INTERNATIONAL JOURNAL OF
SOCIAL SCIENCES BULLETIN
ISSN: (E) 3007-1917 (P) 3007-1909

Volume 3, Issue 11, 2025

IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE APPS TO IMPROVE ATTENTION SPAN IN BOYS WITH MILD INTELLECTUAL DISABILITY ENROLLED IN SPECIAL EDUCATION SCHOOL

Muhammad Asif Faiz[*1], Dr. Hina Fazil [2]

[*1]*PhD Scholar, Institute of Special Education, University of the Punjab, Lahore, Pakistan*
[2]*Associate Professor, Institute of Special Education, University of the Punjab, Lahore, Pakistan*

[*1]masiffaizmnd@gmail.com , [2]hinafazil.dse@pu.edu.pk

Corresponding Author: *
Muhammad Asif Faiz

DOI:https://doi.org/10.5281/zenodo.17578251

Received	Accepted	Published
19 September 2025	29 October 2025	11 November 2025

ABSTRACT

Attention difficulties have been known to affect children with intellectual disabilities (IDs), and this issue could lead to cognitive, educational, and social problems. Recent technology, especially AI, offers new possibilities for addressing these problems. This paper examined the use of artificial intelligence apps as a pedagogical intervention to enhance attention span among boys with mild intellectual disabilities. An experimental single-subject design was used for this research. The participants were 05 boys with mild IDs, aged 7 to 14 years, who were chosen for AI-based interventions. The intervention spanned twelve weeks and included 25 structured sessions, each lasting 10 minutes with a 5-minute break. One-to-one sessions were conducted using an AI-based apps (Khan Academy Kids & JADE Autism) supported by lesson plans. The students' performance was assessed using a checklist based on a 5-point Likert scale, which was administered at baseline, mid, and post-intervention to assess the changes in attention. The AI apps-assisted interventions showed improvements in attention span. Children showed a significant result after receiving the intervention. Their attention span increased while learning in the classroom. Based on the findings, it suggests that attention span may improve with the help of AI-based apps. The children may show more promise to learn more if this type of teaching method is adopted in the classroom.

Keywords: *Children with intellectual disabilities, Artificial Intelligence, Attention, Special education, Adaptive learning.*

Introduction

Intellectual disability (ID) is a condition that begins in childhood and affects how a person learns and functions in daily life. Children with ID often have difficulty understanding, communicating socially, and performing everyday tasks. These challenges persist throughout life and affect many activities. The causes of ID are diverse and may include genetic factors, congenital problems, environmental issues, or family and social problems (Katz & Lazcano, 2008). Although ID cannot be cured, research shows that some learning skills can be improved with appropriate training. Studies also show that early support helps children improve their thinking, language, academic performance, and behavior over time (Purugganan, 2018).

Although early support is essential, many children with ID still do not receive a quality education due to economic challenges, lack of facilities, and lack of resources. These obstacles need to emphasize the necessity of new facilitated teaching modes. In this respect, the digital technology is receiving more and more attention due to the availability of easy and convenient means of supporting the learning process of children (Torra Moreno et al., 2021). Educational apps, games, and virtual reality may allow making learning more interactive and engaging. The technologies are also able to regulate the pace of learning in the child and give the child more chance of playing on the safe side (Zhou and Zhan, 2025). They enable the parents and caregivers to be involved in the learning process at home. These approaches when combined with daily classroom teaching can assist intellectually disabled children to have access to quality and more inclusive education (Michalski et al., 2023).

Special education schools are meant to provide a comprehensive support, however, the children with intellectual disabilities (ID) usually lack attention when the conventional teaching methods are used. Educators must be prepared to address both the individual needs of each child and the diverse needs of the children in the classroom (Hornby & Kauffman, 2024). Research indicates that the children with ID when taught using a repetitive non-interactive approach lose interest in the lesson, and, therefore, such approach negatively influences the process of learning (Klang et al., 2020). On the other hand, interactive and technology-based strategies, such as the use of video lessons, digital prompts, and tablet-based activities, will help students to be engaged and achieve better learning outcomes (Barman et al., 2021, 2024; Lancioni et al., 2024). Recent surveys also testify to the fact that inclusive technologies and AI-related tools improve the involvement, engagement, and adaptive learning of students with different needs (Navas-Bonilla et al., 2025; Mukhtarkyzy et al., 2025). It suggests that modern tools are necessary to maintain attention and deliver timely feedback.

Technology has played a very significant role in the last few years so as to enhance the learning experience of special needs children. The digital resources, interactive applications, web-based programs, computer-based applications give teachers opportunities to create tasks that would cater to the strengths and needs of every child. Quick comments are also given by these tools and this factor makes the students more focused and motivated compared to traditional methods. Artificial intelligence is better than conventional practices as it learns to be more personal. Having artificial intelligence applications, the difficulty may be increased or decreased according to the progress of a child, and the application can be used with an immediate help and track the development of a child (Voultsiou and Moussiades, 2025). Such an approach allows not only to give teachers the opportunity to suit different needs but also provide children with disabilities with the opportunity to study independently due to customized and engaging lessons (El Morr et al., 2024).

The popularity of smartphones allows making mobile-based educational programs more realistic and useful. Mobile devices are ubiquitous, and people are starting to recognize their value in flexible learning even though we haven't fully leveraged them. With a mobile app, children and families can easily access learning help, no matter where they are or what time it is. Game-style mobile apps have already demonstrated promising results in helping children with disabilities develop academic and everyday skills (Mahmoudi et al., 2023). In schools, tablets and smartphones are some of the most common assistive tools used to support children's communication, social interaction, and cognitive skills (Mukhtarkyzy et al., 2025).

Mobile applications which apply artificial intelligence are becoming acceptable as helpful resources to aid teaching of special needs children. Smartphones and tablets offer a mobile platform that is flexible and accessible to the delivery of customized instructions, adaptive learning assignments, and assistive communication technology. Such applications have the ability to deliver educational information based on the cognitive capability of the learner, real time tracking of progress and instant feedback to both students and teachers. With intellectual and developmental disabilities, AI-based mobile applications provide children with chances to enhance their attention, memory, recognition, language, and socialization via gamified, engaging, and interactive activities (Faiz, & Fazil 2024). They are portable and make learning go outside the classroom, which limits access barriers in terms of time, cost, and access. It is also emerging that AI-based mobile interventions might not solely enhance academic and cognitive outcome but aid the inclusion and independent functioning and participation of children with special needs in diverse learning settings (Perry et al., 2024; Hussein et al., 2025).

Mobile interventions may be of great importance in intellectual disability child education. Interactive, gamified, and personalized learning experiences can be provided to the children using smartphones and tablets so that teachers and families can tailor educational experiences to the specific needs of the children. Such applications offer adaptive lessons, graphics and audio directions, and real time feedback, and help in building up the focus, memory, communication and problem solving skills. Mobile platforms are extremely mobile too, and affordable with respect to cost, which renders them convenient in the classroom and at home (Mukhtarkyzy et al., 2025).

The studies have revealed that mobile interventions have a good impact on cognitive and academic improvement of children with IDs. Even though these prospects are encouraging, there are not a lot of empirical studies that specifically address the use of AI in enhancing attention among children with intellectual disabilities. Hence, the given study was designed to introduce the use of artificial intelligence applications to enhance the attention of intellectually disabled boys in special education schools.

Statement of the Problem

Children with intellectual disabilities have difficulty on keeping focus, which is one of the important skills in the process of learning and daily activities. The teachers in the special education classes also note that they are often distracted and struggle to maintain focus. These attention issues stall the learning development. Conventional pedagogical processes, however, are effective but they do not capture their attention. The activities in the classrooms are not usually interactive and students find it difficult to be attentive. New technology is being introduced to enhance the level of focusing with the help of adaptive and interactive learning offered the AI-based technologies. This type of tools provides immediate feedback, graphics and games that make a learner work. A number of studies have demonstrated that there is a lack of sufficient evidence on AI tools in enhancing the attention span of children with ID. This gap can be discussed as the necessity to conduct research on the topic of how the AI application can be used to increase the attention span in children.

Significance of the Study

This research can also assist us to understand how the current technology, especially artificial intelligence, can assist intellectually disabled children in enhancing their attention abilities. This research can have a practical use to instructors because children with ID find it difficult to remain focused on their activity, which has an impact on the learning process and functioning in general. With the assistance of a teacher and an AI-driven application, educators can present something new and stimulating, to teach children to remain attentive and allow them to learn at their own speed. This research may increase attention span by using these apps, which could lead to more equal educational opportunities and long-term improvements in the lives of children with intellectual disabilities.

Research Objectives

The following objectives were aimed to be met by carrying out the study to:

1. identify the benefits of AI-based mobile apps in improving the attention span of children with intellectual disabilities.
2. implement the AI-based mobile applications to increase the attention span of children with IDs during class activities.
3. examine the significant differences in the improvement of attention span among the children with mild intellectual disability as a

result of intervention phases with the use of AI-based applications.

Research Questions

The research questions that were targeted in this study are as follows:

1. What are the benefits of AI-based mobile apps in improving the attention span of children with IDs?
2. How can AI-based mobile applications be implemented to increase the attention span of children with intellectual disabilities during classroom activities?
3. Were there significant differences in the improvement of attention span among children with mild intellectual disability as a result of intervention phases with the use of AI-based applications?

Literature Review

Intellectual and developmental disabilities have been on a steady rise (Zablotsky et al., 2019). These typically exist at birth and tend to be persistent throughout the lifetime of the affected person, affecting physical, intellectual, and emotional development. They may be learning disorders, pervasive developmental disorders, communication disorders, genetic disorders, and neurological disorders. This rising trend is exerting more pressure on educational systems to offer the student an opportunity to learn by diverse and complex ways (Boyle et al., 2011). The integration of educational and assistive technologies is a potential remedy that might make individual support according to personal needs and abilities of different learners.

The potential of artificial intelligence offers even more with the help of adaptive learning experiences, which are constructed on the basis of it. The AI-based applications will have the capability of tracking the progress of students and noting any loss of attention and usually accelerate, decelerate, or switch the activity to ensure that the students are interested. With children with intellectual disabilities, the personalized teaching is more effective, as compared to the conventional approach, as it allows the children to learn through methods that are more effective, thus making the learning process more accessible and interesting. Recent studies have shown that AI-based tools can not only improve the performance in academics but also train the underlying cognitive capabilities because of the immersive, gamified and engaging learning experiences (Lee et al., 2015; El Morr et al., 2024; Hussein et al., 2025; UNESCO, 2023). Among the most viable sources of delivering AI-based interventions in the classroom or at home, mobile applications are included. They are easy to transport, relatively cheaper, and both teachers and families can use them, which is why they are appropriate in education environments with limited resources (Breitwieser et al., 2024). Mobile applications are AI-based interactive, gamified, and adaptive learning activities that can make children with intellectual disabilities engaged and attentive during the lesson. Recent literature states that the mobile-based interventions such as adaptive learning platforms and AI-based instructional games have already had a positive effect on the attention and motivation and the ability to study in developmentally and cognitive impaired children (Wang et al., 2024 and Zhang et al., 2024). It implies that AI-driven mobile applications have an immense potential to complement the traditional methods of learning and can be implemented to solve one of the most widespread issues in special education the necessity to make students focused (Hussein et al., 2025).

Regardless of such benefits, the readiness and disposition of teachers towards the apps define the success of the application of the AI-based mobile apps in the special education classroom. As it has already been shown, when considering the potential of applying AI tools to promote engagement and attention, most educators are not the first to hear the notion but also suggest drawbacks in the form of training, resources, and privacy concerns of data (El Morr et al., 2024; UNESCO, 2023). This obstacle might be even more acute when it comes to developing countries, where schools might be underdeveloped and financially weak. The usability, feasibility and effectiveness of AI application among the teachers is critical, therefore, with the introduction of AI application in the classroom and development of professional development programs to meet the specific needs of the teachers.

Based on literature, technology-based intervention may prove useful in improving attention and learning in children with different developmental challenges. Mobile apps, game-based programs, and AI tools can be designed to keep children engaged, distracted, and motivated throughout the lesson (Zhang et al., 2024; Hussein et al., 2025). They are not only a tool that aids academic skills but also assist children in building core skills, including attention, which is vital in the learning process. Nevertheless, few studies examine children directly with intellectual disabilities, and even fewer that experiment with these interventions in actual classroom environments in third-world countries. For this reason, it is timely and essential to study the application of AI-based mobile apps in enhancing attention in children with intellectual disabilities (Wang et al., 2024).

Artificial Intelligence based Mobile Apps

An app, also known as a mobile application, is a particular category of software that is supposed to be executed on the mobile phone, tablet, or gadget with a touchscreen (Crook et al., 2017). The reason why these applications are popular is due to convenient and easy to use services offered. There are a lot of different mobile apps such as games, calculators, web-browsing applications and educational platforms. The majority of mobile applications are small, purpose-oriented and can be easily accessed which makes them very convenient in day-to-day life. Mobile apps can go beyond their basic functionality, and provide adaptive, interactive, and personalized learning experiences, which can be especially useful in learning and special needs. These educational apps can best be used by a special education teacher to interest his students. Now we would like to learn about some of these AI applications (Fitria, 2021; Faiz, & Fazil 2024).

Khan Academy Kids

Khan Academy Kids is a free learning application that is aimed at children aged between 2 to 8 years old. Khan Kids Library includes children's books, games, reading, and math games and activities. This application gives a child with a customized lesson and captivating images that motivate children to develop and acquire knowledge. Another benefit of this app is that it gives all children an opportunity and encouragement to make an all-embracive educational experience ((Faiz, & Fazil 2024; Muttaqin, et al., 2025).

ABCmouse

ABCmouse is a pre-school learning application targeting children aged between 2 and 8 years and provides a structured learning program along reading, math, science, art and music in form of interactive games, puzzles, e-books and songs. Its reward system and self-paced design can maintain the motivation and attention of children. Its straightforward navigation, colorful graphics, and gamified activities ensure this is an app that young learners will find interesting. This application can assist children with intellectual disabilities as it has interactive games that help strengthen the initial skills and assists them to concentrate in an entertaining way to learn (Muttaqin, et al., 2025).

AutiSpark

AutiSpark is an interactive educational application. In this application, children get an opportunity to understand how to connect things with the help of photos, understand feelings, classify, identify sounds, words, etc. It is highly effective and convenient in dealing with children who are intellectually disabled (Faiz & Hina, 2024).

Luca & Friends

Luca & Friends is an augmented children learning application among 4-8 year old that uses motion capture technology to integrate physical activity and educational topics. The app is an amalgamation of English, STEM classes and exercise. This is because the games enable the user to participate in an interactive learning process by using gestures like stretches, jumps or dodges. It includes over 100 lessons and activities, a reward system to motivate children, and parent dashboard. Because it encourages children to be active in learning, it could be one method of keeping the children attentive by integrating the mental and the physical. Although little published research has applied it with children with intellectual disabilities, its structure can be applied with special education, especially through helping with attention, engagement, and embodied learning, as long as teachers scaffold and closely monitor its application. (GOFA, 2022).

Osmo

Osmo is a learning experience platform developed by Tangible Play as a hybrid physical-digital educational platform that designs interactive learning experiences based on physical game pieces, a tablet, and a mirror attachment (reflective AI techniques). The system features applications such as Words, Tangram, Newton, and Masterpiece, which integrate real-world manipulatives (blocks, letters and drawing tools) with computer-based responses to help students master skills in spelling, geometry, physics and drawing (Teacher's Guide to Osmo). Osmo supports children with learning and attention problems by enabling them to touch, see and hear to make some challenging tasks easier to grasp, stay engaged and encourage learning through trial and error. Osmo is being used already in a range of environments, such as elementary classrooms, libraries, and special education programs (Teacher's Guide to Osmo). Being a versatile and multisensory interactive tool, it is a potential application in special education, especially when implemented through guided instructions to facilitate cognitive and attention functions (Muttaqin, et al., 2025).

DreamBox Learning

DreamBox Learning is an online course programme aimed at children between kindergarten and grade 8 with mathematics as the main subject. It uses the adaptive technology to vary the level of lessons according to the responses of each student to questions. As an example, when the child is having trouble, the app will give additional hints and steps that are simpler to follow; when the child is fast, the app will present a more difficult task. By doing so, each learner will receive lessons at his or her level. DreamBox lessons incorporate games, making math fun and motivating to students. It has been found that children who attend DreamBox on a regular basis achieve higher math performance than those who do not. Although it is not specifically aimed at children with intellectual disability, it may also be beneficial to them due to its interactive and adaptive approach, which keeps them focused and supports them personally (Muttaqin, et al., 2025).

Role Of AI Apps in the Improvement of Attention Span

Educational applications, based on mobile and AIs, can be of critical importance in improving the attention span of children with intellectual and developmental deficiencies. These applications are interactive, featuring colourful images, sounds, animation, and gamified activities which attract and keep the attention of a child. Most of them apply adaptive learning, in which the difficulty of activities adapts to the performance of the child to avoid boredom or frustration. Even short structured programs such as Khan Academy Kids, DreamBox Learning, or Auti Spark have the side effect of training children to be able to concentrate on activities more long-term, since their programs consist of short bursts of attention-intensive games. Studies have demonstrated that this type of digital intervention can decrease off-task behaviour, enhance engagement, and reinforce central cognitive skills that facilitate learning (Wang et al., 2024). The applications will be powerful tools that will help intellectually disabled children to enhance their attention capacity by subjecting them to interactive practice.

Application of artificial intelligence (AI) in special education has provided new opportunities to solve the problem of attention in children with intellectual disabilities. Artificial intelligence-based apps, including digital therapeutics and adaptive learning-based software provide structured, interactive, and gamified assignments to maintain engagement in the learners and to slowly increase their attention. Studies conducted in the area of educational technology indicate that these tools can minimize distractions, extend attention, and develop fundamental mental abilities required to achieve success at school. Although most of these interventions have been applied to children with learning deficits, little bit of evidence exists on their application in the classroom with children with ID. This is why the introduction of AI-based mobile applications in a special education community is noteworthy to be discussed to work out its prospects (Santoso, 2019).

There is a growing trend in the use of AI tools in education, but little research has been conducted on how these tools can be applied to enhance attention among children with intellectual disabilities, especially in classroom settings in less developed countries. The available literature targets general education and hence is an evidence gap in the education of students with intellectual disabilities. This research is thus imperative as it will test the practicality of AI-based mobile applications in special education schools and give an insight into their efficacy in enhancing the attention while also offering directions on how teachers can use these tools in their classrooms (Faiz, & Fazil 2024).

Methodology

The methodology employed in the study was a single subject with repeated measures experiment (Cranmer, 2017; Thyer, 2012; Jimenez, 2018) to determine the effect of AI-based mobile app in enhancing attention among boys with mild intellectual disabilities. This design involved repeated measurements of the performance of each individual at various stages: before the intervention (baseline), during the intervention, and, after the intervention was completed (Fabrizi & Winston, 2016). Every child was his control, and this had the advantage of making individual progress easy to observe instead of group comparisons. This design was deemed suitable due to a small number of students and the interventions had to be provided in a very personalized way that is characteristic of special education research (Alqraini, 2017).

Population and Sample

The study population was a sample of boys with mild IDs studying in government special education schools in Punjab, Pakistan. The inclusionary criteria were applied to select a sample of five students aged 7 to 14 years from the Government Special Education Centre for 03 Remaining Disabilities in Okara. The following criteria were used to select them: (a) a disability certificate of mild intellectual disability, (b) teachers reports of problems with maintaining attention, and (c) parental written consent to participate. Only boys were selected for this study. Inclusion criteria are predefined characteristics used to identify participants who are included in a study. They help ensure the study's validity and focus by defining who qualifies to participate (Patino & Ferreira, 2018).

The researchers reviewed several articles on the applications of artificial intelligence and identified two mobile applications to use in the study: Khan Academy Kids and JADE Autism. The apps were selected due to having AI features, which included personalization, adaptive content, and feedback. They were child friendly, easy to use by teachers and students and assist in attention and learning in the classroom activities involving the child with special needs.

Procedure for Implementing the Intervention Plan

The intervention was carried out during 12 weeks where 25 scheduled classes were involved. The sessions took approximately 10 minutes and after every session a 5 minutes rest was taken to avoid exhaustion and also to ensure that the students were attentive. All the sessions were made one-on-one sessions and each participant got individual attention. The primary teaching resources were AI-based applications (Khan Academy Kids and JADE Autism). These applications were selected as they have the potential to provide adaptive, interactive, and entertaining activities that would address the educational needs of children with IDs. All the activities were to be supported, and the lesson plans were made according to the rules that are provided in the curriculum by the Punjab Department of Special Education.

Research Instrument for Data Collection

The researchers made a checklist to measure the performance of the students. A checklist consisted of 25 tasks and they were observed to understand the attention of a person. All the tasks were scored using the 5-point Likert scale that ranged between very poor and excellent. Whether things improved was also seen using the same checklist and three times were taken as the starting point (before the intervention), the middle point (during the intervention), and the end point (after the intervention). This repeated-measures design was applied to track and compare the changes in the level of attention at the intervals of the multiple stages of intervention. The researchers carefully followed the structure of the session, with an equal amount of the use of AI-based tools and the ability to provide all the participants with equal exposure time to ensure that the implementation process was accurate.

Data Analysis & Interpretation

Analysis of the quantitative data was performed with the help of Statistical Package of the Social Sciences (SPSS, Version 27). The scores of attention (which were obtained at three stages of intervention, i.e., pre, mid, and post test) were initially characterized by simple statistical measures, the mean. This provided a rough idea of the performance of the students at each stage. Non-parametric tests were applied because the data could not be passed to normal distribution. The Friedman test was applied to check whether there were any meaningful differences in attention scores across the three stages. This test was suitable because it works well with repeated measures when the data are not normally distributed. When the Friedman test showed a significant difference, further analysis was done to determine exactly between which stages the changes occurred. For this purpose, the Wilcoxon signed-rank test was used to compare scores between pairs of stages (pre-test vs. mid-test, pre-test vs. post-test, and mid-test vs. post-test). The level of significance was set at $p < .05$, indicating that the results were considered statistically significant if the probability of error was less than 5%. The results indicated the demographic information of the participating students, including age and grade level. The result was the continuous improvement of the attention scores during the three stages of the interventions. The line graphs were the most evident in demonstrating the improvement between pre, during, and post-interventions, with rising trends.

Demographic Distribution

Table 1

Age-wise classification of respondents

Age	Frequency	Percent
7 to 8	1	20.0%
9 to 10	1	20.0%
11 to 12	1	20.0%
13 to 14	2	40.0%
Total	05	100.0

Table 1 presents the age of the respondents; most of the students were between 13 and 14 years old, accounting for 40% of the group. The other students were of the ages: 7-8 years, 9-10 years, and 11-12 years and each group had 20 percent. The majority of the students belonged to the 13-14-year-old age group.

Figure 1
Line graph 1 shows student 1's performance (pre, during, and post) across 25 tasks.

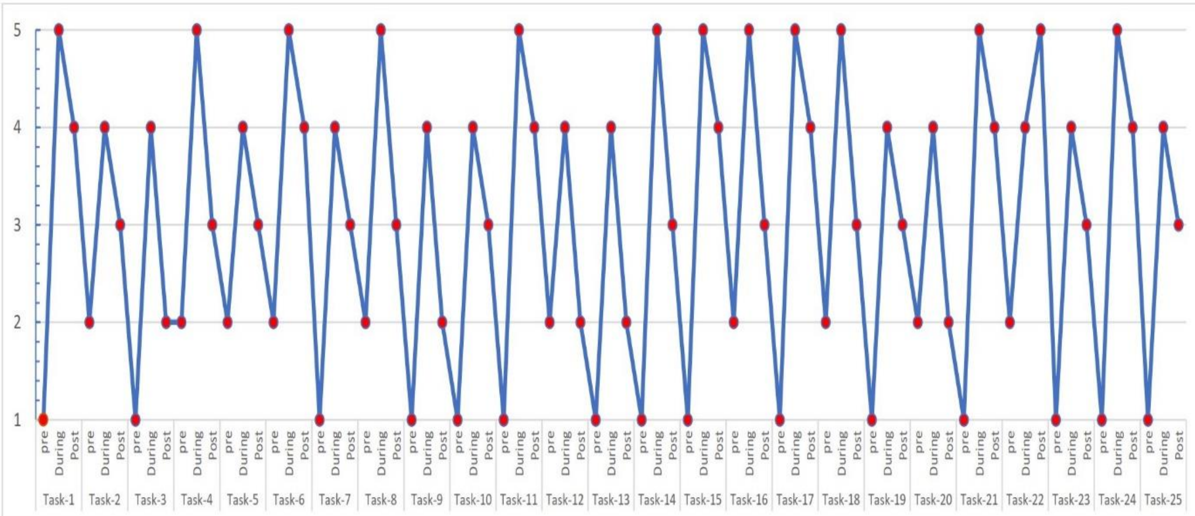


Figure 1 represents how student 1 performs on 25 tasks during the intervention to enhance the attention with the help of AI-based mobile apps. Recording of performance was in five-point scale at three stages, which included pre, during and post-test. During the pre-test phase, the scores were mainly low and were mostly between 1 and 3, indicating low attentional involvement. As the intervention progressed, there was a slow improvement in performance, and some of the tasks achieved level 4 and 5, which indicates that the applications helped to increase focus and persistence. Student 1 scored higher at the post-test level as most tasks rated 4 or 5 showing a strong improvement in comparison to the base test. Task scores did not differ substantially; however, the general trend is towards significant improvements in attention after the intervention.

Figure 2
Line graph 2 shows student 2's performance (pre, during, and post) across 25 tasks.

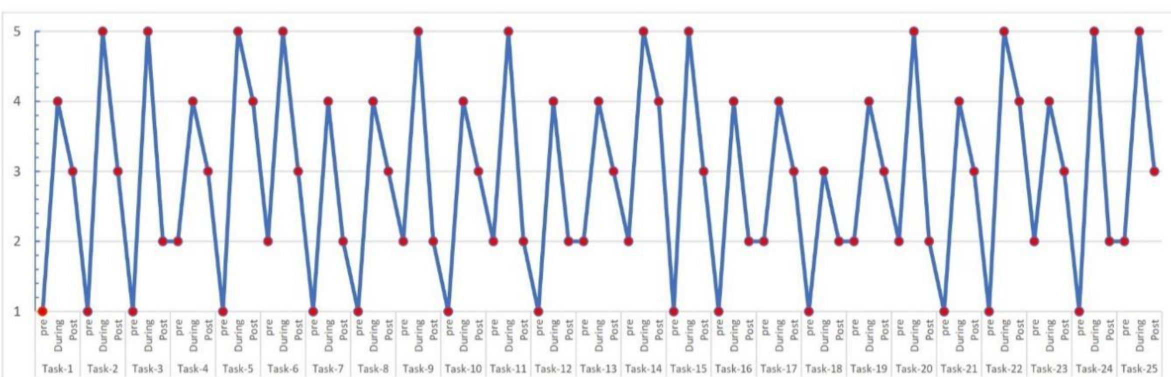


Figure 2 displays the performance of student 2 concerning 25 tasks evaluated by AI-based mobile applications. The results were gathered in pre-test, during-test, and post-test with the help of a five-point scale. Although at the pre-test phase, the scores of student 2 were still quite low (1-3), which implies a weak baseline attention. There were inconsistent results in performance during the intervention, although with a significant improvement, since some tasks achieved level 4 and 5. During the post-test phase, the majority of the scores were increased with most of them being 4 or 5. This enhancement proves the efficiency of the intervention in enhancing the attentional skills of student 2, although the difference in the performance across activities is present.

Figure 3
Line graph 3 shows student 3's performance (pre, during, and post) across 25 tasks.

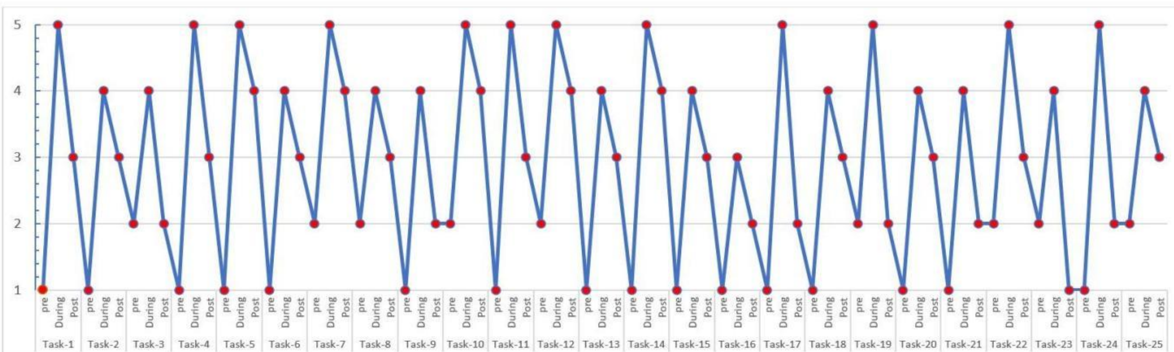
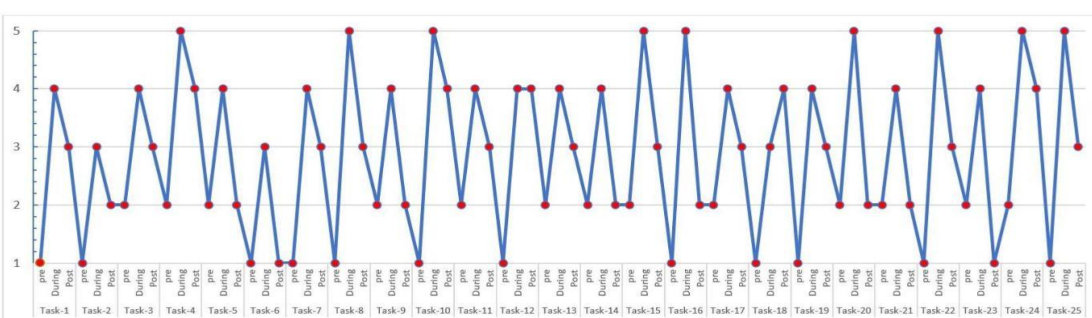


Figure 3 represents the performance of student 3 in 25 tasks. The measurements of the results were done on five-point scale during pre-test, during-test, and post-test. During the pre-test phase, student 3 made between 1 and 3 out of the majority of tasks, which shows lack of focus and interests. Throughout the course of the intervention, the scores were better on various tasks, some of them being 4 and 5, indicating that an initial positive response to the AI-based applications was emerging. The level of performance was better at the post-test time, as most of the tasks were rated 4 or 5. Despite the fact that certain differences still occurred between tasks, the general tendency shows that the level of attention has been greatly improved due to the intervention.

Figure 4
Line graph 4 shows student 4's performance (pre, during, and post) across 25 tasks.



The figure 4 shows the performance of student 4 on an instance of 25 tasks that were assessed using the AI-based mobile applications. The scale of five points was used in three stages: pre, during and post-test. The performance in the initial performance was irregular with pre-test scores often ranging between 1 and 3. The task scores were also higher during the intervention with some of them being 4 or 5 indicating the positive effect of the applications on attentional control. Student 4 showed significant improvement by the post-test stage with the majority of the tasks being rated 4 or 5. Though still difference in tasks was observed, the general course shows that there were significant improvements in attention due to the intervention.

Figure 5

Line graph 5 shows student 5's performance (pre, during, and post) across 25 tasks.

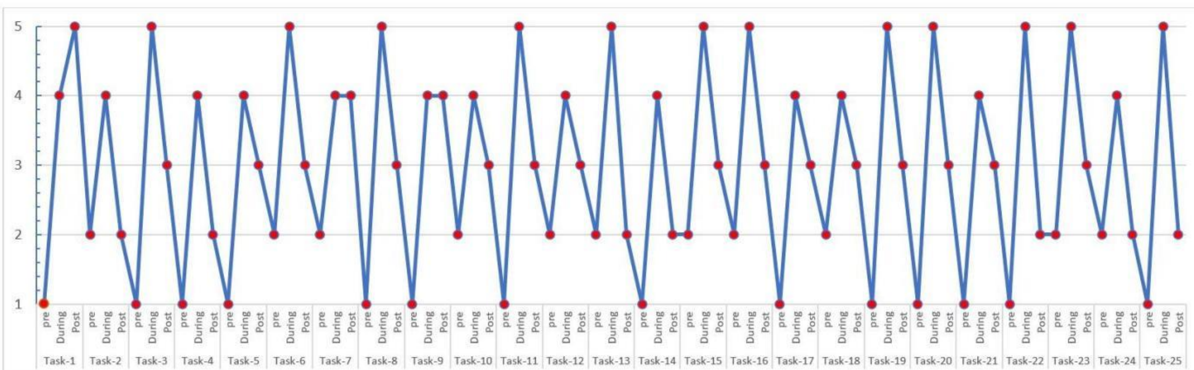


Figure 5 shows the performance of student 5 on 25 tasks at three different phases namely pre-test, during-test and post-test. On the performance scale with five points, pre-test scores were relatively low and inconsistent (around 1 to 3, to a great extent). Task performance also fluctuated during the intervention, but some tasks that had a score of 4 and 5 indicated gradual attainments of focus. At the post-test phase, the student 5 results were significantly higher, and most of the tasks have been received with the 4 or 5. The overall picture of the performance profile shows that the intervention had an effect of aiding in better attention, although it varied among tasks.

Table 2

Friedman and Wilcoxon Test Results for Student 1's Performance Across Intervention Phases

Test / Comparison	N (tasks)	Mean	χ^2 / Z	df	p (2-tailed)
Pre-test	25	1.04	–	–	–
During-test	25	2.92	–	–	–
Post-test	25	2.04	–	–	–
Friedman Test	25		χ^2 = 45.14	2	< .001
During-Pre (Wilcoxon)	25		Z = −4.44	–	< .001
Post-During (Wilcoxon)	25		Z = −4.05	–	< .001
Post-Pre (Wilcoxon)	25		Z = −4.26	–	< .001

Table 2 Student 1 was assessed on 25 tasks at three stages, i.e., pre, during, and post-test, on a five-point scale. The low mean rank (M = 1.04) at the pre-test stage showed that there was weak baseline attention. The performance increased drastically during the intervention (M = 2.92), which indicates that blocking with the help of AI-based mobile applications influenced the

attention highly positively. The mean rank (M = 2.04) at the post-test stage remained higher than the baseline level but lower than in case of during-test demonstrating slight improvement after the intervention and relative improvement compared to pre-test. The Friedman test was used to prove that the difference between the three phases was statistically significant, χ^2 (2, N = 25) = 45.14, p <.001. The pair-wise Wilcoxon signed-rank tests further showed that there was the significant improvement between the pre-test and during-test (Z = -4.44, p <.001), significant decline between the during-test and post-test (Z = -4.05, p <.001), and there was the sustained improvement between the pre-test and post-test (Z = -4.26, p <.001). On the whole, it is possible to note that the student 2 demonstrated the best performance in terms of attentional performance during the intervention period and the gains were to some extent retained at the post-test phase.

Table 3
Friedman and Wilcoxon Test Results for Student 2's Performance Across Intervention Phases

Test / Comparison	N (tasks)	Mean	χ^2 / Z	df	p (2-tailed)
Pre-test	25	1.06	–	–	–
During-test	25	3.00	–	–	–
Post-test	25	1.94	–	–	–
Friedman Test	25		χ^2 = 48.64	2	< .001
During-Pre (Wilcoxon)	25		Z = −4.22	–	< .001
Post-During (Wilcoxon)	25		Z = −4.46	–	< .001
Post-Pre (Wilcoxon)	25		Z = −4.46	–	< .001

Table 3 illustrates the performance of student 2 on 25 tasks, through assessment, at pre-test, during-test, and post-test stages on a five-point scale. The pre-test scores were poor (M = 1.06) which showed low baseline attention. The scores increased significantly (M = 3.00) during the intervention, and it is possible to conclude that AI-based applications have a significant positive impact. At the post-test level, the scores were above the baseline level (M = 1.94), but lower than in the case of during-test. The Friedman test established that there was a significant difference in phases, χ^2 (2, N = 25) = 48.64, p <.001. These were supported by pairwise Wilcoxon tests: attention increased significantly between pre-test and during-test (in all 25 tasks positive change was observed) but post-test scores decreased with respect to during-test scores (in all 25 tasks decreased). Nevertheless, post-test results were much higher than pre-test, and 22 tasks improved and 3 ties were observed. These findings suggest that even though the greatest impact was found in the course of the intervention, the student still acquired significant improvements in attention compared to the control levels.

Table 4
Friedman and Wilcoxon Test Results for Student 3's Performance Across Intervention Phases

Test / Comparison	N (tasks)	Mean	χ^2 / Z	df	p (2-tailed)
Pre-test	25	1.08	–	–	–
During-test	25	3.00	–	–	–
Post-test	25	1.92	–	–	–
Friedman Test	25		χ^2 = 47.27	2	< .001
During-Pre (Wilcoxon)	25		Z = −4.44	–	< .001
Post-During (Wilcoxon)	25		Z = −4.05	–	< .001
Post-Pre (Wilcoxon)	25		Z = −4.26	–	< .001

Table 4 shows the result of student 3 in 25 tasks, which is measured in the pre, during, and post-test by a five-point scale. Mean rank scores at baseline were low (M = 1.08) and this represented little attention. There was a substantial improvement in attentional performance as the scores improved by a significant value (M = 3.00) during the intervention. The score at the post-test level was slightly lower (M = 1.92) than in the during-test but still high as compared to the baseline. The Friedman test established that the difference between the three phases was significantly different, $\chi^2(2, N = 25) = 47.27$, $p < .001$. The pair-wise Wilcoxon signed-rank tests also demonstrated the significant improvement between pre-test and during-test ($Z = -4.44$, $p < .001$), significant decrease between during and post-test ($Z = -4.05$, $p < .001$), and the sustained gain between the pre-test and post-test ($Z = -4.26$, $p < .001$). In general, student 3 showed the best performance of attentional performance in the intervention period with some gains being maintained at the post-test period as compared to the baseline period.

Table 5

Friedman and Wilcoxon Test Results for Student 4's Performance Across Intervention Phases

Test / Comparison	N (tasks)	Mean	χ^2 / Z	df	p (2-tailed)
Pre-test	25	1.16	–	–	–
During-test	25	2.94	–	–	–
Post-test	25	1.90	–	–	–
Friedman Test	25		$\chi^2 = 42.98$	2	< .001
During-Pre (Wilcoxon)	25		Z = −4.44	–	< .001
Post-During (Wilcoxon)	25		Z = −3.92	–	< .001
Post-Pre (Wilcoxon)	25		Z = −3.85	–	< .001

Table 5 presents how student 4 performed on 25 tasks at pre-test, during-test and post-test on a five-point scale. Mean rank scores were at baseline low (M = 1.16) indicating poor performance in terms of attention. The scores have increased (M = 2.94) significantly through the intervention, which means that the AI-based applications exert a strong positive intervention on the focus and engagement. During post-test stage, a slight decrease in the scores to 1.90 was recorded as compared to the during-test, and also it was lower than the baseline scores. The Friedman test showed that the difference between the three stages was found to be statistically significant, χ^2 (2, N = 25) = 42.99, $p < .001$. Pairwise Wilcoxon signed-rank tests indicate that there was a significant improvement between pre and during-test ($Z = -4.44$, $p < .001$), a significant decrease between during-test and post-test ($Z = -3.92$, $p < .001$), and a sustained improvement between pre and post-test ($Z = -3.85$, $p < .001$). Overall, student 4 demonstrated the most desirable results regarding attentional performance during the intervention, and that the enhancement was partially maintained at the same level of performance during the post-test.

Table 6

Friedman and Wilcoxon Test Results for Student 5's Performance Across Intervention Phases

Test / Comparison	N (tasks)	Mean	χ^2 / Z	df	p (2-tailed)
Pre-test	25	1.06	–	–	–
During-test	25	2.96	–	–	–
Post-test	25	1.98	–	–	–
Friedman Test	25		$\chi^2 = 47.52$	2	< .001
During-Pre (Wilcoxon)	25		Z = −4.44	–	< .001
Post-During (Wilcoxon)	25		Z = −4.05	–	< .001

Post-Pre (Wilcoxon)	25	Z = −4.26	–	< .001

Table 6 illustrates the performance of student 5, who was evaluated at three levels: pre-test, during-test, and post-test, each comprising 25 tasks, on a five-point scale. The low mean rank (M = 1.06) in the pre-test stage also showed poor baseline attention. The performance had significantly improved in the course of the intervention (M = 2.96), which implied that attentional performance was strongly supported with the application of AI-based mobile applications. The mean rank (M = 1.98) at the post-test stage was still higher than the baseline and lower than the during-test one as it demonstrated that despite the fact that the level of attention worsened at the end of the intervention, it remained higher than before. Friedman test established the statistically significant differences between them, χ^2 (2, N = 25) = 47.52, p <.001. Wilcoxon signed rank tests performed on a pairwise basis further showed that there had been significant improvement between the pre-test and during-test (Z = -4.44, p <.001), significant decline between during and post-test (Z = -4.05) and sustained improvement between the pre-test and post-test (Z = -4.26, p =.001). Once again, student 5 displayed the most favorable results throughout the intervention, and some of them were maintained in the post-test period.

Findings

The study revealed several important findings. All five respondents were male students, most of whom (40%) belonged to the 13-14 age group, and every participant was identified with a mild level of intellectual disability, making the sample homogeneous in severity. Data collection was balanced, with equal observations recorded at the pre-test, during-test, and post-test stages. All students recorded poor attention at the baseline with low points of between 1 and 3 on the five-point scale. Nevertheless, at the intervention stage, performance was also improved significantly, as most of the tasks were rated at 4 and 5. These gains were found to be significantly high (p <.001) among all the participants as proved by statistical tests (Friedman and Wilcoxon). Post-test scores were slightly lower than during the intervention phase, but still significantly above the level at baseline thus this is sustained. On the whole, the results indicate that the application of AI-based mobile apps impacted the improvement of attentional abilities of students with mild intellectual disabilities in a strong and positive way.

Conclusion

This research made a conclusion that AI-based mobile applications can make a tremendous contribution to improve the attention span of students with mild IDs. The interactive, adaptive and engaging tools in the daily learning helped the students to maintain focus and perform tasks better than they had at the baseline. This indicates that technology may be used to supplement conventional instruction in special education and offer a personalized support where teacher-initiated interventions may fail to meet the needs. Consistency is also brought out in the study. Although there was an improvement in attention during the intervention stage, some of the improvements were observed even after the intervention was finished and this implied that the improvements should be sustained in case long-term benefits were to be realized. This raises the question of how schools should integrate AI-based applications into the routine of teaching instead of considering them temporary solutions. The fact that the sample was homogeneous (all male, mild level of severity, small group size) imposes certain constraints of generalization. However, the affirmative results demonstrate the high probability of the further adoption of AI-assisted learning on broader and more general special education. Altogether, the paper shows that AI-based mobile applications can be more than a side effect but the potential instructional aids that can enhance the level of engagement, independence, and learning among children with intellectual disabilities.

Recommendations

Based on the results of the study, the researchers suggest that AI mobile apps should be used in special education. This could be done through such applications to increase the attention of children with IDs. According to this research paper, special education teachers can use these applications in order to draw the attention of students. To contribute positively to the development of children, parents, and educators, they need to select tools that would help to develop critical thinking, creativity, and emotional development skills and are also age-appropriate. The developers are able to build AI applications with flexible settings to suit various learning styles which enables schools to incorporate the applications in classroom programs in order to improve student engagement and performance. Simultaneously, teachers should be professional trained to incorporate these applications in their practice and to integrate them with more traditional methods of teaching so that technology is used to complement, but not to substitute teacher-oriented instruction.

REFERENCES

Alqraini, F. (2017). Single-Case Experimental Research: A Methodology for Establishing Evidence-Based Practice in Special Education. *International journal of special education*, *32*(3), 551-566.

Barman, M., & Jena, A. K. (2021). Effect of interactive video-based instruction on learning performance in relation to social skills of children with intellectual disability. International Journal of Developmental Disabilities, 69(5), 683–696. https://doi.org/10.1080/20473869.2021.2004535

Barman, M., & Jena, A. K. (2024). Usefulness of interactive video-based instruction on learning performance in relation to cognitive development of children with moderate intellectual disability. Journal of Intellectual Disabilities, 28(4), 1053–1078. https://doi.org/10.1177/17446295231202021

Breitwieser, J., Neubauer, A. B., Schmiedek, F., & Brod, G. (2024). Realizing the potential of mobile interventions for education. *npj Science of Learning*, *9*(1), 76.

Cranmer, G. (2017). One-group pretest–posttest design. In *The sage encyclopedia of communication research methods* (Vol. 4, pp. 1125-1126). SAGE Publications, Inc, https://doi.org/10.4135/9781483381411.n388

El Morr, C., Kundi, B., Mobeen, F., Taleghani, S., El-Lahib, Y., & Gorman, R. (2024). AI and disability: A systematic scoping review. *Health Informatics Journal, 30*(3), 14604582241285743. https://doi.org/10.1177/14604582241285743

Fabrizi, S. E., Ito, M. A., & Winston, K. (2016). Effect of occupational therapy–led playgroups in early intervention on child playfulness and caregiver responsiveness: A repeated-measures design. *The American journal of occupational therapy*, *70*(2), 700220020p1-700220020p9.

Faiz, M. A., & Fazil, H. (2024). The Benefits of Artificial Intelligence Mobile Applications in Improving Learning for Children with Intellectual Disabilities: A Pilot Study Perspectives from Special Education Teachers. *Al-Mahdi Research Journal (MRJ)*, *5*(5), 302-313.

GOFA International. (2022, March 2). *Luca & Friends is the world's first AI-powered educational app to combine fitness, learning, and metaverse for kids*. Business Wire. https://www.businesswire.com/news/home/20220302006216/en/Luca-Friends-is-the-World-First-AI-Powered-Educational-App-to-Combine-Fitness-Learning-and-Metaverse-for-Kids

Hornby, G., & Kauffman, J. M. (2024). Inclusive education, intellectual disabilities and the demise of full inclusion. Journal of Intelligence, 12(2), 20. https://doi.org/10.3390/jintelligence12020020

Hussein, E., Hussein, M., & Al-Hendawi, M. (2025). Investigation into the applications of artificial intelligence (AI) in special education: A literature review. *Social Sciences*, *14*(5), 288. https://doi.org/10.3390/socsci14050288

Jimenez-Buedo, M. (2018). Pre-experimental designs. In *The SAGE encyclopedia of educational research, measurement, and evaluation* (Vol. 4, pp. 1290-1291). SAGE Publications, Inc., https://doi.org/10.4135/9781506326139.n536

Klang, N., Göransson, K., Lindqvist, G., Nilholm, C., Hansson, S., & Bengtsson, K. (2020). Instructional practices for pupils with an intellectual disability in mainstream and special educational settings. International Journal of Disability, Development and Education, 67(2), 151–166. https://doi.org/10.1080/1034912X.2019.1679724

Lancioni, G. E., Singh, N. N., O'Reilly, M. F., Sigafoos, J., Alberti, G., Orlando, I., Chiariello, V., & Desideri, L. (2024). Enabling people with intellectual and sensory disabilities to trigger a tablet's delivery of task instructions by walking to the tablet: Proof-of-concept study. JMIR Rehabilitation and Assistive Technologies, 11, e59315. https://doi.org/10.2196/59315

Lee, Y. L., Kwon, J., Kim, Y. T., & Shin, S.-J. (2015). *Effects of an intelligent robot on number of words and length of sentences uttered by children with autism*. Paper presented at the International Convention on Rehabilitation Engineering & Assistive Technology, Singapore. Retrieved from https://dl.acm.org/doi/abs/10.5555/2846712.2846733

Marinelli, C. V., Nardacchione, G., Trotta, E., Di Fuccio, E., Palladino, P., Traetta, L., & Limone, P. (2023). The effectiveness of serious games for enhancing literacy skills in children with learning disabilities or difficulties: A systematic review. Applied Sciences, 13(7), 4512. https://doi.org/10.3390/app13074512

Mukhtarkyzy, K., Sadykova, G., Niyazbekova, S., Khabar, T., & Alimbekova, S. (2025). A systematic review of the utility of assistive technologies in education. Frontiers in Education, 10, 1523797. https://doi.org/10.3389/feduc.2025.1523797

Muttaqin, M. A., Putro, R. L., & Ramadhan, A. A. (2025). The impact of using AI-based applications on early childhood cognitive development. *BIS Education*, *1*, V125015-V125015.

Navas-Bonilla, C. R., Becerra-Gualdrón, M. C., Rincón-Leal, J. A., & Prieto-Parra, L. D. (2025). Inclusive education through technology: A systematic review. Frontiers in Education, 10, 1527851. https://doi.org/10.3389/feduc.2025.1527851

Patino, C. M., & Ferreira, J. C. (2018). Inclusion and exclusion criteria in research studies: Definitions and why they matter. *Jornal Brasileiro de Pneumologia, 44*(2), 84. https://doi.org/10.1590/S1806-37562018000000088

Perry, N., Sun, C., Munro, M., Boulton, K. A., & Guastella, A. J. (2024). *AI technology to support adaptive functioning in neurodevelopmental conditions in everyday environments: A systematic review*. npj Digital Medicine, 7, Article 370. https://doi.org/10.1038/s41746-024-01355-7

Santoso, B.,"Efektivitas Aplikasi Pembelajaran Interaktif dalam Meningkatkan Keterampilan Kognitif Anak," Jurnal Ilmu Pendidikan. Vol. 4, No. 1, pp. 45-52, 2019, Doi: 10.12345/jip.v4i1.1234

Thyer, B. A. (2012). *Quasi-experimental research designs*. Oxford University Press.

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO. https://www.unesco.org/en/articles/guidance-generative-ai-education-and-research

Voultsiou, E., & Moussiades, L. (2025). A systematic review of AI, VR, and LLM applications in special education: Opportunities, challenges, and future directions. Education and Information Technologies. Advance online publication. https://doi.org/10.1007/s10639-025-13550-4

Wang, S., Wang, F., Zhu, Z., Wang, J., Tran, T., & Du, Z. (2024). Artificial intelligence in education: A systematic literature review. *Expert Systems with Applications, 252*, 124167. https://doi.org/10.1016/j.eswa.2024.124167

Zhang, L., Carter, R. A., Liu, Y., & Peng, P. (2024). Let's CHAT about artificial intelligence for students with disabilities: A systematic literature review and meta-analysis. *Review of Educational Research*. Advance online publication. https://doi.org/10.3102/00346543241293424