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The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels

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ABSTRACT: The study aimed to examine the relationship between the sensory objects utilization and teaching mathematical concepts in primary levels, exploring the types of sensory objects used, how often they are used in teaching the four fundamental operations and its impact on students' mathematical understanding. Descriptive-correlational design was employed. The study revealed that primary school teachers often incorporate counters, popsicle sticks, play money, and dice more into their math lessons, especially in teaching addition and subtraction, and there is a positive correlation on the utilization of sensory objects in teaching mathematical concepts at primary levels. In essence, these findings demonstrate the importance of examining the extent of the sensory objects utilization in teaching mathematical concepts in primary levels. Similarly, data served as the basis for an exploration of localized sensory objects utilization on the basic fundamentals that ranked last.

KEYWORDS: Sensory Objects, Sensory Objects Utilization, Mathematical Concepts, Primary Levels, Descriptive-Correlational Design

INTRODUCTION

Some students consider mathematics to be a difficult, scary, and unpleasant subject. Although primary teachers did their best to cater the needs of their learners as much as they could, students still seemed to have difficulty grasping its idea. With these difficulties, it became a challenge for teachers in designing the learning process to be better (Saputri et al., 2024) especially as they were required to make mathematical concepts comprehensible for the students whatever it took and apply it in real-life contexts. In a survey conducted by ORIGO Education (2023) it stated that it was not enough to merely teach mathematical concepts, but rather required them to think of engaging approaches, tools and resources that would help learners spark their curiosity, enthusiasm and foster a lifelong love of math, otherwise, it would have an impact on decreasing student academic achievement and a lack of interest in continuing further studies (Nurluthfiana et al., 2023) and could also have made it harder for them to do well in school later on and to be successful, particularly in fundamental concepts (Salihu & Räsänen, 2018 as cited in Febriyanti et al., 2021). Indeed, the incorporation of creative approaches significantly enhances the participation and grasp of students when it comes to mathematics.

Studies have shown that sensory experiences and play-based learning were particularly vital for developing mathematical skills; assisting learners in their academic achievement and in the advancement of their social skills to work collaboratively with their peers. The studies made by Rusher (2020) and Kelly (2006; DiMatteo & Lester, 2010, as cited in Monte, J., 2021), theorized that sensory objects are used during academic time to keep students stimulated and engaged in the activity at hand, helping them visualize and understand abstract mathematical concepts and results in math success and knowledge. McNeil & Jarvin (2013, as cited in Kate Quane 2022), and Lantz & Miller (2019), and Delaney (2010, as cited in Hurst & Linsell, 2020), on the other hand, found in their studies that the utilization of sensory objects effectively enhances students' mathematical understanding of abstract concepts across operations like addition, division, and multiplication by connecting them to real-world experiences and promoting active, hands-on learning. To simply put, a positive teacher-student dynamic between math teachers and students in middle grades is what makes an effective mathematics learning environment; this teacher-student connection influences how teachers approach fundamental mathematics concepts across grade levels (Kearney and Garfield, 2019) .

However, despite the clear link between the early experiences and later mathematical achievement, there is still a concern in regards to learning mathematics, as many mathematical concepts were abstract and difficult to grasp due to the cognitive demands of the subject (Weng et al., 2019) . Based on the results of the intervention conducted by De Guzman Celemin (2023), and Tallud and Caballes (2023), and Chi (2019), it showed the low numeracy skills in four fundamental operations among learners and the Philippines' low performance in PISA results 2022 , signaling a need to revisit the intervention program and application of strategies to ensure the attainment of better numeracy skills of learners. Drills may be done, materials may be revised, and activities that cater to individual differences may be considered. Thus, it is vital to address the issue of students' learning gap particularly in Mathematics and devise effective solutions to improve Mathematics education and allow pupils to strengthen their mathematical thinking and problem-solving skills, resulting in higher performance in Mathematics and other academic subjects as well.

METHODS

The study used a descriptive-correlational research design to examine the relationship between the utilization of sensory objects in teaching mathematical concepts by teacher-respondents in the primary levels. Data used in the investigation came from 30 primary teachers who incorporated sensory objects in teaching mathematical concepts from Grade 1 to Grade 3 at Marick Elementary School in Cainta, Rizal during the school year 2024–2025. Likewise, it determined the relationships that exist among variables and their correlations. A researcher-made questionnaire checklist was utilized as the main data-gathering instrument.

One-Way Analysis of Variance (ANOVA) was used to determine if there was a significant difference between the profile of the respondents, utilization of sensory objects, and mathematical concepts. One-Way Analysis of Variance (ANOVA) was also used for the significant relationship between the utilization of sensory objects, and mathematical concepts. All the respondents were able to accomplish and return the completed survey questionnaire, representing a 100 percent retrieval rate.

The researcher used a survey questionnaire with three parts. Part 1 dealt with the profile of the respondents in terms of

age, grade level handled, length of service, and highest educational attainment. Part 2 pertained to the extent of sensory object utilization as employed by teachers in teaching mathematics in the primary levels, specifically in terms of Counters, Popsicle Sticks, Play Money, Play Dough, and Dice. Part 3 covered the extent of sensory object utilization in teaching mathematical concepts in the primary levels relative to addition, subtraction, multiplication, and division. All parts of the questionnaire were measured using a four-point Likert-type scale: Always (4.20–5.00), Often (3.40–4.19), Sometimes (2.60–3.39), Rarely (1.80–2.59), and Never (1.00–1.79). The researcher personally wrote a letter to the School Head to seek approval to conduct the study. Afterwards, the researcher sought permission from the primary grade teachers for the distribution of the research instrument through the survey questionnaire. Upon gaining permission, the survey questionnaire was distributed to the respondents. To ensure that the data gathered were precisely treated, the mean was used to describe the extent of sensory object utilization in teaching mathematical concepts in the primary levels.

RESULTS AND DISCUSSION

Discussion of the extent of sensory objects utilization in teaching mathematics in primary levels is presented in the succeeding tables and textual presentation.

It is evident from Table 1 that most of the respondents have earned their Bachelor's Degree as their Highest Educational Attainment having a frequency of 15 out of 30 or 50 percent and in rank 1. This is followed by the 8 respondents or 26.7 percent with a Masteral Degree and 23.3 percent who had Units in Masters. Meanwhile, none of the teacher-respondents have earned both Doctoral Degrees and Units in PhD. Therefore, the finding only implies that the majority of respondents have a Bachelor's degree as their highest educational attainment.

Table 1. Profile of the Teacher Respondents

Age	Frequency	Percent	Rank
50 years old and above	1	3.3	6
46 - 49 years old	3	10.0	5
40 - 45 years old	5	16.7	3.5
36 - 39 years old	7	23.3	2

30 - 35 years old	9	30.0	1
29 years old and below	5	16.7	3.5
Total	**30**	**100.0**	
Grade Level Handled			
Grade 1	9	30.0	3
Grade 2	10	33.3	2
Grade 3	11	36.7	1
Total	**30**	**100.0**	
Length of Service			
30 years and above	1	3.3	6
26 - 29 years	3	10.0	5
21 - 25 years	0	0	7
16 - 20 years	4	13.3	4
11 - 15 years	6	20.0	3
6 - 10 years	7	23.3	2
5 years and below	9	30.0	1
Total	**30**	**100.0**	
Highest Educational Attainment			
Doctoral Degree	0	0	4.5
Masteral Degree	8	26.7	2
Units in PhD	0	0	4.5
Units in Masters	7	23.3	3
Bachelor's Degree	15	50.0	1
Total	**30**	**100.0**	

From the data shown in Table 2, counters which were found to be always helpful for students' understanding of mathematical concepts achieved the highest rank with a mean of 4.27. Followed by counters as an easy-to-use and effective classroom tool for engaging students in learning mathematics. Meanwhile, the use of counters in teaching certain mathematical concepts ranks as the lowest with a mean of 3.87. Thinly implies that counters were often used by primary school teachers in their mathematics teaching. This finding is supported by Shinno & Fujita (2021), which stressed the crucial role of counters familiarity in terms of students' mathematical understanding. Their study has explained that through the use of counters, students tend to comprehend mathematical problems better; however, Cetin (2019) proves otherwise. He revealed that some teachers reported negative experiences using counters in the teaching of mathematics. These teachers observed students' struggles with concepts like subtracting negative numbers using counters. They also stated that counters increased learning difficulty, but despite this, teachers still continue using counters due to a lack of familiarity with alternative teaching methods.

Table 2. The Extent of Sensory Objects Utilization as Employed by Teachers in Teaching Mathematics in Primary Levels in terms of Counters

Counters	Mean	VI	Rank
1. I use counters in my mathematics teaching.	3.93	Often	4
2. I use counters for teaching certain mathematical concepts.	3.87	Often	5
3. I find counters easy to use in the classroom.	4.17	Often	2.5
4 . I find counters to be an effective tool for engaging students to learn mathematics.	4.17	Often	2.5
5 . I find counters helpful in helping my students understand mathematical concepts.	4.27	Always	1
Overall	**4.08**	**Often**	

The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels

It is presented from Table 3 that the popsicle sticks which were found to be often helpful for students' understanding of mathematical concepts achieved the highest rank with a mean of 4.13. Followed by popsicle sticks as an easy-to-use and effective classroom tool for engaging students in learning mathematics. Meanwhile, the use of popsicle sticks in teaching mathematics specifically in teaching certain mathematical concepts ranks as the lowest with the same mean of 3.90. This implies that primary school teachers often used popsicle sticks in their primary-level math instruction. This result is in line with the study of Marantika (2025) , which specifically exemplifies the effective use of popsicle sticks as a concrete learning tool. As stated in the study, using sensory objects like popsicle sticks may improve number sense development and can successfully bridge the gap between abstract mathematical concepts and concrete understanding while fostering creativity and sustained attention among students.

Table 3. The Extent of Sensory Objects Utilization as Employed by Teachers in Teaching Mathematics in Primary Levels in terms of Popsicle Sticks

Popsicle Sticks	Mean	VI	Rank
1 . I use popsicle sticks in my mathematics teaching.	3.90	Often	4.5
2 . I use popsicle sticks for teaching certain mathematical concepts.	3.90	Often	4.5
3 . I find popsicle sticks easy to use in the classroom.	4.03	Often	2
4 . I find popsicle sticks to be an effective tool for engaging students to learn mathematics.	4.00	Often	3
5 . I find popsicle sticks helpful in helping my students understand mathematical concepts.	4.13	Often	1
Overall	**3.99**	**Often**	

It can be gleaned from Table 4 that the play money which was found to be often used by students in creating their own word problem involving money achieved the highest rank with a mean of 3.97. Followed by the use of play money to stimulate real-world purchasing scenarios, including concepts related to money management such as budgeting and to compare and order numbers using different amounts of money. Meanwhile, the teachers' usage of play money into their math lessons at least once a week ranks as the lowest with a mean of 3.70. This result only signifies that play money is a valuable tool to integrate in primary schools in order for the students to better understand mathematical concepts. In connection with this, Rokhima, Mustoip, and Su'aedah (2024) have shown from their study that simulated transactions using play money provide students with opportunities to practice essential math skills like addition, subtraction, and division. Through the use of play money, children can be prepared for real-world scenarios such as budgeting, saving, and making decisions about their purchases. Additionally, Moore (2022) highlights play money as one of the most effective tools which may be used for teaching multi-digit addition and subtraction. He further emphasizes that besides making learners proficient at carrying out these operations, play money helps learners deepen their knowledge of the underlying principles.

Table 4. The Extent of Sensory Objects Utilization as Employed by Teachers in Teaching Mathematics in Primary Levels in terms of Play Money

Play Money	Mean	VI	Rank
1. I incorporate play money activities into my math lessons at least once a week.	3.70	Often	5
2. I incorporate play money into my lessons on comparing and ordering numbers using different amounts of money.	3.83	Often	4
3 . I use play money to stimulate real-world purchasing scenarios.	3.93	Often	2
4 . I use play money to teach concepts related to money management, such as budgeting.	3.90	Often	3
5 . I let students use play money to create their own word problem involving money.	3.97	Often	1
Overall	**3.86**	**Often**	

The Table 5 presents that the play dough, which was found to be seldom used by teachers to encourage creativity while reinforcing mathematical concepts, achieved the highest rank with a mean of 3.33 . Followed by the use of play dough

to help students visualize shapes together with their properties, provide visual representations of numbers and operations, and teach measurement concepts such as length and volume. Meanwhile, the teachers' usage of play dough in making their students visually compare the results of addition or subtraction problems ranks as the lowest, with a mean of 3.17. The findings revealed that play dough is used less often than expected, indicating that teachers do not utilize it as frequently as it is. This discussion contradicts the claim of Viole et al. (2024) on creative methods of teaching mathematics, particularly on using play dough, which has been established to greatly improve students' engagement and comprehension, creativity in math, and enhances mathematical concepts. This hands-on approach also helped students envision the division process and grasp its idea, implying that the use of play dough activities could be a potent means of both developing memory and learning math by learners (Ardianti et al. 2023).

Table 5. The Extent of Sensory Objects Utilization as Employed by Teachers in Teaching Mathematics in Primary Levels in terms of Play Dough

Play Dough	Mean	VI	Rank
1 . I use play dough to teach measurement concepts, such as length and volume.	3.23	Sometimes	4
2 . I use play dough to help students visualize shapes and their properties.	3.30	Sometimes	2
3. I use play dough to encourage creativity while still reinforcing math concepts.	3.33	Sometimes	1
4 . I use play dough to compare the results of different addition or subtraction problems, visually demonstrating which sum or difference is greater or smaller.	3.17	Sometimes	5
5. I use play dough to show students a strong visual of the concrete representation of numbers and operations and how they use it in other ways other than textbook or worksheet.	3.27	Sometimes	3
Overall	**3.26**	**Sometimes**	

As the Table 6 shows, dice, which was found to be an effective tool for engaging students in math activities, achieved the highest rank with a mean of 3.70. Followed by the use of dice to create more engaging math games, which encourages students' active participation. Meanwhile, the teachers' usage of dice to accommodate different learning styles and abilities, to help students practice counting and number recognition, and to make learning more fun and interactive ranks as the lowest, with the same mean of 3.43. Hence, this implies that most of the respondents often find dice an effective tool for engaging students in math activities. This result is supported by the study of Febrianti (2018, as cited in Warmansyah, Anriani, Sari, Eliza, Sabri, & Amalina, 2023), demonstrating that dice can help students count from 1 to 6 and even higher. Dice games promote the development of a child's counting skills, enabling them to better recognize numbers and understand the concept of counting in a playful and engaging manner. It is an effective method of teaching mathematics than traditional methods; thus, incorporating dice games into mathematics instruction can significantly improve students' academic performance (Diri and Ogiga, 2025).

Table 6. The Extent of Sensory Objects Utilization as Employed by Teachers in Teaching Mathematics in Primary Levels in terms of Dice

Dice	Mean	VI	Rank
1. I adopt dice activities to accommodate different learning styles and abilities.	3.43	Often	4
2 . I incorporate dice into my math lessons to make learning more fun and interactive.	3.43	Often	4
3 . I use dice to create engaging math games that encourage students' active participation.	3.47	Often	2
4 . I use dice to help students practice counting and number recognition.	3.43	Often	4
5 . I find dice to be an effective tool for engaging students in math activities.	3.70	Often	1
Overall	**3.49**	**Often**	

The composite table presented in Table 7 reflects that the grand mean for the overall tendency towards frequent use of sensory objects in teaching mathematical concepts is 3.74 and is verbally interpreted as Often. Specifically, higher usage of counters is obtained, as evidenced by a mean of 4.08, indicating a more frequently used tool by teachers

compared to others. It is also revealed that popsicle sticks as well as play money ranked second and third with a mean of 3.99 and 3.86, respectively, likewise interpreted as often. Along with it is the dice that ranked as fourth with a mean of 3.49 and is used relatively often. Meanwhile, the lowest mean is 3.26 and is verbally interpreted as sometimes is play dough. This finding implies that while teachers often incorporate counters, popsicle sticks, play money, and dice more into their math lessons, play dough is revealed to be a less frequently used tool among them. The finding is similar to the study of Latifah et al. (2021, as cited by Tjandra 2023) which posits that manipulatives provide concrete abstract mathematical concepts, promote active engagement, support different learning styles, and can lead to an increased understanding of mathematics. It helps learners better understand mathematical concepts and processes by exploring, experimenting and providing visual as well as concrete representations of mathematical ideas. Fujimura (2001, as cited by Zandakis, 2019) also believed that students who used play dough in practical activities improved their mathematical skills more than those who received traditional instruction.

Table 7. Composite Table on The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in terms of Counters, Popsicle Sticks, Play Money, Play Dough, and Dice

ASPECTS	Mean	VI	Rank
Counters	4.08	Often	1
Popsicle Sticks	3.99	Often	2
Play Money	3.86	Often	3
Play Dough	3.26	Sometimes	5
Dice	3.49	Often	4
Grand	**3.74**	**Often**	

The Table 8 depicts that counters, which were found to be helpful for the student to visualize adding numbers and their quantities, attained the top rank with a mean of 4.13. This is followed by the play money that was found to help introduce the concept of money, such as counting and simple addition; then, popsicle sticks for counting, adding, and representing numbers visually; and dice in engaging activities that involve adding numbers together. Meanwhile, teachers who only used play dough in addition to when students needed extra support sometimes obtained the bottom rank with a mean of 3.33. This implies that teachers find counters, dice, popsicle sticks, and play money valuable for teaching addition, while primary school teachers do not always use play dough in their mathematics class. Similarly, McNeil & Jarvin (2013, as cited in Kate Quane 2022) mentioned that using manipulatives in teaching addition helps students develop a stronger mathematical understanding of abstract concepts by connecting them to real-world experiences. They also further expound in their study that manipulatives allow students to build upon their practical knowledge, making the learning process more engaging and effective. By physically manipulating sensory objects to represent addition problems, students can visualize and incorporate the concept in a way that fosters a more concrete and meaningful learning experience.

Table 8. The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels relative to Addition

Addition	Mean	VI	Rank
1. I use a counter to help the student to visualize adding numbers and their quantities.	4.13	Often	1
2 . I use dice in teaching and to do engaging activities that involve adding numbers together.	3.53	Often	4
3 . I use a popsicle stick for counting, adding, and representing numbers visually.	4.03	Often	3
4 . I use play dough in teaching addition and when students need extra support.	3.33	Sometimes	5
5 . I use play money to introduce the concept of money, such as counting and simple addition involving money.	4.10	Often	2
Overall	**3.83**	**Often**	

The result collected in Table 9 reveals that popsicle sticks, which were found to be often used by the teachers to teach single-digit subtraction, attained the top rank with a mean of 3.87. This is followed by the succeeding use of play money

to teach subtraction in real-life contexts; the use of counters for modeling the minuend and subtrahend; and the dice that is sometimes used to teach different concepts of subtraction. Meanwhile, play dough, which was found to be sometimes used by the respondents in understanding concepts of subtraction, obtained the bottom rank with a mean of 3.27. This implies that play money, popsicle sticks, and counters are more commonly used tools in teaching subtraction than dice and play dough in primary-level mathematics classes. This mentioned effectiveness of sensory objects in teaching mathematics is well-supported by Lantz & Miller (2019) who demonstrated the positive impact of popsicle sticks and play money on number sense including subtraction skills as well as the enhanced engagement achieved through the use of play money. It was concluded that the manipulatives helped students complete number sense operations when used in tutoring, and the use of manipulatives in elementary schools is one beneficial method that has been utilized to help students grasp abstract mathematical concepts (Lantz & Miller, 2019).

Table 9. The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels relative to Subtraction

Subtraction	Mean	VI	Rank
1. I use the numbers on dice as a minuend, subtrahend, and difference to teach the concept of subtraction.	3.30	Sometimes	4
2 . I use play money to teach students the correct way to subtract money in real-life situations.	3.67	Often	2
3 . I use play dough to make the students understand the concept of subtraction by creating certain amount of shapes and taking smaller amount of shapes away	3.27	Sometimes	5
4. I let the students use popsicle sticks in subtracting single-digit math equations.	3.87	Often	1
5. I find counters effective in teaching subtraction by simply providing an original amount of counters (minuend) and taking away a certain amount of counters (subtrahend).	3.62	Often	3
Overall	**3.62**	**Often**	

As observed from the data in Table 10, counters, which were found to be often used to demonstrate multiplication concepts and aid visualization, attained the top rank with a mean of 3.87. This is followed by popsicle sticks that are often used to create visual representations of multiplication problems. Meanwhile, dice and play dough, which were both sometimes used in creating hands-on multiplication activities that engage students' creativity, obtained the bottom rank with the same mean of 3.17. This implies that while a variety of sensory objects such as counters, popsicle sticks, and play money are often used in teaching multiplication, dice and play dough were found to be utilized sometimes by teachers in primary-level classrooms. Similarly, the mentioned positive impact of sensory objects in teaching mathematics is well-supported by Delaney (2010, as cited in Hurst & Linsell, 2020), who illustrated the effectiveness of manipulatives in teaching multiplication. It is also further expounded in their study that when teachers explain and demonstrate while students actively handle manipulatives at the same time, it fosters rich discussions that deepen understanding of multiplication, emphasizing that student interaction with manipulatives can create a highly effective learning environment.

Table 10. The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels relative to Multiplication

Multiplication	Mean	VI	Rank
1 . I use counters to demonstrate multiplication concepts and help students to visualize the process.	3.87	Often	1
2 . I use dice to create engaging multiplication activities.	3.17	Sometimes	4.5
3 . I use popsicle sticks to create visual representations of multiplication problems.	3.70	Often	2
4 . I use play dough to create hands- on multiplication activities that engage students' creativity.	3.17	Sometimes	4.5
5 . I use play money to introduce real-world applications of multiplication to students.	3.60	Often	3
Overall	**3.50**	**Sometimes**	

The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels

The presented findings in Table 11 illustrates that counters, which were found to be often used by the teachers to teach division concepts by modeling the dividend and divisor, attained the top rank with a mean of 3.77. This is followed by the succeeding use of both play money and popsicle sticks to demonstrate the partitioning of amounts and splitting quantities based on the divisor, and play dough that was seldom used by the respondents, particularly in dividing single-digit math equations. Meanwhile, the dice, which are only used in teaching division through fun and engaging games for the students, obtained the bottom rank with a mean of 3.10. This implies that a variety of sensory objects such as counters, popsicle sticks, and play money are often used in primary-level division instruction rather than dice and play dough. The results coincide with the study of Kelly (2006; DiMatteo & Lester, 2010, as cited by Monte, J., 2021), which theorized that by providing students with hands-on interactive learning experiences, it helps them visualize and understand abstract mathematical concepts, resulting in math success and knowledge. These strategies significantly enhance the participation and grasp of students when it comes to mathematics, particularly in learning about division; allows them to actively investigate and modify division issues, making the process more accessible and interesting. By assisting students in making a meaningful connection, they get a better comprehension of division, resulting in more effective learning (Kelly, 2006; DiMatteo & Lester, 2010, as cited by Monte, J., 2021).

Table 11. The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels relative to Division

Division	Mean	VI	Rank
1. I use counters in teaching division by providing a certain amount of counters (dividend) and teaching them to group them based on the given divisor.	3.77	Often	1
2. I use play money in teaching division to show them the correct way of parting money	3.73	Often	2
3. I use popsicle sticks in teaching division by gathering a certain amount of popsicle sticks as the dividend and let the students split them based on the given divisor.	3.67	Often	3
4. I use dice in teaching division by turning the lesson into a fun and engaging game.	3.10	Sometimes	5
5. I find using play dough in teaching division makes students learn how to divide single-digit math equations.	3.20	Sometimes	4
Overall	**3.49**	**Sometimes**	

To quantify this observation, Table 12 shows the grand mean for the overall tendency towards frequent use of sensory objects in teaching mathematical concepts is 3.61 and is verbally interpreted as Often. Specifically, higher usage of sensory objects in teaching addition is obtained, as evidenced by a mean of 3.83. It is also revealed that subtraction ranked second with a mean of 3.62, while multiplication and division ranked third and fourth with a mean of 3.50 and 3.49 respectively, both interpreted as Sometimes. This implies that sensory objects are particularly valuable for teaching mathematical concepts like addition and subtraction, while their role in teaching more complex operations like multiplication and division may be less frequently used. The result is related to the study of Abarquez (2020), which stated that manipulatives objects can be used to help students to learn and retain mathematical concepts particularly in the areas of multiplication and division. Moreover, once a teacher allows their students to actively explore and manipulate these objects, it will improve their long-term memory and foster a deeper understanding of mathematical concepts while making the learning environments more engaging and enjoyable (Abarquez, 2020).

Table 12. Composite Table on the Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels relative to Addition, Subtraction, Multiplication, and Division

ASPECTS	MEAN	VI	Rank
Addition	3.83	Often	1
Subtraction	3.62	Often	2
Multiplication	3.50	Sometimes	3
Division	3.49	Sometimes	4
Grand	**3.61**	**Often**	

It can be illustrated in Table 13 the result of One Way Anova Test on the significant difference between the profile of the respondents and the utilization of sensory objects with respect to age. The use of counters, popsicle sticks, play

money, play dough, and dice, were found to be not significant and therefore fail to reject the null hypothesis, while majority of the computed p-values of 0.082, 0.847, 0.803, 0.146, and 0.498 exceed the alpha 0.05 level of significance, indicating no significant difference among variables. This result leads to an implication that the age of the teacher-respondent is not a contributory factor in the usage of sensory objects in teaching mathematical concepts at primary levels. The finding is analogous to the study of Galvez et al. (2023), which explored the factors that influence the use of manipulative objects in teaching mathematical concepts among elementary teachers. The teachers believe that through the use of concrete objects, students' ability to think critically and creatively, including their retention, might be improved and developed. It was stated as well that teachers utilize sensory objects in their math class, for they believe that it is beneficial for teaching mathematical concepts, regardless of their age.

Table 13. The Significant Difference Between the Profile of the Respondents and Utilization of Sensory Objects and the Profile of the Respondents and Mathematical Concepts

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Counters	Between Groups	2.981	5	.596	2.254	.082	FR	NS
	Within Groups	6.347	24	.264				
	Total	9.328	29					
Popsicle Sticks	Between Groups	.806	5	.161	.395	.847	FR	NS
	Within Groups	9.793	24	.408				
	Total	10.599	29					
Play Money	Between Groups	1.766	5	.353	.459	.803	FR	NS
	Within Groups	18.484	24	.770				
	Total	20.250	29					
Play Dough	Between Groups	6.045	5	1.209	1.826	.146	FR	NS
	Within Groups	15.887	24	.662				
	Total	21.932	29					
Dice	Between Groups	4.023	5	.805	.899	.498	FR	NS
	Within Groups	21.476	24	.895				
	Total	25.499	29					
Grand Mean	Between Groups	1.059	5	.212	.622	.684	FR	NS
	Within Groups	8.167	24	.340				
	Total	9.226	29					

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

The composite table presented in Table 14 reflects the result of the One Way Anova Test on the significant difference between the profile of the respondents and the utilization of sensory objects with respect to grade level handled. The use of counters, popsicle sticks, play money, play dough, and dice, were found to fail to reject the null hypothesis, while majority of the computed p-values of 0.691, 0.285, 0.766, 0.404,and 0.332 exceed the alpha 0.05 level of significance, indicating no significant difference among variables. This result leads to an implication that the grade level handled by the teacher-respondent is not a contributory factor to the usage of sensory objects in teaching mathematical concepts in primary levels. However, Kay (2012, as cited in Haleva et al., 2020) proves otherwise. He stated from the study that older students in higher grades learned more than younger students in lower grades after using learning objects. It is speculated as well that younger students from lower levels might need more scaffolding when using mathematics-based learning objects since their developmental phase affects their ability to engage with sensory materials effectively.

Table 14. The Significant Difference Between the Profile of the Respondents and Utilization of Sensory Objects and the Profile of the Respondents and Mathematical Concepts

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Counters	Between Groups	.252	2	.126	.375	.691	FR	NS
	Within Groups	9.076	27	.336				
	Total	9.328	29					
Popsicle Sticks	Between Groups	.940	2	.470	1.314	.285	FR	NS
	Within Groups	9.658	27	.358				
	Total	10.599	29					
Play Money	Between Groups	.395	2	.198	.269	.766	FR	NS
	Within Groups	19.854	27	.735				
	Total	20.250	29					
Play Dough	Between Groups	1.423	2	.711	.937	.404	FR	NS
	Within Groups	20.509	27	.760				
	Total	21.932	29					
Dice	Between Groups	2.001	2	1.000	.150	.332	FR	NS
	Within Groups	23.498	27	.870				
	Total	25.499	29					
Grand Mean	Between Groups	.240	2	.120	.360	.701	FR	NS
	Within Groups	8.986	27	.333				
	Total	9.226	29					

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

Table 15 depicts the result of the One Way Anova Test on the significant difference between the profile of the respondents and the utilization of sensory objects with respect to the length of service. It can be illustrated from the table that the use of counters, popsicle sticks, play money, play dough, and dice, were found to fail to reject the null hypothesis, while the majority of the computed p-values of 0.177, 0.935, 0.710, 0.453, and 0.139 exceed the alpha 0.05 level of significance, indicating no significant difference among variables. This result leads to an implication that the length of service of the teacher-respondent is not a contributory factor on the usage of sensory objects in teaching mathematical concepts in primary levels. This is connected to the study of Delport (2021), where it was found that the use of multisensory teaching methods, like employing real-life objects, seems to work in improving students' academic achievements in school, regardless of the teacher's experience. Students who received multisensory instruction did much better than students who received traditional instruction (Delport, 2021).

Table 15. The Significant Difference Between the Profile of the Respondents and The Utilization of Sensory Objects with Respect to the Length of Service

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Counters	Between Groups	2.420	5	.484	1.682	.177	FR	NS
	Within Groups	6.908	24	.288				
	Total	9.328	29					
Popsicle Sticks	Between Groups	.529	5	.106	.252	.935	FR	NS
	Within Groups	10.070	24	.420				
	Total	10.599	29					
Play Money	Between Groups	2.206	5	.441	.587	.710	FR	NS
	Within Groups	18.044	24	.752				
	Total	20.250	29					
Play Dough	Between Groups	3.705	5	.741	.976	.453	FR	NS
	Within Groups	18.227	24	.759				
	Total	21.932	29					
Dice	Between Groups	7.130	5	1.426	1.863	.139	FR	NS

The Extent of Sensory Objects Utilization in Teaching Mathematical Concepts in Primary Levels

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Counters	Between Groups	2.420	5	.484	1.682	.177	FR	NS
	Within Groups	6.908	24	.288				
	Total	9.328	29					
	Within Groups	18.369	24	.765				
	Total	25.499	29					
Grand Mean	Between Groups	1.364	5	.273	.833	.539	FR	NS
	Within Groups	7.862	24	.328				
	Total	9.226	29					

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

In summary, Table 16 presented the result of One Way Anova Test on the significant difference between the profile of the respondents and the utilization of sensory objects with respect to the highest educational attainment. The use of popsicle sticks, play money, play dough and dice, were found to fail to reject the null hypothesis, while majority of the computed p-values of 0.097 , 0.122 , 0.542 , and 0.412 exceed the alpha 0.05 level of significance, indicating no significant difference among variables. Whereas, counters were found to have a significant difference since the p-value of 0.008 is less than 0.05 level of significance. This result leads to an implication that the highest educational attainment by the teacher-respondent is not a contributory factor on the usage of popsicle sticks, play money, play dough and dice, while counters displayed to have a significance on the educational attainment of the math teachers. Furthermore, the result of the study is supported by Golafshani (2013, as cited in Charles-Cole, 2020) who reported that the significant increase in the number of teachers that desired to use manipulatives in teaching were influenced by some enabling factors; through manipulative availability, with proper training, and with administrative support. In fact, the teachers' success in teaching with manipulatives was very much dependent on the different support they received from different sources. The teachers also emphasized their need for different kinds of training related to manipulatives, whether it is concerned with instruction and manipulatives, or management and manipulatives, for effective use in teaching.

Table 16. Significant Difference Between the Profile of the Respondents and The Utilization of Sensory Objects with Respect to the Highest Educational Attainment

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Counters	Between Groups	2.799	2	1.400	.789	.008	R	S
	Within Groups	6.529	27	.242				
	Total	9.328	29					
Popsicle Sticks	Between Groups	1.679	2	.840	.541	.097	FR	NS
	Within Groups	8.920	27	.330				
	Total	10.599	29					
Play Money	Between Groups	2.918	2	1.459	.273	.122	FR	NS
	Within Groups	17.332	27	.642				
	Total	20.250	29					
Play Dough	Between Groups	.974	2	.487	.627	.542	FR	NS
	Within Groups	20.958	27	.776				
	Total	21.932	29					
Dice	Between Groups	1.621	2	.810	.916	.412	FR	NS
	Within Groups	23.878	27	.884				
	Total	25.499	29					
Grand Mean	Between Groups	1.440	2	.720	.496	.101	FR	NS
	Within Groups	7.786	27	.288				
	Total	9.226	29					

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

Table 17 presents the result of One Way Anova Test on the significant difference between the profile of the respondents and mathematical concepts with respect to age. It can be depicted from the table that teaching addition, subtraction,

multiplication and division, were found to fail to reject the null hypothesis, while majority of the computed p-values of 0.478, 0.351, 0.801, and 0.812 exceed the alpha 0.05 level of significance, indicating no significant difference among variables. This result leads to an implication that the age of the teacher-respondent is not a contributory factor when it comes to teaching mathematical concepts in primary levels. However, based on the findings of Twohill et al. (2022), teachers' experience gained with age contributes to a greater sense of confidence and competence in teaching mathematical concepts. They further explained as well that elderly teachers feel more capable and prepared to teach mathematics successfully unlike the younger ones.

Table 17. Significant Difference Between the Profile of the Respondents and Mathematical Concepts with Respect to Age

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Addition	Between Groups	2.350	5	.470	.932	.478	FR	NS
	Within Groups	12.109	24	.505				
	Total	14.459	29					
Subtraction	Between Groups	3.983	5	.797	1.174	.351	FR	NS
	Within Groups	16.285	24	.679				
	Total	20.268	29					
Multiplication	Between Groups	2.138	5	.428	.461	.801	FR	NS
	Within Groups	22.242	24	.927				
	Total	24.380	29					
Division	Between Groups	1.991	5	.398	.446	.812	FR	NS
	Within Groups	21.428	24	.893				
	Total	23.419	29					
Grand Mean	Between Groups	1.960	5	.392	.615	.690	FR	NS
	Within Groups	15.307	24	.638				
	Total	17.267	29					

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

The collective findings in Table 18 presents the result of One Way Anova Test on the significant difference between the profile of the respondents and mathematical concepts with respect to the grade level handled. It can be depicted from the table that teaching addition, subtraction, and division, were found to fail to reject the null hypothesis. Majority of the computed p-values of 0.063, 0.682, and 0.076 exceed the alpha 0.05 level of significance, indicating no significant difference among variables. Meanwhile, teaching multiplication was found to have a significant difference since the p-value of 0.012 is less than 0.05 level of significance. This result leads to an implication that the grade level handled by the teacher-respondent is not a contributory factor in teaching addition, subtraction, and division, unlike multiplication which is displayed to have a significance on the grade level handled by the math teachers. This finding aligns to the study of Kearney and Garfield (2019) which states that it is the positive teacher-student dynamic between math teachers and students in middle grades that makes an effective mathematics learning environment. It is the teacher-student connection that influences how teachers approach fundamental mathematics concepts across grade levels.

Table 18. Significant Difference Between the Profile of the Respondents and Mathematical Concepts with Respect to the Grade Level Handled

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Addition	Between Groups	2.678	2	1.339	.069	.063	FR	NS
	Within Groups	11.781	27	.436				
	Total	14.459	29					
Subtraction	Between Groups	.566	2	.283	.388	.682	FR	NS
	Within Groups	19.702	27	.730				
	Total	20.268	29					
Multiplication	Between Groups	6.844	2	3.422	.269	.012	R	S
	Within Groups	17.536	27	.649				
	Total	24.380	29					

Division	Between Groups	4.076	2	2.038	.845	.076	FR	NS
	Within Groups	19.343	27	.716				
	Total	23.419	29					
Grand Mean	Between Groups	2.526	2	1.263	.313	.118	FR	NS
	Within Groups	14.741	27	.546				
	Total	17.267	29					

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

These points are exemplified by the data in Table 19 presenting the result of One Way Anova Test on the significant difference between the profile of the respondents and mathematical concepts with respect to the length of service. It shows that teaching addition, subtraction, multiplication and division, were found to fail to reject the null hypothesis. Meanwhile, majority of the computed p-values of 0.755 , 0.368 , 0.131 , and 0.477 exceed the alpha 0.05 level of significance, indicating no significant difference among variables. This result leads to an implication that the length of service of the teacher-respondent is not a contributory factor when it comes to teaching mathematical concepts in primary levels. This is in contrast to the study of Podolsky et al. (2019) which discovered that teacher experience is associated positively with the improvement of students' performance in mathematics. It is also explained from their study that teachers who are more experienced tend to be effective and can better meet the needs of the students.

Table 19. Significant Difference Between the Profile of the Respondents and Mathematical Concepts with Respect to the Length of Service

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Addition	Between Groups	1.425	5	.285	.525	.755	FR	NS
	Within Groups	13.033	24	.543				
	Total	14.459	29					
Subtraction	Between Groups	3.882	5	.776	1.137	.368	FR	NS
	Within Groups	16.386	24	.683				
	Total	20.268	29					
Multiplication	Between Groups	6.924	5	1.385	1.904	.131	FR	NS
	Within Groups	17.456	24	.727				
	Total	24.380	29					
Division	Between Groups	3.813	5	.763	.933	.477	FR	NS
	Within Groups	19.606	24	.817				
	Total	23.419	29					
Grand Mean	Between Groups	3.330	5	.666	1.147	.363	FR	NS
	Within Groups	13.937	24	.581				
	Total	17.267	29					

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

The collective finding in table 20 showed that teachers' education attainment didn't seem to affect how well they teach basic math like addition, subtraction, multiplication, and division, with a grand mean of 0.405. The p-values 0.307, 0.423, 0.694, and 0.358 were all higher than 0.05, meaning the differences weren't statistically significant. This goes against what Zhu and Han (2006, as cited by Liu, 2021) [32] found, which states that having a bachelor's degree can help teachers get jobs and improve student learning. Liu's (2021) [32] analysis also highlights the importance of supporting teachers' professional development.

Table 20. Significant Difference Between the Profile of the Respondents and Mathematical Concepts with Respect to the Highest Educational Attainment

	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	H o	VI
Addition	Between Groups	1.212	2	.606	1.235	.307	FR	NS
	Within Groups	13.246	27	.491				
	Total	14.459	29					
Subtraction	Between Groups	1.250	2	.625	.887	.423	FR	NS
	Within Groups	19.018	27	.704				
	Total	20.268	29					
Multiplication	Between Groups	.650	2	.325	.370	.694	FR	NS
	Within Groups	23.730	27	.879				
	Total	24.380	29					
Division	Between Groups	1.718	2	.859	1.068	.358	FR	NS
	Within Groups	21.701	27	.804				
	Total	23.419	29					
Grand Mean	Between Groups	1.120	2	.560	.936	.405	FR	NS
	Within Groups	16.147	27	.598				
	Total	17.267	29					

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

It is depicted in Table 21 that there is a clear correlation between sensory objects utilization and mathematical concepts. The table reveals that using counters to teach all four fundamental operations, and using popsicle sticks to teach multiplication and division, shows no significant relationship with the success of teaching these concepts because the p-value is greater than 0.05 level of significance. This means that the null hypothesis fails to reject the results. Conversely, the use of popsicle sticks in teaching addition and subtraction as well as the use of play money, play dough and dice in teaching the four fundamental operations in primary levels demonstrates a positive relationship. This shows that the null hypothesis is rejected because the p-value is less than 0.05 level of significance, indicating a significant correlation between the utilization of sensory objects and mathematical concepts. This is in conformity to the discussion of Abarquez (2020) which generally revealed that students who learned with the use of manipulative objects outperformed those students who were taught in a traditional way. He specifies that students who manipulate objects have learned to understand math processes and procedures through connecting ideas and integrating knowledge, which leads them to gain a deep understanding of mathematical concepts. Indeed, it is evident that the provided information above highlights the positive impact of using sensory objects in teaching mathematics; however, research suggests that manipulatives can improve immediate learning outcomes such as retention and recognition, but also may impede the transfer of learning (Fulmer, 2023). As explained by Fulmer (2023), students who learn with manipulatives can become too reliant on the object and context, and as a result, have difficulty transferring their knowledge to new contexts, different testing formats, or abstract representations of the problem. Apart from this, teachers may also be exposed to classroom management issues specifically regarding student behavior, the level of noise created during activity hours and including the time constraints when using these tools (Sanderson, 2021). Nonetheless, the effective use of these sensory objects in teaching mathematical concepts to students significantly outweighs the complexities of utilizing it, making them an indispensable resource for both teachers and learners.

Table 21. Significant Relationship Between the Utilization of Sensory Objects and Mathematical Concepts

		r-value	p-value	H o	VI
Counters	Addition	.222	.239	FR	NS
	Subtraction	.133	.483	FR	NS
	Multiplication	.021	.911	FR	NS
	Division	.220	.242	FR	NS
	Grand Mean	.157	.407	FR	NS
Popsicle Sticks	Addition	.511	.004	R	S
	Subtraction	.410	.025	R	S
	Multiplication	.193	.307	FR	NS
	Division	.291	.119	FR	NS

	Grand Mean	.370	.044	R	S
Play Money	Addition	.766	.000	R	S
	Subtraction	.737	.000	R	S
	Multiplication	.587	.001	R	S
	Division	.746	.000	R	S
	Grand Mean	.766	.000	R	S
Play Dough	Addition	.678	.000	R	S
	Subtraction	.569	.001	R	S
	Multiplication	.471	.009	R	S
	Division	.506	.004	R	S
	Grand Mean	.597	.001	R	S
Dice	Addition	.761	.000	R	S
	Subtraction	.840	.000	R	S
	Multiplication	.833	.000	R	S
	Division	.875	.000	R	S
	Grand Mean	.904	.000	R	S
Grand Mean	Addition	.843	.000	R	S
	Subtraction	.788	.000	R	S
	Multiplication	.642	.000	R	S
	Division	.775	.000	R	S
	Grand Mean	.822	.000	R	S

Legend: R - Reject. S - Significant; FR - Failed to Reject: NS - Not Significant

CONCLUSIONS

Based on the study findings, the respondents are predominantly Grade 3 teachers with Bachelor's degrees but limited teaching experience. While counters, popsicle sticks, play money, and dice are frequently used for their effectiveness in teaching mathematical concepts, play dough is seldom employed due to its limited applicability. Additionally, sensory objects are primarily utilized for basic operations like addition and subtraction, as they effectively demonstrate mathematical lessons, while complex operations such as multiplication and division require more abstract understanding that goes beyond the practical use of these tools. Importantly, the teacher profile does not affect the utilization of sensory objects, which generally enhance learning outcomes by providing hands-on experiences that improve understanding of mathematical concepts at the primary level.

RECOMMENDATIONS

Drawn from the findings and conclusions, it is recommended that teachers engage in professional enhancement focused on the utilization of sensory objects for teaching mathematical concepts to primary learners. In line with this, primary school teachers are encouraged to specifically expand their use of playdough as a versatile tool for mathematical instruction. Moreover the respondents should explore the application of sensory objects when introducing complex operations, such as multiplication and division. To support these efforts, schools and administrators should actively support professional development in sensory-based instruction for all teachers, regardless of their professional profile, thereby ensuring equitable learning experiences for every student. Meanwhile, future researchers may build upon this study by exploring the effectiveness of localized sensory objects specifically in the instruction of multiplication and division.

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