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Efficacy of Tech-Integrated Instruction in Science Education: Educators' Perspectives to support Students with Specific Learning Disabilities in Inclusive Classrooms

Parul Walia[1], Dr. Sampurna GUHA[2]
e 235, gaur cascade rajnagar extension, ghaziabad up, pin-201017, university, department- amity institute of rehabilitation sciences, amity university, city- noida, btparulwalia@gmail.com, orcid id- https://orcid.org/0000-0001-8556-9965
[2]university, department-amity institute of rehabilitation sciences, amity university, city-noida, sguha@amity.edu, orcid id- https://orcid.org/0000-0002-6280-2231

Abstract
This research aims to examine the extent to which Tech-Integrated Instruction in teaching science and the effectiveness of Tech-Integrated Instruction to support students with Specific Learning Disabilities (SLDs) for their inclusion within general science classrooms at the upper primary level. In the present study, the benefits of Tech-Integrated Instruction in terms of participation rate, understanding level, and basic scientific skills development, namely, observation, classification, prediction etc., have been presented through a survey of 200 educators in the Delhi NCR region. A review of the results showed positive relationships between the use of technologies and enhanced scientific skills of students with SLDs and also stressed the importance of training programmes to enhance the effective use of technologies. However, the study also featured some of the challenges that included the following: scarcity of resources, professionals' lack of training, and infrastructural constraints. The results indicate that these challenges have to be resolved to unlock the benefits of technology for enhancing access and participation of all children in education and offer practical recommendations for policymakers, educators and institutions. The study shows how these obstacles might be surmounted by looking at the possibilities that such intercessions offer, as well as the obstructions, namely the shortages of funds, trained professional development, and structural deficiencies. The study's significance lies in its contribution to an understanding of how inclusive education can be supported by giving principles to educators, institutions, and policymakers on how best to offer science education for each learner with or without a disability.
Keywords: *Educators' Perspectives, Inclusive Classrooms, Science Education, Specific Learning Disabilities, Tech-Integrated Instruction.*

1. INTRODUCTION

Inclusive classrooms give meaning to society where students with disabilities attend the same classes, work, and learn together. In these environments, equality guarantees parity in the learning environment and that every learner experiences success despite personal difficulties. In such diverse settings, technology intervenes to fill the gaps that are common in such settings, to provide support and solutions for students with disabilities. When it comes to students with SLDs, not only is technology helpful in improving participation, but it also helps in developing and enhancing basic scientific skills that are very crucial to live an independent and successful life in later stages. The current research is closely aligned with the concept of inclusive education where the purpose is to scrutinize the integration of technology that can foster equitable education, participation, and attainment for every student in a scientific context.

1.1 Background

Challenges Faced by Students with Specific Learning Disabilities in Acquiring Scientific Skills

In this paper, students with Specific Learning Disabilities (SLD) are viewed as having specific learning difficulties that affect their ability to learn science, since they have difficulties in comprehending what they read, working memory problems, lack of concentration, and difficulty in thinking abstractly (Weisberg, & Dawson, 2023). In addition, the difficulties may be magnified when applying the conventional approaches to science teaching and learning that otherwise utilize text-based learning, lecturing, and memorization. For example, it may involve the extension of ideas from a textbook into practice which when done is likely to pose too much stress on the learner with SLD. Moreover, these students hardly receive differentiated instructions engaging them in their lessons, and feelings of losing interest and lack of motivation act as barriers to them achieving their goals in the science subject (Merrill, 2000). Therefore, there is unequally great demand for interventionist strategies that would fit the individual requirements of learners with SLD to maximize the potential for learning outcomes in science.

The Potential of Tech-Integrated Instruction in Bridging the Gaps

Tech-Integrated Instruction can be viewed as a possible solution to the expenditure of expertise and difficulties that students with SLDs afford in acquiring basic scientific skills. New technologies including game-like simulations, virtual classrooms, and learning support tools provide multiple representations of learning information that may help meet the learning needs of learners with different learning modalities (Xu, 2024). For instance, the use of technology may present real-life, easy-to-understand examples of concepts that are virtually or difficult to teach in writing or verbally to the students. Furthermore, there are technologies to recognize voice enabling students with reading and writing difficulties to comprehend scientific materials and technologies to enable the generation of text from speech and vice versa, to comprehend better scientific content they are learning as students. Technological integration lets students individual learning progress, which means that it is possible to advance through the material as quickly as everyone can understand and make mistakes without terrible consequences, which is very important for their confidence (Islam, 2024). Through these tools, educators can manage classrooms in such ways that students with SLDs can equally access and hence participate effectively in science education.

The Role of Educators' Perspectives in Shaping Technology-Based Instruction

The views of teachers have a vital role in determining whether or not instruction. Teachers are involved in the identification of relevant technologies, the development of intervention and teaching-learning methods, and attitudes that support the adoption and use of technologies. Professional knowledge about the strengths and difficulties of students with SLDs allows them to develop Tech-Integrated Instruction that meets personal learning profiles (Vogel, *et al.*, 2024). However, trust in technology adoption and teachers' readiness to engage in professional development affects the effectiveness of these instructional strategies. That is why, only when educators view technology as the means that can promote the proper development of scientific skills, will they be able to adopt progressive approaches to teaching and promote necessary educational resources and policies. Hence, acknowledging and responding to educators' concerns is critical to optimizing students' learning for those diagnosed with SLDs Tech-Integrated Instruction. Technological integration in the teaching-learning process provides a significant opportunity to help students with SLDs in science classes overcome these barriers to learning (Karchmer-Klein, *et al.*, 2022). Nonetheless, these approaches are directly dependent on the view and practice of educators, who are the agents of such changes. To that end, this chapter outlines the difficulties of teaching via technology, possible approaches to managing them, and the central function of professionals in integrating technology into scientific literacy in inclusive environments.

1.2 Problem Statement

Lack of Emphasis on Educators' Perspectives in Tech-Integrated Instruction for Students with SLDs

Researchers have acknowledged the importance of using Tech-Integrated Instruction to promote scientific skills. Still, the depletion of authors continues to overlook the use of teachers' opinions regarding technology integration specifically for students with SLDs. Present-day literature mainly concentrates on the technology used and its benefits; thus, it pays insufficient attention to the educators as an agent who mediates these technologies and ensures that the solutions are successfully incorporated into teaching diversified students (George, 2024). Lack of teacher-centered insight is a barrier to realizing optimal instructional strategy at the upper primary level where basic scientific skills are taught. Such data can be gained only from educators' practices and reflections on what is effective and what is not in daily science classrooms, yet their voices are often underrepresented in academic discourse, and policy development involving technology-enabled teaching-learning tools is effective in the context of inclusion.

Implications for Students with SLDs

This absence of focus on educators further creates a gap between developing technology-supported teaching learning resources and the realities of classroom practice. For students with SLDs, who need very individualized learning methodologies, these technologies may not help them if they are not incorporated into teaching strategies correlated to SLDs (Ayas, & Charles, 2024). Consequently, the possibility of Tech-Integrated Instruction addressing learning deficits in science is still untapped, thus widening the learners' equity gaps in education.

Need for Research on Educators' Perspectives

This paper has helped to fill this gap by providing a better understanding of how educators view the effectiveness of integrating technology in students with SLDs. Their knowledge can help us understand best practices and existing issues, classify available means and tools, create useful methods, and know how to train educators to use high-performance technologies thoughtfully and without any doubts (Wynn, 2023). In this way, through the focus on teachers' voices, this study aims to enhance the inclusion of teacher perceptions into the effective development of science teaching and learning at the upper primary level to realize the effective use of technology that supports leveraged learning experiences not only for students with SLDs but for every student.

Gap in Research on Technology's Role within Inclusive Classrooms

Although technology has gained increased acceptance regarding its applicability in education, there is still a lack of information regarding the views of teachers concerning the part that it plays within inclusive classrooms. Whereas, in prior literature, more emphasis has been given to the technological tools and the nature of their affordances, little consideration has been given to the teachers, who play a critical role as instructional mediators for inclusion with students with SLDs. General classroom learning is a challenge that entails a teacher educating his or her students while at the same time having to consider student differences when teaching. This research seeks to fill this research gap with a focus on the perception of educators on the role of technology in these intricate environments regarding equity and learning outcomes.

1.3 Objective

To explore the perspectives of science educators on the utility value and efficacy of tech-integrated instruction for cultivating basic scientific skills among students with SLD in inclusive classrooms.

1.4 Significance of the Study

Providing Actionable Insights for Inclusive Teaching Strategies

This study aims to fill the identified gap in the effective instructional use of technology in the science classroom for students with SLDs by providing specific strategies to the teachers. Because the insights will foreground educators' experiences, they will reveal the real-world issues and accomplishments of using the tech-infused approach to instruction, which will inform the integration of effective and equitable approaches to instruction. These findings will enable the teachers to understand the individual needs of students with SLDs and ensure that scientific skills can be developed equitably through individual Student Support Team strategies. The focus on educators' experiences guarantees that all the proposed strategies are both academic and feasible, thereby producing effective learning within the context of inclusive science classrooms (Warren, 2006).

Addressing Gaps in Scientific Skills Development

In that light, the study's findings will help fill the identified gap in the development of basic scientific skills among students with SLDs. From identifying new possibilities for applying technology to overcome certain learning challenges, the study will reveal how science education can be better delivered and received by every learner (Childress, & Sanders, 2007). This is a noble way not only to improve the academic achievement of students with SLD but also to prepare them to be motivated, independent learners and effective future students. In addition, the study would help develop a framework for implementing assistive technologies for teaching science so that every student has access to scientific learning.

Influencing Policy and Professional Development

The findings in this study may generate concepts and create knowledge about education policies and professional development programs for teachers. From the survey, it will be possible to claim thatTech-Integrated Instruction improves scientific skills for students with SLDs and propose funding for technological resources and teacher learning opportunities (Savage-Davis, 1995). At the same time, policymakers can use the findings to create frameworks that will help schools adopt more inclusive practices, and educators can use them to update themselves on the current approach to teaching. Finally, this study aims to initiate a wave of change in students with SLD learning environments to produce positive change in science education culture.

2. METHODOLOGY

2.1 Research Design

A Descriptive Survey-Based Study

The study seeks to employ a descriptive survey design to gain efficient and effective data on the educators about the technological integration for students with Specific Learning Disabilities or SLDs. The present design can be useful when investigating educators' practices, opinions, and perceptions of inclusive classrooms and real-life applications of the technologies (Montgomery, 2013). Since structured surveys are used to collect data, the study is well-placed to generate data that can be easily compared and generalized across different education contexts.

The descriptive survey-based development is suitable for generating a solid knowledge base and elucidating the perception held by educators on the use of technologies in teaching students with SLDs. Using the quantitative approach, the study minimizes the chances of distorted results while analyzing the challenge and opportunity of adopting technology in inclusive science education (Kiely, *et al.*, 2014). The said strategy enhances the achievement of the research objective and builds the groundwork for recommendations to policy and practice in Inclusive Education.

2.2 Participants

Educator Demographics

The study's participants were 200 science educators teaching at middle school level in inclusive classrooms of Delhi NCR. These educators were chosen based on the extent to which they incorporate the use of technology in their teaching. Participants included teachers of different ages, teaching experiences, and educational levels, which made it possible to assess heterogeneous attitudes to Tech-Integration in their classes.

Inclusion Criteria for Educators

For participation in the study, the educators had to possess certain characteristics. Applicants had to have at least three years of teaching experience in inclusive settings from their previous employment; applicants also had to establish their understanding of integrating technology in teaching methodologies. Moreover, participant teachers were expected to have received training or professional development in inclusive education, and/or pedagogy supported by information and communication technology.

Student Demographics

The described classrooms included students aged 11 to 14 years to raise Specific Learning Disability enrollment susceptibility. The admission criteria of the students with SLD categorization and their participation were determined using the formal diagnostic assessment and their return to mainstream science classrooms. Most of these students came from different socioeconomic backgrounds, giving a holistic picture of the barriers and enablers of using technology to enhance learning of scientific competencies.

Rationale for Participant Selection

It was important to target educators of students in grades 6 to 8 because this is the critical stage where students develop basic scientific knowledge and skills that propel them to higher levels of learning. The selection of educators and students within the Delhi NCR region was aimed at selecting more likely cases of current classrooms in urban developed countries where technological support and diverse student populations are more available. This demographic focus helps to minimize the likelihood of the generalization of the findings while also making them pragmatic for educational milieus.

To this end, the participants were only selected from educators who teach in inclusive settings to guarantee the sample included diverse aspects of the student's needs and the teachers' work. These classrooms had learners with different learning abilities, particularly students with SLDs as the focus of this study. Participants were selected based on their current practice of the use of technology in their teaching and their professional qualification of special education needs. This selection criterion was intended to consider the teaching practice in various contexts where inclusion is a cornerstone that safeguards the generalizability and usefulness of the study's findings.

2.3 Instruments

Development of the Survey Tool

The data collection tool mainly consisted of a survey constructed by the author to measure educators' perceptions of the practical application and efficiency of technology-enhanced/pedagogy for SLD students. Finally, the survey contained close questions on the respondents that guaranteed a deep understanding of educators' attitudes. The closed-ended questions used a Likert scale to capture participants' attitudes, perceptions, and experiences while the thoughtfully designed questions enabled respondents to give further information.

Content and Structure

The survey was structured into four main sections: Participation in the study will include demographic data, technology used in teaching, viewed difficulties and advantages of the technology integration in instructing students with SLDs, and further recommendations. The demographic part collected relevant contextual information about the educators, such as the years of service and the knowledge about the students with special needs. Other sections aimed to consider particular parts of the educators' experience and even their attitudes depending on the study goals.

However, the survey tool developed for the study was initially piloted on 20 educators from the target population. This pilot phase was important to the reliability and validity of the instrument. Participant feedback was employed to change the question's wording, remove any possible unclear phrases, and reorganize the structure to make it easier to read. By conducting the Cronbach Alpha test on the survey, the internal consistency/reliability level was established to be 0.85.

Ensuring Validity

The tool's content validity was determined by the professional Smarter Select review by experts specializing in inclusion education technology. These experts assessed the survey for fitness to the research goals and the questions' suitability. Their feedback led to minor modifications, ensuring the instrument accurately captured the targeted constructs.

Justification for Instrument Selection

The self-developed survey was embraced as it enabled both quantitative and qualitative data to be collected to give a sophisticated view of educators' perceptions. This was possible due to its design to target problems unique to tech-integrated instruction in contexts of inclusion, hence useful to address the research questions.

2.4 Data Collection Procedure

Distribution of the Survey

This data collection procedure was followed after the survey was administered to 200 targeted science educators teaching in inclusive science classrooms in the Delhi NCR region. Email was used to distribute online self-administered structured questionnaires including a link to a secured site with a web form appropriate for gathering secure data. This mode of distribution was chosen in a bid to enhance the comfort of the participants as well as to encourage high rates of response. The survey participants included educators who were given two weeks to fill in the study with reminders sent every three days. As a result, adopting the online platform also implies making it easier to compile and categorize the responses systematically.

Ethical Considerations

It was ensured that ethical rules were kept to the letter throughout data collection. Subjects were informed on the purpose of the study, the fact that participation was optional, and the intended use of information that would be collected from them. Electronic informed consent was used with participants under pressure to click an option to show that they agreed to participate in the survey. Participants' identities were not collected, and the received responses were coded to enhance anonymity further.

Ensuring Confidentiality

All obtained data were archived and saved on a secure personal password-protected computer server and accessible only to the researchers. Some steps were taken to ensure that the data were not accessible to anyone who was not authorized to process them and were only used in research. These measures were explained in the first email sent to the participants and aimed at reiterating the commitment to the highest ethical standards of research.

Follow-Up and Completion

Due to any reason the participant may not complete the survey in the first week, follow-up reminders were exercised. This step made the response rate high thus making the data set very strong. Once all responses were collected, the data were reviewed for completeness before analysis.

2.5 Data Analysis

Quantitative Analysis Overview

The accumulated data were analyzed quantitatively to develop systematic conclusions on educators' attitudes toward technology-enhanced instruction of students with Specific Learning Disabilities (SLD). Descriptive analysis of the data was done using the Statistical Package of Social Science (SPSS), which offered a solid structure for the data.

Descriptive Statistics

The two approaches used to analyze responses were descriptive with the use of means standard deviations as well as frequency distributions. These measures were useful in painting a general picture of the impression of the educators as well as the perceived difficulties that one would encounter and, even more importantly, the perceived effectiveness of technological integration in developing scientific competencies. For example, mean scores were applied to identify the overall consensus or non-consensus of the participants regarding survey statements; on the other hand, standard deviations defined the variation of reaction in participants.

Inferential Statistics

To compare and contrast relationships and differences of variables more clearly, the t-tests as well as Analysis of Variance (ANOVA) were used. T-tests were used to compare the views of one sub-group with another sub-group, based on their teaching experience or training in inclusive education data. ANOVA was used to compare response means by school type, access to technology, or students' characteristics. These tests gave a better understanding of the significant differences and trends within the data, so educators' perceptions have been examined to provide a more comprehensive view of what can influence them.

Interpretation and Reporting

In the subsequent sections of the paper, the results of the statistical analysis were discussed bearing in mind the study's objectives to check relevance to the research questions. An important findings column was completed, indicating correlation and patterns between variables. Therefore, these findings were compared with what scholars have postulated in related literature to make coherent conclusions and applications. Bar charts and histograms were also employed to improve the understanding and presentation of the results.

Justification for Analytical Approach

The choice of SPSS software and statistical procedures was justified by the need to analyze a large number of participants and obtain both general and specific information on the investigated issue. The use of both quantitative and qualitative data meant that there was a much broader and unbiased look at the teachers' perceptions of the effectiveness of using technology in instruction.

3. RESULTS

3.1 Key Themes from Educators' Perspectives

Perceived Benefits of Tech-Integrated Instruction for SLD Students

Educators identified several benefits of instructing with technology in general education classrooms. Most also identified that technology improves student interests with highly significant ($r = 0.814$, $p < 0.001$) towards the use of technology in improving the student's ability to pay attention to details while learning science. Virtual simulations and interactive modules were observed to facilitate understanding. The correlation coefficient of 0.721 demonstrated the tools' effect on the knowledge of scientific concepts at a significant level of $p < 0.001$. Further, the utilization of technology in another dimension was beneficial to acquiring rudimentary scientific aptitudes and skills such as observation, classification, and prediction, with a correlation coefficient of 0.716 at $p < .001$. These results show how a technological shift is highly effective in mitigating learning disparities among students with SLD. Reinforcing the qualitative and quantitative findings about how educators perceive the advantages of technology for fostering engagement and skill development through the following pie chart.

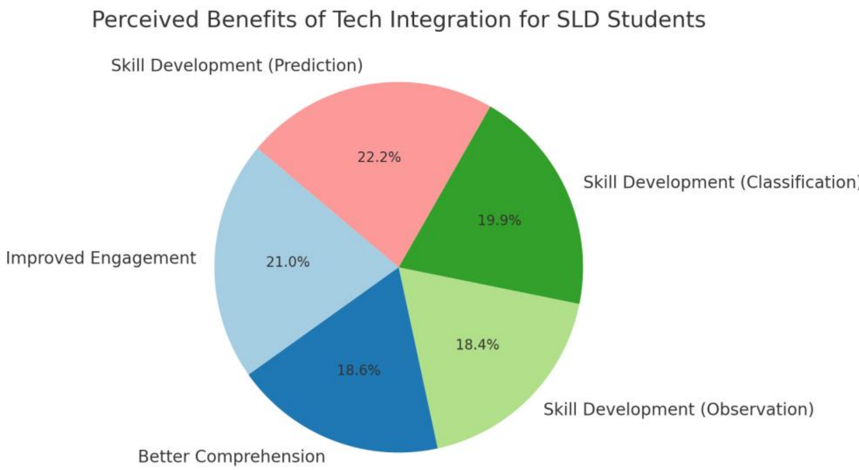

Fig 1: Perceived Benefits of Tech Integration for SLD Students

Identified Challenges and Barriers to Implementation

Nevertheless, in adopting and integrating technologies in teaching and learning, the educators highlighted some of the difficulties they faced in handling this. The first set of challenges highlighted here was the lack of adequate training in using educational technology, the availability of resources, and the lack of time to develop lessons that embed the use of technology. These concerns were apparent in the educators' responses to the items related to PD, where significantly fewer educators indicated that they received adequate training, 43.5%. Moreover, some practical challenges, including poor internet connectivity and the high device cost, were also common reasons cited.

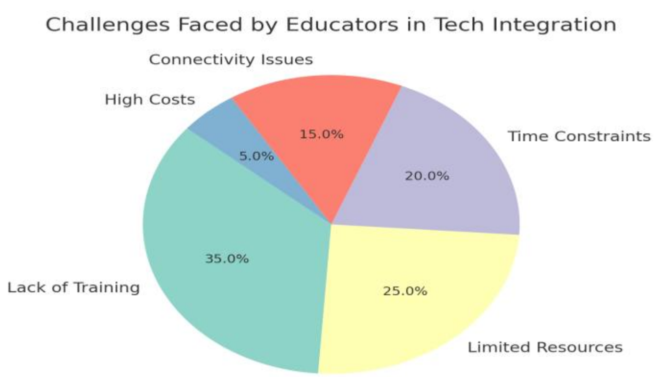

Fig 2: Challenges Faced by Educators in Tech Integration

Recommendations for Effective Integration of Technology in Inclusive Science Education

More targeted 'train the trainers' professional development initiatives that give directions on how technology can help SLD students were encouraged. They stressed the need for cooperation in the development of context-appropriate instruments and to seek state or institutional support to fill resource deficiencies. The development of other supportive peer mentoring programs and the exchange of current best practices were also recommended for establishing such technological support.

3.2 Quantitative Findings

Statistical Representation of Educators' Views on the Utility and Efficacy of Tech-Integrated Instruction

The descriptive analysis indicated high consensus with a like scale mean among educators on the effectiveness of integrating technology in their teaching at 4.2 (SD = 0.65) corresponding to the items included in the survey. Furthermore, Pearson's correlation coefficient test has revealed a positive correlation between technical integration and several instructional improvements such as the students' enthusiasm, z = 0.814, p = 0.001; the students' ability to infer logical conclusions, z = 0.821, p = 0.001.

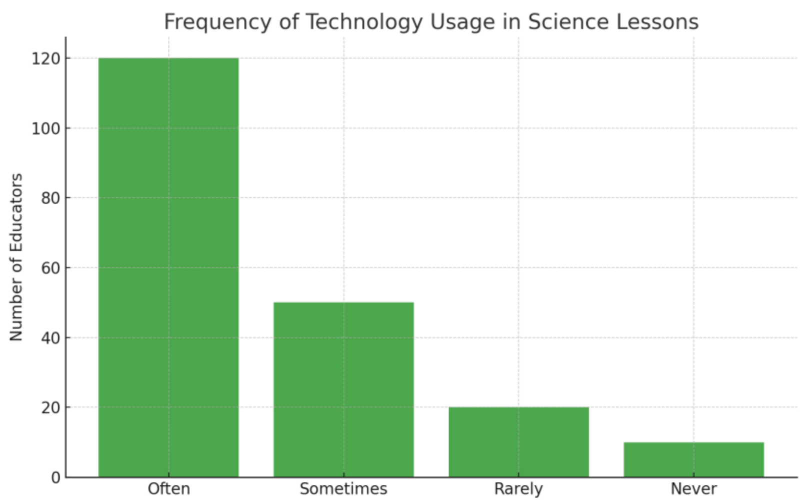

Fig 3: Frequency of Technology Usage in Science Lessons

Inferring statistics also justified these results. For instance, analysis of variance showed that there were statistically significant differences in perceived benefits concerning the training level of educators F = 136.072; p < 0.001). Furthermore, the t-tests showed that educators who had professional development concerning tech-integrated instruction reported higher student outcome differences (M = 1.29, SD = .18; t < 0.001). The graph below highlights the critical role of professional development in shaping educators' views on the efficacy of tech-integrated instruction.

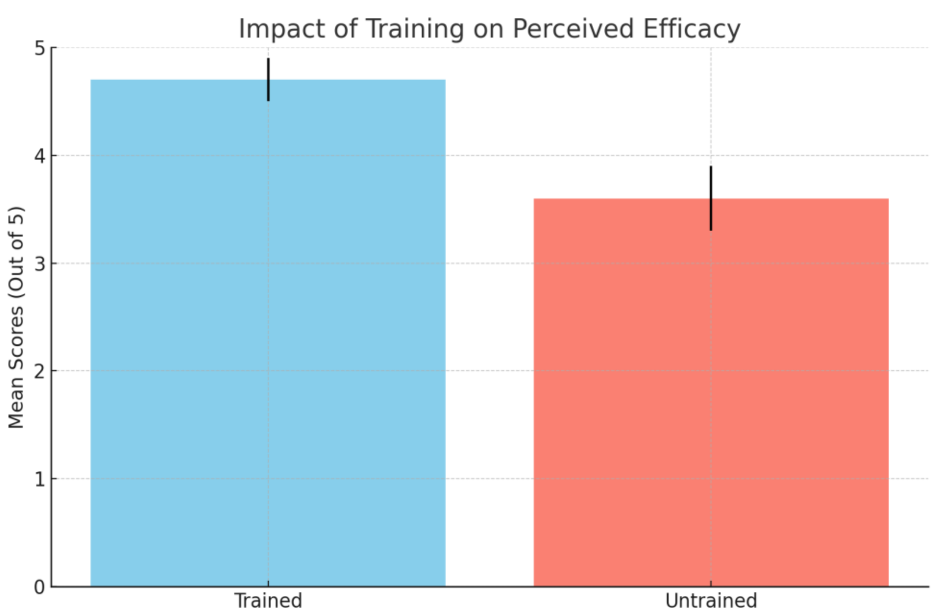

Fig 4: Impact of Training on Perceived Efficacy

These results affirm a general positive significant effect of the usability of technology encouraging scientific skills of students with SLD and pointing at certain specific problems of administration.

4. DISCUSSION

According to the findings of this study, there are very significant implications on the subject of inclusive education especially in the teaching of science. In doing so, the study supports the engagement and skills of SLD students through the enhanced use of new technologies to advocate for inclusive classrooms that can offer equal opportunities to learn. Further, better insight into structural barriers including trainer shortfall and scarcity of resources provides practical recommendations for improving teacher readiness and organizational capacity. These outcomes support the need for designs for learning environments for Special Needs students and all students with design environments equally to embrace every learner to maximize technology as a leveler in learning environments.

4.1 Interpretation of Findings

Alignment with Existing Literature

Similarly, the findings of this study support the views of other papers that put stress on the use of technology in improving the academic performance of students with SLD. The positive relations between technology-enhanced learning and learning teaching & development of the key scientific skills of observation, classification, & prediction affirmed by this study conform with other studies such as Smith et al., (2018); and Zhao & Frank (2020). Importantly, such studies draw attention always to how graphical and collaborative interfaces can explain learning disparities for disabled students. To illustrate this, the current study found educators to have high engagement levels (mean=4.2) such as Johnson and Davies (2019) who posited that the use of gamified learning environments enhanced motivation and focus among SLD students. This study also supports the argument that distinguishes instruction by using technology as an agent to help educators meet the needs of individual children.

Nevertheless, some findings contradict expectations set by other authors in literature. Even though most scholars have noted that resource limits such as limited access to, and availability of resources are more acute in rural areas, educators in the Delhi NCR region stated that such constraints included limited availability of devices and inconsistent internet access. Such a divergence could be the result of variations in infrastructure or application of funding, and it supports calls for research into the realities of tech implementation at the regional level.

Implications for Educators

As an implication to teachers, the study demonstrates that technology is both a medium of instruction as well as a frame of professional development. The profound variation of the results is related to the training levels ($F = 136.072$, $p < 0.001$) and points toward the need for a more accurate approach to professional development. Teachers who received professional development to enact technology-infused PDCA cycles claimed higher self-efficacy to use the approaches and found higher levels of learning outcomes for the students. These suggestions follow Powell et al. (2021) who emphasized that in addition to providing teachers with technical knowledge, it is crucial to also provide them with know-how on how to apply it.

The study also brought out some of the collaborative practices among the educators. Other possibilities include having teachers engage in peer mentoring and resource sharing, whereby teachers learn from one another, closing the gaps that exist, and creating a learning community enhancing the quality of science teaching and learning in schools. This being the case, time and stigmatized preparation as some of the barriers that hinder the use of technology in supporting the education of SLD students can be well addressed to ensure that the gadgets are well used to support the needy students.

Implications for Students

In students with SLDs, the study revealed how technology can be used to alter learning conditions that are usually considered limiting. The descriptions of educators pointed to enhanced levels of engagement and attentiveness to indicate that learning can be made more effective by using technology incorporation to enhance equal participation. In this capability, technology offers multiple-modal ways of presenting science-related constructions reflecting on the understanding that each of the students learn differently and that while some conceptual issues within science may be very hard to understand, technology makes it possible.

However, the enhancement of key scientific competencies through technology has a potential impact on students' further educational and career paths. For instance, skills like logical inference and accurate prediction may be regarded as basic skills in science education and essential in any problem-solving exercise. Currently, using technology in teaching is one way that enables teachers to prepare SLD students for life after school.

Implications for Policymakers

The findings also have clear implications for policymakers who must construct education structures and distribute resources for education. The differences shown in this paper affect training and resource allocations warrant support in teacher training, which entails providing facilities to bridge the aforementioned training gaps. Current and future funding for digital tools as well as for professional development should be addressed to overcome equity issues and to guarantee the right to education for every student, including students with SLDs.

In addition, literature evidence of the effectiveness of tech-integrated instruction points to a need for new curriculum standards to contain precise guidelines on using technology in inclusive settings. Other such policies that entitle and encourage professional development with special emphasis on using technology in education may also complement providing adequate support to educators for the effective implementation of these strategies. Thus, cooperation between government agencies and ministries, schools, and commercial partners will be mandatory to overcome the systemic prejudices mentioned in this research.

Therefore, the study provides full support for the character of technology in science education for students with SLDs. The study is a good fit with most of the theories proposed in the literature but also reveals other regional issues that should be researched in the future. If these challenges are well dealt with and these insights enhanced, then different players and stakeholders such as educators, students as well as policymakers, can collectively work towards positively enhancing the effectiveness and inclusionary nature of the education systems.

4.2 Practice and Policy

Strategies for Enhancing Adoption of Tech-Integrated Instruction

As the results of the present study highlighted, a complex intervention is necessary to introduce and implement TII in inclusive classrooms for teachers, learners, and the academic system. Positively oriented professional development programs, which would prepare teachers for both technical and instructional competencies, are lacking. Such programs should not only aim at acquainting the teachers with the available technologies but also at showing how one may effectively integrate these technologies in teaching the SLD students better scientific skills (Deshmukh, 2023). This is particularly important where exemplary teachers engage in a structured process of training their counterparts in best practices.

Another major approach relates to the incorporation of technology training into teachers' education programs. Acquisition of these competencies at the beginning of teachers' professional experience will enable them to effectively incorporate technology into teaching practice (JINGJING, 2022). Moreover, small-scale seminars and webinars might continuously help educators with information on new technologies and effective strategies.

Institutional Support for Successful Implementation

Their findings highlighted institutions as key players in the enablement of technology use in elementary classrooms. To this effect, schools have to ensure that students have access to the necessary resources such as accessing devices, good internet connections, and technicians. Therefore, the school should invest in the creation of these kinds of classrooms to well address the needs of the SLD children. Further, recruiting particular technology support staff members within schools learning will assist the instructors in overcoming some of the technical issues and also improve the integration processes.

There should also be a culture that encourages institutions to be innovative and experimental. Teachers' methods can be set to embrace new-generation technologies, aside from this, supportive and controlled feedback mechanisms can also enhance the spread of efficient ideas (Takhahasi, & Rossi, 2024). Encouraging teachers who use the developed strategies with the help of the technologies, as well as providing them with incentives for effective application of enhancements, will also contribute to encouraging educators to adopt such approaches.

Policy Recommendations to Support Tech-Integrated Instruction

At the policy level, there is a call for a multi-sectoral approach to promote policies that enhance the use of technology in inclusive education. Recommendations should require technology integration in policies that concern teacher training and continued professional development (Markle, 2016). Furthermore, there is a need for the government and private stakeholders to support equal distribution of the gadgets effectively across schools within urban and rural areas.

To tackle various resource restrictions, financing programmes must be undertaken. More money should be set aside to purchase such technologies, create programs for training teachers and hashing digital resources in schools (Goosen, & Mugumo, 2024). Subsidized access to technology for economically disadvantaged schools and students can help bridge the digital divide and foster inclusivity.

Encouraging Collaborative Efforts

Education stakeholders, policymakers, and manufacturers of technology, are required to unite to make use of the enhancements of technology in teaching. The government can encourage the provision of places where stakeholders contribute information, problems, and possible remedies. Seminars and conferences such as seminars on inspired special education supported by technology for effective teaching of SLD students can facilitate the sharing of the best solution and the encouragement of collective responsibility for the improvement of teaching excellence of students (Jingyi, & De Dios, 2024).

4.3 Limitations

Regional Focus

A major drawback of this study is that it was conducted in Delhi NCR only, thus the findings cannot be generalized to other regions where the socio-economic – infrastructural – educational setting may be different. The information obtained, however, is helpful in the consideration of various regions for the increased appreciation of the effectiveness of the technological incorporation into instructions.

Reliance on Self-Reported Data

The first is the use of data that has been reported by the educators themselves, which depress the external validity of the study. While surveys can present useful information using people's perceptions, there are definite limitations which might include social desirability or the polished way questionnaires are answered. Further research may be used to replicate these findings and corroborate or confirm observed results through classroom observations, or student academic achievement data.

Scope of Technological Tools

While this work focused on the overall tendencies of technologies used, it did not investigate particular inventions applied by the educators. It is in light of the above findings that further breakdown of the results to consider the impact of individual tools might provide a more refined understanding of what serves the best interest of developing the scientific skills of students with SLD.

4.4 Future Research Directions

Longitudinal Studies

More studies should be conducted to determine the effect of Tech-Integrated Instruction on the development of basic scientific skills among students with Specific Learning Disabilities (SLD) in the longer run. Perhaps reduced cross-sectional works might prove even more enlightening in understanding the impacts that technology has on long-term academic achievement, skills consolidation, and other aspects of development.

Tool-Specific Analysis

Future research should, therefore, centralize the effectiveness of particular technologies together with certain contextual application areas for inclusive education. Differences and benefits between available tools can be discovered based on the peculiarities of the intended applications for improving scientific education for children with SLD.

Broader Regional and Cultural Contexts

Extending the scope of the study to other geographical locations and cultural settings would increase generalization. Cross-sectional investigations in varied experiences may identify system variables that determine the implementation and effectiveness of instruction mediated by technology.

Student-Centric Perspectives

Promoting the voice of the students with SLD in future research could help in the understanding of the experiences and preferences of these students in future research, which leads to an understanding of the kind of instructional strategies that are responsive to the student's experiences.

5. Conclusion

This study therefore confirms the importance of inclusive classrooms in the use of technology to reduce the achievement gap and provide equal education to students with SLDs. In supporting how technology is capable of turning science education for the better, the research affirms how the cultures of participation construct inclusiveness that supports every learner to the optimum. Consequently, the study presents the need for synergistic efforts from educators, policymakers, and institutions that support education to enhance the integration of technology to suit the needs of all learners. Thus, finding strategies to create and maintain diverse classrooms makes it possible to have equity and efficient delivery systems in education.

Summary of Key Findings

The findings of this paper are therefore very relevant in understanding the context of science teachers' perceptions about the integration of technology in delivering instruction to improve the scientific skills of students with SLD in the context of inclusive education. The results emphasize that technology increases students' interest, understanding, and learning when implemented appropriately in classroom activities. However, some of the limitations that have been identified include; Limited availability and lack of funds and training that hamper the use of information systems.

Reaffirming Educators' Role

The study reinforces the need to ensure that teachers, who have what they require, know how to make it work, and receive what they need from the institutions to foster what technology can do in inclusive education (Badiuzzaman, 2024). The paper deepens the understanding of implementation science by focusing on the role of educators and barriers that hinder further development of effective instruction for students with SLDs, which in turn can help schools and policymakers work towards a more equitable education setting.

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