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PAPER

Mobile Technology, Artificial Intelligence, and Poverty: Are There Links with Early Childhood Education?

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ABSTRACT

The relation between income for early childhood families and subsequent academic success has been linked to several issues, counting parenting styles, stress, sensory stimulation, children's neurodevelopment, and socioeconomic differences in the quality of early childhood schooling. The use of mobile technologies and artificial intelligence (AI) in early childhood education (ECE) is analyzed in the current paper. AI technology, through interactional instruments and modified understanding proposals, is able to assist youthful children in emerging detailed soft skills such as cooperation and communication. These technologies allow for the customization of education to each student's needs, fostering certainty and worth. Plus, they make it straightforward to solve problems by suggesting investigating options. This article examines how AI is transforming education through the development of dynamic software, creative teaching strategies, and captivating gamified learning environments. This paper focuses on how fundamentally practicing AI correctly and cooperatively supports kids' complete progress. We have explained the advantages of AI in the ECE and problems related to ethics accompanying its use in ECE, and in what way it might enhance soft skills.

KEYWORDS

artificial intelligence (AI), early childhood education (ECE), mobile technologies

1 INTRODUCTION

The implementation of artificial intelligence (AI) raises significant ethical and operational issues, particularly for vulnerable groups such as young children. The possibility of bias in training data may result in inappropriate or discriminatory recommendations. Furthermore, tight governance is necessary for the collection and use of sensitive information to ensure children's safety and protection. Finally, the crucial question of the necessity of human judgment is raised: rather than being viewed as a replacement for the warm and enriching human interactions that are at the core of a child's healthy development, AI should be seen as a helpful tool to support parents and teachers. Mobile technology integration can encourage active

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participation from young children and accommodate a variety of learning styles. In the rapidly evolving digital world, the incorporation of cutting-edge technology such as AI offers early childhood education (ECE) both new potential and problems. Nonetheless, the development of soft skills like empathy, communication, and creativity remains the cornerstone of early learning. This paper will be backing in attending the resulting: Are there links between mobile technology, AI, and poverty in ECE? Test automation, learning tracking, performance prediction, and resource recommendation are just a few of the numerous applications in the field of education [1], [2], [3], study investigates how to engage preschool-aged children with interactive robotic toys that are powered by AI. AI in ECE has received little attention; most of the inquiries on the topic focus on primary, postsecondary education, and secondary [4].

2 LITERATURE REVIEW

2.1 Artificial intelligence

The goal of the multidisciplinary science and technology field of AI is to create systems that can reproduce, improve, or mimic human intelligence. These systems are designed to understand their environment, make decisions to accomplish certain objectives, learn from experience, and draw conclusions from the data collected. AI, also referred to as low, is not restricted to the mental representation of humanoid robots; rather, it excels at performing cognitive tasks such as image identification, natural language processing, or personalized suggestion-making, often surpassing human capabilities in these domains. AI preserves knowledge and processes in the same measure [5]. Literature has grown significantly because of advancements in AI research across several disciplines [6], [7], [8], [9]. AI is currently being used in a variety of fields, including robotics, computer programs, machine control systems, real spoken language dealing, and optical and hearing establishment. Vision-hearing technologies have made it possible for certain machines to speak to people [10]. Fully developed AI is regarded as one of the most important technical developments because of its ability to communicate with people and guide them toward improved performance. It enables the creation of modern, customized, adaptable, and thorough acquisition techniques when paired with big data [11]. The main objective of AI in education is to be used to finance changes to learning schemes [12], [13], [14]. Because it might greatly improve schooling. Because AI has the potential to revolutionize educational experiences, scientists and educators have embraced its usage in the classroom. AI facilitates experimentation, research, and learning. This potential does, however, call for strong infrastructure, transparent governance, and sufficient teacher preparation. Without clear rules and solid ethical principles, AI might reveal inequalities, introduce digital monitoring tactics, or even standardize human intelligent quotient (IQ) based on technical norms. Education must therefore utilize AI's instructional potential and promote critical thinking regarding its possible applications. Therefore, integrating AI into education in a humanist, moral, and astute manner could improve student engagement, equity, and readiness for the difficulties of modern learning. This ability to analyze and adjust gives AI a singular transformational potential in the educational and developmental sector. An AI-driven educational system may transition from a standardized approach, in which all students use the same resources at the same time, to a highly customized approach.

2.2 AI and ECE

Artificial intelligence technology is increasingly taking over children's lives through devices like voice assistants, networked smart toys, and home robots [15]. System effectiveness is increased, and progress is advanced by AI. Experiential learning approaches are more effective for younger children because of their active and curious learning styles. It is believed that three-year-olds could begin learning about AI in a straightforward and elementary way. Thus, the three prerequisites for AI literacy can be summed up as follows: AI's ability, aptitude, and mindset. If students have an attitude competency toward technology, they will be better able to contribute to the conversation around AI in society at large. "Team up with AI" and "communal effect" are binary facets of the AI attitude. The AI mindset competency assesses students' ability to think critically about the AI's application and to see both the benefits and drawbacks of AI for people. lists several useful tools and resources that instructors and students can use, such as the Cozmo robot, Google's AIY, Cognimates, eCraft2Learn, TensorFlow Playground, and others [16], [17]. Without clear rules and solid ethical principles, AI might reveal inequalities, introduce digital monitoring tactics, or even standardize human IQ based on technical norms. Education must therefore utilize AI's instructional potential and promote critical thinking regarding its possible applications. Children can participate in interactive and exploratory learning thanks to their facilitation of access to a multitude of resources and knowledge. But there are drawbacks to these technologies' quick development as well, like the need to guarantee fair access and handle issues with screen time and content quality. By encouraging participation, creativity, and critical thinking abilities, the practice of technology into ECE has improved the educational experiences of young learners [18], [19]. Research indicates that educational applications with a strong design might encourage young students to collaborate and participate actively [20]. A foundation for comprehending how kids use technology is offered by several youngster progress models. According to Piaget's cognitive development's theory, which emphasizes the value of active learning and exploration, technology can be a useful tool for promoting cognitive development if used properly. Technology can help peers learn collaboratively, according to Vygotsky's social development theory, which emphasizes the importance of social contact in learning [21]. Furthermore, according to the theory of multiple intelligences, children have a variety of learning styles, which technology can accommodate by providing engaging and varied learning opportunities [22], [23], [24]. Together, these views highlight how technology, when carefully incorporated into teaching methods, can promote children's overall development. Teachers' ability to adjust to novel gears and approaches is crucial to the successful incorporation of technology in ECE. According to research, professional development programs help teachers become more competent and confident in their ability to use technology However, there are obstacles that educators must overcome, such as disparities in digital literacy and restricted access to resources and training Research highlights how crucial it is for educators to work together and provide continuous assistance to create an atmosphere that encourages the use of technology [25]. By giving teachers the right tools and information, the potential of technology to improve ECE may be fully realized. ECE effectiveness depends on family involvement, and technology can greatly improve communication between the home and the school. According to research, communication platforms and mobile applications can assist paternities in breaking knowledge around their children's development in real time, which encourages more parental involvement in their

education [26]. Technology-enabled communication improves the link between educators and families and gives parents the ability to help their kids learn at home [27]. This flexibility makes it possible to design truly inclusive experiences where each child can advance at their own pace in a setting tailored to their own learning preferences and skills. According to research by [28] and [29] interactive technologies have the power to hold young students' interest and encourage a deeper engagement with academic material. According to the study's educators, augmented reality apps produced immersive learning environments that let kids actively investigate difficult subjects.

2.3 Early childhood family income and academic success

The relation between early childhood family income and subsequent academic success has been linked to several factors, including parenting styles, stress, sensory stimulation, children's neurodevelopment, and socioeconomic differences in the quality of early childhood schooling. We briefly discuss each of these mediating factors. The early years of life are the most sensitive time for environmental events and stimulate the anatomical and functional architecture of the brain. Accordingly, the shape of the developing brain can be permanently impacted by early experiences and environmental influences [30]. In general, parents from very low socioeconomic backgrounds have less time and money to provide cognitive stimulation for their children [31] and find it difficult to provide toys, books, and other learning aids [32]. There is a correlation between family wealth and the entire inner surface of the brain in areas relevant to language, reading, spatial perception, and executive function, especially for children from the lowest-income families [33]. Most recently, mothers' income has been connected to the pattern and strength of EEG power in a child's brain during the first year of life in neural regions that affect language and cognitive outcomes [34], [35], [36]. Uncertainty regarding one's ability to manage a certain situation at a particular time is known as stress. Important brain systems that control emotions, planning, and social conduct are in the prefrontal cortex. The functioning of these systems may be hampered by stress. Long-term stress exposure in early life can interfere with normal cognitive and emotional development, which can cause learning to be significantly delayed [37], [38], [39]. Early childhood is a time when the brain is particularly vulnerable to stress. Poverty and stress can be caused by a variety of negative environmental factors, including employment instability and unemployment, family and community violence, family dissolution, frequent moves, and a rise in the use of negative parenting techniques. AI-based mobile learning platform to improve students' motivation and performance in math [40]. Children's motivation, self-efficacy, and artistic involvement can all be improved with AI [41]. In addition, the use of mobile learning is still a hot topic in many educational organizations [42]. Another thing, AI technology can help young children develop fine-grained soft skills like cooperation and communication by using interactional tools and modified understanding recommendations. Furthermore, young children can benefit from interactive tools and individualized learning platforms made possible by AI technologies, and the technology makes it possible to tailor instruction to each student's needs, which increases confidence and self-worth. Sophisticated interactive solutions that can provide captivating educational experiences while getting around conventional hardware constraints are becoming increasingly necessary in mobile learning environments. Due to the variety of mobile devices and persistent material limitations (limited treatment capacity, battery life, intermittent

connection), educational solutions must demonstrate their inventiveness. Therefore, the development of applications and platforms that focus on software complexity and perfection will be the mainstay of future mobile learning evolution. It is possible to create enriching experiences without requiring the most up-to-date and powerful equipment by choosing innovative concepts and utilizing some technologies. Even if previous research has demonstrated the potential of mobile technology in this field, there are still problems in aligning technical instruments with the development of knowledge systems. The substantial disconnect between academic theory and real-world professional practice remains a major barrier in accounting education, even with the educational sector's quick transition to digital and mobile technology breakthroughs. Although students are regularly taught demanding theoretical frameworks and standards, they often find it difficult to implement these lessons in unpredictable, dynamic work contexts. The intricacy of the actual world, where theoretical proficiency must continuously balance contextual specificities and commercial operating requirements, leaves many aspiring accountants perplexed by this duality. On the other hand, English as a Foreign Language (EFL) classes have embraced a virtual learning environment since the COVID-19 pandemic. The study offers a variety of online tools and activities designed to boost the motivation and engagement of aspiring EFL teachers. Another important problem is the frequent and postponed delivery of educational materials. Although prior research has explored the use of AR in musical learning environments, there are still significant gaps in the dynamic recording of learner behavior data and its application in personalized adaptation. The ECE sector is undergoing a particularly revolutionary digital transition in the field of music education, thanks to the combination of augmented reality (AR) and mobile interactive technology. Therefore, the goal for this part of reality-enhanced music education is to move toward a cognitive and adaptive dimension rather than to increase the visual aspect. The goal is to develop technologies that, with accurate data collection, become proactive teaching aids. By offering a really tailored course that would continuously adapt based on the learner's profile to fix its deficiencies and develop its strengths, these virtue tutors might thus fully realize the promise of an intelligent and individualized musical education. So, higher childcare arrangements and are less likely to participate in high-quality early childhood education and care (ECEC) programs. Attending high-quality ECEC can greatly enhance children's cognitive and non-cognitive skills, which can ultimately result in greater educational and job possibilities; Furthermore, the intergenerational cycle of poverty can be broken by providing disadvantaged communities with high-quality ECEC. Consequently, our hypothesis:

- H1: Mobile technologies boost positively early childhood education.
- H2: AI positively on early childhood education.
- H3: Poverty has negative impact on early childhood education.

2.4 Conceptual framework

This conceptual framework (see Figure 1) emphasizes the fundamental idea that mobile technology and AI are not separate fields but rather can be used as tools to address a fundamental social issue: the effect of poverty on young children's education. The two technologies are positioned lower by the arrangement of the elements, not as independent entities but rather as potential foundations and engines that can support the structural integrity. A crucial role is played by early childhood

education (ECE), which clarifies the main goal and application area. When all is said and done, poverty ranks first because it is both the primary barrier to overcome and the factor that shapes all other factors. The ascendancy that uses mobile technology to AI within the ECE represents the intervention procedure. The smartphone offers a universal and easily accessible distribution channel that can reach families and children living in remote and underprivileged areas. According to her, AI gives this method the ability to adapt and personalize itself, turning a standard tool into a virtuous guide that can be tailored to each child's unique learning style and cognitive needs. Collectively, they create a strong synergy to provide superior and innovative educational solutions.

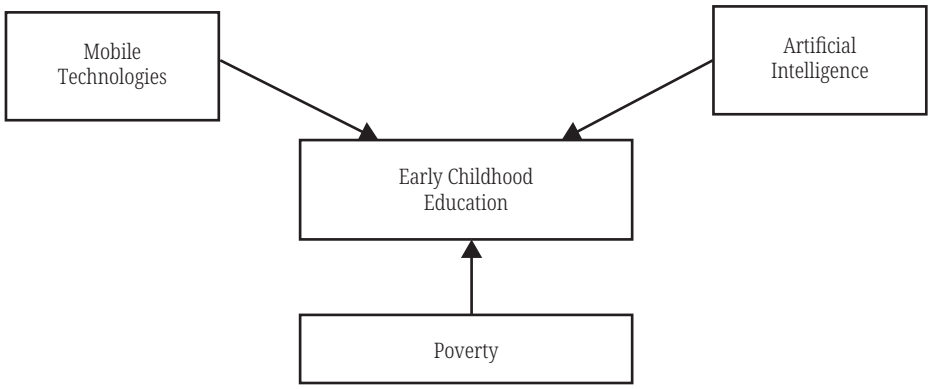

Fig. 1. Conceptual framework

The goal of this approach, as shown by the flesh pointing to the picture, is to highlight the detrimental effects of poverty on a child's development. This model aims to break the cycle of intergenerational inequality by providing a high-quality, personalized, and stimulating early education. It affirms that, despite an initially unfavorable socioeconomic environment, by developing cognitive, socioemotional, and executive skills in children from an early age, one may give them the tools they need to succeed in school and beyond. However, this model fails to highlight the challenges to be addressed.

3 RESEARCH METHODOLOGY

This study research is based on the conceptual model and exploratory in nature, where a qualitative method is applied to synthesize knowledge from various disciplines, including education, developmental psychology, AI, and mobile learning. The authors have critically examined how AI and mobile technologies can be integrated into ECE to address the challenges posed by poverty while studying existing literature. The study explores the potential of technology to support children's cognitive, emotional, and social growth. Results are based on the findings from the literature; the paper formulates three hypotheses as explained in the literature review section. These hypotheses are represented in a conceptual framework shown in Figure 1, which explains how AI and mobile technologies can act as intervention tools to mitigate the negative effects of poverty on children's early learning outcomes. The framework positions poverty as a root because that influences educational access and quality, while AI and mobile tools are presented as mechanisms to support personalized, engaging, and accessible learning experiences.

4 RESULT

The results are analyzed by studying various research work and past studied on the transformative potential of mobile learning applications, particularly when powered by advanced technologies such as cloud infrastructure, AI, and adaptive user interfaces. Based on the findings from the previous work, the current study made a conclusive analysis highlighting how mobile learning platforms can support diverse educational needs by offering flexible, engaging, and personalized experiences for young children. These applications, which include language learning tools, medical simulations, and interactive science labs, are shown to enhance accessibility, motivation, and learning outcomes especially for students from under-resourced backgrounds. The integration of mobile technologies allows education to extend beyond the classroom, enabling learning anytime and anywhere, while also fostering collaboration between parents, teachers, and children across the world. The paper emphasizes that AI and mobile technologies together can be most effective applications to support teaching and compliment traditional learning methods rather than replace them completely.

By enabling sophisticated learning applications that were previously unattainable on typical mobile devices, cloud gaming infrastructure revolutionizes mobile learning. To produce seamless learning experiences, the framework combines codec efficiency (optimization of video compression), GPU virtualization (shared graphics processing), and adaptive user interface design. It facilitates a range of teaching approaches in numerous academic domains and tackles fundamental issues in mobile learning. The framework facilitates a wide range of mobile learning applications, such as language immersion platforms for cultural learning, medical training simulations for the development of practical skills, collaborative learning environments for peer interaction, and virtual science labs for hands-on experimentation. These apps improve learning goals through cloud gaming features and are compatible with a range of mobile devices. Educational institutions can save money and give students access to top-notch software regardless of their device specifications by leveraging cloud resources. Autonomous resource provisioning enhances the efficiency of educational applications. Improved accessibility of mobile learning technologies aids initiatives to provide education to a range of student demographics. To optimize learning outcomes, applications for mobile learning refer to programs created to run on portable devices like smartphones and tablets, offering access to education that is not dependent on geographical location or time. These programs cover a wide range of educational topics, from early language and math instruction to the development of socioemotional and creative skills. Their main advantage lies in their ability to convert times into learning opportunities because of their portability and ease of use. These programs target not only children but also their parents and teachers, who act as a bridge between formal and informal education. When these applications are used as an addition to traditional teaching methods rather than as a replacement, their true value becomes clear. Encouraging parents and educators to utilize it wisely and critically is crucial for effective implementation.

5 CONCLUSION

In conclusion, the junction of mobile technology, AI, and poverty alleviation in the preschool education sector is a promising yet challenging area of innovation.

These developments offer potential ways to overcome obstacles that have historically been seen as insurmountable, such as geographic distance, a lack of educational resources, and the difficulty of providing large-scale, individualized support. With its ability to tailor educational content to each child's unique needs and its connection to increasing mobile device accessibility, AI promotes a level of democracy in education that has never been seen before. There is a lot of interest in incorporating next-generation mobile technologies into ECE, especially in underdeveloped nations such as Morocco, where socioeconomic and infrastructure issues have an impact on teaching methods. Together, these four seemingly disparate elements aim to prepare future generations to live, learn, and act in a complex, uncertain, and interconnected world. The foundation required to address the issues resulting from social and environmental concerns is also provided by these human capacities. We suggest doing a quantitative study that considers the part that educators play in this process to achieve this. From a young age, these foundations must be laid. Character development, interpersonal relationships, nature, and emerging technologies are all impacted by ECE. A potent and progressive educational approach combines teaching techniques that develop creativity, emotional intelligence, and ecological concern with careful reliance on AI. In addition to incorporating these elements, the goal is to articulate them in a coherent and all-encompassing educational vision where technology fosters long-term human development.

6 ETHICAL STATEMENT

This study is based on the analysis of existing literature and does not involve any experiments on humans or animals, personal data, or any procedure. The study does not require any ethical approval from research committees, and the authors have followed all academic regulations in this study. The authors also declare that there are no conflicts of interest related to the publication of this paper.

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