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Differentiated Instructional Strategies for Special Needs Students with Learning Difficulties in Mathematics

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Abstract

This paper aims at identifying the effectiveness of differentiated instructional strategies implemented for special needs students who have problems learning mathematics. The study employed a quantitative research design, administering a self-developed questionnaire to 250 teachers through simple random sampling. We collected data both physically and online, and analyzed responses using descriptive and inferential statistics in SPSS. Findings suggested that there is immense support for the differentiated strategies among teachers, such as visual aids, hands-on activities, peer-assisted learning, and individualized feedback, as they enhance mathematical understanding in students with learning difficulties. Teachers credited technology-based tools and tailored instruction for increasing student engagement and assisting students' improvement in problem-solving skills. This study concluded that experience, designation, and place of posting immensely affect teachers' perceptions of these strategies, whereas gender and educational qualifications do not make a difference. The findings of the above study raise awareness of the diversified needs of different learners and stress the importance of continuous professional development for the implementation of differentiated instruction.

Keywords Differentiated Instructional, Strategies, Special Needs, Learning Difficulties, Mathematics

Introduction

Differentiated Instruction, or DI, has emerged as a crucial pedagogical approach to address the diverse learning needs of students, particularly in mathematics, where it appears to be a significant issue. The fundamental principle of DI stems from the recognition that a one-size-fits-all teaching approach cannot effectively teach students of diverse abilities and expect them to grow. Such an approach cannot adequately cater to students struggling with mathematics (Marks et al., 2021). The differentiation allows the teachers to streamline their instruction according to the needs of their learners, thus varying in order to provide the same content with different levels of difficulty, pacing, and modes of delivery. These approaches make the learning environment more inclusive and nurturing, allowing students to learn mathematics meaningfully despite their learning difficulties, as Barana et al. (2021) stated. When applied effectively, DI not only scaffolds learning but also fosters higher levels of engagement and success among students who might otherwise face marginalization in a traditional classroom.

The use of DI in special education has, in particular, been advantageous in terms of its application to students with specific learning difficulties in mathematics. A number of studies have

shown that differentiated instruction, such as small group instruction, peer-assisted learning, and manipulatives, can have an impact on students' mathematical understanding of SLD (Bi, 2023; Qasserras, 2024). These methods allow students to interact and explore mathematical ideas in a way that is most useful for their learning: visually, auditorially, or kinesthetically—thus improving their overall understanding of the concepts. The incorporation of technology into DI has enhanced its practicality. According to Van de Walle (2007), adaptive learning technologies enable one-to-one adapted learning pathways that produce instant feedback that develops changing scenarios in learning to enable self-correction and proper understanding of mathematical concepts. Trpin (2023) asserts that these technologies tailor instruction to the students' varying levels of understanding, promoting inclusivity and equity in learning.

This potential often presents challenges for teachers, as they strive to ensure that differentiated instruction in mathematics is effective for students with learning difficulties. Indeed, creating differentiated lessons to meet the needs of diverse learners in a large classroom with limited resources can be challenging for teachers (Marks et al., 2021). Furthermore, the continuous formative assessment, which heavily relies on DI, requires teachers to monitor and modify their methods based on students' responses, a process that can be time-consuming (Martin et al., 2022). Engaging DI in mathematics also requires the use of manipulatives and other visual aids to create a link between concrete and abstract thinking, as stated by Bungao-Abarquez (2020). However, poor practice intensifies a weakness in DI methods (Hidayati, 2020). Despite the establishment of teacher professional development to aid in the implementation of DI, the provision of sustained hands-on support for teachers tasked with teaching pupils with learning difficulties in mathematics remains uneven.

Although the majority of existing literature highlights the significant benefits of differentiated instruction as a method for teaching mathematics to students with learning difficulties, there are still gaps in its practical implementation, especially in classrooms with limited resources. This study bridges the gap by examining the application of DI strategies by teachers, particularly with students facing learning difficulties in mathematics, and assessing their effectiveness in modifying student outcomes. Despite the theoretical benefits of DI, very few studies have effectively compiled empirical evidence that might shed light on whether DI is useful in real-world practice settings with students who have specific learning needs in mathematics. The purpose of this study is to gain a deeper understanding of how educators experience challenges and successes when applying DI in mathematics classrooms, which will contribute to developing more practical and scalable strategies for supporting students with learning difficulties in such a critical subject area.

Objective of Study

Objective of the study was to explore the differentiated instructional strategies for special needs students with learning difficulties in mathematics.

Literature Review

The strategy caters to students' diverse learning requirements, particularly in the math classroom, where students often require significant effort to truly grasp the subject. Such research espouses that one-size-fits-all instruction does not foster the needs of students with learning difficulties, as most students suffering from learning challenges still understand mathematical concepts when their peers can, even with a little ease. DI offers a method for adjusting the difficulty, pace, and content presentation to enhance student engagement and success in mathematical tasks (Barana et al., 2021).

The principles of DI have proven very effective in special education for students with specific learning difficulties (SLD) in mathematics. Bi (2023) suggests differentiated strategies such as small group instruction, peer tutoring, and the use of manipulatives to ensure that students with SLD understand mathematical concepts. There are multiple avenues for content exploration, which could make abstract mathematical concepts more accessible. Peer-reviewed studies have established that DI enables the students to learn in ways or modes to which they are comfortable—with being visual, auditory, or kinesthetic (Qasserras, 2024).

Numerous reports have highlighted the use of technology to differentiate mathematics instruction for students with learning difficulties. Adaptive learning, a type of interactive software, is one of the technologies that tailor learning paths to each student's unique needs. Van de Walle (2007) suggests incorporating technology into the differentiated instruction process to boost engagement, provide real-time feedback, and enable students to rectify their mistakes and comprehend

mathematical principles. It is useful because technology allows for the personalization of content with regard to students' varying degrees of understanding, thereby promoting a conducive learning environment for all students (Trpin, 2023).

Although the benefits of DI instruction are numerous, math teachers face the challenge of effective implementation. In reality, designing and conducting a multi-level classroom is challenging for teachers (Marks et al., 2021). Careful planning and assessment, as well as the ability to change strategy based on student performance, are required. Such processes can be very long-winding, especially for teachers who have or follow gigantic class sizes or lack resources (McTighe & Ferrara, 2021). However, research has shown that effective DI practices significantly improve students' performance, especially in mathematics for students with learning disabilities (Re et al., 2020).

Formative assessments are another critical aspect of differentiated instruction in mathematics. Research shows that continuous assessment enables teachers to find out where their students lack understanding and adjust their teaching strategies to address those gaps (Martin et al., 2022). For a learner with difficulties, formative assessment can offer timely interventions that may prevent small misunderstandings from growing into large academic issues. For example, some of the more effective formative assessments are through observational techniques, quizzes, or oral questioning because they inform one about how students are progressing (Lee et al. 2020).

Thus far, the practice of using manipulatives to teach students with learning difficulties has received significant support, making the instructions differentiated. Manipulatives are concrete materials used to teach mathematical concepts in a hands-on manner, allowing pupils to explore intangible ideas through concrete experiences (Bungao-Abarquez, 2020). Studies have indicated that students with learning difficulties learn more from the application of manipulatives, since these help close gaps where students only think concretely and abstractly. For example, Green (2020) believes that manipulatives may assist in explaining intricate mathematical functions such as addition, subtraction, and multiplication.

In addition to manipulatives, students with learning difficulties have used graphics organizers as support graphics for their mathematics instruction. Graphic organizers are pictures that help to present mathematical ideas, hence enabling the students to organize their thinking and enhance comprehension (Powell et al., 2021). Such tools assist students with learning difficulties because they provide a clear, well-organized framework for problem-solving that is normally difficult for students with learning challenges (Law et al., 2020).

Yet another more distinctive instructional strategy that seems to work is PALS, a shortened form of peer-assisted learning strategies. Students there collaborate on solving math problems despite differing levels of competency, but the more skilled students are there to provide the necessary aid and support (Wood et al., 2020). According to research, PALS improves students' mathematical performance and facilitates social interaction between students, giving them confidence in solving their mathematics problems (Klang et al., 2021).

Hence, the successful implementation of differentiated instructional strategies in mathematics for students with learning difficulties necessitates the incorporation of teacher training and professional development. Numerous studies have demonstrated that after receiving specific DI training, teachers become more adept at addressing the diverse needs of their students (Smets & Struyven, 2020). Training programs that emphasize practical strategies for adjusting content, process, and product to cater to diverse learners can significantly improve a teacher's capacity to provide differentiated instruction in mathematics (Hidayati, 2020).

Research shows that collaborative learning environments increase differentiated instruction on mathematics difficulties among students. The use of cooperative learning structures makes this possible. Here, students collaborate in diverse groups to solve mathematical problems, fostering a sense of shared responsibility for their learning. This is according to Lai et al. (2020). Research has proven that an environment like this fosters deeper engagement in mathematics content among students with learning difficulties, while also facilitating their problem-solving and thinking capabilities (Shanta & Wells, 2022).

Cognitive strategies play a crucial role in the differentiation process of instructions for students with learning difficulties in mathematics. Cognitive Strategy Instruction (CSI) entails teaching learner’s procedural or heuristic ways of solving mathematical problems. Among the aspects used in CSI are self-monitoring, self-questioning, and mnemonic devices. According to Budin et al.

(2022), CSI has been most successful for students with a learning disability. Because it develops the metacognitive skill of learners, it enables them to solve demanding mathematical problems (Soleymani Khashab et al., 2021).

We cannot undervalue the importance of individualized instruction in mathematics for students with learning difficulties. This type of instruction allows a teacher to individualize instructions to suit the needs, abilities, and interests of each pupil (Faragher, 2023). Personalization at the learning level prevents the non-learning disabled pupil from progressing while the learning disabled pupil continues to learn. This is even more important in subjects such as mathematics, which tend to build on previous work accomplished in earlier school years (Annuš & Kmeť, 2024).

Researchers also depict group-based instructional strategies as effective tools for differentiating mathematics instruction for learners with learning difficulties. Numerous studies have demonstrated the advantages of students participating in small, adaptable groups that adapt to the particular skill they are learning (Gyöngyösi-Wiersum, 2021). Such groups provide focused instructions and ensure that each student receives the individualized support needed to be successful at mathematics (Awofala & Lawani, 2020).

According to research evidence, task analysis is very effective in the case of students with learning difficulty in mathematics through differentiated instruction. Task analysis breaks down complex mathematical tasks into smaller solvable pieces that students can tackle at a given time (Herner-Patnode & Lee, 2021). This process helps students try and focus on one particular instance of the problem at hand, thus reducing cognitive overload and increasing their chances of solving a mathematical problem successfully (Chew & Cerbin, 2021).

Effective classroom management is another important factor in differentiated mathematics instruction for learners with learning difficulties. Teachers ought to create an environment that accommodates a number of activities at the same time, therefore calling for explicit routines and expectations (Pozas et al., 2020). According to research, classes with effective classroom management learn better to offer differentiated instruction because the class hastens transition procedures among other activities and minimizes children's distractive actions (Bhadouria, 2024).

Mahharrini et al. (2020) have shown that instruction scaffolding, in which the teacher provides temporary support to students while they learn new mathematical concepts, is effective for students with LD. The approach is gradual, providing students with the appropriate amount of support at a certain level of dependency while gradually removing that support as they become independent. Masinading & Gaylo (2022) have proven that this scaffolding concept helps learners with learning difficulties explore better math content while also boosting their confidence.

Griful-Freixenet et al. (2020) define universal design for learning as a conceptual framework that makes learning accessible to students with learning difficulties. UDL offers multiple means of representation, expression, and engagement, ensuring that there are various ways by which different students could approach accessing and demonstrating their knowledge about mathematics (CAST, 2011). Studies also indicate that UDL supports differentiated instruction as a way of teaching mathematics that is even more inclusive (Griful-Freixenet et al., 2021).

Assessment plays a variety of roles in differentiating instruction for students with learning difficulties in mathematics. Teachers have to both use summative and formative assessments to monitor the progress of students and then adjust their instruction strategies to be in tandem with those observations (Russo et al., 2021). Formative assessments, such as quizzes and students' reflection, provide immediate feedback that allows for real-time adjustment in instruction. At the end of a unit or course, educators administer summative assessments to track the overall success of the instructional strategy (Carney et al., 2022).

Last but not least, it is recognized that the students' motivation impacts the successful implementation of differentiated instruction in mathematics. Researchers have determined that most students with special needs often exhibit low motivation and poor dispositions towards mathematics, contributing to their significant progress lag (Lai et al., 2020). Differentiated instruction, through personalized learning experiences, can engage and motivate students to learn more, as it recognizes and values their individual needs and strengths (Alamri et al., 2020).

Research Methodology

Research Design

This study selected a quantitative research design to examine the effects of differentiated instruction strategies on students with learning problems in mathematics. In this regard, a quantitative approach is appropriate because the respondents' responses can be objectively and statistically measured, providing a deep insight into the success of such approaches.

Population and Sample

The study's population consisted of education department teachers who have experience teaching students with special needs in mathematics. We used a simple random sampling technique to select a sample of 250 teachers from this population for this study. This sampling procedure aimed to select every teacher in the population, thereby reducing potential biases and improving the generalizability of findings.

Instrumentation

A self-administered questionnaire served as the primary data collection tool. We developed the questionnaire after conducting a thorough review of the literature on differentiated instructional strategies and their application in the special needs classroom. The instrument's questionnaire featured both closed-ended and Likert scale questions. The aim of the questionnaire was to quantify teachers' perspectives on the effectiveness of differentiated strategies for students facing learning difficulties in mathematics.

Data Collection

Data collection procedures utilized both physical and online methods to increase respondents' response and convenience. Teachers received copies of the questionnaire in advance through physical visits. We forwarded additional copies of the online versions to the teachers via email or other access channels to facilitate their completion. This helped raise the response rate and ensured a wider reach of the population under study.

Validity and Reliability

Experts in special education and mathematics instruction reviewed the questionnaire to ensure its validity. We refined the questions based on feedback from the subject matter experts to ensure clarity and relevance. Finally, we conducted a pilot test with a small sample of teachers from the population to estimate the instrument's reliability. We determined the level of reliability for the scales used in this questionnaire using Cronbach's alpha, which resulted in high reliability.

Ethical Considerations

The research maintained ethical requirements at every stage. Before obtaining any data, we assured all participants that their information would remain private and anonymous. Furthermore, we informed them that their participation was entirely voluntary and the teachers had the freedom to withdraw at any time. We kept all collected data confidential and did not include information about individual responses in the final analysis.

Analyzing Data

To analyze the data, I used the SPSS computer software. Additionally, I conducted data summaries using descriptive statistics, including frequencies, means, and standard deviations. We evaluated the responses for significance based on the differences in other demographic variables, using the theoretical framework and inferential statistics such as t-tests and ANOVA. Otherwise, we applied regression analysis to establish a relationship between differentiated instructional strategies and student performance in mathematics.

Table 1

Frequency Distribution at the Basis of Demographics

Title	Description	Frequency	Percentage (%)
Gender	Male	76	30.4%
	Female	174	69.6%
		250	**100%**
Age of Respondents	21-30 Y	59	23.6%
	31-40 Y	77	30.8%
	41-50 Y	80	32.0%
	51-60 Y	34	13.6%
		250	**100%**
Designation	SSET	135	54.0%

	JSET	115	46.0%
		250	**100%**
Qualification	Master	203	81.2%
	M.Phil.	33	13.2%
	PHD	14	5.6%
		250	**100%**
Place of Posting	School	135	54.0%
	Center	115	46.0%
		250	**100%**
Area of Posting	Rural	135	54.0%
	Urban	115	46.0%
		250	**100%**
Experience	1-5 Y	131	52.4%
	6-10 Y	94	37.6%
	11-15 Y	25	10.0%
	>15 Y	0	0.0%
		250	**100%**

The sample is predominantly female (69.6%), between the ages of 41-50 years old (32.0%), holding master's degrees (81.2%), and working as SSETs (54.0%). The majority of these individuals work in schools (54.0%) and rural areas (54.0%), with 52.4% possessing 1 to 5 years of experience.

Table 2

Frequency Distribution at the Basis of Objective Statements

Sr.	Statements of Questions	SA	A	UD	DA	SDA	M	SD
1	Differentiated instructional strategies enhance the learning of students with learning difficulties in mathematics.	34 14%	198 79%	18 7%	0 0%	0 0%	4.06	0.45
2	Using visual aids (e.g., diagrams, charts) is an effective strategy to teach students with learning difficulties in mathematics.	73 29%	176 70%	1 0%	0 0%	0 0%	4.29	0.46
3	Incorporating hands-on activities helps students with learning difficulties grasp mathematical concepts better.	89 36%	159 64%	1 0%	0 0%	1 0%	4.34	0.53
4	Providing students with learning difficulties extra time to complete mathematical tasks improves their performance.	67 27%	178 71%	2 1%	3 1%	0 0%	4.24	0.52
5	Tailoring instructional methods based on individual student needs significantly benefits students with learning difficulties in mathematics.	40 16%	202 81%	4 2%	4 2%	0 0%	4.11	0.48
6	Frequent use of peer-assisted learning supports students with learning difficulties in understanding mathematical concepts.	106 42%	139 56%	5 2%	0 0%	0 0%	4.40	0.45
7	Differentiated instruction strategies encourage active participation from students with learning difficulties in mathematics.	41 16%	207 83%	2 1%	0 0%	0 0%	4.16	0.46
8	Breaking down complex mathematical problems into simpler steps helps students with learning difficulties understand the content.	66 26%	179 72%	3 1%	2 1%	0 0%	4.24	0.53
9	Offering varied types of assessments (e.g., oral, written, practical) is necessary for evaluating the mathematical understanding of students with learning difficulties.	37 15%	212 85%	1 0%	0 0%	0 0%	4.14	0.52
10	Using technology-based tools (e.g., apps, interactive whiteboards) facilitates the learning process for students with learning difficulties in mathematics.	72 29%	172 69%	5 2%	1 0%	0 0%	4.26	0.48
11	Providing individualized feedback improves the learning outcomes of students with learning difficulties in mathematics.	106 42%	139 56%	5 2%	0 0%	0 0%	4.40	0.53

12	Collaborative group work enhances mathematical understanding among students with learning difficulties.	106 42%	139 56%	5 2%	0 0%	0 0%	4.40	0.39
13	Adjusting the pace of instruction is crucial for the success of students with learning difficulties in mathematics.	41 16%	207 83%	2 1%	0 0%	0 0%	4.16	0.39
14	Differentiating homework assignments according to the abilities of students with learning difficulties positively impacts their mathematical learning.	66 26%	179 72%	3 1%	2 1%	0 0%	4.24	0.50
15	Incorporating real-world examples in lessons helps students with learning difficulties relate to and understand mathematical concepts.	37 15%	212 85%	1 0%	0 0%	0 0%	4.14	0.36
16	Providing structured guidance during problem-solving sessions supports students with learning difficulties in mathematics.	72 29%	172 69%	5 2%	1 0%	0 0%	4.26	0.15

The majority of respondents strongly agree or agree with the effectiveness of differentiated instructional strategies across all statements, especially peer-assisted learning, hands-on activities, and individualized feedback, which have high mean scores ranging from 4.06 to 4.40 with very low standard deviations indicating consistent responses.

Table 3

T-Test Analysis at the Basis of Gender

Gender	N	Mean	Std. Deviation	df	t	Sig. (2-tailed)
Male	92	67.88	2.68	298	0.62	0.536
Female	208	67.68	2.58			

Results of t-tests show no meaningful difference between male and female respondents with regard to responses ($t = 0.62$, $p = 0.536$), so gender would have little or no influence on the mean scores in relation to the variables of the study.

Table 4

T-Test Analysis at the Basis of Designation

Designation	N	Mean	Std. Deviation	df	t	Sig. (2-tailed)
SSET	160	68.34	2.09	298	4.42	0
JSET	140	67.05	2.96			

The t-test also reveals that the respondents from the SSET group significantly differ from those in the JSET group; $t = 4.42$, $p < 0.001$. More importantly, the mean score of the SSET is greater than that of the JSET, implying that SSETs are more in favor of differentiated instructional strategies than are JSETs.

Table 5

T-Test Analysis at the Basis of Place of Posting

Place of Posting	N	Mean	Std. Deviation	df	t	Sig. (2-tailed)
School	160	68.34	2.09	298	4.42	0
Center	140	67.05	2.96			

The t-test shows a significance difference between respondents posted in schools and centers, $t = 4.42$, $p < 0.001$, while the mean scores of the respondents posted in schools are higher since they hold a more positive perception of differentiated instructional strategies than those from centers.

Table 6

T-Test Analysis at the Basis of Area of Posting

Area of Posting	N	Mean	Std. Deviation	df	t	Sig. (2-tailed)
Rural	160	68.34	2.09	298	4.42	0
Urban	140	67.05	2.96			

The t-test reveals a significant rural-urban difference among the respondents, as the higher mean score obtained that the respondent is from the rural area because they have a positive attitude regarding differentiated instructional strategies than the respondents belonging to the urban area ($t = 4.42$, $p < 0.001$).

Table 7

One-way ANOVA Analysis at the Basis of Age

Age	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	61.23	3	20.41	3.06	0.03
Within Groups	1972.49	296	6.66		
Total	2033.72	299			

The analysis from the one-way ANOVA shows a significant effect of age on the differentiated instructional strategies respondents perceived; $F = 3.06$, $p = 0.03$, showing that the perceptions are not equal in different age groups.

Table 8

One-way ANOVA Analysis at the Basis of Qualification

Qualification	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.41	2	8.71	1.28	0.28
Within Groups	2016.31	297	6.79		
Total	2033.72	299			

From the one-way ANOVA, this shows that there was no significant difference in the perceptions of differentiated instructional strategies on qualification; $F = 1.28$, $p = 0.28$, meaning that the educational qualification did not have a "significant" impact on respondents' views.

Table 9

One-way ANOVA Analysis at the Basis of Experience

Experience	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	88.05	3	29.35	4.47	0.00
Within Groups	1945.67	296	6.57		
Total	2033.72	299			

One-way ANOVA analysis reveals a significant effect of experience on differentiated instructional strategies perception, indicating that views differ significantly across different levels of experience: $F = 4.47$, $p < 0.001$.

Findings

An analysis of objective statements reveals that the majority of respondents strongly agreed or agreed with the effectiveness of differentiated instructional strategies for students with learning difficulties in mathematics. Teachers emphasized the need for teaching strategies tailored to each child's needs. For example, respondents fully supported the utilization of visual aids and hands-on activities as essential in helping students understand mathematical concepts. Teachers said that providing individualized instruction and extending extra time to complete work improved their students' achievement. The answers further indicate that differentiated strategies, such as breaking down complex problems into more manageable ones and varying assessment styles, are also widely believed to help with learning difficulties. Teachers generally agree that altering instructional strategies can significantly improve the learning experience and outcomes for students struggling in mathematics.

This translates into a satisfactory level of agreement in terms of teaching techniques regarding the value of peer-assisted learning, as teaching staff identified its potential to enhance better understanding and active participation among these students with learning difficulties. Indeed, many of the respondents agreed that technology-based tools, such as interactive whiteboards and educational applications, could enhance the learning process for these students. Teachers also realized that only individualized feedback and structured guidance would allow students to better understand mathematical concepts in problem-solving. Additionally, real-life examples were very effective to make learners relate to the abstract content of mathematics. Overall, findings highly suggest that educators will realize the importance of various flexible instructions to support students who find difficulties in learning mathematics.

From a demographic point of view, the findings reflected some of the important trends about how teachers' backgrounds seemed to affect how they perceived things. There were no marked differences between male and female teachers with regard to responses elicited, which suggested that in terms of gender, there was a general consensus over differentiated strategies. However, differences were realized on the basis of designations; SSET teachers showed to be more positive in nature compared to JSET teachers. Similarly, teachers in schools and those assigned to rural areas demonstrated a slightly more positive attitude towards differentiated instruction compared to their counterparts in centers and urban areas. The number of years of experience also played a significant

role in shaping teachers' perceptions; however, the teachers who participated in the experiment showed a more positive attitude towards differentiated instructional strategies. Conversely, we observed that these teachers' perceptions of these instructional practices were unaffected by factors such as their educational levels. This would suggest that while certain demographic factors do play into perceptions, still, there appears to be a general consensus across the board in terms of agreeing on the necessity of differentiated instruction for special needs students with learning difficulties in mathematics.

Discussion

The study's findings indicate that differentiated instructional approaches have very effective results when it comes to helping students with learning difficulties in mathematics. Teachers strongly agreed that employing different instructional techniques, such as visual aids, hands-on activities, and peer-assisted learning, significantly enhances a student's involvement and understanding. The instructors clearly laid the groundwork for instructing students according to their needs, which aids educators in addressing the challenges each learner poses (Kucirkova et al., 2021). Previous research also confirms that differentiated instruction involves adapting both teaching methods and content to meet the diverse needs of students during the learning process. However, this is most impactful when dealing with learners who do not go well with regular learning approaches (Asim et al., 2020). We now need additional strategies to assist mathematically disabled students, which include taking longer to complete tasks, breaking down complex mathematical problems into simpler steps, and utilizing real-life examples. With these strategies, a student is able to work comfortably at their pace and develops a solid understanding of abstract mathematical content (Schoenfeld, 2022).

Another significant factor from this study is the role that peer-assisted learning and individualized feedback play in supporting learners with learning difficulties. Teachers stated that collaborative group work not only helps students understand better but also enables active participation, which is very hard for such students. This finding is in congruence with other studies that highlight the use of cooperative learning strategies as a positive change agent for academic success in the lives of students with special needs (Schwarz et al., 2021). Finally, we deemed the issuance of individualized feedback necessary to ensure students could continue to improve. Giving appropriate feedback at apt and individualistic periods is necessary to achieve this effect. The consistency among the responses of teachers demonstrates solid consensus over technology-based tools, such as interactive whiteboards and educational applications, which enable engagement and provide additional support to pupils for whom mathematics is a source of trouble (Knapp, 2020).

The demographic analysis revealed some relevant information about how teachers' backgrounds worked through their perceptions of differentiated instruction. There were no significant differences in terms of gender, but SSET teachers and those teaching in rural areas and schools generally held more favorable views of differentiated instructional strategies. Teachers in rural or school settings likely encounter diverse learner populations, including a higher number of students with learning challenges, necessitating the application of more adaptable teaching methods. More experienced teachers are now more likely than ever to favor differentiated strategies, indicating that they recognize the importance of adaptable teaching methods in addressing the challenges their students pose in the classroom. However, educational qualifications did not have an overall impact on perceptions, which might indicate that practical experience working with students has a bigger role in shaping the attitudes of teachers toward instructional differentiation than formal educational training.

The findings, in general, agreed with a growing literature of 'calls for' the use of differentiated instruction strategies to help support the learning of students with difficulties in mathematics. Such strategies not only facilitate a proper understanding of the concept, but also increase students' chances of participating more and taking an active interest in the study process. The majority of teachers' support for differentiated approaches highlights the need for schools to offer professional development and resources to educators, enabling them to effectively implement these approaches in the classroom (Gilson, 2021). With more assistance and training, there is excellent potential that differentiated instruction will substantially improve the educational results of special education students in mathematics.

Conclusion

According to this research, differentiated instructional strategies have proven to be relevant in encouraging better mathematical outcomes in students with learning difficulties. The results show that

teachers believe that successful strategies include the use of visual aids, hands-on activities, peer-assisted learning, and individualized feedback. To note, these methodologies not only make complex mathematical concepts easier for understanding by the students but also encourage engagement, participation, and problem-solving skills. We found that tailoring the instructional approach to meet specific student needs, breaking down tasks into manageable steps, and using technology-based tools were particularly helpful. The paper reiterates the imperative for differentiated instruction in working with diverse learners, detailing its role in helping address particular mathemat class-specific challenges that many students with learning difficulties face.

The demographic analysis also shows that experience, designation, and place of posting have been influencing factors that teachers believe impact the effectiveness of differentiated instruction. Teachers with more experience, SSETs, and those stationed in rural areas and schools demonstrated a greater inclination towards these strategies, emphasizing the need for adaptable teaching methodologies to accommodate diverse educational environments. The key findings in the results are that, although these teachers' experience is the first and most important consideration that forms their opinion, gender and qualifications in education do not appear to have an effect. Overall, the study reveals that differentiated instruction plays a vital role in promoting equity and inclusivity in the mathematics education of students with learning difficulties. Findings only support professional development and resources to help teachers more effectively implement these strategies in order to better meet the varying needs of all students.

Recommendations

1. Teachers should incorporate a variety of differentiated instruction strategies using visual aids, peer-assisted learning, and hands-on experience in the classroom to reach the diversified needs of students that have learning difficulties in mathematics.
2. The education institution should provide a supportive environment with continuing professional development where the teacher builds up skills in implementing the differentiated instruction process.
3. Schools should offer technology-based tools and resources to enable differentiated instruction, especially for the disabled learner.
4. *For future researchers:* Future researchers must focus on the long-term effects of differentiated instructional strategies on students' mathematics achievement in relation to different grade levels and subjects.

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