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The Benefits of Artificial Intelligence Mobile Applications in Improving Learning for Children with Intellectual Disabilities: A Pilot Study Perspectives from Special Education Teachers

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Abstract

This pilot study aimed to explore the benefits of artificial intelligence educational mobile applications in improving the learning skills of children with IDs from the perspective of special education teachers. The integration of AI mobile applications in education offers personalized learning experiences, adaptive content delivery, and real-time feedback, addressing the individual needs and learning paces of students. The objectives of this research were to examine the practical impacts of AI applications on student engagement, comprehension, and skill acquisition, and to know the perspectives about the benefits of artificial intelligence technology in the teaching and learning process of children with IDs. The researchers used a descriptive approach to measure the perceptions of special education teachers using AI mobile applications to improve the learning skills of children with intellectual disabilities. Through the random sampling method, 50 special education teachers were selected for the data collection who were employed in one division of Punjab Province, Sahiwal. Only five AI mobile apps (AutiSpark, Khan Academy, Happy Kids, Daily Tasks and Luca & Friends) were also selected by using a simple random technique. The study tools consisted of a self-made, closed-ended questionnaire aimed at identifying the perspectives of special education teachers on using AI educational mobile applications to improve learning skills for children with IDs. Findings indicated that AI-based educational applications significantly improve attention spans, motivation, and learning outcomes by providing interactive and tailored educational content. Teachers reported a noticeable change in increased student autonomy and confidence. The perceptions of special education teachers based on their qualifications were quite different about the use of artificial intelligence mobile applications in the teaching and learning process of children with IDs. The results showed that higher-qualification teachers were more eager about the use of AI mobile applications. The researchers recommended that AI educational mobile applications can play a significant role in the improvement of the learning skills of children with IDs.

Keywords: Artificial Intelligence (AI), Mobile Applications, Children with Disabilities, Special Education Teachers.

Introduction

Due to the rapid development of technology and science, the interest in technology products is increasing day by day among people, irrespective of their age and the environment they live in. With the use of technological products affecting every aspect of daily life, the advancement of technology has also made a huge impact in the field of education. Special education, like other fields, has been greatly affected by technology (Metatla et al., 2018). In addition to the proliferation of information sources in technology and the increase in the variety of technological products, technology is constantly securing its position in the field of special education through its various effects make such as easy access, rapid use, and appeal to multiple people (Woodward, 2002).

Rapid technological advancements are bringing significant changes to the lives of people with special needs. The use of technology in special education gives everyone the opportunity to learn without the constraints of time and space (Bouck, & Flanagan, 2014). Technology can create a special learning environment within the classroom in which instruction can be tailored to the interests and needs of students, taking into account individual differences and the needs of children with learning difficulties. In this way, each child can learn things at their own pace and can access information without the help of another person. Thus, through the effective use of technology, people

with special needs can learn about any subject or in the field in which they want to express themselves, can express themselves more easily (Boyle & Kennedy, 2019).

Artificial intelligence (AI) has played an undeniable role in most technological developments. AI-based computer applications, robots, and other technological devices have provided great convenience to users in all areas of human life. In recent decades, AI-based applications have also begun to find their place in special education (Chen, et al., 2022). AI applications are designed to assess special children, individual differences, and affinities, adjust learning at their own pace, and support independent learning. Recent advancements in AI applications are facilitating the development of collaborative environments for people with special needs and the lives of their caregivers. By applying AI to schools for children with special needs, it may be possible to improve your quality of life at home and at work (Zhai, et al., 2010).

In recent times, many studies have been conducted to apply artificial intelligence and machine learning to mobile devices in order to increase the quality of computing, improve it, and create possibilities for new applications, such as facial recognition, speech recognition, natural language processing, and virtual reality. However, machine learning requires a large computational capacity for complex training and learning (Okagbue, et al., 2023). The use of AI in mobile devices takes education to a higher level, facilitating interactive and personalized learning by helping students in less time. For example, virtual reality facilitates the learning process outside the learning space to create a global classroom, as AI can connect students to the virtual classroom. Also, AI-based chatbots provide education by transforming chat into easy-to-understand conversations. Artificial intelligence technology can also predict a student's level of understanding (Martin, et al., 2023).

AI-based teaching apps are revolutionizing the education sector by offering learning experiences tailored to the individual needs of the students. These applications use machine learning and natural language processing to deliver interactive, engaging and personalized content. The use of AI in education is not only about leveraging technological advancements, but also about democratizing education and empowering children, including high-quality learning experiences and accessibility to a wider audience. By leveraging AI, teachers can create inclusive and engaging learning environments in their classrooms that promote the academic and social development of children with special needs (Umali, 2023).

Today's education professionals are witnessing a technological revolution unfold in real-time, with AI-powered learning platforms, educational games, chatbots, virtual tutors, and organizational tools proliferating by the day in education (Denga & Denga, 2024). In the future, teachers should be able to maximize the benefits of using AI in the classroom. Through this study, the researchers highlighted the importance of AI mobile apps and also found out how effective these AI mobile apps are in improving the learning skills of children with intellectual disabilities from the perspective of special education teachers.

Statement of the Problem

The continued use of AI applications in education has inevitably impacted education in different ways. The rise of AI in education is not just about technology. It's about transforming the way we teach and learn, making education more accessible, personalized, and effective. The study seeks to explore how AI has affected the teaching and learning processes and curricula. It is anticipated that the study will ascertain that AI educational mobile applications have fostered effectiveness in the field of special education to enhance the learning skills of children with IDs and have overall fostered improved instructional and learning effectiveness in special education.

Significance of the Study

Special education teachers face many challenges while teaching students with intellectual disabilities in class. This study may help to resolve these issues with the use of AI educational mobile applications in the classroom. AI mobile applications have the potential to provide support in the teaching and learning process. These applications can offer personalized learning experiences, adapting to the unique needs and capabilities of each student. This personalization can maximize learning outcomes and facilitate skill development. This study may also help to enable students with intellectual disabilities to acquire the necessary skills in the classroom and at home according to their self-paced learning and immediate feedback during the learning process, which can also reduce the anxiety and burden of these children.

Research Objectives

The study was conducted to achieve the following objectives to.

1. analyze the perceptions of special education teachers about the use of AI mobile applications for children with IDs.
2. find out the benefits of AI mobile applications in improving learning skills for children with intellectual disabilities.
3. see the significant difference in perceptions of special education teachers about AI-based apps on their gender, age, qualification and BPS.

Research Questions

This study was focused on these three research questions, which are as follows:

1. What were the perceptions of special education teachers about the use of AI mobile applications for children with IDs?

2. What were the benefits of AI mobile applications in improving learning skills for children with intellectual disabilities?
3. What were the significant differences in perceptions of special education teachers about AI-based apps on their gender, age, qualification and BPS?

Literature Review

Technology is evolving to serve a wide variety of sectors in life, including civil and military applications (Rodriguez, et al., 2010). Cell phones and the Internet are interconnected technologies that are significantly affecting our daily lives (Huba & Kozák, 2016). A controversial debate continues between parents. Similarly, another fast-growing innovation in technology that could fundamentally change the education system is artificial intelligence. The use of AI in education has gained the attention of researchers and educators in recent times, with experts hailing it as a revolutionary tool to improve teaching and learning. One of the most important benefits of AI in education is the technology's ability to personalize learning experiences for individual students.

Kelleher and Tierney (2018) noted that artificial intelligence algorithms are used to create personalized learning plans for each student based on their needs, interests, and abilities, allowing children to better adapt lessons. can help improve learning and engagement. Because students are more likely to be motivated by content tailored to their interests. The use of artificial intelligence can help reduce the workload of teachers, thereby allowing them to plan better in less time and work more efficiently with individual children and save more time. To illustrate this with this example, with the help of artificial intelligence we can easily assess and classify children, thus teachers can save time for their other tasks. (Mandernach, 2018). Additionally, artificial intelligence tools can help provide valuable data on children's performance, allowing a teacher to improve their instruction and learning outcomes using artificial intelligence (Baker & Siemens, 2014).

Over time, technological tools have changed, or at least modified, to become real aids in the teaching and learning process. If we look at these technological tools in detail, the progressive spread of these technologies cannot be stopped, especially since computers used to be on the desks of our homes and offices and have now been replaced by mobile devices, chatbots and the Internet. Furthermore, according to Larry Page, artificial intelligence should be the ultimate version of any Internet search engine that teachers and students can use for educational purposes (Todino, et al., 2022).

Various research shows that most artificial intelligence applications are for students (Miao et. al., 2021), with intelligent tutoring systems (ITS) being the most researched and available applications used by students in education (Feng & Law, 2021). Therefore, the framework taken for this study was the Intelligent Tutoring System, developed by John Anderson at Carnegie Mellon University. An intelligent tutoring system that selects problems and feedback based on a (constantly updated) model of possible knowledge for the learner by comparing the questions or answers inputted by the student to an expert model provides correct answers and feedback to the learner and gives an expert opinion to the learner (Butcher & Jameson, 2016).

Special children face many challenges in the traditional school environment, especially children with learning disabilities in regular classes. An intelligent tutoring system (ITS) is any computer system or software application that attempts to mimic the work of a human tutor while supporting learning theory. An intelligent tutoring system that provides direct and customized instruction without human intervention in problem domains such as mathematics, clinical diagnostics, and distance learning (Feng & Law, 2021). An ITS also supports the creation of programs that support one-to-one and collaborative learning. Some studies show that intelligent tutoring systems help special children learn. This system aims to support and complement special children with better learning strategies through mobile applications. Therefore, adapting ITS for mobile devices will support the learning process of children and increase the possibilities for collaborative learning (Cabot, et al., 2014). It concludes that intelligent tutoring systems enabled by mobile apps can be very helpful for learning by reducing stressful environments for special children (Baker & Smith, 2019).

There are many educational apps based on artificial intelligence that can be easily used through mobile phones, with the help of these apps, a teacher can increase the possibilities of teaching children with mental disabilities and get good results, it can also increase interest in children (Hassan & Al-Sadi, 2009). This literature review explored the benefits of AI mobile applications effective for children with IDs, and through this pilot study took the perceptions of special education teachers on how AI apps could be useful in improving the learning skills of children with IDs.

Children with Intellectual Disabilities

Intellectual disability, sometimes called cognitive disability, is defined as a disability formerly known as mental retardation. These children are characterized by deficits in both intellectual functioning and adaptive behavior, such as conceptual Manifested in cognitive, social, and functional adaptive skills, this disability occurs before the age of 18. (Schalock et al., 201; Tassé, et al., 2012). Schalock et al. (2011) pointed out that due to intellectual disability, these children have reduced cognitive and adaptive abilities and require extraordinary assistance to participate in activities that include normal human functioning.

Problems Faced by Children with IDs in the Classroom

Children with IDs face some challenges in the classroom, which also affect their learning, here we discuss these challenges faced by these children.

Learning Problems

Children with intellectual disabilities often have difficulty performing cognitive tasks, making it difficult for them to understand and retain new concepts. As a result, these children may make slower academic progress than their peers. Other studies have shown that these children require more repetition and simplified instruction to be taught effectively (Smith, 2017).

Low Attention Span

Many children with ID also have a short attention span, which makes it difficult for them to stay focused during reading lessons. Instructions have to be given. Research shows that attention deficit disorder is common among these children due to this lack of cognitive ability, which affects their academic performance (Guralnick, 2017).

Learning at a Different Pace

Children with intellectual disabilities need more time to understand things and complete tasks. In a traditional classroom, teachers try to rush their lessons, but these children cannot follow the lessons taught by the teacher. Therefore, these children lag behind other children. Hence, teachers should adjust their teaching strategies according to their learning speed (Beaulieu & Morin, 2016).

Motor Skill problems

Some children have mental disabilities as well as physical impairments that affect their motor skills. Children may have difficulty completing tasks that involve writing, using tools, or participating in physical activity. Because motor skill development is delayed in these children (Matheis & Estabillo, 2018).

Health Related Issues

These children also suffer from various health problems that require medical attention and are often absent from school. Health problems disrupt their learning and social interactions. Health problems often make it difficult for these children to participate in educational activities (Arora et al., 2020).

Inadequate Special Education Resources

Schools lack the resources needed to support these children, such as special teachers and adaptive learning materials. Therefore, limited resources limit the effectiveness of their education. The availability of resources for special education programs is a critical factor in their success (Peyton & Acosta, 2022).

Faced rejection by the Teacher

Teachers who teach children in regular schools may not have the training or experience needed to teach these children effectively. As a result, it is difficult for a typical teacher to teach these children in the classroom. Therefore, it is important to develop the professional development of these teachers so that they are equipped with the skills to support these students (Mapuranga, 2015).

Reasons behind the need AI for special children

Special education includes children with physical, mental, emotional, or behavioral difficulties who have unique learning needs. Therefore, individualized education programs are provided to these students to meet their specific learning needs. These children cannot be taught in traditional settings and old teaching methods, so modern methods have to be resorted to meet their diverse needs.

Applying AI in special education can help address these types of challenges. AI-powered tools, applications, and technologies can help provide personalized learning experiences that can help improve the skills development of these children, and these students can easily access the learning process. Now there are artificial-intelligence-based apps that help every student learn according to their ability. With the help of these apps, teachers can understand the performance of students and improve their teaching strategies (Singh & Jain, 2024).

Benefits of AI Applications Using in Learning

There are various AI apps for special children that we can use to make the educational process of these children more efficient and beneficial (Şen & Akbay, 2023). They are as follows:

Increased Student Engagement

Educational apps that use AI are immensely beneficial to students' learning experiences. These apps help these students understand their course work. Using these AI apps promotes the active participation and interaction of the child in the classroom ‹and AI algorithms analyze user data to facilitate learning for students based on their customized needs, preferences, and learning styles (Malik et al., 2017).

Fill Gaps between Teachers and AI

The development of artificial intelligence-powered tools has made its mark in education. These tools are beneficial in supporting children's skill development and assessment systems. These tools help fill the gap when a teacher is not available. Using AI in the educational process can benefit both teachers and students. AI allows teachers to connect with students more effectively and efficiently (Yagyaeva, et., 2024).

Lifelong Learning and Professional Development

The use of AI has enabled lifelong learning by facilitating the continuous development of individuals. Students can create customized plans that help them learn and study anywhere and anytime. AI tracks students' progress to ensure relevance and timely suggestions to improve their professional development journey. This personalized approach also allows for improved adaptability to the changing educational landscape for teachers (Sangapu, 2018).

Adaptive Learning Paths

For students who have learning difficulties, adaptive learning helps them learn dynamically and adjust the content. It helps such students learn things at their own pace. This can improve the progress of these students by increasing their motivation. These tools are useful for providing schedules and plans for students who struggle to find time to study (Lin, et al., 2022).

Universal Access for all Students

An important and exciting aspect of the benefits of AI in EdTech apps is that these apps have the potential to provide a universal classroom for all students, regardless of language barriers and disabilities. This opens up study opportunities for students who are unable to attend school due to illness or disability. These artificial intelligence apps have enhanced learning opportunities for students with disabilities or special needs. AI apps have the ability to enable students with visual impairments and dyslexia to learn and listen to their respective courses (Celik, 2023).

Meaningful and Immediate Feedback to the Students

AI apps have this capability that allows students to find solutions to their questions on time using these apps. For those students who feel shy about asking questions of the teacher in the classroom, these apps are very useful. So, AI helps those students who feel shy about asking questions these apps provide an opportunity to correct these children's mistakes. These students can use these apps to get timely, useful, and appropriate feedback (Sangapu, 2018).

Provides Data Driven Insights

AI apps have the ability to analyze vast amounts of data provided by students to support them, offering opportunities for individualized learning and improvement. Educators can review their students' test scores and provide feedback to each student. Data-driven methods help instructors develop their teaching methods and better deliver curriculum content, thereby enhancing the student learning experience (Yagyaeva, et., 2024).

Mobile Applications

A mobile application is often referred to as an app (Crook et al., 2017). It is a type of application software designed to run on a mobile device such as a smartphone, tablet or any touchscreen device. Mobile applications provide convenient services to common users who can use them with ease. Now in the market there are games, calculators, mobile web browsing and other different types of mobile software platforms which are small, limited and Isolates are functionally lightweight.

AI Apps Using in Education

After analyzing the benefits of AI, we can now decide how we can use AI-featured educational apps to teach children. A special education teacher can use these educational apps in the best way to engage his students. Let us now to know about the usage of these AI apps (Fitria, 2021).

Google Assistant

Google classroom is a comprehensive platform that allows teachers to improve the grading process for their children with the help of AI. AI-powered algorithms help teachers simplify course content and make the course easier for students. Google Translate and Google Scholar are great tools that enrich the student experience with a better and easier research experience (Felix, et al., 2018 & Elahi et al., 2019).

Duolingo

The Duolingo app generates sounds using AI. It generates AI prompts, a tool that serves as a key tool that provides convenience, speed, and productivity to in-house teachers. With the Duolingo app, a teacher can enhance their students' learning experience (Nushi, et al., 2017 & Fitria, 2021).

Daily Tasks

The Daily Task App is designed for children who have difficulty with motor skills and attention spans. This app helps them improve their fine motor skills and attention span. In addition, the app involves children going through different scenarios and enabling them to complete each task, such as brushing their teeth or applying shampoo while taking a bath. Additionally, it includes improving eye/hand coordination by enabling children to focus on simple everyday tasks in an engaging and interactive story (Rehman, et al., 2021).

Happy Kids

HappyKids is a mobile app that includes educational videos and games for special children. The feature of this app is that it uses AI technology to recommend videos and games based on the interests and abilities of children, which makes the learning process more personalized and engaging (Rehman, et al., 2021).

Khan Academy

Khan Academy Kids is a free educational app designed for children aged 2–8 years. Khan Kids Library includes children's books, games, reading, math activities, and more. This app empowers children through personalized lessons and engaging visuals that help them develop and understand. This app also provides an opportunity and encouragement for all children to create a comprehensive educational experience (Fitria, 2021).

AutiSpark

AutiSpark app offers kids fun and interactive learning games. In this app, kids can learn to connect objects through pictures, understand emotions, sort, recognize sounds, words, and much more. It is highly effective and beneficial for children with intellectual disabilities (Kim, et al., 2018).

Luca & Friend

It is the first app to provide children with an immersive, interactive learning experience for learning and fitness through the latest AI motion technology. Luca & Friends gives kids an adventure; this app is full of educational games and animated characters, which is a dream for a child (FE Bureau, & Chaudhary, 2022).

Research Evidence AI Mobile Applications use in Special Education

Pilot studies and case studies help us understand the practical implications of AI mobile applications in special education. Kucirkova et al. (2014), conducted a pilot study exploring the use of a personalized storytelling app for children with autism spectrum disorder (ASD), highlighting improvements in communication skills and social interactions. What did Similarly, another study by Costanzo et al. (2023) study showed that artificial intelligence applications could improve communication abilities and promote adaptive abilities in children with DS. This study also reported that use of the applications could improve linguistic abilities, particularly naming.

Special Education Teacher Perspectives on AI Applications

Special education teachers cannot live without being influenced by today's rapidly growing technologies. Therefore, teachers can play an important role in implementing and testing AI mobile applications as they have experience in their field. can improve the educational development of children. These AI apps can reduce teachers' workload in routine tasks such as grading and tracking progress, allowing teachers to tailor instruction to children's individual needs (Goldman, et al., 2024). Teachers can better prepare their lessons with the help of AI and eliminate the mistakes they face while teaching children.

Methodology

This pilot study was employed a survey research design using a quantitative method to provide a comprehensive understanding of the benefits and importance of AI mobile applications in improving the learning skills of children with IDs. This study examined special education teachers' perspectives on the implementation and effectiveness of these AI applications in the classroom.

Earlier, many researchers applied quantitative research with a survey design to achieve their research objectives. Through the quantitative method, results could be easily generalized, compared, and summarized, because it relies heavily on random sampling. This survey consisted of self-administered questionnaires, developed according to supervisor instructions, to collect information on the variables of interest (McMillan & Schumacher, 1993). This allowed researchers to reach more respondents and generalize the research findings to a representative population (Gall, et al., 2003).

Population and Sample

The population for this study was special education teachers in Sahiwal Division. The researchers selected 50 special education teachers using a simple randomization technique who had experience teaching children with IDs in public schools. They knew how to operate mobile devices, computers, and tablets well and how to install and use AI applications. They used the applications selected by the researchers in class during their teaching. Whenever these teachers encountered a problem, the researchers immediately solved it. The researchers reviewed various articles about artificial intelligence-based applications in which AI-based technology was used. After that, the researchers carefully selected five AI mobile apps for study (AutiSpark, Khan Academy, Happy Kids, Daily Tasks and Luca & Friends).

Artificial intelligence technology has been used in the design of these apps. These apps could also provide children with personalized learning experiences, feedback, and adaptation of content. These apps were also designed or adapted for children with special needs. Most importantly, teachers and children could easily use these apps. Using their apps was helpful and supportive in providing educational benefits to children, such as improving cognitive skills, academics, motor skills, communication and social skills.

Research Instrument for Data Collection

For this study, the researchers conducted an online survey of special educators. The survey included a 5-point closed-ended questionnaire to measure teachers' perceptions of the effectiveness, use, and impact of AI mobile applications. The instrument was further divided into five subscales: cognitive skills, social skills, motor skills, academic performance, and communication skills, to measure the effectiveness of AI applications on their students' performance. It also collected demographic information and details about the specific AI applications used. The online survey was conducted with the formal consent of the school heads.

Data Analysis

Descriptive statistics were used to summarize teachers' responses, which were obtained through a survey to provide an overview of teachers' perceptions and experiences when teachers used AI mobile applications to improve the learning skills of their children in the classroom. Inferential statistics, such as T-test and one-way ANOVA, were employed to examine differences in perceptions based on demographic variables and specific AI applications.

Ethical Considerations

The researcher provided detailed information about this study's purpose, procedures, and rights. Informed consent was obtained from all participants before data collection. The anonymity and confidentiality of participants were maintained throughout the study. The participants had the right to withdraw from the study at any time.

Results & Discussion

Table 1

Sample Distribution

Variables		F	%	N
Gender	Male	15	30	50
	Female	35	70	
BPS	16	36	72	02
	17	14	28	
Districts	Okara	18	36	03
	Sahiwal	23	46	
	Pakpattan	9	18	

The above table presents the distribution of the sample population (N = 50) based on gender BPS and district categories. The sample consists of 30% males (n = 15) and 70% females (n = 35). 72% of the population falls under BPS 16 (n = 36), and 28% falls under BPS 17 (n = 14). Additionally, 36% of participants participated from Okara (n = 18), 46% from Sahiwal (n = 23), and 18% from Pakpattan (n = 9).

Table 2

Gender wise perceptions towards the learning skills with use of AI apps

Learning skills	Gender	N	Mean	Std. Deviation
Cognitive Skills	Male	15	5.73	.511
	Female	35	5.51	.664
Academic Skills	Male	15	4.48	.376
	Female	35	4.10	.834
Communication Skills	Male	15	4.45	.374
	Female	35	4.18	.921
Social Skills	Male	15	4.36	.610
	Female	35	4.01	.891
Motor Skills	Male	15	4.37	.700
	Female	35	4.01	1.008

The above table expresses the means & standard deviations for five groups (cognitive skills, academic skills, communication skills, social skills, and motor skills) divided by gender. In the first group of cognitive skills, males (n = 15) had a mean score of 5.73 (SD = .511), while females (n = 35) had a lower mean of 5.51 (SD = .664). In the academic skills second group, males (n = 15) scored higher with a mean of 4.48 (SD = .376) compared to females (n = 35), who had a mean of 4.10 (SD = .834). In the 3rd group, which belongs to communication skills, males (n = 15) had a mean of 4.45 (SD = .374), which was slightly higher than females (n = 35) with a mean of 4.18 (SD = .921). In 4th group social skills, males (n = 15) had a mean of 4.36 (SD = .610), while females (n = 35) had a mean of 4.01 (SD = .891). In the last group, which belongs to motor skills, males (n = 15) had a mean of 4.37 (SD = .700), and females (n = 35) had a mean of 4.01 with a notably smaller standard deviation (SD = 1.008). Overall, the table shows that the males consistently showed higher mean scores across all groups, with females exhibiting greater variability in their scores in most groups.

Table 3

Over all mean score perceptions of teachers about learning skills using AI mobile apps

	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Cohen's d
Cognitive Skills	.357	.553	1.139	48	.260	.219	.623
Academic Skills	1.459	.233	1.673	48	.101	.377	.730
Communication Skills	2.200	.145	1.117	48	.270	.276	.801
Social Skills	.568	.455	1.401	48	.168	.354	.819
Motor Skills	.718	.401	1.283	48	.206	.368	.929

The above table indicates the cognitive skills F-value was 0.357 (p = .553), with a t-value of 1.139 (df = 48, p = .260). The mean difference between males and females was .219, and Cohen's d .623, above social and motor skills F-values .568 &.718 (p=.455 & p=.401) indicating a moderate to large effect size. The academic & communication skills F-values 1.459 & 2.200 (p= .233 & p= .145) with t-values 1.673 & 1.117 (df= 48, p= .101& .270. The mean difference between participants is .377 & .276 and Cohen's d .730 &.801, which is low from social, motor, and cognitive skills indicating a moderate to large effect size.

Table 4

Independent Samples Test

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Cohen's d
perceptions of teachers towards the use of AI mobile apps for children with IDs	1.014	.319	1.409	48	.165	.332	.763

The above table shows that Levene's test for equality of variances indicated no significant difference in variances between groups, F (48)=1.014, p=319. The results of the t-test shows there is no significant difference in teacher perceptions, t(48) = 1.409, p = .165 using the AI mobile apps for children with IDs. The mean difference between groups was .332, and the effect size calculated using Cohen's d was .763, indicating a large effect size despite the non-significant result.

Table 5

Difference about the use of AI mobile apps on teachers' BPS

Learning skills	BPS	N	Mean	Std. Dev	Std. Er	t	df	P	Cohen's d
Cognitive Skills	16	35	5.59	.728	.123	.147	48	.884	.631
	17	15	5.56	.285	.074				
Academic Skills	16	35	4.21	.860	.145	-.148	48	.883	.751
	17	15	4.24	.372	.096				
Communication Skills	16	35	4.22	.939	.159	-.496	48	.622	.810
	17	15	4.35	.325	.084				
Social Skills	16	35	4.09	.925	.156	-.340	48	.735	.835
	17	15	4.17	.560	.145				
Motor Skills	16	35	4.09	1.076	.182	-.347	48	.730	.943
	17	15	4.19	.487	.126				

The above table depicts that the P value is greater than.05 (cognitive skills score: t=-.147, df=48, P=.884, Cohen's d value .631 academic skills score: t-.148, df=48, P=.883, Cohen's d value .751 communication skills score: t=-.496, df=48, P=.622, Cohen's d value .810 social skills score: t=-.340, df=48, P=.735, Cohen's d value .835 and motor skills score: t=-.347, df=48, df=48, P=.730 Cohen's d value .943. Therefore, teachers' opinions at BPS 16 are lower than at BPS 17 regarding the use of AI mobile apps in learning skills for children with IDs.

Table 6

Difference perceptions of teachers about the use AI apps in districts of Punjab

Learning Skills	Districts	Distt to Distt	N	Mean	St. Dev	Mean Difference	Std. Error	P
Cognitive Skills	Okara	Sahiwal	23	5.86	.273	-.594*	.181	.002
		Pakpattan	9	5.49	.176	-.222	.234	.348
	Sahiwal	Okara	18	5.27	.894	.594*	.181	.002
		Pakpattan	9	5.49	.176	.372	.226	.106
	Pakpattan	Okara	18	5.27	.894	.222	.234	.348
		Sahiwal	23	5.86	.273	-.372	.226	.106
Academic Skills	Okara	Sahiwal	23	4.47	.317	-.547*	.225	.019
		Pakpattan	9	4.16	.260	-.233	.292	.428
	Sahiwal	Okara	18	3.92	1.119	.547*	.225	.019
		Pakpattan	9	4.16	.260	.314	.281	.270
	Pakpattan	Okara	18	3.92	1.119	.233	.292	.428
		Sahiwal	23	4.47	.317	-.314	.281	.270

Communication Skills	Okara	Sahiwal	23	4.48	.380	-.500*	.248	.049
		Pakpattan	9	4.27	.283	-.289	.321	.373
	Sahiwal	Okara	18	3.98	1.219	.500*	.248	.049
		Pakpattan	9	4.27	.283	.212	.309	.497
	Pakpattan	Okara	18	3.98	1.219	.289	.321	.373
		Sahiwal	23	4.48	.380	-.212	.309	.497
Social Skills	Okara	Sahiwal	23	4.46	.310	-.672*	.244	.008
		Pakpattan	9	3.87	.656	-.078	.317	.807
	Sahiwal	Okara	18	3.79	1.157	.672*	.244	.008
		Pakpattan	9	3.87	.656	.594	.305	.058
	Pakpattan	Okara	18	3.79	1.157	.078	.317	.807
		Sahiwal	23	4.46	.310	-.594	.305	.058
Motor Skills	Okara	Sahiwal	23	4.55	.309	-.803*	.271	.005
		Pakpattan	9	3.76	.979	-.011	.352	.975
	Sahiwal	Okara	18	3.74	1.215	.803*	.271	.005
		Pakpattan	9	3.76	.979	.792*	.339	.024
	Pakpattan	Okara	18	3.74	1.215	.011	.352	.975
		Sahiwal	23	4.55	.309	-.792*	.339	.024

*. The mean difference is significant at the 0.05 level.

The above table shows that in the first cognitive skills group, the mean score for students in the Okara learning style (M = 5.86, SD = 0.273) was significantly higher than those in the Sahiwal learning style (M = 5.27, SD = 0.894), with a mean difference of -0.594 (SE = 0.181, p = .002). There was no significant finding in Okara (M = 5.27, SD = 0.894) and the Pakpattan (M = 5.49, SD = 0.176), with a mean difference of 0.222 (SE = 0.234, p =.348). In the academic group, Okara district learning skills (M = 4.47, SD = 0.317) scored significantly higher than those in the Sahiwal learning skills (M = 3.92, SD = 1.119), with a mean difference of -0.547 (SE = 0.225, p = .019). There was no significant difference between the Okara learning skills (M = 3.92, SD = 1.119) and the Pakpattan learning skills (M = 4.16, SD = 0.260), with a mean difference of 0.233 (SE = 0.292, p = .428). In the communication skills Okara (M= 4.48, SD = .380) scored is higher than Sahiwal (M = 3.98, SD = 1.219) with a mean difference of .500 (SE = .248, p = .049). There was no significant difference between the Okara (M= 4.48, SD = .380), and Pakpattan (M = 4.27 SD =.283) with a mean difference of (SE = .309, p = .497). In the social skills, Okara (M= 3.79, SD = 1.157) scored is higher than Sahiwal (M = 4.46, SD = .310) with a mean difference of .803 (SE = .274, p = .008). There was no significant difference between the Okara (M= 3.79, SD = 1.157), and Pakpattan (M = 3.87 SD =.656) with a mean difference of (SE = .305, p = .058). In the motor skills Okara (M= 3.74, SD = 1.215) scored is higher than Sahiwal (M = 3.09, SD = .803) with a mean difference of .803 (SE = .271, p = .005). There was no significant difference between the Okara (M= 3.74, SD = 1.215), and Pakpattan (M = 3.76 SD =.979) with a mean difference of (SE = .339, p = .024). So, this table concludes that significant differences exist between specific districts and learning skill combinations, underscoring the influence of these factors on student performance.

Conclusion

This study concluded that the use of AI mobile applications improves the learning skills of children with IDs, according to teacher responses. Using AI mobile apps improves learning skills such as cognitive, social, communication, academic, and motor skills, especially children's attention span. All the participants in the study share the same point of view in their opinion that AI mobile applications are more effective and beneficial for improving the learning skills of children with IDs. The results of the study also show that high-ability teachers are more eager to use AI apps than low-ability teachers. The results also showed that children with IDs had lower stress levels when using these apps, feeling more relaxed.

Recommendations

In light of the results of the present study, the researchers recommend the use of AI mobile apps in the field of special education. These apps could be helpful in the learning process for children with IDs. This study recommended that special education teachers use these apps to attract students' attention. This pilot study recommended that teachers use these types of technological programs to improve the learning process and provide immediate feedback to the students. This study also suggests the role of continuous technical support for teachers to enable them to fully understand the possibility of modern technology and get the most benefit from these technologies for children with special needs. The government should provide financial support to institutions regarding modern technology so that children with intellectual disabilities can have maximum opportunities in the educational process. This research also recommended the need to hold workshops and training programs for special teachers to learn about the use of AI technology in learning for children with IDs.

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