

ADVANTAGES AND DISADVANTAGES OF IMPLEMENTING ARTIFICIAL INTELLIGENCE IN PRESCHOOL EDUCATION: SOCIETAL IMPLICATIONS AND IMPACT

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Abstract: Artificial intelligence is increasingly becoming an integral part of preschool education, offering tools for more efficient management and innovative learning. However, its application also raises concerns about potential challenges impacting the educational trajectories of new generations and broader social contexts. The societal implications of artificial intelligence are particularly significant, as they intersect with issues of reshaping educational standards and, consequently, with social equity.

This paper examines the key advantages and disadvantages of applying artificial intelligence in preschool education within a societal framework. The identified advantages emphasize social benefits, such as the development of executive control, experiential learning, creative problem-solving, and intrinsic learning motivation for the new generations. The disadvantages, on the other hand, include cognitive laziness, algorithmic bias, and data misuse, which may undermine educational equity and the principles of inclusive education.

This paper underscores the dual impact of artificial intelligence and examines both benefits and risks by addressing both societal dimensions. It advocates for a balanced approach to integrating artificial intelligence in early education, with particular attention to its potential role in either reducing or exacerbating social inequalities.

Key words: artificial intelligence, preschool education, management, social equity, societal impact.

1. INTRODUCTION

Artificial intelligence (AI) refers to the ability of computers, robots and devices to perform functions usually associated with human intelligence [1]. The basic definition of artificial intelligence can be expressed as the skilful imitation of human behaviour or mind by tools or programs [2]. The field of artificial intelligence is related to computational learning to perceive and analyse the environment and to make decisions and achieve specific goals. AI is increasingly finding and securing its place in the education system, especially in the preschool education system. Digitalization and many AI systems and tools have contributed to the modernization of the preschool education system, as the entire learning process is expanded. The way children experience and acquire new knowledge and skills has been completely revolutionized by the application of artificial intelligence, but artificial intelligence as a neutral technological phenomenon [3], depending on the application, can positively or negatively impact preschool education. Depending on the application, various advantages and disadvantages of artificial intelligence in preschool education will be manifested to a greater or lesser extent. The advantages and disadvantages of applying artificial intelligence in preschool education can positively or negatively affect children in their educational and personal future. Therefore, it is important to carefully apply artificial intelligence in preschool education, in order to foster advantages and minimize disadvantages.

This paper presents the most common and important advantages and disadvantages of applying artificial intelligence in preschool education, with advantages being development of executive control, experiential learning, creative approach to problem solving and motivation for learning, and disadvantages being cognitive laziness, data misuse and algorithmic bias. The way those advantages and disadvantages impact children in preschool education is explained.

2. SOCIETAL ADVANTAGES OF APPLYING ARTIFICIAL INTELLIGENCE IN PRESCHOOL EDUCATION

The rapid development of artificial intelligence, which especially include the rise of machine and deep learning algorithms, natural language processing and adaptive learning systems, has changed

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education and learning radically. These technologies enable personalized, data-driven educational experiences that adapt to the unique cognitive and social needs of each child. Such advancements provide tailored content, encourage engagement, and help new generations develop critical skills. The most significant aspects of the application of artificial intelligence in preschool education within a societal context relate to the development of executive control, experiential learning, a creative approach to problem solving and motivation for learning of new generations.

2.1. Societal Influences on Executive Control through AI in Preschool Education

The application of AI affects the executive control. Like a computer, the human mind receives information, performs operations on it to change its form and content, stores it, retrieves it when needed and generates responses to it [4]. Executive control refers to cognitive processes that controls goal-directed behaviour [5] and occurs at the sensory – working – long-term memory relationship. Information is encoded in sensory memory, temporary stored in working memory [6] and primarily processed and associated in long-term memory. The path from sensory memory to long-term memory is made up of implicit memories, while the path from long-term to sensory memory is the influence of knowledge [3]. AI also plays a role in reshaping social structures by providing children with opportunities to explore learning from diverse perspectives, potentially reducing societal gaps in access to educational resources. AI provides the child with adequate content that the child can remember, to return to it and to build on it with new content, so the executive control cycle and memory based on information processing are always accompanied by artificial intelligence. AI expands the capabilities of the child's sensory, working and long-term memory, because it brings the child's cognitive abilities to a higher level. Through artificial intelligence, executive control is expanded, as it brings children's cognitive abilities to a higher level. In this way, artificial intelligence contributes to cognitive development of new generations and to narrowing social inequalities by improving access to diverse and enriched learning experiences for all children.

2.2. Societal Dimensions of Experiential Learning with AI

Experiential learning is a holistic philosophy of education based on the notion that an individual's life experiences, education and work play a central role in their learning and understanding of new knowledge [7]. To develop their potential, children need rich and diverse opportunities to explore the environment, participate in activities with peers and adults in preschool [8]-[10]. AI, especially in combination with virtual reality technology and chatbots [11], allows a child to interact with a new and unusual environment, thereby satisfying their innate curiosity and testing their assumptions, opinions and attitudes [3]. Although artificial intelligence follows the child's pace of work, it gives the child the freedom to choose what to do with the given content. When a child successfully solves a given task, achieves a given goal or discovers something new that they did not know before, then curiosity, self-confidence, security and the spirit of inquiry only deepen [12], which confirms that experiential learning is a cyclical process that never stops [13], and artificial intelligence uses this adequately, offering children individual content. AI therefore enhances experiential learning by supporting cognitive development and influencing how children interact with the world around them, and thus contribute to a broader sociocultural transformation in education, where technological tools break down barriers related to social inequality as well as access to resources.

2.3. Fostering Creative Potential in New Generations

Children are uniquely inclined to solve complex problems. Problem solving is usually defined as the formulation of new answers, going beyond the simple application of previously learned rules, in order to achieve a specific goal. In order for a child to be able to creatively solve problems, it must first be in a creatively stimulating environment, and use materials and tools that further stimulate creative potential and expression [14]. Therefore, the application of artificial intelligence in preschool education is ideal because it breaks down existing boundaries and expands the prism of educational possibilities [3]. AI provides the child with new learning perspectives [15], thus providing the child with new content that the child can perceive, adopt and apply in new, unusual ways. Consciously or unconsciously, artificial intelligence constantly emphasizes creativity and finding new ways of working and learning, without the pressure for a child. Freedom of expression, pace of work and learning are key to contributing to creative problem solving. Creative problem solving in the aspect of

artificial intelligence is also associated with an imaginative approach to problem solving, because humans working alongside AI shapes the future of creative problem-solving [16].

2.4. Societal Perspectives on Motivation for Learning through AI

The application of AI in preschool education brings innovations which are necessary for the child to adequately develop its potentials. Motivation is generally defined as an internal state that arouses, directs, and sustains a child's behaviour. The success of learning depends on whether or not the learners are motivated [17]. Motivation for learning is characterized as a child's tendency to view academic activities as meaningful and worthwhile [18]. The content that artificial intelligence offers to children originates from their needs, interests and skills, which means that artificial intelligence based educational content is only a driving force for fulfilling the natural inclination to seek and overcome challenges [3]. As artificial intelligence adapts to a child's development, it fosters a surrounding that encourages exploration, innovation, and problem-solving, which can enhance motivation across different social groups of children. This individualized support through AI can serve as an important motivator for children from marginalized communities, in a way that offers equal access to high-quality educational content that may otherwise be unavailable to them. Children enjoy mentally and creatively stimulating and innovative tasks, which is precisely what working with artificial intelligence ensures. AI contributes to motivation because it provides authentic tasks, supports achievement, creativity, individuality and choice. Motivation for learning through artificial intelligence rise above individual development as it influences social equity, and the availability of learning opportunities for children from diverse backgrounds. AI, therefore, contributes to motivating learners, and to reshaping the educational landscape in ways that address systemic disparities in access and opportunities.

3. SOCIETAL DISADVANTAGES OF APPLYING ARTIFICIAL INTELLIGENCE IN PRESCHOOL EDUCATION

AI is changing the world in many ways, bringing exciting possibilities but also some problems [18]. In the context of preschool education, while artificial intelligence offers innovative learning opportunities, it also brings challenges that could affect social equity and fairness. The main disadvantages of applying artificial intelligence in preschool education are cognitive laziness, data misuse, and algorithmic bias. These issues not only raise concerns about children's development but also highlight potential inequalities in access to quality education, reinforcing the need for a careful, socially responsible approach to AI implementation.

3.1. Cognitive laziness

AI has greatly contributed to all aspects of the educational systems, but individuals can get used to using artificial intelligence to the point that they are losing their cognitive capacities [19]. Cognitive laziness is referring to the tendency to follow existing mental patterns that leads individuals to accept certain information, beliefs or suggestions without questioning them. Cognitive laziness makes children more suggestible and manipulable [20], and getting an addiction to artificial intelligence use will lead to laziness and a problematic situation in the future [21]. One of the forms that cognitive laziness takes is by accepting personal impressions about problems, conflicts or concerns. Once people establish a starting point, they do not look for other ways to understand reality [22],[23]. As artificial intelligence increasingly offers suggestions, children may start to rely on these recommendations rather than engaging in independent decision-making. This growing dependence on AI suggestions reduces their ability to critically evaluate situations and make their own choices, a process that is essential for cognitive development.

With excessive and inadequate application of artificial intelligence in education, children could begin to rely too much on AI tools, causing them to put less mental effort into solving problems, thus not stimulating cognitive development to the necessary extent [23],[24]. AI in preschool education should be used as an educational supplement that enriches the learning process, not as a substitute for cognitive effort. Cognitive laziness as a consequence of excessive and inadequate use of artificial intelligence in preschool education is also closely linked to technological dependency [24].

Technological dependency stems from when children rely too much on technology to function through their daily lives [21]. Due to excessive technological dependence, especially in the application of artificial intelligence in preschool education, children do not rely on their own cognitive capacities, knowledge and experience, but on a quick solution to a specific task or problem that does not essentially stimulate the child's development.

3.2. Data misuse

Data misuse refers to using information in ways it was not intended to be used [25]. Current applications of AI in preschool education show that these systems are being utilized to identify specific learning needs and enhance the educational process [3]. However, such data can be misused in inappropriate or even harmful ways, and this raise “questions about the validity or objectivity of the data collected, its flow, secondary use and misuse” [12, pp. 16].

Negligence, carelessness, or lack of proper training can also lead to data misuse. This could involve unintentionally sharing data with other individuals, accidentally encountering sensitive information, or downloading data to unprotected personal devices [26]. Poor data protection practices can lead to further data misuse. AI systems can provide insights for teachers, but that can lead to children feeling powerless and despondent in relation to these AI technologies, which can negatively impact their attitudes toward preschool and overall education [27]. On the other hand, many AI systems and tools are owned by third-party companies and are commercial in nature, which can lead to personal data being aggregated and processed, enabling detailed profiles of children to be constructed, potentially reinforcing social inequalities [12],[27],[28]. These management practices in education must carefully address the risks of data misuse to prevent extending biased outcomes and ensure fairer, more equitable decisions for all children.

3.3. Algorithmic bias

The biggest limitation of artificial intelligence is that it's only as useful as the data on which it was trained [12],[27]. The main limitation of artificial intelligence is that it learns from given data, which confirms that there is no other way that knowledge can be integrated, unlike human learning. This means that any inaccuracies in the data will be reflected in the results. Bias in data-driven systems is typically caused by prejudiced assumptions in algorithm development and/or the composition of the dataset that the algorithm is trained on [12]. It has both statistical and social dimensions and can lead to inaccurate measurements and representations [27],[29]. AI processes data and the quality of decision-making depends on it. The higher the data on which artificial intelligence is based, the better the decisions will be, but there are concerns about the fairness of the predictions and uses of these algorithmic systems [30],[31].

When large databases do not have comprehensive data, then it comes to the point that artificial intelligence gives decision suggestions that are based only on that data, that are not reliable and comprehensive [29],[31]. For example, the algorithm of the artificial intelligence – facial recognition system – was trained on white faces, and in practice it has been observed that the algorithm misinterprets dark-skinned people and black people as a danger [32],[33]. This does not mean that the wrong result is the product of programmers' prejudices, but of incomplete data [12],[29]. Teachers, directors, and administrative staff in education management – may uncritically accept decisions suggested by AI systems. Algorithmic bias, which arises from incomplete or unrepresentative data, can result in recommendations that unfairly disadvantage certain social groups (racial, gender, economic, etc.). When such biased suggestions are applied in education, they can influence critical decisions about children's futures, such as school enrolment, access to resources, participation in competitions, or special statuses. These biases not only affect individual children but can also extend broader social inequalities.

4. CONCLUSION

The role of AI in education is becoming ever more important. The need for modernizing education directly impacts the implementation of artificial intelligence in preschool education. The application of AI in preschool education has advantages and disadvantages to an equal extent. Preschool teachers,

principals, and other professionals involved in educational management and educational policy are obliged to use artificial intelligence in a conscientious, controlled, appropriate, and adapted manner. This means that they should encourage children's executive control, experiential learning, creative problem-solving, and motivation for learning by using artificial intelligence, but also avoid cognitive laziness, data misuse, and algorithmic bias.

When applying artificial intelligence in preschool education, it is necessary to align its implementation with educational policy, considering all the advantages and disadvantages, and to conceptualize educational work and activities accordingly. Maintaining equilibrium in management of AI tools, as well as careful evaluating their societal impact, is necessary for fostering the development of future generations through the use of artificial intelligence. As much as artificial intelligence can contribute to the educational process, it can also hinder it, which is why a professional approach to the development of preschool education is necessary. Preschool education shapes future generations, and the competent and socially responsible application of artificial intelligence is a reflection of the future. Finally, the successful integration of artificial intelligence requires ongoing collaboration between educators, policymakers, and AI developers to ensure that it serves the best interests of both children and society.

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