socio-cultural approach to understanding the evolution of the paradigmatic process in the space of pedagogical research. The polyparadigmatic approach proposed in the work determined the use of the paradigmatic analysis method (comparison, identification of similarities and differences in educational paradigms), prognostic methods. The methodological basis of the study also included the theory and methods of informatization of education, a personal-activity approach to the analysis and assessment of pedagogical phenomena, a personality-oriented approach to learning, and the theory of designing and use of intelligent systems.

4. RESULTS AND DISCUSSION

The educational social paradigm of the recent past, which includes the 1700s, brings us to the 1800s and the mental and social aspects of student-teacher interaction. This gave insight

into the ongoing impact, notably in Europe, of Jean-Jacques Rousseau (1712-1778), as elaborated in his educational and social work Emile, and the innovative ideas of the Swiss educational reformer and pedagogue Johann Heinrich Pestalozzi (1746-1827) (Compayre, 2014). Many professors at the time used this new paradigm to communicate Rousseau's humanism and concern in social improvement. Rousseau developed friends with literary and social figures such as ordinarius professors and docents while writing Emile. As his social status grew, so did his theoretical foundation for schooling. Rousseau thought that educational changes would result in a return to nature and the complete development of the natural man (Compayre, 2014).

Pestalozzi got interested in educational reform after reading Rousseau's book Emile, and he subsequently published volumes on scientific methodology and general science. Pestalozzi's philosophical idea of "learning by head, hand, and heart" contributed to education's development as a scientific field (Compayre, 2014). It also attempted to make learning more student-centered in all areas, including self-activity, individuality, and sensory perception. Being affectionate individual and a devoted educator, he believed that educational courses should be broken down into many components. Student growth, ethically, socially, and educationally, resulted in the construction of personality and individual thought. These are ideals that must be supported and preserved in the twenty-first century, while also being adapted to an ongoing pattern of sophisticated technological development. It is critical that the "technoman" of the future retains much of his humanity while employing compassion to progress civilization's technical objectives.

Pestalozzi also emphasized an idea that is almost forgotten in most American colleges. This is required for the use and production of root languages such as Latin, Greek, and Hebrew in order to comprehend and speak current languages. With English as the dominant social language and Japanese and Chinese emerging as business communication tools, there appears to be less need in today's culture to master language rootology and linguistic form edification. Such forms help to increase cognitive quickness and brain function. This does not appear to be true in ordinary computer activity. Although an ancient paradigm, some prior training approaches can improve brain function and contribute in the formation of new paradigms (Jain et al., 2007).

A quick summary of several significant paradigms in pedagogy is provided below:

1) Behaviorism. This paradigm emphasizes observable actions and environmental cues. It holds that all actions are acquired via contact with the environment and may be modified through reward or punishment.

2) Cognitivism. Cognitivism, which replaced behaviorism in the 1960s, is focused on the mental processes involved in learning. It sees learners as information processors, and learning entails organizing and storing information.

3) Constructivism. This method proposes that students actively develop their own understanding and knowledge of the world by doing things and reflecting on those experiences. It underlines how important the learner's background and culture are.

4) Humanism. Humanistic education is focused with helping people reach their greatest potential and promote self-actualization. It sees learning as a personal act of realizing one's potential.

5) 21st century skills. This modern paradigm stresses the abilities that students require to excel in today's digital, interconnected world, including as critical thinking, creativity, cooperation, communication, and problem-solving.

Each paradigm provides a unique view on how learning takes place and the role of the instructor in the learning process. Figure 1 depicts the conceptual distinction between the old and new paradigms of education.

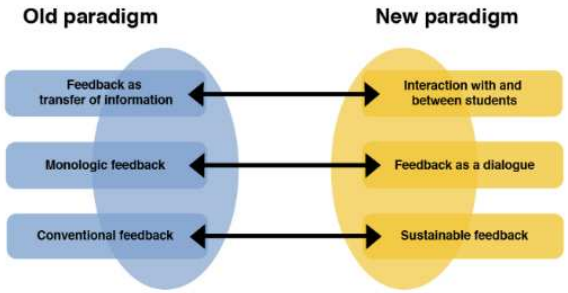


Figure 1. Conceptual difference between old and new paradigms of education.
Source: Hamidi, 2024.

Table 1 contrasts educational features before and after the twenty-first century, demonstrating how educational concepts and approaches have progressed.

Table 1. Educational aspects before and after the 21st century (Chetry, 2024)

ASPECT	PRE-21ST CENTURY	POST-21ST CENTURY
Primary Focus	Knowledge redistribution	New knowledge generation
Objectives	Content mastery / Personal and social growth	Personality development and societal betterment
Key Skills	Knowledge acquisition	Skills of practical application
Teaching Activities	Lectures by teachers/ Rote learning	Interactive, needs-based activities; Initiatives guided by instructor insights
Learner Dependency	Reliant on teachers	Independent and proactive
Knowledge Orientation	Emphasis on historical knowledge	Focus on future-oriented knowledge
Content Approach	Concentrated on memorizing	Emphasizes knowledge application
Curriculum Design	Standardized and broad	Tailored and targeted
Assessment	Knowledge retention-based	Learning process-based
Learning Methods	Traditional teaching techniques	Innovative, technology-driven techniques
Learner Autonomy	Dependent on teacher direction	Promotes learner independence

Source:

The primary elements of the new education paradigms are around a more individualized, learner-centered approach. Here are some key peculiarities:

- Self-directed learning. Encourage students to take responsibility of their own learning process, choosing what and how they want to study, rather than being passive consumers of knowledge.
- Interdisciplinary approach. Integrating diverse subjects of study to give a more holistic education, breaking down conventional academic silos.
- Emphasis on skills. Developing crucial 21st-century abilities such as critical thinking, creativity, cooperation, and communication.

- Use of technology. Using digital tools and technology to improve learning experiences and access to information.
- Flexibility and adaptability. Designing educational systems that are adaptable and can respond swiftly to changes in society and the labor market.
- Collaborative learning. Encourages collaboration and collaborative initiatives that resemble real-world work contexts.
- Global perspective. Incorporating a global perspective into the curriculum to help students prepare for a linked world.
- Emotional intelligence. Recognizing that social and emotional learning are just as important as academic knowledge.

Baker et al. (2021) present a synthesis of educational "paradigms", drawn from a multidisciplinary body of literature and geared to health professions education. Each paradigm represents a distinct viewpoint on the goal of education, the nature of knowledge, what information is valued and included in the curriculum, what it means to learn and how learning is measured, and the roles of instructors and students in the learning process.

The paradigms overlap but differ significantly in terms of their philosophical assumptions about what exists in the world (ontology) and how we learn about what exists (epistemology). Each paradigm offers a unique viewpoint on the goal of education, the nature of knowledge, what knowledge is valued and included in the curriculum, what it means to learn and how learning is evaluated, and the roles and nature of instructors and students in the learning process. We want to highlight these contrasts as well as the underlying assumptions that each paradigm is built upon.

In specifically, the behaviorism-citizenship paradigm aims to mold desired behaviors in order to prepare students to be important members of society. Individuals can gain knowledge of unique truths under this paradigm, which has just one external reality. Learners are regarded blank slates, and learning entails obtaining accurate knowledge about the world.

Learning or knowledge acquisition is considered as a causal process, similar to any other natural event, with the desired goal being a change in the form or frequency of observable behavior. Teachers who are subject matter experts change observable behavior by conveying information to students via rigorous conditioning and reinforcement. Reinforcement enhances the chance of a certain behavior occurring more frequently in the future by giving or removing a stimulus immediately following a behavior.

The Cognitivism-Expertise paradigm broadens the behaviorist paradigm to include understanding why and when certain behaviors are desirable. This change creates specialists who can respond more flexibly, as opposed to 'good citizens' who comply. Knowledge is still defined as material or information that is external to the learner, but the emphasis here is on how this knowledge is preserved in memory.

Rather than concentrating on observable actions, the cognitivism-expertise paradigm is concerned with the development of unobservable mental structures and processes within the mind, which determine what learners know and shape how they learn new information. Learning is defined as the acquisition of information by the senses, experiences, or formal instruction provided by teachers. Learners are considered as information processors, and teachers support this processing by paying close attention to how information is structured, processed, retrieved, and applied to new contexts.

The Constructivism-Expertise paradigm represents an ontological and epistemological change on the nature of knowledge. Learners actively "construct" information as they make sense of their experiences, rather than acquiring it from outside sources. This paradigm focuses on understanding mental representations to help learners create new knowledge. Knowledge is

viewed as dynamic, with learners building on existing knowledge to address novel issues. The purpose of education in this paradigm remains to produce experts, and adaptive expertise shows the dynamic character of knowledge necessary for expert practice.

Learners participate in activities that encourage knowledge discovery, and the teacher's duty is to offer appropriate tools and assistance at each level of cognitive growth. A constructivist curriculum places less emphasis on specific content and more on the process of knowledge production.

The transition to the Constructivism-Interlocution paradigm marks the beginning of education's social orientation. According to Constructivism-Interlocution, knowledge formation is inextricably linked to the social environment in which it occurs. Whereas constructivism-expertise focuses on comprehending mental representations, constructivism-interlocution focuses on how knowledge is created through sociocultural influences and interactions.

Learning is defined as the construction of one's identity and the collaborative creation of knowledge. This is supposed to occur through involvement in social situations and enculturation, in which one learns the language, behavior, and norms of a new social group and adopts its belief systems in order to become a member of that culture. Indeed, education is viewed as a technique of socializing students so that they can become active members of their communities. Students are active participants, and the teacher's duty is to foster social connections and collaborative work.

It should be mentioned that constructivism has been an underlying methodology that has affected education since the middle of the twentieth century, and it continues to serve as an important basis for contemporary e-learning. Constructivism has been widely used as a framework for educational research, curriculum creation, and suggested teaching.

In turn, the humanism-self-actualization paradigm seeks to equip students to realize or achieve their full potential and autonomy (self-actualization). This paradigm aims to engage the learner as a whole, including cognitive and emotive dimensions. Education's aims consider the student as a whole, focusing on learning in terms of emotional and physical well-being. To attain these aims, schooling is learner-centered, with learning defined as the fulfillment of one's personal goals.

Teachers facilitate and nurture the learning process, while learners are given more choice and control over their education. According to this paradigm, the curriculum's purpose is to provide individually rewarding experiences for each individual student. As a result, self-evaluation is the only significant assessment under this paradigm; external grading is considered meaningless and is regarded to drive students to strive for a grade rather than for personal happiness.

Finally, the transformation-change agency paradigm seeks to enable students to view the social environment through an increasingly ethical lens, allowing them to question and change the status quo as agents of change toward a more equitable society. This paradigm sees knowledge as a social construct. Learning is defined as a movement in perspective toward a critically reflective mode of being that constantly questions individual and social beliefs and behaviors, with a focus on ethics, justice, and power.

Traditional educational practices are perceived as reinforcing the existing quo, sustaining societal disparities and contributing to learners' oppression. The learner-teacher difference is reduced under the concept of transformational change agencies. Social change and responsibility for the future of society are critical, beginning with enhancing learners' knowledge of prevailing power relations and institutions. The assessment focuses on changes in viewpoint, discussion foci/content during debriefs and discourse, or responses to system-level events.

Today, there is a change from thinking about education in terms of "filling buckets to lighting fires" (Morgan, 2024). Education's aims are increasingly reflecting the rising concern with encouraging and allowing students to learn how to study and to continue learning throughout their lives in order to become curious individuals who not only utilize information, but also generate and interpret knowledge. The educational challenge will be less about teaching factual knowledge and more about inspiring students to study and apply their mental powers to solve everyday and unique issues.

However, the 21st century educational paradigm is constructivist in nature, supported by digital technology, including artificial intelligence. The term AI-Assisted Constructivism was coined to highlight the fact that learning is an active process in which people construct their own understanding of the world via experiences and interactions with others. Furthermore, it would recognize the importance of observation, imitation, and modeling in the learning process.

One of the core concepts of AI-Assisted Constructivism is that learning is an active process in which people construct their own knowledge of the world via their experiences and interactions with others. This aligns with the constructivist perspective of learning, which emphasizes the importance of hands-on, experiential learning (Mariappan & Krishnan, 2022).

Cohen defines the present paradigm shift in education as "beyond books into real-world experience and technology" (Cohen, 2023). He underlines that the traditional approach to education, which focuses on books and lectures, is no longer sufficient to prepare students for the difficulties of the twenty-first century. Embracing real-world experiences, new technology, constructive arguments, problem solving, and fear management provides students with the skills and mentality required to flourish in an interconnected and dynamic world. This shift is necessary to provide students with the skills and mentality required to flourish in an ever-changing world.

Education is no longer limited to the four walls of the classroom and textbooks. Rapid technological breakthroughs have given students unprecedented access to a huge body of information and the ability to engage with experts from diverse sectors. Embracing real-world experiences encourages students to apply theoretical principles to real-world circumstances, resulting in a better knowledge of the subject matter. Internships, field excursions, and project-based learning are effective methods for bridging the gap between theory and practice, equipping students to face real-world difficulties.

It is critical for educators to foster a secure and supportive atmosphere in which students feel encouraged to take chances, experiment, and learn from failure. Students must develop resilience and flexibility in order to successfully navigate a constantly changing world. AI can make a significant contribution, and may even serve as the foundation for the creation of such an ecosystem. Simulations are one sort of performance-based assessment that allows students to practice real-life skills in a safe and controlled setting (Levitt et al., 2023). Simulations have been found to be helpful for evaluating a variety of abilities, including problem-solving and decision-making.

Ouyang and Jiao (2021) discuss three paradigms offered for Artificial Intelligence in Education. According to the authors, throughout its brief existence, AIEd has undergone many paradigmatic transformations. There are three paradigms: AI-directed, AI-supported, and AI-empowered.

Paradigm One employs artificial intelligence to describe knowledge models and guide cognitive learning. The prior work in Intelligent Tutoring Systems (ITSs) is a good example of Paradigm One implementation. AI based on statistical relational approaches is commonly used in Paradigm One to describe knowledge as a set of production rules, recognize certain student behavior patterns, and offer automatic feedback or tips. In Paradigm One, AI acts as a director

of all learning processes, and learners get AI services to perform cognitive inquiry, solve challenges, and attain learning objectives. In Paradigm One, while some systems gather the learner's information to diagnose the learning state, the system defines the learning material, process, and objective, while the learner is compelled along a certain learning path supplied by the AI system. The system's or the expert's perspective may result in a stereotype of the knowledge and abilities that the AI system expects the learner to acquire. To counter the over-dominance of AI as a "black box" for learners in Paradigm One, learners are viewed as collaborators in Paradigm 2.

In Paradigm Two, AI is used to encourage learning, and students work with AI. Paradigm Two is characterized as AI-supported, learner-as-collaborator, in which the AI system relinquishes control to serve as a supporting tool, and the learner works with the system to focus on the learner's specific learning experience. The second AIEd paradigm is based on a cognitive and social constructivist approach to learning, which states that learning occurs when a learner interacts with people, information, and technology in socially situated contexts. Similarly, in Paradigm Two, the AI system and the learner should communicate actively and reciprocally in order to increase learner-centered and personalized learning. Specifically, the AI system leverages learners' emergent, tailored knowledge as input to adaptively enhance the student model, while learners work with the AI system to improve or optimize learning (Du Boulay, 2000; Rosé et al., 2019). Overall, as compared to Paradigm One, Paradigm Two marks a substantial step toward learner-centered human learning through reciprocal interaction and ongoing cooperation between the learner and the AI system. To build mutual interactions between the system and the student, Paradigm Two developed a range of AI implementations, including dialogue-based tutoring systems and exploratory learning environments.

In contrast to Paradigm One, in which AI systems predetermine the cognitive learning route while learners get AI services to help them learn, Paradigm Two involves mutual interactions between the AI system and the learner, resulting in more student-centered learning. A major concern in Paradigm Two, however, is how much and how well learners' input is integrated into the AI system in order to maximize the student model, represent various elements of the learning state, and build adaptive, AI-supported learning and instruction. The overall issue is a lack of ongoing communication or collaborative human-computer interactions. This link is complex since neither the learner's information and data, nor the system's state, are static or clear. Both have complex hierarchical structures that change dynamically during the learning process. In other words, it is critical for AI systems to give learners with real-time data analysis and feedback, as well as for learners to use that information to enhance continuous learning processes. As a result, it would be beneficial if the AI system continued to collect and analyze data generated by learners while also providing learners with real-time, exploratory opportunities to make learning decisions. In Paradigm Three, learners are considered as leaders, which increases learner agency.

In Paradigm Three, AI is employed to empower learning while learners take control of their learning. Paradigm Three is described as AI-empowered, learner-as-leader, with learner autonomy at the heart of AIEd and AI as a tool to boost human intellect (Law, 2019). Paradigm Three represents a complexity theory perspective, which sees education as a complex adaptive system requiring synergetic teamwork across numerous entities (e.g., the student, the instructor, information, and technology) to assure the learner's enhanced intelligence. In this complex system, AIEd must be designed and executed with the idea that AI methods are part of a larger system that includes students, instructors, and other people (Riedl, 2019).

To achieve synergetic collaboration in complex systems, concepts such as human-computer cooperation, human-centered AI and ML systems, human-AI collaboration, and human-centered artificial intelligence in education are proposed. These approaches AI from a human

perspective by taking into account human conditions, expectations, and contexts. Within Paradigm Three, AI helps learners and educators reach enhanced intelligence by ensuring high levels of transparency, accuracy, and efficacy (Yang et al., 2021). AI technologies provide the instructor with intelligible, interpretable, and tailored support to encourage learner-centered learning (Baker et al., 2021). The human-computer collaboration system, which combines sophisticated AI methods with human decision-making, has the ability to realize Paradigm Three's AI-enabled, learner-as-leader aim.

Overall, the AIEd development trend has been growing to empower learner agency and personalization, allowing learners to reflect on learning and inform AI systems to change accordingly, and leading to iterative development of learner-centered, data-driven, personalized learning.

Although AI has the potential to alter education (Holmes et al., 2019), high educational outcomes are rarely achieved only via the use of advanced AI computer technologies (Castañeda & Selwyn, 2018). More importantly, the employment of various types of educational technology implies diverse philosophical and pedagogical viewpoints, which have a significant impact on the quality of learning and teaching (Hwang et al., 2020).

Although AIEd uses current computing and information processing techniques in education, it does not guarantee successful educational outcomes or high-quality learning (Castañeda & Selwyn, 2018). The use of technology should be tightly related to educational and learning theory in order to influence instructional design and technological innovation.

Several research teams have conducted systematic investigations to identify a prevalent problem in AIEd, namely the lack of link between AI techniques and theoretical underpinnings, which has a substantial impact on the success of AI implementations in education. In particular, after evaluating 146 research publications on AI applications in higher education, Zawacki-Richter et al. (2019) found that there was a dearth of critical reflection on the theoretical, pedagogical, and ethical consequences of implementing AI applications in higher education.

Chen, Xie, Zou, and Hwang (2020) conducted a thorough study of 45 noteworthy AIEd articles and found that only a few studies used learning theories to promote AIEd research, such as situational learning theory, collaborative learning theory, and adaptive learning theory. Deeva et al. (2021) examined 109 publications on automated feedback systems and determined that the majority of examples did not include applied learning theories or educational frameworks, despite the fact that these theories were crucial in understanding the environment in which a system was implemented.

Furthermore, while face-to-face interactions are crucial in the notion of educational growth, there must be a way in the future that allows groups to learn through one-on-one and block teaching tactics using advanced technology. Today, some professors have hundreds of students in each class, and academic learning frequently fails because instructors are more engaged in publishing and research than in teaching. In these classes, lecturers are unconcerned about student engagement and assign much of their teaching to graduate assistants.

The dilemma is whether all future learning will be done online or via more advanced ways. The answer is probably yes. AI tools and platforms provide unparalleled assistance in education and evaluation. However, in addition to potential biases that may exist even with progressive machine learning, there is a difficulty with the development of social skills in kids. While AI improves productivity by automating processes such as scheduling and data processing, it also eliminates the need for human engagement. Researchers were particularly concerned about the influence of social chatbots on neurodiverse persons and others who struggle with social interactions.

Despite their initial appeal for safe and judgement-free connection, their research shows that these AI technologies have the potential to exacerbate social isolation and reliance. Studies

warn that relying too heavily on chatbots may impede the development of real-world social skills and cause social isolation (Levy, 2024).

This change may result in a loss in social skills, emotional intelligence, and the capacity to build meaningful connections. Furthermore, as AI-powered gadgets such as virtual assistants and chatbots improve their conversational abilities, there is a risk that individuals may replace real-life encounters with these artificial entities, compounding the loss of social skills. AI offers both possibilities and obstacles for developing emotional intelligence (EI) in students.

These considerations highlight the importance of taking a balanced strategy that integrates AI technologies with traditional teaching techniques and human interactions in order to successfully foster EI while mitigating associated dangers. In turn, the choice of traditional teaching methods should be carried out based on thorough analysis of previous paradigms in pedagogy and defining appropriate elements which would not hinder the educational potential of AI technologies.

5. CONCLUSION

The practical applications of AI in education give solid evidence of its ability to bring about significant changes. Virtual and augmented reality are frequently used in educational settings, in tandem with AI-powered tutoring systems and adaptive learning platforms.

These technologies successfully improve individualized learning experiences, optimize educational administration, and promote overall student success. However, incorporating artificial intelligence into education presents a number of challenges, including ensuring the accuracy and reliability of AI-driven insights, preserving teacher autonomy and expertise in the face of automated systems, addressing the risk of technological dependence, and regulating the impact of automation on teaching jobs.

Addressing these issues necessitates comprehensive tactics that involve ongoing monitoring and validation of AI systems to ensure accuracy and fairness. Professional development programs should also be established to enable instructors incorporate AI efficiently while maintaining their vital role in teaching and mentoring pupils.

It is also critical to promote a balanced approach that responsibly uses technology to supplement, rather than replace, human connection in the classroom. Policymakers and educational leaders must collaborate to set ethical norms and regulatory frameworks that preserve the interests of all stakeholders and guarantee that the integration of AI in education results in a more enriched and equal learning environment – that is, the process of changes and overcoming challenges, in essence, corresponds to the character of paradigm shift in any crucial domain of society, in particular, education.

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