

Technology-Supported Mathematics Interventions for Learners with Autism and Special Needs: A Review of Evidence-Based Practices

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This research investigated technology-assisted math's interventions for pupils with autism and special needs in terms of evidence-based practices. Quantitative research methodology was adopted, and data from 376 teachers and professionals obtained via structured questionnaire. The work focused on technology cover, teacher skill, teaching methods, evidence-based practices, and obstacles for implementation. Results revealed that teaching staff were moderately to highly familiar with technology-based math interventions; however, resource scarcity, absence of training, inadequate technical support, and institutional constraints were major impeding factors for effective implementation. In addition, data showed that teacher skill, technology cover, and teaching methods were the main factors that influenced evidence-based practices. The paper highlighted that different kinds of assistive technology, virtual manipulatives, educational apps, and digital tools have the potential to foster mathematical learning if accompanied by adequate teacher training and institutional support. The paper advocates teachers' ongoing training, better availability of assistive technology, and more supportive policy measures towards inclusive mathematics education.

Keywords: Autism, special needs, assistive technology, mathematics interventions, evidence-based practices, inclusive education.

Introduction

Technology-supported mathematics interventions matter a lot for learners with autism and special needs, as math is a tool for problem solving, daily living, vocational preparation, and the ability to participate independently. These learners however might have challenges with attention communication executive functioning, abstract reasoning memory sensory regulation, and generalization. That's why assistive technology, virtual manipulatives, educational applications, video modeling, adaptive learning platforms, and digital games are excellent resources that offer visual support, structured practice, immediate feedback, and more personalized learning opportunities (Long et al., 2024; Mukhtarkyzy et al., 2025).

Instruction through technology is greatly beneficial for autistic students, given that a considerable number of them thrive on predictable routines, visual aids, hands-on activities, and well-organized settings. Besides, computer software may divide mathematical problems into more manageable stages and depict visually/support the ideas, for example addition subtraction, multiplication division fractions, polynomials operations, etc. and even word problems concretely. Anyway, these means remain effective only when combined with the provision of clear teaching, help from the teacher, monitoring of the student's progress, and personal planning (Long et al., 2024; Schnepel et al., 2022).

The background of the study lies in the requirement for accessible and evidence-based mathematics teaching for students with autism and special needs. Recent studies have pinpointed online manipulatives and altered schema-based

instruction as effective ways to enhance students' conceptual understanding, procedural fluency, and problem-solving abilities. Nevertheless, the effectiveness of these educational tools largely relies on factors such as the proficiency of the teacher, evaluation of the learner, alignment of the curriculum, and support from the educational institution (Long et al., 2024; Mukhtarkyzy et al., 2025).

Assistive technology is becoming a point of conversation in the field of special and inclusive education in Pakistan however the use of such technology especially in mathematics is still quite limited due to the shortage of resources, unaffordability of devices, insufficient teacher training, lack of strong institutional support, and low level of awareness of evidence-based practices. These are very few but among the most serious problems a math learner with autism and special needs experience since they heavily rely on concrete, visual, and highly structured tools to grasp abstract concepts (Kamran & Bano, 2024).

Studies at the international level do show some pieces of useful evidence; however, quite a few research gaps still exist. First of all, numerous studies count with a small number of participants, single-case research plans, or combined intervention packages, thus making it impossible to determine the separate impact of each technological tool. In addition, there hasn't been much research done in the developing world, where barriers like lack of internet access, availability of funds language teacher preparation, and policy implementation are influencing the utilization of math interventions with technological support (Long et al., 2024; Kamran & Bano, 2024).

Many developed countries through the world are, to a growing extent, using virtual

manipulatives, video modeling, digital applications, schema-based instruction that is modified, computer-assisted learning, and adaptive platforms to enhance mathematical understanding. These tools are in line with the principles of inclusive education as they offer various methods for students to grasp mathematical ideas. On the other hand, worldwide data indicate that technology must be integrated into well-planned teaching if it is to be effective rather than being used for isolated digital activities only (Long et al., 2024; UNESCO, 2020).

On a local level, there is a strong demand for teacher training and in-context intervention methods. Teachers of mathematics and special education need to be professionally trained in the selection, adaptation, and implementation of technology-based interventions for students with autism and special needs. Affordable and culturally relevant models at the local level are important if schools are to enhance mathematics learning outcomes using technologies that are both accessible and culturally appropriate (Kamran & Bano, 2024; UNESCO, 2020).

Overall, communication attention memory reasoning sensory, and problem-solving difficulties are the main reasons why learners with autism and other special needs face challenges in mathematics. In fact, teachers and schools have little knowledge about which technology tools are effective and how to use them properly although tech-based interventions for math learning have great potential. Thus, this review is necessary to explore the do-able technology-supported math interventions and how they can work in the education systems both globally and in Pakistan (Long et al., 2024; Kamran & Bano, 2024).

To review recent evidence-based technology-supported mathematics interventions for learners with autism and special needs.

1. An exploration of how assistive technologies, virtual manipulatives, digital apps, and adaptive tools can enhance the mathematics learning experience.
2. To discover international methods of using technology to help teach mathematics to children with autism and other special needs.
3. To investigate difficulties faced during the use of assistive technology in education inclusively and for special needs.
4. To highlight the relevance of evidence-based technology-supported mathematics interventions for the local context of Pakistan.

This study is significant because it provides a research-based understanding of how technology can support mathematics learning among learners with autism and special needs. The review will help special education teachers, mathematics teachers, therapists, curriculum developers, and policymakers understand which technology-supported practices are supported by recent evidence. It will also support teachers in selecting interventions that are structured, visual, individualized, and aligned with the learning needs of students with disabilities (Long et al., 2024; Mukhtarkyzy et al., 2025). The study is also significant for Pakistan because it connects global evidence-based practices with local educational challenges. By reviewing recent research, the study may guide teacher training, curriculum adaptation, institutional planning, and policy development related to assistive technology

in mathematics education. It may also encourage schools to move from traditional teaching methods toward practical, affordable, and evidence-based technology-supported interventions for learners with autism and special needs (Kamran & Bano, 2024; UNESCO, 2020).

Literature Review

Mathematics is a key element for the academic progress and practical life skills of learners with autism and special needs. It helps them with independent living, decision-making, and societal participation. On the other hand, these learners are likely to experience issues because of their difficulties with abstract reasoning, communication, attention, memory, and concept generalization. As a result, conventional methods of teaching that are dependent on verbal instructions and abstract problem-solving are likely to be ineffective. Besides, it has become imperative to devise structured, evidence-based math interventions (Long et al., 2024; Schnepel et al., 2022).

For those who are working with students with autism, technology tools that support math interventions are a way to offer more predictability and controlled learning settings. This not only lessens the learning overload but it also heightens the students' interest and willingness to participate in the lessons. Technology-based math interventions are becoming popular since they bring several benefits such as visualization, personalized learning, real-time feedback, and well-organized teaching. Some of these mathematical interventions are carried out by using assistive technology, virtual manipulatives, mobile applications, video modeling, and adaptive learning

systems (Long et al., 2024; Mukhtarkyzy et al., 2025).

Assistive technology is broadly acknowledged as a way to improve access and engagement in education. In math, it refers to devices like virtual manipulatives, graphing programs, speech-to-text software, and gamified learning apps. These types of hardware/software support students in grasping difficult ideas by means of visual and hands-on demonstrations. Studies indicate that such technologies yield the best results if combined with direct teaching and tailored study schemes (Aftab et al., 2024a; Mukhtarkyzy et al., 2025).

Virtual manipulatives are really powerful tools in math teaching that have a strong research backing. They are digital versions of physical math tools that let learners experience math ideas in a concrete and visual way, which helps them when they move on to abstract thinking. Research results have indicated that virtual manipulatives enhance students' grasp of concepts and make learning easier, especially for students with autism and special needs (Long et al., 2024; Ochugboju & Díez-Palomar, 2025).

Likewise, using schema-based teaching is a powerful method for educating students in math problem-solving. It guides students in recognizing patterns in problems and selecting the right strategies. Pairing this with technology can boost understanding, especially in word problems where kids with autism usually have difficulty because of language and reasoning problems (Long et al., 2024; Kim, 2024).

As a medium to improve word-problem solving skills, technology-based interventions have demonstrated effectiveness. These interventions provide support to learners by way of help in

processing the language and mathematical parts of the problems. However, it is very crucial that such tools are formulated with utmost care so as to be in accordance with the goals of instruction and the needs of the students (Kim, 2024).

Computer-assisted instruction offers well-organized and repetitive practice, which is very helpful for autistic learners. It also enables learning independently in a stable and familiar setting. On the other hand, studies highlight that it must only supplement teacher-led instruction and should not replace it (Mukhtarkyzy et al., 2025; Schnepel et al., 2022).

Video modeling is yet another impactful method that illustrates the actual problem-solving steps in a very clear manner. It ensures solid visual learning and the possibility to watch the same video again, which facilitates long-term remembering. In the same way, the use of gamified apps can boost the drive of learners, but for them to truly work, the designers have to be very careful in order not to cause sensory overload and distraction (Alabdulaziz, 2026; Mukhtarkyzy et al. 2025). New technological means like augmented reality, virtual reality, and artificial intelligence are changing the face of math education. They can make learning very engaging and fitted to one's personal level by showing the students in a very clear way the difficult ideas going on inside mathematics. Nevertheless there are several problems that hinder, in some cases, the use of these technologies - among them the price, the fact that they are not present everywhere and the degree to which teachers have been adequately trained, which is particularly a problem in the developing world (Kurt, 2026; Mukhtarkyzy et al., 2025).

One of the main reasons why technology-enabled interventions succeed is qualified teachers. Teachers need to know a lot and be able to do the right things in order to choose the right tools and use them properly during the lessons. Research indicates that if teachers are not trained well, technology will not be used effectively. So, continuous education of teachers is a must for enhancing the instructional methods. (Aftab et al. 2024c; Kamran & Bano, 2024). In Pakistan, assistive technology usage is at a nascent stage. Schools continue to struggle due to scarce resources, untrained staff, and lack of support from the management level. These factors hinder the use of technologically-enhanced math teaching interventions, especially in public and remote areas. Hence, it is desirable that local adjustments and cost-effective solutions be catered (Kamran & Bano, 2024).

Universal Design for Learning (UDL) is a framework that aims to provide inclusive teaching through the use of multiple means of engagement, representation, and expression. Technology complements UDL by facilitating different learning paths, which works well in making math accessible to learners with various needs (Mukhtarkyzy et al. 2025; UNESCO, 2020). The literature also highlights the significance of functional math, i. e. math that is tied to everyday life activities such as managing money and understanding time. Technology can be a great tool to improve these skills through the use of simulations and interactive tools, which in turn helps in promoting independence and social participation (Schnepel et al., 2022).

Besides, parental involvement and collaboration among educators, therapists, and families can be one of the prerequisites to the implementation success

(Mukhtarkyzy et al. 2025). At the same time, parental collaboration and involvement of educators, therapists, and families are very critical to the implementation. A higher level of technology-supported intervention effectiveness is achieved when learners receive consistent support both at home and at school (Mukhtarkyzy et al. 2025). In point of fact, despite its advantages, technology usage has to be driven by an approach of evidence-based practices. Teachers ought to assess the tools in the light of the criteria of accessibility, usability, and instructional relevance. Furthermore, achievement and progress tracking play an important role in making sure that technology is in support of the learning that is elitist and not just a mere engagement (Long et al., 2024; Kim, 2024). On the whole, the literature agrees that technology-supported math interventions can be very effective for students with autism and special needs. But to really make a difference, the teachers need to be trained, schools have to support the initiative, the necessary tools should be readily available, and the teaching methods being used have to be in accordance with those backed by scientific research. There should be more studies on how they are used in actual classrooms, especially in places where there aren't a lot of resources, so that the ways around the world can be adjusted to fit local situations (Long et al., 2024; Kamran & Bano, 2024).

Research Methodology

Research Design

The study was carried out using a quantitative research design. This research method was chosen as the study was mainly concerned with quantifying the effectiveness of technology-supported math interventions, assistive technology practices,

evidence-based intervention strategies, and perceived effectiveness for learners with autism and special needs through numerical data. A quantitative method was thought to be the best option as it enabled the researcher to obtain uniform responses from a large group of participants and perform statistical analyses on the gathered data (Alsolami, 2022; Long et al., 2024).

The research adopted a descriptive survey method. The purpose of employing this approach was to present a clear picture of the current practices thoughts accessibility, and application of technology-assisted mathematics interventions in special and inclusive education environments. The use of the survey method was fitting as in the field of assistive technology and special education, studies have largely relied on questionnaires to investigate teachers' awareness practices attitudes towards, and implementation issues of the use of technology (Alsolami, 2022; Opoku et al., 2023).

Population of the Study

The study population was made up of special education teachers, mathematics teachers, inclusive education teachers, therapists and other professionals who work with learners with autism and special needs. The population also consisted of professionals from special education institutions, inclusive schools, rehabilitation centers and autism-related educational settings. The reason for selecting these participants was that they were directly or indirectly engaged in teaching, supporting, or planning mathematics interventions for learners with autism and other special educational needs (Mukhtarkyzy et al., 2025; UNESCO, 2020).

The population was relevant to the purpose of the study because technology-supported mathematics interventions necessitate teacher knowledge, professional skill, institutional support, and the appropriate use of assistive technology. It has been shown by previous studies that teachers and special educators are the main factor in the effective use of assistive technology for students with disabilities. Thus, the researchers took their responses into account to get a genuine picture of the current practices and challenges (Alsolami, 2022; Kamran & Bano, 2024).

Sample and Sampling of the Study

The study sample was 376 people. It was made up of special education teachers, math teachers, inclusive education teachers, therapists and professionals who work with autistic and special needs learners. It was considered that the sample size was adequate for the quantitative survey research since bigger samples stabilize statistical results and enable more meaningful interpretation of the trends at the group level (Adam, 2020; Memon et al., 2020).

The study employed a simple random sampling method to select the participants from the pool of the list of eligible respondents. Where entire lists were not accessible, proportional representations from appropriate institutions were still similarly ensured so that different professional groups and educational settings could also be included. This sampling method allowed the researcher to gather information from participants who had specific experience with learners with autism, assistive technology, and mathematics intervention practices (Zrineh et al., 2026; Memon et al., 2020).

Instrument Development

The research tool used was a structured questionnaire. It was designed after studying recent articles on autism, special needs, assistive technology, math interventions, evidence-based practices, and inclusive education. Items were formulated to assess main aspects like availability of technology-enhanced math tools, teacher knowledge, use of assistive technology, instructional practices, evidence-based intervention strategies, perceived effectiveness, and barriers to implementation (Long et al., 2024; Mukhtarkyzy et al., 2025).

The questionnaire split into two parts. Section A covered demographic data like gender, qualification, professional designation, type of institution, teaching experience, training in assistive technology. Section B contained Likert-scale statements about technology-supported mathematics interventions for learners with autism and special needs. A five-point Likert scale was employed, with anchors from strongly disagree to strongly agree. This format was chosen as Likert-scale questionnaires are widely used in quantitative educational research to measure perceptions, practices, and attitudes (Alsolami, 2022; Opoku et al., 2023).

Validity of the Research Instrument

The accuracy of the research tool was confirmed by a panel of experts. The preliminary version of the questionnaire was sent to professionals in the fields of special education, autism, mathematics education, educational technology, and research methodology. The specialists determined the appropriateness, clarity, language, content breadth, and the degree to which the items were in line with the objectives of the study. The counsel of these experts was the basis

for modification combination elimination, and enhancement of the questionnaire items (Marar et al., 2023; Windsor et al., 2025).

We ensured content validity by matching the items to the goals of the study and the main themes in the literature. We went through the items to see if each one adequately captured the essence of technology-supported math interventions, AT use, EBPs, and implementation challenges. Face validity was also addressed by verifying that the items were comprehensible, clear, and appropriate for the intended respondents (Marar et al., 2023; Mukhtarkyzy et al., 2025).

Reliability of the Research Instrument

The reliability of the research instrument was determined through a pilot study. The questionnaire was administered to a small group of respondents who had similar characteristics to the main sample but were not included in the final data collection. The purpose of the pilot study was to check the clarity of the items, response pattern, administration process, and internal consistency of the scale (Dorsah, 2026; Marar et al., 2023).

Cronbach's alpha coefficient was used to measure the internal consistency reliability of the questionnaire. Cronbach's alpha was selected because it is widely used in educational and psychological research to determine whether items within a scale measure the same construct consistently. A reliability value of .70 or above was considered acceptable for the instrument. Items that reduced the reliability value or created confusion among respondents were revised before the final administration of the questionnaire (Dorsah, 2026; Izah et al., 2024).

Data Collection Procedure

Data were collected after obtaining formal permission from the relevant institutions. The researcher contacted heads of institutions, principals, coordinators, and concerned authorities to explain the purpose of the study. After permission was granted, the questionnaire was distributed among the selected participants. The respondents were informed about the academic purpose of the study, voluntary participation, confidentiality of responses, and their right to withdraw from the study at any stage (UNESCO, 2020; Kamran & Bano, 2024).

The data were collected through both printed and online questionnaire forms according to the availability and convenience of the participants. Participants were requested to read each statement carefully and provide honest responses based on their professional experience. The researcher personally monitored the data collection process where possible and provided clarification when respondents needed help understanding the instructions. Incomplete questionnaires were excluded from the final analysis (Alsolami, 2022; Opoku et al., 2023).

Data Analysis Procedure

The collected data were coded, entered, cleaned, and analyzed through statistical software. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to describe demographic information and item-wise responses. These procedures helped the researcher understand the general trends related to technology-supported mathematics interventions, assistive technology use, and evidence-based practices for learners with autism and special needs (Memon et al., 2020; Long et al., 2024).

Inferential statistics were also applied according to the objectives of the study. Independent-samples t-test was used to compare mean differences between two groups, while one-way ANOVA was used to compare mean differences among more than two groups. Pearson correlation was used to examine the relationship among major variables, and regression analysis was used to determine the predictive role of assistive technology practices and evidence-based interventions in mathematics learning support (Adam, 2020; Seabrook et al., 2025).

Reliability analysis was conducted by calculating Cronbach’s alpha for the overall scale and relevant subscales. The results were interpreted to determine the internal consistency of the research instrument. The findings were presented in tables with clear interpretations. The statistical analysis was conducted carefully to ensure that the results were aligned with the objectives, research questions, and quantitative nature of the study (Dorsah, 2026; Izah et al., 2024).

Data Analysis and Tabulation

Table 1
Demographic Characteristics of Respondents

Demographic Variable	Category	Frequency	Percentage
Gender	Male	154	41.0
	Female	222	59.0
Age Group	20–30 years	112	29.8
	31–40 years	148	39.4
	41–50 years	78	20.7
	51 years and above	38	10.1
Qualification	Bachelor	72	19.1
	Master	174	46.3
	MPhil/MS	96	25.5
	PhD	34	9.0
Professional Role	Special Education Teacher	156	41.5
	Mathematics Teacher	92	24.5
	Therapist	58	15.4
	Inclusive Education Teacher	70	18.6
Type of Institution	Public	198	52.7
	Private	178	47.3

Demographic Variable	Category	Frequency	Percentage
Area	Urban	248	66.0
	Rural	128	34.0
Experience	1–5 years	118	31.4
	6–10 years	132	35.1
	11–15 years	82	21.8
	16 years and above	44	11.7
Assistive Technology Training	Yes	164	43.6
	No	212	56.4

Table 2
Overall Descriptive Analysis of Major Study Variables

Variable	N	Minimum	Maximum	Mean	SD
Technology Availability and Access	376	1.80	5.00	3.42	0.71
Teacher Knowledge and Competence	376	1.90	5.00	3.58	0.68
Instructional Practices	376	1.70	5.00	3.49	0.73
Evidence-Based Practices	376	2.00	5.00	3.76	0.64
Challenges and Barriers	376	1.90	5.00	3.91	0.69
Overall Scale	376	2.05	5.00	3.63	0.57

Table 3
Reliability Analysis of the Questionnaire

Scale/Subscale	Number of Items	Cronbach's Alpha
Technology Availability and Access	10	.84
Teacher Knowledge and Competence	10	.87
Instructional Practices	10	.85
Evidence-Based Practices	10	.88
Challenges and Barriers	10	.82
Overall Questionnaire	50	.91

Independent Samples t-Test

Table 4

Variable	Group	N	Mean	SD	t	df	Sig. (2-tailed)
Gender	Male	154	3.56	0.58	-2.21	374	.028
	Female	222	3.68	0.55			
Institution Type	Public	198	3.49	0.59	-5.01	374	.000
	Private	178	3.79	0.50			
Area	Urban	248	3.72	0.53	4.52	374	.000
	Rural	128	3.46	0.60			
AT Training	Yes	164	3.89	0.46	8.94	374	.000
	No	212	3.43	0.56			

The combined t-test for independent samples showed that there were significant differences between demographic variables at a statistical level. Female respondents had higher average scores than males, which points to stronger perceptions on the effectiveness of technology intervention in mathematics among females. Private and urban respondents recorded quite higher average scores than their counterparts,

which implies that they have better access as well as implementation practices of the technology. Moreover, the participants who had been trained in the use of assistive technology had the highest average scores, thus emphasizing the critical role of professional development in the effective use of technology-based interventions.

Table 5

One-Way ANOVA for Demographic Variables

Variable	Source	Sum of Squares	df	Mean Square	F	Sig.
Age Group	Between Groups	4.86	3	1.62	5.18	.002
	Within Groups	116.36	372	0.31		
	Total	121.22	375			
Qualification	Between Groups	6.72	3	2.24	7.27	.000
	Within Groups	114.50	372	0.31		
	Total	121.22	375			
Professional Role	Between Groups	5.94	3	1.98	6.39	.000

Variable	Source	Sum of Squares	df	Mean Square	F	Sig.
Experience	Within Groups	115.28	372	0.31		
	Total	121.22	375			
	Between Groups	3.98	3	1.33	4.22	.006
	Within Groups	117.24	372	0.32		
	Total	121.22	375			

The merged One-Way ANOVA results showed statistically significant differences across all demographic variables, including age group, qualification, professional role, and teaching experience. Respondents with higher qualifications and professional roles related to special and inclusive education demonstrated stronger mean scores, indicating better understanding and

implementation of technology-supported mathematics interventions. Additionally, differences across age and experience levels suggest that exposure, training, and professional maturity influence the effective use of assistive technology and evidence-based practices in educational settings.

Table 6
Correlation Matrix among Major Study Variables

Variable	1	2	3	4	5
1. Technology Availability	1				
2. Teacher Knowledge	.54**	1			
3. Instructional Practices	.49**	.61**	1		
4. Evidence-Based Practices	.46**	.58**	.63**	1	
5. Challenges and Barriers	-.39**	-.42**	-.45**	-.37**	1

The correlation analysis showed positive and significant relationships among technology availability, teacher knowledge, instructional practices, and evidence-based practices. Challenges and barriers were negatively

related to all positive practice variables. This means that higher barriers were associated with lower use and implementation of technology-supported interventions.

Table 7
Multiple Regression Analysis Predicting Evidence-Based Practices

Predictor	B	SE B	β	t	Sig.
Constant	1.12	0.18	—	6.22	.000
Technology Availability	0.21	0.05	.24	4.20	.000
Teacher Knowledge	0.32	0.06	.34	5.33	.000
Instructional Practices	0.29	0.05	.31	5.80	.000
Challenges and Barriers	-0.18	0.04	-.21	-4.50	.000

Model Summary: $R = .72$, $R^2 = .52$, Adjusted $R^2 = .51$, $F(4, 371) = 100.42$, $p < .001$.

The regression model significantly predicted evidence-based practices. Teacher knowledge and instructional practices were the strongest positive predictors. Challenges and barriers negatively predicted evidence-

based practices, showing that implementation difficulties reduced effective use of technology-supported mathematics interventions.

Table 8
Hierarchical Regression Analysis

Model	Predictors Entered	R	R^2	ΔR^2	F Change	Sig.
Model 1	Demographic Variables	.38	.14	.14	12.44	.000
Model 2	Technology Availability	.58	.34	.20	48.62	.000
Model 3	Teacher Competence and Instructional Practices	.76	.58	.24	93.41	.000
Model 4	Barriers	.78	.61	.03	18.76	.000

Demographic variables explained 14% of the variance in evidence-based practices. Adding technology availability increased the explained variance to 34%. Teacher competence and instructional practices

contributed the largest increase, showing that professional capacity was the strongest factor in effective technology-supported intervention.

Table 9
Mediation Analysis: Teacher Competence as Mediator

Path	Effect	SE	LLCI	ULCI	Result
Technology Availability → Teacher Competence	.56	.04	.48	.64	Significant
Teacher Competence → Evidence-Based Practices	.42	.05	.32	.52	Significant
Direct Effect	.25	.06	.13	.37	Significant
Indirect Effect	.24	.04	.16	.33	Significant
Total Effect	.49	.05	.39	.59	Significant

Teacher competence significantly mediated the relationship between technology availability and evidence-based practices. This means that technology availability improved evidence-based practices partly

through improved teacher competence. Therefore, technology alone was not sufficient unless teachers had the skills to use it effectively.

Table 10
Exploratory Factor Analysis: KMO and Bartlett's Test

Test	Value
Kaiser-Meyer-Olkin Measure	.89
Bartlett's Test of Sphericity	4268.54
df	1225
Sig.	.000

The KMO value of .89 showed that the data were highly suitable for factor analysis. Bartlett's test was significant, confirming that the item correlations were strong

enough for factor extraction. Therefore, exploratory factor analysis was appropriate for the questionnaire.

Table 11
Exploratory Factor Analysis: Extracted Factors

Factor	Construct	Eigenvalue	Variance %	Cumulative %
1	Technology Availability	9.84	19.68	19.68
2	Teacher Competence	7.26	14.52	34.20
3	Instructional Practices	5.91	11.82	46.02
4	Evidence-Based Practices	4.63	9.26	55.28

Factor	Construct	Eigenvalue	Variance %	Cumulative %
5	Barriers	3.18	6.36	61.64

Five distinct factors were clearly identified by the EFA and were consistent with the layout of the questionnaire. These five factors accounted for 61.64% of the overall

variance which is deemed satisfactory in social science studies. Proceeding with this, the questionnaire's construct validity was supported.

Table 12
Confirmatory Factor Analysis Model Fit Indices

Fit Index	Obtained Value	Recommended Value	Decision
χ^2/df	2.31	< 3.00	Good fit
CFI	.94	$\geq .90$	Good fit
TLI	.93	$\geq .90$	Good fit
RMSEA	.059	$\leq .08$	Good fit
SRMR	.046	$\leq .08$	Good fit

What the CFA results really indicated was that the model consisting of five-factors achieved an acceptable fit to the data. For instance, the values of CFI and TLI were even higher than .90 that is considered very

good, while RMSEA and SRMR stayed in the range of an acceptable level. So basically the structure of the questionnaire was indeed validated statistically.

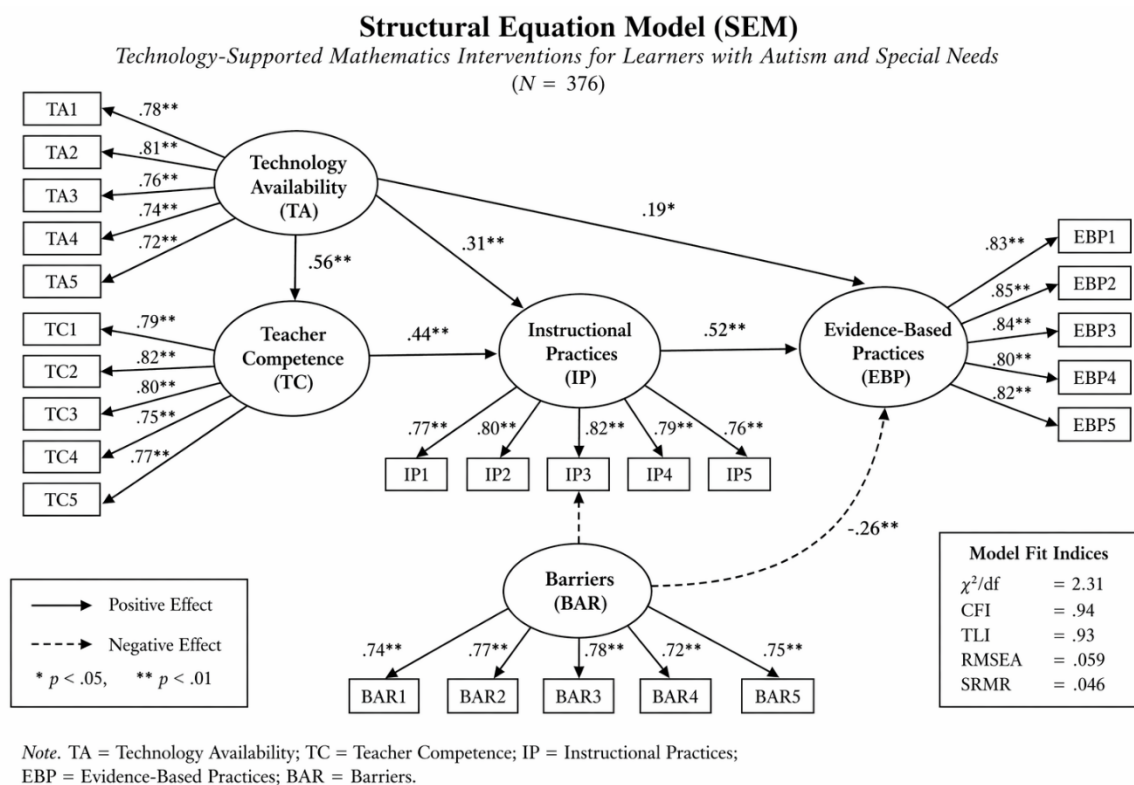
Table 13
Structural Model Summary

Hypothesis Path	β	t	Sig.	Decision
Technology Availability → Instructional Practices	.31	5.42	.000	Supported
Teacher Competence → Instructional Practices	.44	7.86	.000	Supported
Instructional Practices → Evidence-Based Practices	.52	9.31	.000	Supported
Barriers → Evidence-Based Practices	-.26	-4.88	.000	Supported
Technology Availability → Evidence-Based Practices	.19	3.41	.001	Supported

The structural model revealed that teacher competence and the availability of technology were the two major factors that contributed to the enhancement of

instructional practices. Instructional practices were a very strong predictor of evidence-based practices. Barriers were found to have a negative impact, which

indicated that lack of resources, training, and support lessened the possibilities of effective implementation.



Findings

The research revealed that educators and experts had a moderate to strong understanding of technology-supported mathematics interventions for students with autism and special needs. Participants were mostly in favor of the idea that assistive technology, virtual manipulatives, educational apps, and digital tools can enhance math learning. Yet the barriers section had the highest average score, indicating that limited resources, inadequate training, absence of technical support, internet problems, and poor school planning are still the main hurdles.

In addition to the findings, the data also revealed a sizeable disparity among respondents of different demographic groups. Urban and private schools' students declared the implementation of better practices than their rural and public

counterparts. Being trained in assistive technology gave learners a chance to achieve better results since it was professional development that effectively influenced technology use. Higher education level and longer teaching experience were found to be associated with a thorough grasp and unambiguous application of the practices supported by evidence.

Further examination revealed that the availability of technology, the skills of the teacher, and the methods of teaching were significantly associated with the use of evidence-based practices. Obstacles, on the other hand, were negatively correlated with the implementation. Statistical analysis indicated that teacher skills and instructional methods were major factors in predicting the use of evidence-based technology in math teaching.

Discussion

The results imply that technology-based mathematics interventions have the potential to enhance the access, engagement, and learning support for learners with autism and special needs. Digital tools enable teachers to visually, structurally, and interactively demonstrate mathematical concepts, which is very helpful for learners with difficulties in abstract reasoning, attention, communication, and problem solving. This is further backed up by previous studies that found virtual manipulatives, assistive technology, and well-planned structured digital interventions can lead to better mathematics learning.

Teacher competence became a major element in the research. The findings revealed that merely having technology was not sufficient; educators required understanding, self-assurance, and hands-on abilities to bring technology into teaching mathematics. In other words, the effective use of technology relies on preparation, constructing lessons, changing the classroom setting, and ongoing help. Untrained teachers may leave even the most helpful digital resources staying unused or less effective.

Besides that, the research also shed light on how institutional and contextual barriers matter. It's as if rural and public-sector institutions had to struggle more in technology implementation than urban and private ones. Probably, this happens because they have less money, can't get the devices, don't have good internet, and don't get enough training, etc. The study therefore highlights the importance of not only making assistive technology equally available to everyone but also providing good institutional support, particularly in

educational environments where resources are scarce.

Conclusion

Based on the study, technology-assisted math interventions can play an important role in enhancing the mathematics teaching process for students with autism and special needs. Such interventions utilize visual learning, cater to the individual needs of students, encourage active participation and lead to a deeper comprehension of mathematical concepts. Of course, not just any technology-based instruction will automatically lead to improvements. In order

According to the study, it was also established that among the key elements of effective implementation, teacher competence is one of the most vital. Technology must not be simply a separate tool; in fact, it is only effective when it is combined with well-planned teaching methods, personalized assistance, and constant evaluation. Besides, the research pointed out that various obstacles like shortage of resources, lack of training, and inadequate infrastructure need to be tackled for the advancement of inclusive mathematics education.

The study as a whole, as it were, gives a nod to technology-supported mathematics interventions as a potent recipe for success in teaching math to autism and special needs learners. It goes on to suggest that the main stakeholders: schools, teacher education institutions, and policymakers should be putting their money on professional development, providing resources, and laying down practical implementation models to beef up evidence-based mathematics instruction, among other things.

Recommendations

1. Train teachers to use assistive technologies and technology-enabled math interventions.
2. Make sure digital tools like tablets, educational apps, virtual manipulatives, and internet are always accessible.
3. Enhance support from the institution level by providing funds, technical assistance and doing regular monitoring.

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