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Effectiveness of Assistive Technology in Teaching Grade 2 Mathematics in an Inclusive Setting

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Abstract — This study aimed to determine the effectiveness of assistive technology in teaching Grade 2 learners in an inclusive setting at Dechabordin School, Si Samrong, Sukhothai. Specifically, it aimed to determine the performance of the Grade 2 learners before and after they are exposed to assistive technology and conventional method of teaching; the significance of the difference between the performance of the learners before and after exposure to assistive technology and conventional method, and the significance of the difference in the performance of the learners exposed to assistive technology and those exposed to conventional method.

The study made use of the repeated measures (within subjects) experimental research design. The experiment was conducted on a weekly basis, alternating between assistive technology-based instruction and the conventional method of teaching. The study involved 20 Grade 2 learners composed of 9 students with disabilities and 11 students without disability. Before the experiment started, the pretest was administered. A day after the experiment, the posttest was also administered. The data gathered were submitted to appropriate data analysis tools.

The results of the study showed that the performance of the learners before and after they are exposed to assistive technology (AT) improved. It was also found that before they were exposed to AT, they already possess competence in the concepts and skills. After their exposure to assistive technology their performance improved and rose to a higher level. Similar results were observed when they were exposed to the conventional method of teaching. Lastly, the performance of the learners exposed to assistive technology and those exposed in the conventional method did not differ significantly.

Based from the findings, the researcher concludes that the two methods work equally well in improving the performance in mathematics of the Grade 2 learners. As such, the following were highly recommended: The Ministry of Education officials may conduct professional development programs and develop tailored, evidence-based pedagogies. School heads may promote blended approach, leveraging assistive technology for engagement while maintaining robust traditional techniques. Teachers may adopt blended approach, prioritizing learner preference, engagement, and individualized needs rather than relying on only one method. Future researchers may replicate the study in the public schools and may also employ a longitudinal design.

Keywords: effectiveness, assistive technology, inclusive setting, performance, conventional method of teaching

I. INTRODUCTION

The study focused on the effectiveness of assistive technology (AT) in teaching Grade 2 mathematics in an inclusive classroom at Dechabordin School, Si Samrong, Sukhothai, Thailand. The background emphasized that education is a universal human right supported by international frameworks such as the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) and Sustainable Development Goal 4 (SDG 4), which promote inclusive and equitable quality education for all learners. The study highlighted that inclusive education allows learners with and without disabilities to study together in the same classroom. This approach helps learners develop empathy, respect, and equal participation while improving academic and social outcomes through differentiated instruction and supportive teaching strategies.

Thailand supports inclusive education through the National Education Act B.E. 2542 (1999) and the Education for Persons with Disabilities Act B.E. 2551 (2008). These policies encourage the use of digital and assistive technologies to improve learning engagement and academic performance, particularly in mathematics education. Despite these efforts, challenges such as limited technological resources, inadequate teacher training, and insufficient assistive devices continue to affect the effectiveness of inclusive education. Traditional teaching methods

alone often fail to address the diverse needs of learners, especially those requiring multisensory and interactive learning experiences.

The study explained that assistive technology, including digital manipulatives, adaptive software, and mathematics applications, can support differentiated instruction, improve learner engagement, and help students better understand mathematical concepts. However, most existing studies focused mainly on individual devices rather than the pedagogical integration of assistive technology in inclusive mathematics classrooms. Because of this research gap, the researcher conducted the present study to determine the effectiveness of assistive technology in teaching Grade 2 mathematics in an inclusive setting.

Statement of the Problem

This study aimed to determine the effectiveness of assistive technology in teaching Grade 2 mathematics in an inclusive setting at Dechabordin School, Si Samrong, Sukothai.

Specifically, the study sought answers to the following problems:

1. What is the performance of Grade 2 learners in mathematics before and after they are exposed to assistive technology?
2. What is the significance of the difference between the performance of the learners before and after exposure to assistive technology?
3. What is the performance of Grade 2 learners in mathematics before and after they are exposed to the conventional method?
4. What is the significance of the difference in the performance of the learners before and after they are exposed to the conventional method of teaching?
5. Is there a significant difference in the performance of learners in mathematics when exposed to assistive technology and conventional method of teaching?

Research Hypotheses

This study tested in their null form and at the 0.05 level of significance the following hypotheses:

1. There is no significant difference in the mathematics performance of Grade 2 learners in an inclusive setting before and after exposure to assistive technology.

2. There is no significant difference in the mathematics performance of Grade 2 learners in an inclusive setting before and after exposure to conventional method of teaching.

3. There is no significant difference in the mathematics performance of Grade 2 learners exposed to assistive technology and those exposed to conventional method of teaching.

Significance of the Study

This study aimed to determine the effectiveness of assistive technology in teaching Grade 2 mathematics. The study is beneficial to school administrators, teachers, learners, and future researchers. To the school administrators, the results of the study will provide empirical evidence that can support the creation of policies and enhancement of school programs that promote the use of assistive technology in inclusive classrooms. The teachers will be provided with valuable insights into the practical and effective integration of assistive technology in teaching mathematics within inclusive classrooms. By enabling personalized, interactive, and engaging activities, assistive technology can help learners better understand mathematical concepts, participate actively in lessons, and feel valued as integral members of the classroom community. To future researchers, the study will serve as a useful reference for future research related to inclusive education, assistive technology, and digital pedagogy. It will provide baseline data, insights, and

methodological guidance for subsequent studies aiming to explore the effectiveness of using assistive technology in teaching mathematics or other subject areas.

Literature Review

Inclusive Education

Inclusive education refers to an educational approach where learners of different abilities, backgrounds, and disabilities learn together in the same classroom environment. It promotes equal participation, acceptance, and meaningful learning opportunities for all students. UNICEF (n.d.) emphasized that inclusive education helps all children develop the skills needed to succeed while reducing discrimination and exclusion.

According to Galleto and Bureros (2017) and Tagyamon et al. (2025), inclusive education in the Philippines is supported by policies promoting equal learning opportunities. However, challenges such as inadequate facilities, lack of assistive technologies, and limited teacher training hinder effective implementation.

Deignan (2022) explained that inclusive classrooms require flexible instructional strategies such as Universal Design for Learning (UDL) and differentiated instruction to meet the diverse needs of learners. These approaches allow teachers to provide accessible content, supportive learning environments, and varied assessment methods.

Assistive Technology in Inclusive Education

Assistive technology refers to tools, software, devices, and equipment that improve the learning and functional abilities of students with disabilities. According to the World Health Organization (2025), assistive technology promotes inclusion, independence, participation, and educational access for learners with disabilities.

Visser et al. (2024) identified different forms of assistive technology such as screen readers, adaptive keyboards, voice recognition systems, alternative input devices, and eye-tracking software. These tools support learners with visual, motor, cognitive, and communication difficulties.

The Understood Team (2023) identified mathematics-related assistive technologies including graphing tools, equation-solving tools, manipulatives, graphic organizers, text-to-speech applications, and drawing tools. These technologies help students understand mathematical concepts more clearly and independently.

Bouck and Satsangi (2020) stated that mathematics can be difficult for learners with disabilities; therefore, assistive technology supports access, participation, and achievement in inclusive mathematics classrooms.

Challenges in the Use of Assistive Technology

The World Health Organization (2024) identified barriers affecting access to assistive technology, including high costs, low awareness, limited funding, inadequate policies, poor infrastructure, and lack of teacher training.

Vaccarella et al. (2025) explained that teachers often experience difficulties integrating assistive technology because of limited access, insufficient training, and lack of confidence in using digital tools. Additionally, students may encounter challenges such as unreliable internet connectivity, stigma, poor usability, and technological problems, which may lead to abandonment of assistive devices.

Related Studies

Del Rosario et al. (2025) conducted a study titled “Technologies in Inclusive Education: Solution or Challenge.” The researchers found that technologies such as virtual reality (VR), augmented reality (AR), and mobile devices improve participation, collaboration, and accessibility

in inclusive classrooms. However, they emphasized that teacher training and institutional support are necessary for effective technology integration.

López et al. (2025) reviewed studies on inclusive educational technology and found that assistive tools such as screen readers, speech-to-text software, and AR/VR platforms enhance student participation and personalized learning. However, poor infrastructure, lack of devices, and inadequate teacher preparation remain major barriers.

Antara et al. (2024) investigated the use of math manipulatives as assistive technology for students with disabilities. Their findings showed that manipulatives improved students' understanding, motivation, participation, and collaboration during mathematics instruction.

Campado et al. (2023) studied the integration of assistive technology among SPED teachers in the Philippines. The study revealed that assistive technology reinforces learning and motivates students, but challenges such as inadequate resources, technical problems, and insufficient teacher skills limit its effectiveness.

Rahmawati and Pamungkas (2023) examined the use of assistive learning technology for students with hearing impairment in mathematics. Their study found that assistive technology significantly improved students' representation skills and learning independence in fraction operations.

Li et al. (2021) explored the factors affecting the use and abandonment of assistive technologies among people with disabilities in China. The study identified stigma, usability issues, poor infrastructure, and lack of community support as major reasons for discontinuing assistive devices.

Chiu and Lim (2020) investigated the strategic use of educational technology in inclusive classrooms in Hong Kong. They found that content-specific technologies and visual learning tools improved accessibility and understanding in language and mathematics lessons.

Rou-Rou Sung et al. (2018) studied collaborative assistive technology in mathematics learning among students with special needs. The study concluded that assistive technology

combined with interactive games improved students' motivation, cooperation, participation, and mathematical understanding.

Overall, the reviewed literature and studies support the idea that assistive technology improves academic performance, engagement, participation, and inclusion among learners with diverse needs. However, there is still limited research focusing on Grade 2 mathematics in inclusive classrooms at Dechabordin School, Si Samrong, Sukhothai, Thailand using a repeated measures experimental design. This research gap served as the basis for conducting the present study.

II. METHODOLOGY

Research Design

This study employed a repeated measures (within-subjects) experimental research design to evaluate the effectiveness of assistive technology in teaching Grade 2 mathematics in an inclusive classroom setting. In this design, the same group of learners was exposed to two (2) instructional conditions: assistive technology–based instruction and the conventional teaching method.

A repeated measures (or within-subjects) experimental design is a study setup where the exact same participants are tested across all conditions, treatments, or multiple time points. Because individuals undergo every condition, they serve as their own controls, which eliminates participant-based variables (like age or baseline intelligence) from skewing the data (Bhandari, 2023).

The repeated measures design was chosen because it allows learners to serve as their own control, thereby minimizing the influence of individual differences such as ability level, learning pace, and prior knowledge (Creswell, 2014). Weekly mathematics instruction alternated between lessons delivered with assistive technology and lessons delivered without assistive technology.

Learners' performance under each instructional condition were measured using weekly tests, pretests, and posttests, making direct comparison possible (Fraenkel et. al, 2019).

The repeated measures design (within-subjects) is appropriate for the study, as it allows for a valid comparison of learning outcomes between assistive technology-based instruction and conventional teaching methods within the same group of Grade 2 learners in an inclusive setting.

Participants of the Study

The study involved 20 Grade 2 learners currently enrolled in Dechabordin School during the school year 2025-2026. The class was composed of 9 learners with disabilities and 11 learners without disability. The learners were taught using assistive technology for two (2) weeks and the conventional method of teaching also for two (2) weeks.

Instrument Used

To gather the data pertinent to the study, the researcher constructed weekly tests which were administered every Friday of the week. The tests covered the topics in Module 10 which are multiplication facts for zeros, ones, fours, sixes, eights, and nines, as well as solving simple multiplication problems. The content validity of the weekly tests were assessed by a pool of evaluators.

Data Collection and Analysis

Prior to the conduct of the study, the researcher sought the approval of the School Administrator of Dechabordin School. The researcher secured written consents from the parents or guardians of the learners considering that they are minors.

After obtaining the necessary approval, the researcher prepared the weekly schedule for the implementation of the instructional intervention. The experiment was conducted on a weekly basis, alternating between assistive technology-based instruction and conventional teaching, as shown below.

Weeks	Teaching Methods
First Week	Assistive Technology-Based Instruction
Second Week	Conventional Teaching Method
Third Week	Assistive Technology-Based Instruction
Fourth Week	Conventional Method of Teaching

Before the start of the experiment, the researcher administered the pretest. The experiment began the following day. The researcher was the teacher of the Grade 2 learners. Weekly tests were administered every Friday. After the completion of the experiment, the posttest was administered. The data collected were submitted to the PSU-School of Advanced Studies Statistical Center.

Problem number 1 which is on the performance in mathematics of Grade 2 learners before and after they are exposed to assistive technology was answered using minimum and maximum scores, mean, standard deviation, skewness, and kurtosis.

Problem number 2 which is on the significance of the difference between the performance of the learners in mathematics before and after exposure to assistive technology-base instruction was answered through the use of Paired t-test.

Problem number 3 which is on the performance in mathematics of the Grade 2 learners before and after exposure to conventional method of teaching was answered using minimum and maximum scores, mean, standard deviation, skewness, and kurtosis.

Problem number 4 which was on the significance of the difference in the performance in mathematics of the Grade 2 learners before and after they are exposed to the conventional method of teaching was answered through the use of Paired t-test.

Problem number 5 which is on the significance of the difference between the performance in mathematics of the Grade 2 learners exposed to assistive technology-based instruction and those exposed to conventional method of teaching was answered using the Paired t-test.

III. Results and Discussion

Results

Performance in Mathematics of Grade 2 Learners Before and After Exposure to Assistive Technology

Table 1 presents the performance in mathematics of the grade 2 learners before and after they were exposed to assistive technology.

TABLE1
DESCRIPTIVE STATISTICS ON THE PERFORMANCE IN MATHEMATICS OF GRADE 2 LEARNERS BEFORE AND AFTER THEY ARE EXPOSED TO ASSISTIVE TECHNOLOGY

Statistic	Pretest	Posttest
Minimum	8.5	10.0
Maximum	20.0	20.0
Mean	13.15	15.43
Std. Deviation	3.70	3.50
Skewness	0.56	-0.43
Kurtosis	-1.11	-1.18

The table shows that the Grade 2 learners obtained a maximum score of 20 and a minimum score of 8. 5 in the pretest. The 11.5-point difference between the highest and lowest scores indicates a large variation in learning. This suggests that some students have fully mastered the lessons while others are struggling significantly. Furthermore, the lowest score falls below the 75 percent proficiency baseline set by the Department of Education (DepEd). As shown on the table, the mean and the standard deviation of the pretest scores of the learners are 13.15 and 3.70, respectively. These values indicate that the average performance of the learners was above 50 percent (13/20 = 65.75 percent). The standard deviation indicates that scores of the Grade 2 learners were quite spread out from the mean rather than clustered tightly together.

It could also be gleaned on the table that the pretest scores of the learners obtained a skewness value of 0.56. This indicates that the data distribution is *moderately skewed to the right* (positively skewed). This means that the data is asymmetrical, with a long tail tapering to the right and most of the scores of the learners concentrated on the lower left side. The skewness value of 0.56 also shows that the mean is higher than the median because extreme high scores pull the average upward. Since the distribution is positively skewed, most of the Grade 2 learners score low in the pretest, only a few scored very high.

The computed kurtosis value of the learners' scores in mathematics is -1.11.

The value indicates that the distribution of scores of the learners is platykurtic. This means that the distribution has light tails, meaning there are a few outliers and is flatter or more spread out compared to a normal (bell-shaped) distribution. Simply put, the scores of the learners are relatively evenly distributed with few extreme scores, creating a flat-topped or spread-out, thin-tailed distribution.

In terms of the performance of the learners in the posttest administered after the experiment, the table shows that the maximum and minimum scores obtained are 20 (100 percent) and 10 (50 percent), respectively. The findings indicate that while at least one learner mastered all the content, the Grade 2 learners has a wide range of performance and significant variability.

The scores of the learners, as shown on the table, obtained a mean of 15.43 (approximately 77 percent) and a standard deviation of 3.50. The values indicate that the learners performed

generally well in the posttest, but with a moderate amount of variation in their scores. In addition, the standard deviation of 3.50 indicates that most scores are clustered relatively close to the mean. As evidenced by the mean and standard deviation of the scores of the learners in math, the learners performed well in the posttest, but there is still a noticeable spread in ability, with a standard deviation of 3.50 suggesting a fair degree of differentiation between higher and lower performers.

The posttest scores of the learners have a computed skewness value of -0.43. This indicates that the data is negatively skewed or left-skewed. This shows that most of the learners performed relatively well and achieved higher scores with a small number of students pulling the average down with very low scores.

It is also shown on the table that the posttest scores of the learners obtained a kurtosis value of -1.18. The value indicates that the distribution of the scores is platykurtic, meaning the distribution is flatter than a normal distribution with thinner tails and a broader peak, meaning there are fewer extreme outliers (very high or very low scores). This also shows that the scores of the learners in the posttest are more spread out across the range rather than being heavily concentrated around the mean.

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Level of Performance in Mathematics of Grade 2 Learners Before and After Exposure to Assistive Technology

Table 2 presents the distribution of the learners in the different levels of performance in mathematics in the pretest and posttest.

TABLE 2
LEVEL OF PERFORMANCE IN MATHEMATICS OF GRADE 2 LEARNERS BEFORE AND AFTER THEY ARE EXPOSED TO ASSISTIVE TECHNOLOGY
N=20

Level of Performance	Score Range	Pretest		Posttest	
		Frequency	Percent	Frequency	Percent
Very High	17-20	5	25.0	9	45.0
High	13-16	5	25.0	5	25.0
Average	9-12	10	50.0	6	30.0
Low	5-8	0	0.0	0	0.0
Very Low	0-4	0	0.0	0	0.0

The table shows that half of the learners (10 or 50 percent) have an average performance in mathematics before they were taught concepts and skills using assistive technology. The other

half (5 or 25 percent of the learners in each level) have very high and high level of performance. The results indicates that the learners already possess the competence in the concepts and skills taught before they were exposed to assistive technology.

Difference of the Performance in Mathematics of the Grade 2 Learners Before and After Exposure to Assistive Technology

Table 3 found presents the summary of the computation of the Paired t-test

which was used to establish the difference the performance of the learners before and after their exposure to assistive technology.

TABLE 3
DIFFERENCE BETWEEN THE PERFORMANCE OF THE LEARNERS BEFORE AND AFTER EXPOSURE TO ASSISTIVE TECHNOLOGY

Test	Mean	SD	Mean Difference	tc	Sig.	Cohen's d
Pretest	13.15	3.70	**-2.28**	**-4.40***	**0.000**	**-0.983**
Posttest	15.43	3.50				

**Significant*

The results reveal that the posttest mean score (M=15.43) is higher than the pretest mean score (M=13.15), indicating an improvement in learners' performance following significance level of 0.000, shows that the difference is statistically significant. Furthermore, the effect size (Cohen's d=-0.983) indicates a large magnitude of effect which implies the intervention. The computed mean difference of -2.28, along with the t-value of -4.40 and shows that the use of assistive technology had a substantial impact on enhancing learners' performance.

Performance of the Grade 2 Learners in Mathematics Before and After Exposure to Conventional Method of Teaching

Table 4 presents the results of the computations of the different statistical tools used to describe the performance of the learners before and after exposure to conventional method of teaching.

TABLE 4
DESCRIPTIVE STATISTICS ON THE PERFORMANCE OF THE LEARNERS IN MATHEMATICS BEFORE AND AFTER THEY ARE EXPOSED TO THE CONVENTIONAL METHOD

Statistic	Pretest	Posttest
Minimum	8.5	9.5
Maximum	17.5	20.0
Mean	13.05	15.10
Std. Deviation	2.79	3.07
Skewness	-0.26	-0.40
Kurtosis	-1.34	-0.59

The table shows that the pretest scores of the learners exposed to conventional method of teaching obtained minimum score of 8.5 and a maximum score of 17.5. The values suggest that the learners have a limited prior knowledge or mastery before they were exposed to the conventional method of teaching. The minimum score represents a 42.5 percent (8.5/20) success rate, indicating a low-level of understanding among the learners of the competencies covered

during the experiment period. The maximum score represents 87.5 percent (17.5/20) success rate, indicating that even the highest performer did not get a perfect score.

It is also reflected on the table that the learners' pretest scores have a mean of 13.05 and with a standard deviation of 2.79. The computed values indicate that the average learners performed well, with most scores clustered in the moderate-to-high range. It shows that that the spread between 8.5 and 17.5 suggests a wide

range of ability within the group of learners, ranging from below-average to high-proficiency performance.

The pretest scores of the learners obtained a computed skewness value of -0.26. This value indicates that the "tail" of the distribution is on the left side. This means that the majority of the grade 2 learners performed well and scored higher than the average, with a small number of students scoring very low. While the distribution is technically left-skewed, the data is close enough to a normal distribution (bell curve) or it is interpreted as being approximately symmetric. Moreover, the distribution shows that the mean is likely slightly less than the median.

The computed kurtosis of the pretest scores of the learners which is -1.34 the distribution of learners' scores is platykurtic. This means the scores are more thinly spread out or flatter than a normal bell-shaped curve, with fewer extreme scores (very high or very low) and more scores concentrated in a broader range around the center. It shows also that most of the grade 2 learners achieved similar scores, likely falling in the middle-to-high or middle-to-low range, rather than having a few perfect scores and many failing scores.

As to the posttest scores of the learners exposed to conventional method of teaching, the table shows that the minimum and maximum scores of the learners are 9.5 and 20. This goes to show that the test scores are heavily skewed towards the top, with all learners scoring roughly 47.5 percent or higher, and at least one learner achieved a perfect score.

The table shows that the mean of the posttest scores is 15.10 and a standard deviation of 3.07. This value suggests that the students performed well on average, but there was a moderate spread in their performance. The average Grade 2 learner got approximately 15 out of 20 items

correct (about 75.5 percent). This is generally considered a good, or above-average level of mastery, typically interpreted as moving towards mastery or average mastery. This goes to show further that most learners grasped the core concepts covered in the test.

The computed skewness of -0.40 indicates that the distribution of the Grade 2 learners scores is negatively skewed or left-skewed, is generally moderately to lightly skewed, and is approximately symmetric. The majority of the students performed well (high scores), while only a few students received very low scores. Furthermore, the average (mean) score is likely lower than the median (middle) score because the few low scores pull the mean downward.

The posttest scores of the learners have a computed kurtosis of -0.59, indicating a platykurtic distribution. The distribution of scores is flatter, broader, and has thinner tails than a normal bell curve. There are fewer outliers, meaning fewer extreme values (very high or very low scores) compared to a normal distribution. This goes to show that the scores are more spread out towards the middle rather than clustered in the extremes.

Level of Performance of the Grade 2 Learners in Mathematics Before and After Exposure to the Conventional Method

Table 5 below presents the levels of performance of the learners, and their corresponding frequencies and percent.

TABLE 5
LEVEL OF PERFORMANCE OF THE LEARNERS IN MATHEMATICS BEFORE AND AFTER THEY ARE EXPOSED TO THE CONVENTIONAL METHOD
N=20

Level of Performance	Score Range	Pretest		Posttest	
		Frequency	Percent	Frequency	Percent
Very High	17-20	1	5.0	8	40.0
High	13-16	11	55.0	8	40.0
Average	9-12	8	40.0	4	20.0
Low	5-8	0	0.0	0	0.0
Very Low	0-4	0	0.0	0	0.0

Majority of the learners (11 or 55 percent) have a high performance in mathematics before they were exposed to the conventional method of teaching. One (1) or 5 percent of the learners has a very high performance. Moreover, the table also shows that 8 or 40 percent of the learners have an average performance in mathematics before they were exposed to conventional method of teaching.

With regards to the learners' performance after exposure to the conventional method of teaching, the same number of learners (8 or 40 percent) were categorized under the very high and high levels. Only four (4) or 20 percent have an average level of performance.

Compared to their pretest performance, the results indicate that three (3) students initially classified as having a high level of performance reached a high level in the posttest. In the same vein, four (4) learners classified at the average level during the pretest may have achieved a high or very high performance.

Difference in the Performance in Mathematics of the Grade 2 Learners Before and After Exposure to Conventional Method of Teaching

Table 6 presents the summary of the computation of the Paired t-test which was used to establish the significance of the difference between the performance of the learners before and after exposing them to the conventional method of teaching.

TABLE 6
DIFFERENCE IN THE PERFORMANCE OF LEARNERS BEFORE AND AFTER THEY ARE EXPOSED TO CONVENTIONAL METHOD OF TEACHING

Test	Mean	SD	Mean Difference	tc	Sig.	Cohen's d
Pretest Posttest	13.05 15.10	2.79 3.07	**-2.05**	**-4.17***	**0.001**	**-0.932**

**Significant*

The results show that the posttest mean score (M=15.10) is higher than the pretest mean score (M=13.05), indicating an improvement in learners' performance after the intervention. The computed mean difference of -2.05, with a t-value of -4.17 and a significance level of 0.001, indicates that the observed difference is statistically significant. Moreover, the effect size (Cohen's d = -0.932) suggests a large effect, implying that the conventional method of teaching also had a substantial impact on improving learners' performance.

Difference in the Performance in Mathematics of Grade 2 Learners Exposed to Assistive Technology and Those Exposed to the Conventional Method of Teaching

Presented in Table 7 is the summary of the computation of the Paired t-test which was used to establish the significance of the difference between the performance of the learners exposed to assistive technology and those exposed to conventional method of teaching.

TABLE 7
DIFFERENCE IN THE PERFORMANCE OF LEARNERS IN MATHEMATICS EXPOSED TO ASSISTIVE TECHNOLOGY AND THOSE EXPOSED TO THE CONVENTIONAL METHOD OF TEACHING

Method	Mean	SD	Mean Difference	tc	Sig.	Cohen's d
Assistive Technology	15.43	3.50	0.33	0.59^{ns}	0.564	0.131
Conventional Method	15.10	3.07				

^{ns}Not Significant

The results indicate that learners exposed to assistive technology (M=15.43) obtained a slightly higher mean score compared to those exposed to the conventional method (M=15.10). However, the computed mean difference of 0.33, along with the t-value of 0.59 and a significance level of 0.564, shows that the difference is not statistically significant. Additionally, the effect size (Cohen's d = 0.131) suggests a very small effect, indicating minimal practical difference between the two methods.

IV. DISCUSSION

The primary objective of this study is to determine the effectiveness of assistive technology in teaching mathematics to Grade 2 learners in an inclusive setting. The study specifically determined the performance of the learners before and after exposure to assistive technology and conventional method of teaching.

The results of the data analysis indicate that when the learners were taught mathematics concepts and skills using assistive technology that there is no unified mastery among the learners. Results indicate a wide variation in learning outcomes, where some learners likely mastered the concepts, while others did not, despite having access to the same tools. This statement could be due to several factors. As explained by Bright, et. al. (2024), the connection between employing technology in mathematics teaching and learning, students' performance in mathematics is somewhat mediated by students' interest in mathematics. Other studies conducted, such as that David, et. al (2023), have shown that the high variability of learners' performance despite being exposed to assistive technology could be attributed to inconsistent use and misalignment of assistive technology, lack of proper training and technical difficulties, stigma and reduced usage, pedagogical and instructional factors, initial differences in readiness, variability in student motivation, socioeconomic and environmental differences, and distraction and reduced concentration.

With regards to the performance in mathematics of the Grade 2 learners when they were exposed to the conventional method of teaching results showed that this method still significantly impact their performance. The findings of this study are in consonance to the statement of Falasi (2024) that while modern methods offer higher engagement, traditional methods are still valuable for providing structure, covering vast content efficiently, and preparing students for standardized tests.

When the performance of the Grade 2 learners after their exposure to assistive technology and conventional method of teaching were compared, findings showed that both methods work equally well in teaching mathematics concepts and skills. The findings of this study do not align with the findings of the studies of Antara, et. al. (2023) and Campado, et. al. (2023) in which assistive technology was found to be an effective tool to use in teaching concepts in mathematics to learners with disabilities or special needs.

While it was found out that the two teaching methods are both effective in teaching mathematics concepts and skills, the use of assistive technology should be leveraged. Leveraging assistive technology in this era of rapid innovation is vital because it empowers individuals to live independently and supports diverse learning styles and needs. Additionally, classrooms, whether inclusive or not, are filled with digital natives whose unique interests demand modern instructional approaches.

Despite these promising results, several limitations must be acknowledged. First, the study was conducted in a very short span of time (four weeks). Secondly, the study made use of the repeated measures (within-subjects) experimental research design because there is only one section of Grade 2 with only 20 learners in Dechabordin School. In this light, future research studies may employ a longitudinal design extending over a longer period of time to assess the sustained impact of the intervention. Additionally, using a randomized control group alongside the experimental group may allow for a more robust comparative analysis of the outcomes.

V. RECOMMENDATIONS

Based from the findings and conclusions of the study, the following recommendations were formulated by the researcher.

1. The Ministry of Education officials may conduct professional development programs, ensuring equitable access, and developing tailored, evidence-based pedagogies.

2. School heads may promote blended approach of learning, leveraging assistive technology for engagement while maintaining robust traditional techniques. They may also focus the implementation of assistive technology on learners with specific, identified needs to enhance accessibility and independence.

3. Teachers may adopt both assistive technology and conventional method based on learner needs. However, the teachers may leverage the use of assistive technology to increase learner autonomy and motivation while utilizing conventional methods for foundational, hands-on skills.

4. Future researchers may replicate the study in the public schools and may also employ a longitudinal design to track the long-term effects of the two methods of teaching.

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