Artificial Intelligence and Safe Digital Learning for Children with Special Needs

Sara Moustafa Ahmed
Department of Educational Sciences, Faculty of Education for Early Childhood, Alexandria University, Egypt, *saraahmed@alexu.edu.eg*

Magda Mahmoud Saleh
Corresponding author, Department of Educational Sciences, Faculty of Education for Early Childhood, Alexandria University, Egypt, *magda.mahmoud@alexu.edu.eg*

Mahetab Eltieb Ahmed
Department of Educational Sciences, Faculty of Education for Early Childhood, Alexandria University, Egypt, *mahetab.ahmed@alexu.edu.eg*

Given that children with special needs in Egypt practise using artificial intelligence (AI) without learning the principles and standards for the safe ethical use of this technology—for which they have not received training—and that there are no standards for AI in Egyptian curricula, the goal of this study was to create a digital program that addresses some of the standards for the safe use of digital learning for AI. This exposes individuals to the risks and drawbacks of this use, which exacerbates their existing difficulties and essentially impacts their specific needs. It was therefore highly motivated to conduct this study through a sensory activities program that was implemented through one of the AI applications, Magic School, whose tools addressed some principles and standards for the safe use of AI, represented in two principles: the principle of privacy and the principle of security and safety. This was done considering the group's nature and capabilities, the challenges they face in school and in life in general, and the need to avoid the risks of this use without awareness or knowledge. The success of the activities included in the program was statistically indicated with satisfactory statistical significance in the study sample's children's acquisition of the standards required for learning the principles of the principle of privacy, the principle of security, and the principle of safety for the safe use of artificial intelligence. This was achieved by creating an achievement test for scenarios pertaining to the security of the creative use of AI on the network, which allowed for the monitoring and analysis of the students' responses.

Keywords: artificial intelligence (AI), ethical AI education, children with special needs, digital learning, safe AI applications, assistive technology for special education

INTRODUCTION

An international trend is the application of AI and related technologies in education. By giving students educational experiences that improve their learning and may be used to address various educational needs, educational AI technologies play a significant role in contemporary education. How many of the issues with this technology are resolved in the future depends on incorporating AI principles for all kids. Few papers address AI research in early childhood education, even though there are reviews of AI research in education (Bostrom et al., 2014). Teaching pupils with special learning requirements because of physical, mental, emotional, or behavioural issues is known as special education. To suit their educational demands, these pupils frequently need customised educational programs. Every aspect of schooling is significantly impacted by AI (Smith et al., 2024). It can accelerate progress towards the fourth Sustainable Development Goal, which is to promote inclusive and high-quality education and give opportunities for lifelong learning to everyone. It also offers enormous potential to meet the Sustainable Development Goals. (Zaraii, 2019; Gabriel, 2024 & Holmes, 2023) AI can give all students an equal education free from discrimination. Even though this technology is new, artificial intelligence is still in its infancy. But it can be described as: science and the ability to solve problems utilising methods from science, technology, engineering, and mathematics. Because intelligence simultaneously integrates various fields and technologies, it is also beneficial in the sphere of education. According to Ouyang, (2021), artificial intelligence (AI) technology is a key component of special education and support for those with special needs, facilitating their growth. In light of these facts, Egypt's vision (Sustainable Development Strategy: Egypt Vision, 2015 and UNICEF, 2014) aims to create a dynamic society with strong values by instituting the idea of an educational system that supports the achievement, creation, and innovation of all members of society, including those with special needs. This study was conducted from this perspective and in response to Egypt's development objectives, which aimed to improve education at all levels and stay up to date with modern developments. The phrase artificial intelligence (AI) as digital learning is relatively new in Arab nations, where the education sector is paying close attention to its implementation and use in curriculum to support the scientific and practical lives of all members of society, both the public and those with special needs. The present study discusses the significance of using AI and some of its applications in safe digital learning to help people with special needs overcome some of their challenges. By using these applications and utilising them with them in a safe and ethical way, they can improve their living skills and stay up to date with technological advancements like their peers as well as increase their awareness of the risks of using them in an unethical or unsafe way, which is important for their safety.

Literature Review

This study will comprehensively examine the instruction of individuals with special needs regarding the secure digital utilisation of AI technology, its advantages for this demographic, and the ethical standards governing its safe use. It will also illuminate the benefits and risks associated with this technology, emphasising its critical importance for all learners, particularly those with special needs, to ensure that it contributes

positively to their education and development in a manner conducive to their well-being and that of society. The significant lack of Arab research, particularly in Egypt, underscores the necessity of this study to address the gap in this domain concerning individuals with disabilities, who urgently require it due to their unsupervised use of network applications lacking foundational standards that ensure their safety and protection from digital exploitation.

Digital Learning and AI for Students with Special Needs

Digital learning signifies a significant advancement in the era of digitisation, becoming an essential complement to traditional education for all learners. It is particularly crucial for individuals with special needs, as it offers accessible applications and educational materials that facilitate enhanced interaction with content tailored to their unique capabilities (Morison 2023 & Standen et al., 2020). Furthermore, it enables access to resources at any time and from any location, thereby simplifying the learning process and fostering the development of technological skills vital in contemporary society, which in turn bolsters their self-confidence and enhances their learning and communication abilities (Neeharika, 2023; Standen et al., 2020; Zhai et al., 2023) .It offers high-quality education that includes all students, including those with significant disabilities, auditory and visual impairments, as well as physical and cognitive learning challenges (Dalton, 2017). A multitude of studies has examined the application of AI systems in educating individuals with unique educational difficulties. This study is predicated on the most representative and effective applications of AI tools to address issues in special needs education, with several examples discussed herein. Individuals with disabilities are generally termed as individuals with special needs (McMahon, et al., 2021), thereby becoming the phrase special needs a synonym for disability (Powell et al., 2015). Individuals with specific disabilities are seen as having special needs. A person with a physical, psychological, intellectual, neurological, and/or sensory impairment is rendered incapable of functioning (Morrison et al., 2023). AI provides individuals with special needs the opportunity to create dynamic, collaborative learning environments that enhance their lives and interactions with others. UNESCO characterises AI as "computer systems capable of executing tasks that generally necessitate human intelligence, including speech recognition, decision-making, and problem-solving" (UNESCO, 2020). AI is described as the scientific discipline and problem-solving capabilities that utilise technologies encompassing science, technology, engineering, and mathematics (Hwang et al., 2020). Numerous definitions suggest that AI includes a diverse array of applications and technology designed to replicate human intelligence and enhance the efficacy of automated systems. Borgesians, 2018 The integration of AI in education transcends mere technological application. The focus is on the methodology of teaching and learning, enhancing the accessibility and efficacy of education. Intelligent teaching systems represent a primary domain in which AI has achieved considerable advancement. These systems utilise AI to offer students personalised coaching tailored to their unique learning styles and educational pace. Artificial intelligence is extensively utilised in education, providing several chances for instruction and learning. In education, it primarily serves to convey knowledge and enhance comprehension, while also fostering innovation among

students. (Luskin, 2017). Artificial intelligence positively influences inclusive education. Common uses of AI in education encompass knowledge representation, intelligent teaching, and natural language processing (Tambe et al., 2019). It is utilised for those with impairments to assist in communication and interaction challenges, cognitive and learning difficulties, behavioural and emotional development, as well as sensory and physical growth (Leslie, 2019). Artificial Intelligence and special needs education are synergised to facilitate the advancement of those with impairments. Students with learning, auditory, visual, and motor impairments can utilise AI to enhance their educational experience. Artificial intelligence possesses the capacity to deliver equitable education to all students without bias. Artificial Intelligence (AI) is defined as the use of scientific and problem-solving methodologies utilising tools from science, technology, engineering, and mathematics (STEM) (Wang, 2021). Artificial intelligence is beneficial in teaching as it amalgamates several disciplines and diverse technologies concurrently. (West-Smith et al., 2021) Furthermore, AI is vital in education and must be acquired due to its rapid proliferation. (Kamalov et al., (2023). For instance, artificial intelligence can assist: 1) develop adaptive intelligent learning systems tailored to individual students' learning velocities and methodologies 2) provide customised educational experiences, tailored to the distinct needs and capabilities of each student. These customisations can optimise learning outcomes and enhance skill development. Artificial intelligence can also augment assistive technologies. For instance, AI-driven speech recognition systems can assist students with speech problems in communicating effectively. AI-driven predictive text solutions can assist children with dyslexia. AI-driven systems can convert text to voice for visually impaired pupils and transcribe speech to text for hearing impaired students. AI can assess student data to discern learning patterns, forecast performance, and provide individualised learning pathways (Hwang et al. 2020; Luskin 2017). Artificial intelligence is employed across nearly all educational domains and generally exerts a beneficial influence on various facets of education (Nguyen & Also, 2023). Numerous educators are already utilising AI extensively to instruct and support students with special needs, as evidenced by applications and technologies in assistive technology, including writing aids, grammar checkers, word prediction, and text-to-speech conversion (Chen et al., 2020; Hwang et al., 2020; Oh-Young & Karlin, 2024). A significant portion of the population in Egypt is deprived of healthcare, education, and employment opportunities, lacking essential assistive equipment and the ethically sound norms required for the safe utilisation of AI in education and improved living conditions. In this study, Faizi 2023 did research named "Design and Validation of Learning Programs Utilising AI and Their Impact on the Problem-Solving Skills of Students with Learning Disabilities in Mathematics".

AI Technologies

AI technologies in education aim to establish robust learning environments and enhance positive interaction experiences for all students. It serves as an invaluable resource for educators in facilitating, augmenting, and advancing learning. Students, although it cannot supplant human educators (Yi 2024). AI facilitates the automation of routine tasks and enhances data analysis, allowing educators to concentrate on areas such as

offering guidance, emotional support, encouragement, and fostering creativity and critical thinking in students. Additionally, advancements in assistive technology, including writing tools, spelling and grammar checkers, word prediction, and text-to-speech conversion, further contribute to this enhancement (Abidova 2023; Bryson 2019). AI technologies provide substantial advantages in society and education by effecting significant transformations in educational practices, facilitating tailored interventions for pupils (Chauhan, 2017), and fostering innovation while enhancing teaching methodologies. (Grimus, 2020). It fosters equality among all students by accommodating their sensory needs, creating a suitable atmosphere, enhancing their learning, promoting positive social behaviour, and ensuring equal chances. A study by Salas, 2020 indicates that the implementation of these technologies in education fosters innovation and enhances instructional efficacy. Artificial intelligence can significantly contribute to the advancement of assistive technologies for special schooling. From voice recognition software to AI-driven prosthetics, which significantly improve the educational and life experiences of students with impairments (Sadikovna et al. 2023).

Chauhan, 2017 stated that AI technologies are prevalent in society and education, and their rise can induce substantial transformations in education and positively impact students' overall well-being. It fosters innovation and enhances learning. Grimus, 2020 posits that these developing technologies may enhance the multi-sensory dimensions of students. This is accomplished by including all students, creating a conducive climate, and prioritising student learning. Ahmadi, 2023 did a study entitled "Designing Educational Programs Based on Social Robotics Technologies and Their Impact on Social Skills and Motivation to Achieve Academic Performance of Students with High-Functioning Autism Spectrum Disorders." In 2023, Abbas did a study entitled "The Effect of Digital Educational Games on the Visual Perception of First-Grade Students with Dyslexia." The findings indicated that digital educational games enhanced the visual perception of the participants, as all five students could independently recognise and write Persian gestures following their involvement in the study. In conclusion, digital educational games, in contrast to traditional methods, serve as a novel instrument that integrates visuals, audio, and interactive activities within a gaming context, fostering sustained attention and continuity of symbols, thereby enhancing the acquisition of Persian symbols for students with reading disabilities. Three research investigated the outcomes of numerical manipulation. Three e-book studies examined literacy outcomes, encompassing vocabulary enhancement (Boyle et al., 2021; Shamir, et al., 2018), language retention, and oral proficiency (Kong et al., 2021). This study was conducted by Kong et al., utilising interactive listening sessions via headphones. A study demonstrated the efficacy of interactive digital games designed to facilitate the development of target words. All four study projects demonstrated efficacy in attaining favourable outcomes. A study by Boyle et al., 2021, Shamir et al., 2018 and Kong et al., 2021 focused on e-books and their effects on literacy outcomes, encompassing vocabulary enhancement, language retention, and oral abilities, conducted through interactive listening sessions via headphones. All three study initiatives demonstrated efficacy in yielding positive outcomes for the usefulness of interactive digital games that facilitate the generation of certain words. Smith et al., 2021 conducted a study entitled "AI and its Implications in Education," highlighting that recent advancement in

computers, software, and internet services have enhanced classroom environments and pedagogical approaches for students with special needs. Artificial intelligence and technology have significantly influenced individual lives and have notably transformed the education sector, enhancing inclusivity and accessibility for students with visual, auditory, motor, and cognitive challenges.

Ethics of Using AI for Student with Special Needs

AI applications possess both advantageous and detrimental characteristics, akin to all contemporary technological innovations. This necessitates an understanding of AI's capabilities and influence, alongside the ethical considerations and principles essential for mitigating its risks and harms. Consequently, it is imperative to formulate policies, establish evaluation mechanisms, and devise a strategic roadmap for the application of AI (Kitto, 2019). The widespread application of artificial intelligence presents significant ethical risks that necessitate rigorous safeguards to assure its safe utilisation. Consequently, UNESCO established worldwide guidelines for the ethics of artificial intelligence, which were ratified by member nations in November 2021. They encompassed a universal framework for ethical principles in the utilisation of artificial intelligence, UNESCO, 2020. Ethics denote the standards that regulate an individual's conduct or actions. Conversely, they are ethical concepts that direct humans in decision-making and discerning right from wrong. In the realm of artificial intelligence, ethics and morals are crucial, as they dictate the development, use, and regulation of AI systems. The consolidated ethical guidelines for AI present a novel potential to fulfil the demands of digitisation in education. (Reiss, 2021). The scenario may escalate in risk with the proliferation of this technology, necessitating the training of educators and students on the ethical implications of AI, the principle of privacy, and appropriate responses to these issues. Awareness of the benefits and risks associated with artificial intelligence technology is crucial, encompassing surveillance, learner privacy, data ownership and control, data independence, and the necessity for transparency in data collecting, utilisation, and dissemination (Chauncey et al., 2023). Marginalised student groups have obstacles stemming from significant societal issues, including racism, discrimination, xenophobia, and inequality. AI presents ethical implications and privacy hazards that necessitate careful consideration to differentiate between ethical conduct and ethical practices (Hwang et al., 2020).

Additional ethical concerns about AI in education encompass matters pertaining to data collecting, sources, ownership, control, and data autonomy (Miao et al., 2021, Kelly et al., 2023). There is an urgent necessity for ethical standards that reflect meticulous and accountable governance for the secure design and application of AI in education (Kitto & Knight 2018). Research has identified. The ethical and safe utilisation of AI is delineated by the following principles: (a) governance and management, (b) transparency and accountability, (c) sustainability and proportionality, (d) privacy, (e) security and safety, and (f) inclusiveness (Ashok, et al. 2022; Hooij, et al. 2021; United Nations Educational Organisation 2021; Hopcan, 2023), human supervision and decisiveness, h) Cognisance and literacy, i) Equity and non-discrimination and j) Proportionality and non-maleficence. Considering the attributes, competencies, and potentials of the study sample, along with the prevailing conditions in special needs

educational institutions in Egypt, the program was confined to two essential principles for children with special needs: the principle of privacy and the principle of security and safety. This focus aims to promote the ethical application of artificial intelligence, as the remaining principles necessitate the involvement of responsible parties beyond the parameters of the current study. The principle of privacy: It emphasises the safeguarding of personal information. The utilisation of artificial intelligence poses a significant risk to the privacy of learners' personal data. It is essential to guarantee transparency and clarity regarding the threats associated with AI in education, including an elucidation of the potential repercussions for students' learning, careers, and social interactions. To foster trust among learners and retain authority over their data and digital identities (Fagan et al., 2019), as well as to uphold the principle of privacy, it is essential to secure explicit user consent and safeguard the confidentiality of users' information during both the provision and collection of data, as consent to data usage enhances educational performance (Boyle, 2021 and Chauncey et al., 2023). The Children's Online Privacy Protection Act aims to enhance regulations regarding the collection, use, and disclosure of children's personal information online, whereas the EdLa law, enacted in early 2020, forbids the release of personally identifiable information pertaining to students and employees and mandates parental notification in cases of unauthorised access. Considering the ethics of AI is crucial, particularly for the future of autonomous AI and systems that may surpass human intelligence (Naik et al., 2022 & West-Smith et al., 2018). Our objective is to evaluate the responsible and ethical utilisation of contemporary AI techniques. Students must be afforded opportunities to enhance their engagement with ICTs as both users and content creators (Chen, 2020). These opportunities must correspond with practical sectors and applications. The curriculum incorporates instruction on ethical use to ensure students comprehend how to access, appraise, utilise, and cite digital resources securely and effectively. Child-safe search engines exist that filter search content (Kielblock 2023 & Vitanov 2023). Moreover, educational institutions must implement stringent content screening to safeguard students from encountering unsuitable material while engaging with potentially hazardous persons on social media platforms (Fagan, 2019).

Educational Programs for the Safe Digital Use of Artificial Intelligence

To elucidate the concept of AI to children with special needs, one may employ uncomplicated language alongside visual aids and interactive games that facilitate direct engagement, thereby elucidating AI as a phenomenon that "thinks," "learns," and "assists" children in their daily endeavours (Nihal et al., 2023, Sen et al., 2023 & Duncan et al., 2024). Numerous studies have reached a consensus on the training program standards for individuals with special needs, focussing on the safe and secure utilisation of AI and its applications. These standards can be encapsulated as follows: a) a comprehensive introductory course on artificial intelligence, b) reinforcement of privacy and security measures, c) exploration of AI applications in everyday life, d) engagement in sensory and interactive activities, e) fostering enjoyable learning experiences related to AI, f) provision of resources to facilitate self-directed learning, and g) encouragement of creativity and forward-thinking. By employing these specific educational objectives, training courses can be developed to cater to children with

special needs, thereby improving their comprehension of AI and enabling them to engage with it in a secure, responsible, and enjoyable manner. To attain these objectives, the authors employed the "Magic School" application, which offers a user-friendly and streamlined platform for educators to utilise AI tools in education, thereby facilitating personalised learning and improving the experiences of students, particularly those with special needs. The application utilises an extensive repository of educational resources that can be tailored to meet individual student needs, enabling educators to formulate personalised teaching tactics aligned with students' levels of engagement and comprehension. Furthermore, the application enhances communication between students and educators by delivering updates on progress and prospective learning challenges, thereby facilitating informed teaching decisions based on precise data. The program offers a tailored educational experience aimed at enhancing student performance and engagement through innovative and secure methods. Considering the existing capabilities, the educational landscape in Egypt, and the condition of institutions for individuals with special needs, alongside a review of prior studies and references, the objectives of the training program and associated activities were established to equip the study sample of children with special needs with ethical and safe digital AI usage.

Table 1
Objectives and activities corresponding to the acquisition of children with special needs - study sample - ethics of the safe use of AI for the principle of privacy, and the principle of security and safety

Objectives	Corresponding activities
a) A simplified introductory definition of artificial intelligence	We can explain to them that "AI" is something like a "mind" that exists in some devices. Kids can talk to Chat GPT, ask it questions and get answers. Like saying "Hello" and hearing responses like "Hello, how can I help you?", or asking something as simple as "What colour is the sky?" and they will get an answer., etc.
b) Privacy and security support	Helping children make decisions about personal safety: An interactive video presents specific situations, such as someone asking for a password, and asks children to make decisions such as "yes" or "no." Use cards with pictures of "safe" and "unsafe" items.
c) Critical thinking in simplified ways to select and refine content.	-True and false game, cause and effect game, comparing things, choosing the best and why game, "What if?" game, storytelling and character analysis game. -Training on using the smart tools that help children from the (Avatar Kids) program, which allows children to click on pictures to compose sentences and ideas that express their needs, and the application converts them into audible words.
d) Applications of AI in daily life	- Learn about voice commands: Introduce children to interactive sessions where they ask simple questions and commands, such as "What's the weather like today?" or "Play music," and encourage them to interact with voice to understand how these tools interact with them. - Learn about AI in photos: such as recognizing faces and places and easily organizing photos. This can be demonstrated to children through an activity that involves recognizing their friends and family in photos and categorizing them in a simple way
e) Sensory and interactive activities	The "Sound Recognition" game allows the child to distinguish the sound of an animal or a musical instrument and chooses from a group of pictures the sound he heard. - The "Learning Letters Through Touch" game - The "Visual Intelligence" game to distinguish shapes and colours
f) Learning about AI in a fun way	Using illustrated stories and illustrations, providing songs or educational games that explain how AI works

g) Providing resources to support self-learning	- Providing dedicated digital resources such as the Magic School program to encourage children to imitate sounds and improve pronunciation and speech. - An interactive educational game, the Magic School program, responds to the child's movement and touch, providing a fun and safe experience to discover and interact with shapes and colours.
(h) Stimulating creativity and thinking about the future	-The "Little Inventor" game: It includes a set of household tools or simple geometric shapes (such as cubes, plastic pieces) and children are asked to create new inventions using these materials. - "Drawing the Future" activity: Children imagine the world in 50 years, and what the things they use every day will be like, such as cars, houses, or schools, and then draw these

The prior activities of the program were conducted in accordance with safety protocols for each task (Appendix 1), thereby addressing the initial research question: "How can a program be developed to impart ethical principles for the safe utilization of AI applications to children with special needs - the study sample - focusing on privacy and security?" This is in accordance with: Lucken, 2017, Shamir et al., 2018, Brison, 2019, Hwang et al. 2020, Grimus, 2020, Muller, 2020, Wang, 2020, Boyle et al., 2021, Sharma, 2021, Abidova, 2023, Ahmadi, 2023, Faizi, 2023, Sadikovna et al., 2023, Oh-Young & Smith et al., 2024, and Yi H. et al., 2024, among others. In accordance with recent studies, including Chauhan, 2017, Salas, 2020, UNESCO, 2020, Wang 2020, Hwang et al. 2021, Faizi, 2023, Sadikovna et al., 2023, Ahmadi, 2023, Abbas 2023, and Gabriel J. et al., 2024, which pertain to equipping children with special needs with skills for the safe digital utilisation of AI and its applications, and the implications for their future learning, as well as safeguarding against misuse and violations, and ensuring the privacy and security of their data, the current study aims to enhance awareness and educate children with special needs—specifically the study sample—on the ethical and safe use of AI to mitigate associated risks. This demographic in Egypt urgently requires such education, as it is currently lacking in this area. Their courses lacked training in this regard, further contributing to the shortfall in this area.

Study Problem

Digital learning for people with special needs represents a fundamental shift in providing an inclusive and integrated learning environment. Using digital learning tools and assistive technologies, educational content can be adapted to suit students' diverse abilities and individual needs, enhancing their independence, self-confidence and increasing their engagement. These tools help overcome many of the obstacles that students with special needs may face in traditional education, such as difficulties accessing content, the need for a different learning style, and support for interaction and communication. Marzano et al., 2001& Means et al., 2010 Research indicates that the use of digital technology, including AI tools, contributes to improving learning outcomes and facilitating the provision of flexible educational activities designed to support learning. (UNESCO, 2021) Despite the great importance of using AI in the field of special education to overcome many disability problems, the current situation of the safe and ethical use of this technology in Egypt suffers from several difficulties and obstacles that can be summarized as follows: **a** - The high density of learners in classrooms, as many students cannot get the attention they need. **b** - The focus is not on

the learner during teaching and learning, but rather on completing the educational content. **c** - The lack of sufficient resources, in addition to weak communication and little support between peers, parents, teachers, and schools. **d** - There is a fact that most teachers are not qualified to use AI technology and its applications in education and have not received specialized courses in the field yet, and therefore learners are left without conscious supervision with this technology and its challenges, which if not monitored would have negatively affected their minds and concepts. This was a strong reason for conducting this study, so that its results can be recommended to those concerned with educating these children in Egypt, in the hope of drawing attention and moving towards measures that limit the risks, negatives and challenges of AI technology and its effects on children in general and on those with special needs in an urgent manner. Taking into account the above obstacles and difficulties in using AI applications for people with special needs in Egypt, in addition to the capabilities, capacities and needs of the study sample of children with disabilities, the study was limited to two basic principles for the safe and ethical use of artificial intelligence, namely the principle of privacy and the principle of security and safety, in order to develop a program that uses one of the AI applications suitable for disability to train children and familiarize them as much as possible through it with the risks surrounding AI and how to deal with them, which is the goal of the current study, to gain some principles of the safe and ethical use of AIto avoid the risks of this use, as the curricula of this category in Egypt are devoid of them, in addition to not receiving any training in this regard. Thus, the questions that the study discussed the answer to come as follows:

 1 - How can a program be prepared that aims to gain children with special needs - the study sample - the principles and ethics of the safe use of AI applications through the principle of privacy and the principle of security and safety?

2- What is the educational impact of the program on the acquisition by the study sample of children with special needs of the principle of privacy, and the principle of security and safety of the ethics of artificial intelligence?

Hypothesis

In order to address the second question of the study problem, the subsequent hypotheses were established:

H1: "Statistically significant differences exist at the 0.001 level in the pre- and post-application of AI program activities, favoring the study group in the results of testing AI ethics program activities post-application."

H2: The program activities implemented with the study group children effectively impart the principles of privacy and the principles of security and safety in AI ethics targeted in this study.

METHOD

The experimental approach was employed to meet the study objective, as it is suitable for ensuring the ethical use of certain AI applications among the child sample. A program was developed comprising a series of sensory activities along with their

respective objectives. An achievement test was developed to assess the degree to which the designed program met its objectives. The test was administered to a targeted sample of 21 children aged 7 to 8 years at Zahran Experimental School, which is representative of special education institutions and schools in Alexandria Governorate. The Hoda Shaarawy Experimental School served as the representative institution for the exploratory study group. The Magic School program for Ariis serves as the application utilised to fulfil the objectives of the current study and is implemented in certain informal educational institutions in Egypt (Appendix 2).

Study Tools

The study tool comprised a skill test based on sensory activities outlined in the literature and previous studies within the theoretical framework of this research, which aims to equip its sample with objectives related to the safe ethical use of AI applications. The Magic School program was utilised for this purpose, comprising a collection of sub-programs capable of generating individualised education programs and social story programs. It can adapt materials to an educational environment to facilitate the learning process according to the needs of each learner (Appendix 2).

Standardisation of the Research Instrument

1) Test validity: Eleven reviewers with expertise in curriculum and special education psychology from Egypt's schools of education and early childhood evaluated the study to make sure the activities were suitable for the target population and the goals of the research. After the suggested changes were made, the test was finally approved for its intended use.

Reliability Testing

1) Coefficient of reliability: An analysis was conducted to determine the intelligence test's reliability using Cronbach's alpha coefficient. Using the test on the exploratory sample produced a) reliability coefficient of 0.775 according to Cronbach's alpha.

b) The reliability of the intelligence test was evaluated using the reapplication coefficient. An overall test coefficient of (0.814) was obtained from the exploratory sample after administering the test; this value is statistically significant at the 0.01 level. As a result, the test is very reliable, which means it may be used in this study and guarantees that the results are reliable.

2) Time required to complete the test: This was found by averaging the times it took the fastest and slowest students to complete the test. The total time required to complete the test, including all of the questions, was found to be 38 minutes. There were thirty-four picture situations with yes/no questions on the test. For online education to adhere to ethical and safety requirements, these scenarios covered how students should act in response to certain situations and what they may do to lessen the impact of any dangers that may arise.

Design of Environmental Sensory Activities for AI Application Study Program

The literature and prior studies referenced in the research were identified, and the behavioural objectives of the sensory activities and the learning methods employed

were established (Appendices 2 & 3). Appendix 1 presents a program of suggested activities illustrated with elements of real-life educational situations. The following Table 2 illustrates these elements clearly.

Table 2
Elements of the illustrated situations and their numbers as mentioned in the test

Elements	Items numbers as mentioned in the test
1)Situations involving personal information and data	1,3,6,7,15,19,29,33
2)Situations of violating the privacy of information and data about others	2,5,10,13,22,27,30
3)Situations for transparency in data collection and use	4,8,14,12,16,21,24,34
Positions to distinguish between the negatives and positives of security and safety of access to the required content.	9,11,17,18,20,23,25,26 ,27,31,32

FINDINGS

H1: "Statistically significant differences were observed at the level of 0.001 in the pre-post application of AI program activities, favouring the study group in the results of testing program activities related to AI ethics, benefiting the post-application". To assess the validity of this hypothesis, the arithmetic mean, standard deviation, and "T" value were computed for the research experimental group, as presented in Table 3.

Table 3
Mean (M), Standard deviation, (SD), T-value and its significance for the pre and post-tests for the experimental group

	Item	Pre		Post		T value	Significance
		M	SD	M	SD		
1	Situations involving personal information and data	1.616	0.593	3. 753	0.693	14.875	0.002
2	Situations of violating the privacy of information and data about others	1.186	0.670	3.413	0.522	9.226	0.002
3	Situations for transparency in data collection and use	2.343	0.393	6.434	0.503	10.843	0.002
4	Positions to distinguish between the negatives and positives of security and safety of access to the required content.	1.793	0.697	3.721	0.598	9.760	0.002
	Test as a whole	7.938	1.179	17.321	320	23.475	0.002

The "T values" from the preceding table demonstrate substantial differences at the 0.001 level in the pre-post application of the AI program activities, favouring the study group in the results of the AI ethics testing program activities. This signifies that the initial hypothesis of the investigation has been validated.

H2: The program activities implemented with the study group youngsters are effective in imparting the principles of privacy and the principles of security and safety in AI ethics. This study focuses on certain targets. To validate the accuracy of this hypothesis, the experimental research group's post-test and pre-test assessments in the established

benchmarks for preschool aimed at equipping the study group with the principles of privacy and the principles of security and safety in AI ethics, the application of "Black's" equation was utilised, as illustrated in Table 4 below

Table 4
Alterations in the experimental research group's post-test data from the pre-test and Black's adjusted gain ratio

M	Item	Max. limit	Post mean	Pre mean	gain ratio
1	Situations involving personal information and data	3	3. 753	1.616	1.197
2	Situations of violating the privacy of information and data about others	3	3.413	1.186	1.222
3	Situations for transparency in data collection and use	6	6.434	2.343	1.310
4	Situations to distinguish between the negatives and positives of security and safety of access to the required content.	4	3.721	1.793	1.363
	Test as a whole	16	17.321	7.938	1.292

Table 4 indicates that the modified Black acquisition rate for each element pertaining to the ethics of safe AI usage among the study sample surpassed the minimum effectiveness threshold of 1.2. Consequently, both hypotheses of the study were validated, addressing the second research question: "What is the educational impact of the program on the acquisition by the study sample of children with special needs of the principles of privacy, security, and safety within the ethics of artificial intelligence?"

This study aligns with the findings of UNESCO, (2016), Chauhan, (2017), Borgesius, (2018), Collin et al., (2018), Cope, Kitto, and Knight (2018), Kalantzis, (2019), Salas, (2020), Wang, (2020), Boyle et al., (2021), Wang et al., (2021), Lim et al., (2022), Ahmadi, (2023), Faizi, (2023), Hopcan, (2023), Sadikovna et al., (2023), the U.S. Department of Education (2023), Gabriel, (2024), and Smith et al., (2024). The study's results indicate that the sensory activities undertaken by students during the program's implementation had a significant effect on the development of certain skills related to the ethical use of intelligence, as evidenced in Table (2) of the study, which encompasses: 1) Scenarios involving personal information and data, and 2) Scenarios concerning the infringement of others' information and data privacy. 3) Circumstances necessitating transparency in data acquisition and utilisation. 4) Scenarios to differentiate between the advantages and disadvantages of security and safety about access to the necessary content, as highlighted by the studies and the UNESCO 2023 study. The study's results (Tables 3, 4) demonstrated statistical significance at acceptable levels, signifying the successful attainment of its objective in equipping the sample with abilities related to the principles of privacy and the ethics of AI concerning security and safety. The utilisation of Black's equation (Table 4) demonstrated that the

children's replies to the test scenarios (Table 2) yielded a favourable educational impact (Table 3), signifying the experiment's effectiveness in fulfilling its objective.

CONCLUSION

The primary aim of this study is to develop a digital software that enhances the skills of the targeted impaired group regarding the ethical principles of AI, enabling safe use of this promising technology. Despite the statistically acceptable results of this study, the authors observed that the study sample exhibited considerable Internet search skills (refer to average values in Table 3) yet lacked measures to ensure safety while using websites and did not account for privacy or information selection, necessitating significant effort to rectify these detrimental behaviours. It was discovered that they established online folders containing personal information without implementing protective measures against privacy breaches, so rendering them vulnerable to cyber hackers (UNESCO, 2021, Bryson & Theodorou 2019). This was underscored by ongoing feedback when users encountered the program's scenarios to mitigate the risks and drawbacks of unconscious network and AI usage. A significant remark was noted regarding these students' conviction that AI is the ultimate solution to all life challenges, leading to an over reliance on technology that renders them oblivious to the value of traditional learning methods and problem-solving techniques (Wang, 2020). This matter requires the attention of individuals responsible for the education of those with special needs. The utilisation of AI enhances the educational experience by offering comprehensive solutions that facilitate seamless and enjoyable learning, thereby improving learners' skills and addressing their challenges and weaknesses (U.S. Department of Education, 2023). Numerous challenges in Egypt necessitate addressing the education of individuals with special needs in special education, owing to the diverse difficulties and requirements of each person. Furthermore, the implementation of AI necessitates substantial financial investment, which many institutions lack, hence exacerbating the digital divide. Disparities in technological access among pupils may result in varied advantages derived from artificial intelligence. It is imperative to guarantee that the application of AI in special education is inclusive and accessible to all, enabling every student to utilise it as a unique instrument that addresses numerous challenges in teaching and learning for those with disabilities.

RECOMMENDATIONS

Here are some suggestions based on the study's findings and analysis: 1) Research should be undertaken to address the outstanding issues raised in the theoretical review about the safe application of AI ethics to individuals with special needs. 2) Those with power in the realm of education ought to design and implement AI ethics programs for students at all grade levels and special needs populations. 3) Educators and students alike should have access to digital security training programs that cover topics like keeping sensitive data safe and making responsible use of school resources. 4) As artificial intelligence (AI) evolves, it is imperative that everyone involved in special education—from educators and parents to lawmakers and tech specialists join forces to guarantee that all kids will reap the ethical and positive benefits of AI. 5) Traditional methods of instruction should coexist with AI applications because they offer support

for many scholarly and humanitarian concerns that AI cannot. 6) Egyptian society and lawmakers ought to encourage a secure and suitable online learning environment.

REFERENCES

Abbas, Z. R. (2023). *The effect of digital educational game on the visual perception of dyslexic first grade students* [thesis]. Tehran, Iran: Allameh Tabataba'i University.

Abidova, N. (2023). Creating an Inclusive Educational Environment for Children with Special Educational Needs. *Texas Journal of Engineering and Technology, 27*, 36-38.

Ahmadi, A. (2023). *Designing an educational program based on social robot technology and its impact on social skills and academic achievement motivation of high-functioning autism spectrum disorder students*. Tehran, Iran: Allamah Tabatabaei University.

Akgun, S. & Greenhow, C. (2021). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. *AI and Ethics*, 1–10.

Ashok, M.; Madan, R., Joha, A.; & Sivarajah, U. (2022). Ethical framework for Artificial Intelligence and Digital technologies. *International Journal of Information Management, 62*, 102433.

Borgesius, F. Z. (2018). Discrimination, artificial intelligence and algorithmic decision-making. Strasbourg: Council of Europe.

Bostrom, N., & Yudkowsky, E. (2014). The ethics of artificial intelligence. In K. Frankish, & W. Ramsey (Eds.), *The Cambridge Handbook of Artificial Intelligence*, 316–334.

Boyle, S., McNaughton, D., Light J., Babb S., & Chapin S. E. (2021). The effects of shared e-book reading with dynamic text and speech output on the single word reading skills of young children with developmental disabilities. *Language, speech, and hearing services in schools, 52*(1), 426-435.

Bryson, J. J., & Theodorou, A. (2019). How society can maintain human-centric artificial intelligence. *Human-cantered digitalization and services*, 305-323.

Chauhan, S. (2017). A meta-analysis of the impact of technology on learning effectiveness of elementary students. Computers & Education, 105, 14-30.

Chauncey, S. A., McKenna, H. P. (2023). A framework and exemplars for ethical and responsible use of AI Chatbot technology to support teaching and learning. *Computer and Education: Artificial Intelligence, 5*, Article 10018.https://doi.org/10.1016/j.caeai.2023.100182

Chauncey, S. A., & McKenna, H. P. (2023). A framework and exemplars for ethical and responsible use of AI Chatbot technology to support teaching and learning. *Computers and Education: Artificial Intelligence, 5*, 100182.

Chen X., Xie H., Zou, D., & Hwang, G. J. (2020). Application and theory gaps during the rise of artificial intelligence in education. *Computers and Education: Artificial Intelligence, 1*, 100002.

Chen L., Chen P., & Lin, Z. (2020). Artificial intelligence in education: A review. *Ieee Access, 8*, 75264-75278.

Collins, B. C., Lo Y., Park, G., Haughney, K. (2018). Response prompting as an ABA-based instructional approach for teaching students with disabilities. *TEACHING Exceptional Children, 50*(6), 343–355.https://doi.org/10.1177/0040059918774920

Cope, B., & Kalantzi, M. (2019). Education 2.0: Artificial intelligence and the end of the test. *Beijing International Review of Education, 1*(2-3), 528-543.

Cook B., Buysse V., Klingner, J., Landrum, T., McWilliam, R., Tankersley, M., & Test, D. (2014). Council for Exceptional Children: Standards for evidence-based practices in special education. *Teaching Exceptional Children, 46*(6), 206.

Dalton, EM. (2017). Universal Design for Learning: Guiding Principles to Reduce Barriers to Digital & Media Literacy Competence. *Journal of Media Literacy Education 9*(2), 17-29, Doi: 10.18178/ijiet.2020.10.7.1418

Drigas, A., & Ioannidou, R.E. (2013). A review on artificial intelligence in special education. *Communications in Computer and Information Science*, 385–391.

Duncan, K., & Hall, R. (2024). Working with students with lived experience of disability to enhance inclusive and accessible learning. Designing Learning Experiences for Inclusivity and Diversity: Advice for Learning Designers.

Lim, H. A., Ellis, E. M., & Sonnenschein D. (2022). Effect of sing and speak 4 kids: An online music-based speech and language learning game for children in early intervention. *Child Language Teaching and Therapy, 38*(2), 180-196.

Fagan F., & Levmore, S. (2019). *The impact of artificial intelligence on rules, standards, and judicial discretion*. S. Cal. L. Rev., 93, 1.

Faizi, F. (2023). *Designing and validating of learning program using artificial intelligence and its impact on problem solving skills of students with math learning disorder* [thesis]. Tehran, Iran: Allamah Tabatabaei University.

Floridi, L. (2018). Soft ethics and the governance of the Digital. Philosophy & Technology. Holmes W, Porayska-Pomsta K, Holstein K, Sutherland E, Baker T, Shum SB, Santos OC, Rodrigo MT, Cukurova M, Bittencourt II, and Koedinger KR Ethics of AI in education: Towards a community-wide framework *International Journal of Artificial Intelligence in Education*. 2021.

Gabriel, J. (2024). How Artificial Intelligence (AI) impacts inclusive education, *Educational Research and Reviews, 19*(6), 95. https://www.researchgate.net/publication/382540738_How_Artificial_Intelligence_AI_impacts_inclusive_education.

Grimus, M (2020). Emerging Technologies: Impacting Learning, Pedagogy and Curriculum Development. In: Yu S, Ally M, Tsinakos A (eds) Emerging Technologies and Pedagogies in the Curriculum. Bridging Human and Machine: Future Education with Intelligence. *Springer Singapore.* Available at: https://doi.org/10.1007/978-981-15- 0618-5_8

Holmes, W., Liu, L., Mintz, J., & Perez-Ortiz, M. (2023). Artificial Intelligence and K-12 education: Possibilities, pedagogies and risks. *Computers in the Schools, 40*(4), 325-333. https://doi.org/10.58863/20.500.12424/4273108

Hooijer, E, Merwe MVD, Fourie, J (2021). Symbolic Representations as Teachers Reflect on Inclusive Education in South Africa. *African Journal of Teacher Education 10*(1), 127-152.

Hopcan, S., Polat, E., Ozturk, M. E., & Ozturk, L. (2023). Artificial intelligence in special education: A systematic review. *Interactive Learning Environments, 31*(10), 7335-7353.

Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision challenges roles and research issues of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence, 1*, 100001.

Jamelh, Mi, Mohammed, A. (2021). *Universal design for learning for educating students with intellectual disabilities: a systematic review. 68*(6), 800-808.

Kamalov, F., Santandreu, D., & Gurrib, I. (2023). New era of artificial intelligence in education: Towards a sustainable multifaceted revolution. *Sustainability, 15*(16), 12451.

Kelly, S, Kaye, SA, Oviedo-Trespalacios, O. (2023). *What factors contribute to the acceptance of artificial intelligence, A systematic review*. Telematics and Informatics 77:101925.

Kielblock, S, Woodcock, S (2023). *Who's included and Who's not? An analysis of instruments that measure teachers' attitudes towards inclusive education*. Teaching and Teacher Education 122:103922.

Kitto, K., & Knight, S. (2019), Practical ethics for building learning analytics. *British Journal of Educational Technology, 50*(6), 2855-2870.

Kong, N., J. Carta and C. Greenwood (2021), "Studies in MTSS problem solving: Improving response to a pre-kindergarten supplemental vocabulary intervention", *Topics in Early Childhood Special Education, 41*(2), 86-99. https://doi.org/10.1177/0271121419843995.

Leslie, D. (2019). *Understanding artificial intelligence ethics and safety: A guide for the responsible design and implementation of AI systems in the public sector.*

Luckin, R. (2017). Towards artificial intelligence-based assessment systems. *Nature Human Behavior, 1*(3), 0028.

Marzano, R. J., & Pickering, D. J. (2011). *The highly engaged classroom.* Solution Tree Press. Doi: 10.1080/20473869.2021.1900505

McMahon, D. D., Barrio, B., McMahon, A. K., Tutt K., & Firestone, J. (2021). Virtual reality exercise games for high school students with intellectual and developmental disabilities. *Journal of Special Education Technology, 35*(2), 87-96.

McNicholl, A, Casey H, Desmond, D, Gallagher, P (2021). The impact of assistive technology use for students with disabilities in higher education: a systematic review. *Disability & Rehabilitation*: *Assistive Technology 16*(2), 130-143.

Morrison, N. (2023). *Half of teachers believe AI will change education for the better*. Forbes.

Naik, N., Hameed B. Z., Shetty D. K., Swain D., Shah, M., Paul R., & Somani B. K. (2022). Legal and ethical consideration in artificial intelligence in healthcare: who takes responsibility? *Frontiers in surgery, 9*, 862322.

Neeharika, C. H., & Riyazuddin, Y. M. (2023). *Artificial Intelligence in Children with Special Need Education*. In 2023 International Conference on Intelligent Data Communication Technologies and Internet of Things (IDCIoT), 519.

Nihal, K. S., Pallavi, L., Raj, R., Babu, C. M., & Mishra, B. (2023, November). *Enhancing Soft Skill Development with ChatGPT and VR: An Exploratory Study*. In 2023 International Conference on Research Methodologies in Knowledge Management, Artificial Intelligence and Telecommunication Engineering (RMKMATE) (pp. 1-6). IEEE.

Nguyen, A., Ngo, H. N., Hong, Y., Dang B., & Nguyen, B. P. T. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologie, 28*(4), 4221-4241

Oh-Young, C., & Karlin, M. (2024). *Artificial Intelligence... In the Early Childhood Special Education Classroom*? TEACHING Exceptional Children, 00400599241231237.

Ouyang, F., & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. Computers and Education: *Artificial Intelligence, 2*, 100020.

Powell A., Watson, J., Staley, P., Patrick, S., Horn M., Fetzer, L., & Verma, S. (2015). *Blending Learning: The Evolution of Online and Face-to-Face Education from 2008-2015*. Promising Practices in Blended and Online Learning Series. International association for K-12 online learning.

Boyle, S., McNaughton, D., Light, J., Babb, S., & Chapin, S. E. (2021). The effects of shared e-book reading with dynamic text and speech output on the single word reading skills of young children with developmental disabilities. *Language, speech, and hearing services in schools, 52*(1), 426-435.

Rai, H. L., Saluja N., & Pimplapure, A. (2023). AI and Learning Disabilities: Ethical and Social Considerations in Educational Technology. *Educational Administration: Theory and Practice, 29*(4), 726-733.

Reiss, MJ. (2021). The use of AI in education: Practicalities and ethical considerations *London Review of Education, 19*(1), 9.

Sadikovna, RK, Azimjon, oz.'s OJX. (2023). The Importance of Inclusive Education in Solving the Problem of Equality in the Education of Children with Special Needs. *Open Access Repository, 4*(3), 76.

Salas-Pilco, S. (2020). The Impact of AI and Robotics on Physical, Social-Emotional and Intellectual Learning Outcomes: An Integrated Analytical Framework. *British Journal of Education Technology, 51*(5), 1808-1825.

Schmidt, J. J., & Sweeney, J. (2015). *Assistive Technology in Special Education: A Comprehensive Guide*. https://disabilityrightswa.org/publications/assistive-technology-special-education-students/

Şen, N., & Akbay, T. (2023). Artificial intelligence and innovative applications in special education. *Instructional Technology and Lifelong Learning, 4*(2), 176-199

Shamir, A., O. Segal-Drori and I. Goren. (2018), "Educational electronic book activity supports language retention among children at risk for learning disabilities", *Education and Information Technologies, 23*(3), 1231-1252. https://doi.org/10.1007/s10639-017-9653-7

Smith, S. J., Basham, J. D., & Marino, M. T. (2021). Moving Beyond Access: An AI-based Inclusive Education Framework for Students with Disabilities. *Journal of Special Education Technology, 36*(2), 79.

Smith, S. J., Rowland, A., Goldman, S., & Carreon, A. (2024). A Guide for Special Education Leaders to Utilize Artificial Intelligence: Students' Perspectives for Future Consideration. *Journal of Special Education Leadership, 37*(2), 77-92. Journal of Special Education Leadership, 37(2), 77-92.

Standen, P. J., Brown, D. J., Taheri, M., Galvez, M. J., Boulton, H., Burton, A., & Hortal, E. (2020). An evaluation of an adaptive learning system based on multimodal affect recognition for learners with intellectual disabilities. *British Journal of Educational Technology, 51*(5), 1748-1765.

Sustainable Development Strategy: Egypt Vision 2030 -Education and Training Axis. 2015

Tambe, P, Cappelli, P, and Yakubovich, V. (2019). Artificial intelligence in human resources management: Challenges and a path forward California Management. *Review 61*(4), 15-42.

UNESCO, (2023). *Inclusion in Education. UNESCO.* Available at: https://www.unesco.org/en/inclusion-education

UNESCO. "Artificial Intelligence." United Nations Educational, Scientific and Cultural Organization, 2021.

UNICEF. (2014). Conceptualizing inclusive education and contextualizing it within the UNICEF mission webinar 1—Companion technical booklet. *Pridobljeno, 11*(2), 2023. United Nations (2017). Toolkit on disability for Africa. Inclusive Education.

United Nations Educational, Scientific and Cultural Organization, & Organization, C. (2021). *Recommendation on the Ethics of Artificial Intelligence*. United Nations Educational.

U.S. Department of Education. (2023). *Artificial intelligence and future of teaching and learning: Insights and recommendations.*

Vitanov, L., & Dinkova, K. (2023). using information technology in technology and entrepreneurship classes in primary school. *Knowledge-International Journal*, *57*(2), 287-292.

Wang T., & Cheng, E. C. K. (2021). An investigation of barriers to Hong Kong K-12 schools incorporating Artificial Intelligence in education. *Computers and Education: Artificial Intelligence, 2*, 100031.

West-Smith, P., Butler, S., & Mayfield, E. (2018). *Trustworthy automated essay scoring without explicit construct validity.* In Proceedings of the AAAI Spring Symposium on AI and Society: Ethics, Safety and Trustworthiness in Intelligent Agents.

Yi H., Liu, T. & Lan, G. The key artificial intelligence technologies in early childhood education: a review. *Artif Intell Rev. 57*, 12 (2024).

Zaraii, ZE. (2019). Designing and validating the blended learning model with emphasis on digital technologies for students with special educational needs. *Psychology of Exceptional Individuals. 9*(34), 51-78.

Zavaraki, Z., Alimardani, F. (2023). *The role of blended learning approach on interaction process of students with special educational needs*. In: Ed Media+ Innovate Learning. Association for the Advancement of Computing in Education (AACE). USA,1243-1247.

Zhai, X., & Panjwani, S. (2023). *AI for Students with Learning Disabilities: A Systematic Review.*