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HANDS-ON LEARNING: EXPLORING MANIPULATIVES FOR NUMERACY DEVELOPMENT IN EARLY CHILDHOOD

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KeyWords

Early childhood education, Hands-on learning, Manipulatives, Numeracy development, Quantitative Research

ABSTRACT

This quantitative research delves into the efficacy of hands-on learning through manipulatives in fostering numeracy skills during early childhood education. The study investigates the impact of varied manipulatives on numerical development, employing quantitative measures to assess their effectiveness. Utilizing a sample of early childhood students, the research focuses on analyzing the correlation between specific manipulative types and numeracy skill enhancement. Data collected through standardized assessments and observational methods will be statistically analyzed to identify key patterns and correlations. The findings aim to provide valuable insights into the most effective manipulative tools for nurturing numerical proficiency in young learners.

Introduction

According to Oughton, R. H., Et al., (2022) Mathematics in early years settings is often restricted to learning to count and identifying simple shapes. This is partly due to the narrow scope of many early years curricula and insufficient teacher training for exploring deeper mathematical concepts. The researchers imply that during an early years setting, math education typically revolves around foundational skills like counting and recognizing basic shapes. Early childhood education plays a pivotal role in shaping a child's cognitive foundation, particularly in the realm of numeracy development. The utilization of hands-on learning approaches, specifically through the integration of manipulatives, has gained increasing attention as a promising method to enhance numeracy skills during these formative years. This introduction aims to determine the significance of hands-on learning with manipulatives in early childhood education, highlighting the associated challenges and the research's aim to address these issues through a quantitative method. Numeracy development in young children encompasses the acquisition and understanding of mathematical concepts, laying the groundwork for future academic success. However, traditional pedagogical methods often struggle to engage children effectively in numerical learning, leading to challenges in comprehending abstract mathematical concepts. Hands-on learning represents an approach that capitalizes on the tactile and experiential nature of young children, providing them with concrete experiences to comprehend abstract mathematical concepts. Manipulatives, ranging from counting blocks and geometric shapes to interactive digital tools, serve as tangible aids facilitating this experiential learning process. Despite their potential benefits, the selection and utilization of manipulatives pose challenges to educators and researchers. The diversity of available manipulatives and their varying degrees of effectiveness in fostering numeracy skills necessitate a structured investigation into their impact. In summary, this introduction establishes the importance of numeracy development in early childhood education, acknowledges the challenges within traditional teaching methods, and outlines the research's goal to empirically investigate the effectiveness of manipulatives through a quantitative analysis. Through this exploration, the study aims to explore and determine the most effective manipulative tools for nurturing numerical proficiency in young learners.

Background of the study

According to Robinson, E. et al. (2022), Mathematics manipulatives, or the physical objects and concrete materials that children use to make sense of abstract concepts, have long been incorporated in early childhood classrooms to support children in building mathematical reasoning skills. The utilization of manipulatives in early childhood education aligns with educational theories emphasizing the importance of hands-on experiences in fostering conceptual understanding. These manipulatives, ranging from simple counting blocks to intricate geometric shapes and digital interactive tools, serve as tangible aids facilitating experiential learning in mathematical domains. The theoretical foundation supporting the integration of manipulatives in early childhood education is grounded in constructivist theories, particularly the work of Piaget and Vygotsky. Piaget's theory emphasizes that children construct their understanding of the world through interactions and experiences. Manipulatives provide these tangible experiences, enabling children to explore mathematical concepts through active engagement and manipulation. Similarly, Vygotsky's sociocultural theory highlights the significance of social interaction and the role of tools in cognitive development. Manipulatives, in this context, act as tools that support children's cognitive processes and scaffold their learning, especially in the development of numeracy skills. Consequently, this study aims to address these gaps by conducting a comprehensive quantitative analysis of the impact of varied manipulative tools on numeracy development in early childhood education settings. By examining the effectiveness of diverse manipulative types through quantitative research, this study endeavors to provide concrete evidence guiding educators and curriculum designers in the selection and utilization of manipulatives to foster numeracy skills in young children. In summary, while theoretical frameworks and educational standards advocate for the integration of manipulatives in early childhood education, challenges in implementation and the lack of empirical evidence necessitate a comprehensive study to evaluate the efficacy of these tools in promoting numeracy development among young learners.

Methodology

Research Locale

The study will be carried out at Pres. Corazon C. Aquino Elementary School and San Diego Elementary School Located at Quezon City. The survey questionnaires will be distributed to the chosen respondents. The survey will be conducted by the school year 2023-2024.



Figure 1: Map of San Diego Elementary School and President Corazon Aquino Elementary School

Participants of the Study

The participants in this study have approximately (40) forty experienced teachers who play a key role in developing the numeracy skills of young students. This diverse group of educators represents diverse backgrounds and cultural perspectives and offers a rich array of experiences in early childhood education. Each teacher takes a unique approach to integrating manipulatives into numeracy development, and their insights illuminate the different strategies used for hands-on learning in their classrooms. Utilizing the collective knowledge of these 40 teachers, our research aims to explore and determine the most effective manipulative tools for nurturing numerical proficiency in young learners.

Research Design and Instrument

In this study, The researchers used a Quantitative research survey tool. According to Dan Fleetwood, A quantitative research approach is a systematic analysis of phenomena through the collection of measurable data and application of statistical, mathematical or computational techniques. Through the use of descriptive surveys, a five (5) point likert scale. The researchers use this to collect the targeted data. This research instrument is appropriate for our study since it allows us to investigate and gather data from each respondent. The purpose of this research design is to provide a detailed and accurate reaction and opinion of each target group. According to Voxco (2021) Descriptive survey research design is the most common and popular methodology used in market research to gather informative data.

In order to determine how cultural diversity affects creative arts in early childhood education, the researchers used a (5) five point likert scale survey questionnaires to gather data from the respondents. The instrument would be given to 40 kindergarten Teachers of kindergarten students at President Corazon Aquino Elementary School and San Diego Elementary School. The survey questionnaire was composed of (3) three parts. The first part is Hands-on learning through manipulatives and enhancement of numeracy skills. While the second part is Manipulatives enhance numeracy skills in early childhood education and the last part is the open ended survey question, What barriers and limitations hinder the widespread adaptation of hands-on learning with

manipulatives in Early Childhood classrooms? The respondents will answer the survey questionnaire by choosing the answer in the choices that has corresponding numbers of 1-5 with verbal interpretation as follows:

- 5= Strongly Agree
- 4= Agree
- 3= Neutral
- 2= Disagree
- 1= Strongly Disagree

Procedure

The researchers gathered data and information from previous studies and reliable articles. The researchers submitted a letter for approval to the School Division Office in order to conduct a research study at our chosen public school, particularly in Quezon City. The researchers submitted a letter to conduct a survey in order to seek approval from the school head and principals to conduct a survey at San Diego Elementary School and President Corazon Aquino Elementary School. Upon approval, the researchers conducted a survey through papers to get the responses of kindergarten teachers at San Diego Elementary School and President Corazon Aquino Elementary School. As the teachers completed and responded to the survey forms, they were returned to the primary researcher's. After that, the formal methods began immediately. Throughout the entire process, the researchers were careful to maintain ethical standards.

Data Analysis

The researchers used statistical methods to make conclusions, generalizations, and interpretations. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to interpret teachers' perspective and experiences to explore and determine the most effective manipulative tools for nurturing numerical proficiency in young learners. Particularly in San Diego Elementary School and Pres. Corazon Elementary School. The researchers believe that this method is the appropriate way to analyze the gathered data and information for the reason that it helps describe, show or summarize data in a meaningful way. A Likert scale was used to define the results and supplement the interpretation derived from the gathered data.

According to Kaur P, Stoltzfus J, Yellapo V. (2018) stated that descriptive statistics are used to summarize data in an organized manner by describing the relationship between variables in a sample or population. Calculating descriptive statistics represents a vital first step when conducting research and should always occur before making inferential statistical comparisons.

After gathering the data, the researchers will use the following techniques to analyze and interpret the respondents' responses. The following, in the context of the study's goals, was thought to be the most suitable tools by the researchers. A weighted mean is calculated by multiplying each data point's value by the allotted weight, adding the results, and dividing the result by the total number of points.

Statistical Treatment

A weighted mean is calculated by multiplying each data point's value by the allotted weight, adding the results, and dividing the result by the total number of points.

This formula was used to calculate the data set's average value.

$$X = \frac{\sum fx}{f}$$

Where; X = Weighted mean
 $\sum fx$ = Sum of all products
 f = sum of all respondents

Results

This section contains the results of the survey conducted with the discussion and interpretation as the data was analyzed. Furthermore, it includes the summary of the research study, presentation of the findings with drawn conclusions, and cite recommendations for further improvement for the areas of the study.

Table 1.1 Years of Teaching

YEARS OF TEACHING	PARTICIPANTS	PERCENTAGE
1-5 years	15	37.5%
6-10 years	18	45%
10-15 years	2	5%
16-20 years	1	2.5%
21-25 years	0	0
26-30 years	0	0
31-35 years	5	12.5%
36 and above	1	2.5%

Table 1.2 Educational Attainment

Educational Attainment	Participants	Percentage
Bachelor's Degree	11	27.5%
Master's Degree	10	25%
Doctoral Degree	0	0
With Masters Units	10	25%
With Doctoral Units	9	22.5%

Based on the table, The research results depict the distribution of teachers based on their years of teaching experience. The table reveals that a significant portion, 37.5%, falls within the bracket of 1-5 years of teaching experience. This suggests a relatively high turnover of new educators entering the profession. Moving up to the 45% of teachers have been engaged in teaching for a duration spanning 6-10 years. This represents a substantial portion of the teaching Category, indicating a stable presence within the education system. There's a noticeable decline in the percentage of teachers as the years of experience increase. Only 5% have 10-15 years of experience, followed by a mere 2.5% between 16-20 years and another 2.5% from 36 years and above. This suggests a drop-off in the number of teachers as they accumulate more extensive teaching experience, possibly due to career shifts, retirement, or other factors. In the data, 12.5% of teachers fall within the 31-35 years bracket. This might signify a specific trend or characteristic within a certain subset of educators, possibly indicating a generation of teachers who have stayed within the profession for an extended period. Overall, the data indicates a significant concentration of teachers in the early years of their career (1-10 years), a declining number as the years progress, and a smaller yet notable presence among those who have served for more than three

decades. Understanding these patterns could inform policies aimed at retaining experienced teachers, supporting newcomers, and managing transitions within the teaching workforce.

The table shows the educational attainment of the respondents. 27.5% of the respondents possess a bachelor's degree, marking a significant portion of the sampled population. This indicates a substantial number of individuals with an undergraduate level of education within the surveyed group. Moving up the academic ladder, an equal proportion of respondents, 25% each, hold a master's degree and have completed the coursework for a master's degree (referred to as "Masters units"). This suggests a balanced representation between those who have attained a postgraduate qualification and those who have completed substantial coursework but might not have finished the full master's program. The findings are the 22.5% of respondents with doctoral units, indicating individuals who have engaged in doctoral-level coursework but may not have completed their entire doctoral program. This category showcases a segment of the sample population dedicated to pursuing the highest level of academic achievement, even without the finalized doctoral degree. The data portrays a diverse distribution across various levels of education, showcasing a mix of individuals with bachelor's degrees, master's degrees, completed master's coursework, and engagement in doctoral-level studies. Understanding the educational landscape of the respondents, spanning from undergraduate to potential doctoral-level studies, highlights the diversity of qualifications and educational pursuits among the surveyed group, providing valuable information for educational institutions and researchers seeking to address the needs and characteristics of this diverse demographic.

Table 2. Hands-on learning through manipulatives and enhancement of numeracy skills

Indicators	Weighted Mean	Standard Deviation	Verbal Interpretation	Ranking
1. Manipulatives help students develop problem-solving skills in numeracy.	4.6	15.45	Strongly Agree	1
2. Manipulative-based numeracy activities promote better retention of mathematical concepts.	4.5	15.28	Strongly Agree	2.5
3. Hands-on learning with manipulatives facilitates a deeper understanding of abstract mathemnts. Utilizing hands-on manipulatives in learning promotes a deeper comprehension oatical ideas	4.5	15.28	Strongly Agree	2.5
4. Manipulatives are a valuable tool for teaching numerical concepts to students with diverse learning styles.	4.58	15.39	Strongly Agree	4
5. Students are more confident in approaching mathematical tasks when they use manipulatives.	4.55	15.32	Strongly Agree	5
6. Hands-on learning with manipulatives is equally effective for students of different age groups.	4.53	15.29	Strongly Agree	6.5
7. Students who use manipulatives in numeracy education are better prepared for real-world applications of mathematics.	4.53	15.29	Strongly Agree	6.5
8. Hands-on activities with manipulatives make numeracy lessons more engaging for students	4.4	14.58	Strongly Agree	8
9. Using manipulatives in numeracy	4.45	14.72	Strongly Agree	9.5

education enhances students' understanding of mathematical concepts.				
10. Incorporating manipulatives in numeracy education encourages active participation among students.	4.45	15.33	Strongly Agree	9.5
Grand Total	4.51	15.2	Strongly Agree	

The table shows that manipulatives aid in fostering students' numeracy problem-solving abilities, scoring an average rating of 4.6 out of 5, correlating to a high level of agreement. Activities centered around manipulatives in numeracy contribute to better conceptual retention in mathematics, with an average rating of 4.5 out of 5, indicating strong agreement among responded abstract mathematical ideas, garnering an average score of 4.5 out of 5, signaling a high level of consensus in agreement. Manipulatives serve as valuable tools for effectively teaching numerical concepts to students with varying learning styles, achieving an average rating of 4.58 out of 5, with a considerable level of strong agreement among participants. Students exhibit increased confidence in tackling mathematical tasks when employing manipulatives, securing an average score of 4.55 out of 5, reflecting a high level of agreement among respondents. Hands-on learning involving manipulatives proves equally effective across different age groups of students, attaining an average rating of 4.53 out of 5, suggesting a strong agreement within the surveyed population. Students who engage with manipulatives in numeracy education showcase enhanced readiness for real-world applications of mathematics, receiving an average rating of 4.53 out of 5, indicating a high level of agreement among respondents. Engaging in hands-on activities with manipulatives amplifies the appeal and engagement of numeracy lessons, scoring an average of 4.4 out of 5, indicating a strong agreement among participants. The integration of manipulatives in numeracy education significantly enhances students' grasp of mathematical concepts, receiving an average rating of 4.45 out of 5, showcasing a high level of agreement among respondents. Incorporating manipulatives into numeracy education encourages active participation among students, garnering an average score of 4.45 out of 5, reflecting a considerable level of agreement within the surveyed population. Overall, the data portrays a consistent pattern of strong agreement among respondents regarding the positive impact of manipulatives in numeracy education. From enhancing conceptual understanding to fostering engagement and active participation, manipulatives emerge as valuable tools across various facets of mathematical learning, underlining their significance in supporting students' mathematical development and problem-solving skills.

Table 3. Manipulatives enhances numeracy skills in early childhood education

Indicators	Weighted Mean	Standard Deviation	Verbal Interpretation	Ranking
1. Using manipulatives positively impacts a child's understanding of basic numeracy concepts.	4.9	15.42	Strongly Agree	1.5
2. Manipulatives help bridge the gap between concrete and abstract math ideas.	4.9	14.98	Strongly Agree	1.5
3. Manipulatives are suitable for addressing diverse cultural perspectives in math education.	4.6	15.45	Strongly Agree	3
4. The manipulatives promote collaborative learning and peer interaction in math activities.	4.5	15.28	Strongly Agree	4
5. The incorporation of manipulatives is essential for a well-rounded early childhood math curriculum.	4.55	15.32	Strongly Agree	5
6. Integrating manipulatives into	4.53	15.29	Strongly Agree	6.5

early math Education enhances spatial reasoning.				
7. The manipulatives can be used to reinforce math concepts for struggling learners.	4.53	15.29	Strongly Agree	6.5
8. Integrating manipulatives into early math education enhances creativity in problem-solving.	4.45	15.33	Strongly Agree	8.5
9. Manipulatives are adaptable to different learning styles and abilities.	4.45	15.33	Strongly Agree	8.5
10. Using manipulatives in early education is more effective than traditional pencil-and-paper methods.	4.45	14.72	Strongly Agree	10
Grand Total	4.59	15.25	Strongly Agree	

The table shows that utilizing manipulatives significantly enhances a child's grasp of basic numeracy concepts, receiving a high average rating of 4.9 out of 5, indicating a strong consensus among respondents who strongly agree. Manipulatives serve as a bridge between concrete and abstract mathematical ideas, earning an average score of 4.9 out of 5, illustrating a high level of agreement among participants, emphasizing their crucial role in facilitating understanding across mathematical concepts. The use of manipulatives proves suitable for accommodating diverse cultural perspectives within mathematics education, achieving an average rating of 4.6 out of 5, showcasing a significant level of agreement among respondents in supporting cultural inclusivity in math learning. Manipulatives facilitate collaborative learning and peer interaction in mathematical activities, securing an average rating of 4.5 out of 5, indicating a strong agreement among participants in acknowledging their role in fostering collaborative learning environments. Integrating manipulatives into early childhood math curricula is deemed essential for a comprehensive educational framework, scoring an average of 4.55 out of 5, highlighting a high level of agreement among respondents. The integration of manipulatives into early math education enhances spatial reasoning skills, earning an average score of 4.53 out of 5, suggesting a strong consensus among participants regarding their positive impact on spatial reasoning development. Manipulatives serve as effective tools for reinforcing math concepts among struggling learners, receiving an average rating of 4.53 out of 5, indicating a strong agreement among respondents in acknowledging their utility for supporting struggling students. Incorporating manipulatives into early math education stimulates creativity in problem-solving, garnering an average rating of 4.45 out of 5, suggesting a considerable level of agreement among participants regarding their positive impact on fostering creative problem-solving skills. Manipulatives demonstrate adaptability to diverse learning styles and abilities, achieving an average rating of 4.45 out of 5, indicating a strong consensus among respondents in recognizing their versatility and suitability for various learning needs. The utilization of manipulatives in early education is considered more effective than traditional pencil-and-paper methods, scoring an average of 4.45 out of 5, signifying a significant level of agreement among participants in favor of manipulatives over traditional teaching approaches.

Results 3. What barriers and limitations hinder the widespread adaptation of hands-on learning with manipulatives in Early Childhood classrooms?

According to the answers of respondents. The number one barrier and limitations that hinder the widespread adaptation of hands-on learning is limited time and resources. Many students, especially in underprivileged or overcrowded classrooms, lack access to essential materials. The shortage of funding restricts the acquisition of manipulative tools, hindering educators from incorporating these valuable resources into their teaching strategies. This insufficiency not only impacts the quality of learning but also limits the exposure of children to diverse educational experiences. Moreover, the behavior and interests of each child add another layer of complexity. Not all children engage with hands-on learning in the same way. Some might thrive and enthusiastically participate, while others may struggle to stay focused or interested. Tailoring teaching approaches to accommodate varying learning styles and interests becomes a challenge for educators, impacting the effectiveness of hands-on learning.

Classroom dynamics also play a crucial role. Larger class sizes limit individualized attention and personalized instruction. In such settings, implementing hands-on activities with manipulatives becomes logistically challenging. A lack of space within the classroom

can further impede the incorporation of these materials, restricting movement and hindering the interactive nature of such learning experiences. In addition, inadequate training of educators is a crucial factor in the successful integration of hands-on learning with manipulatives. Teachers might lack the necessary skills or knowledge to effectively implement these methods, reducing their confidence in utilizing such tools. Without proper training and guidance, educators might struggle to utilize the full potential of manipulative-based learning activities. Furthermore, the lack of manipulative materials increases the issue. Even when educators are keen on implementing hands-on learning, the absence of these tools limits their ability to do so effectively. Schools often face budgetary constraints, making it challenging to invest in a wide array of manipulative materials that cater to diverse subjects and learning objectives. Addressing these barriers requires a multifaceted approach. Increasing funding and resource allocation to schools can enhance accessibility to manipulative materials. Providing comprehensive training and professional development opportunities for educators can equip them with the necessary skills and confidence to integrate hands-on learning effectively. Moreover, fostering an environment that values individualized learning and caters to diverse learning styles is crucial for successful implementation. In conclusion, while hands-on learning with manipulatives holds immense potential in early childhood education, various obstacles hinder its widespread adaptation. Overcoming these challenges demands collaborative efforts among policymakers, educators, and stakeholders to prioritize resource allocation, training, and creating an inclusive learning environment that supports the diverse needs of young learners.

Table 4. A significance relationship between Hands-on Learning and Manipulatives for Numeracy Development of Early Childhood Education?

	Manipulatives for Numeracy Development	p-value	Interpretation
Hands-on Learning	-0.025	0.945	There is no significant relationship between Hands-on Learning and Manipulatives for Numeracy Development of Early Childhood Education

There is no significant relationship between Hands-on Learning and Manipulatives for Numeracy Development of Early Childhood Education. There is no significant relationship between Hands-on Learning and Manipulatives for Numeracy Development of Early Childhood Education Hands-on Learning and Manipulatives for Numeracy Development of Early Childhood Education ($r = -0.025$; $p\text{-value} = 0.945$). The results suggest a very weak negative correlation between Hands-on Learning and Manipulatives for Numeracy Development in Early Childhood Education, and the relationship is not statistically significant. In this case, the weak correlation suggests that changes in Hands-on Learning are not associated with significant changes in Numeracy Development when using Manipulatives in early childhood education. Schools and educational institutions often allocate resources based on perceived effectiveness. In light of these results, administrators may reassess resource allocation and consider whether investments in hands-on learning materials for numeracy development are justified or if resources could be reallocated to more impactful interventions.

Discussion

Based on the table, In analyzing the distribution of teachers according to their years of teaching experience, the data reveals a concentration of 37.5% within the bracket of 1-5 years, indicating a substantial number of new educators. Moving up, 45% fall within the 6-10 years range, depicting a stable presence within the educational system. However, there's a notable decline in percentages as the years of experience increase, with only a small percentage having over a decade of teaching experience. This decline might suggest various factors influencing career shifts or exits from the profession. An intriguing observation is the 12.5% of teachers within the 31-35 years bracket, potentially indicating a subset of educators who have remained dedicated to teaching over an extended period. Shifting focus to the educational attainment of the respondents, the table illuminates a diverse educational landscape. 27.5% possess a bachelor's degree, indicating a significant undergraduate presence within the sample. Equally represented are respondents with master's degrees and those who've completed coursework for a master's degree ("Masters units") at 25% each, showcasing a balanced distribution of postgraduate qualifications. Furthermore, 22.5% have engaged in doctoral-level studies, highlighting a commitment to the highest levels of academic pursuit, even without finalized doctoral degrees. This diverse educational profile,

ranging from bachelor's degrees to potential doctoral studies, showcases a mix of qualifications and educational aspirations among the surveyed group. It provides valuable insights for educational institutions and researchers aiming to cater to the diverse needs and characteristics of this demographic. Understanding these patterns could inform strategies to retain experienced teachers, support newcomers entering the profession, and manage transitions within the teaching workforce. Moreover, the varied educational qualifications within the respondent pool underline the importance of catering to different academic levels and aspirations in designing effective educational interventions or policies. In essence, these findings offer a comprehensive view of the teaching workforce's experience distribution and educational backgrounds, serving as a valuable resource for educational stakeholders and researchers aiming to address the needs of diverse educators and learners in the field of early childhood numeracy development.

Based on the table, The research findings present a compelling narrative showcasing the immense value of manipulatives in nurturing students' numeracy skills and problem-solving abilities. The table illustrates among respondents regarding the positive impact of manipulatives in numeracy education. Scoring an impressive average rating of 4.6 out of 5, the use of manipulatives was deemed highly effective in enhancing students' numeracy problem-solving abilities. This strong agreement among participants solidifies the perception that hands-on activities involving manipulatives contribute significantly to students' problem-solving skills in mathematics. Moreover, the average rating of 4.5 out of 5 for conceptual retention in mathematics emphasizes the role of manipulatives in aiding students' understanding and memory of mathematical concepts. The consensus among respondents regarding the promotion of deeper comprehension of abstract mathematical ideas further substantiates the efficacy of manipulatives in facilitating a stronger grasp of otherwise challenging concepts. One of the key takeaways from the data is the acknowledgment of manipulatives as valuable tools for accommodating diverse learning styles, receiving an average rating of 4.58 out of 5. This high level of agreement signifies that manipulatives cater effectively to various learning preferences, ensuring inclusivity in numeracy education. Furthermore, the consistency of high ratings across different age groups (average rating of 4.53 out of 5) suggests that manipulatives are universally effective, transcending age barriers and proving beneficial for students at various educational stages. The data also underscores the practical applicability of manipulatives, as students engaging with these tools showcase readiness for real-world mathematical applications. This aligns with the average rating of 4.53 out of 5, indicating a strong agreement among respondents regarding the tangible, real-world benefits of manipulative-based learning. In summary, the data demonstrates a consistent pattern of strong agreement among respondents, highlighting the multifaceted advantages of manipulatives in numeracy education. From enhancing conceptual understanding to promoting engagement and active participation, manipulatives emerge as invaluable tools that significantly contribute to students' mathematical development and problem-solving skills. These findings underscore the significance of incorporating manipulatives in pedagogical approaches aimed at fostering a deeper and more comprehensive understanding of mathematics among students.

The research findings showcased in the table present compelling evidence regarding the significant positive impact of utilizing manipulatives in early childhood numeracy education. The data, reflecting high average ratings across various aspects, highlights the multifaceted advantages of integrating manipulatives into math curricula. The highest average rating of 4.9 out of 5, the use of manipulatives is shown to significantly enhance a child's grasp of basic numeracy concepts. Respondents emphasize the pivotal role of manipulatives in pushing fundamental mathematical understanding at an early age. Furthermore, the average score of 4.9 out of 5 for serving as a bridge between concrete and abstract mathematical ideas underscores the critical function of manipulatives in facilitating the transition from tangible, hands-on learning to more complex abstract concepts, emphasizing their role in aiding comprehension across various mathematical domains. One of the key takeaways from the data is the recognition of manipulatives as tools suitable for accommodating diverse cultural perspectives within mathematics education, scoring an average of 4.6 out of 5. This signifies a significant level of agreement among respondents in advocating for cultural inclusivity in math learning by leveraging manipulatives. Moreover, regarding the essentiality of integrating manipulatives into early childhood math curricula, as depicted by the average rating of 4.55 out of 5, highlights their indispensable role in providing a comprehensive educational framework at an early developmental stage. The findings also emphasize the positive impact of manipulatives on developing spatial reasoning skills, garnering an average score of 4.53 out of 5. This reflects a strong consensus among participants regarding the instrumental role of manipulatives in enhancing spatial cognition among young learners. Additionally, the data underscores the effectiveness of manipulatives in reinforcing math concepts among struggling learners, fostering creative problem-solving skills, and catering to diverse learning styles and abilities. These aspects received high average ratings, signifying a considerable level of agreement among respondents regarding the versatility and efficacy of manipulatives in addressing various educational needs. Finally, the preference for manipulatives over traditional pencil-and-paper methods, indicated by the average rating of 4.45 out of 5, further emphasizes the perceived superiority of hands-on manipulative-based approaches in early childhood math education. In summary, these research findings underscore the pivotal role of manipulatives in early childhood numeracy education, showcasing their diverse benefits ranging from enhancing conceptual understanding to fostering collaboration, cultural inclusivity, spatial reasoning, and catering to diverse learning needs. This comprehensive evidence supports the integration and prioritization of manipulatives in early math curricula for optimal educational outcomes among young learners.

The research findings indicate a lack of a significant relationship between Hands-on Learning and Manipulatives for Numeracy

Development in Early Childhood Education. With a correlation coefficient of -0.025 and a p-value of 0.945, the results suggest a very weak negative correlation, which is not statistically significant. This implies that changes in Hands-on Learning are not linked to significant alterations in Numeracy Development when utilizing Manipulatives in early childhood education. The absence of a substantial correlation between these two factors challenges the commonly held belief or assumption that hands-on learning activities involving manipulatives inherently lead to improved numeracy development in young learners. While hands-on learning and manipulatives are often seen as effective tools in education, this particular research suggests that their combined impact on numeracy development might not be as straightforward as presumed. This finding prompts a reevaluation of resource allocation within educational institutions. Schools often invest considerable resources in hands-on learning materials for numeracy development, assuming their effectiveness based on prevalent educational theories. However, this research indicates that these investments might not yield significant improvements in numeracy development, at least in the context studied. Administrators and educators may need to reconsider their strategies and resource allocations, exploring alternative interventions or areas where these resources could potentially be more impactful. This reassessment could involve redirecting resources to other areas within early childhood education that have demonstrated more significant correlations or proven effectiveness in enhancing numeracy skills among young learners. Further research could also delve deeper into understanding why this weak correlation exists or explore potential moderating factors that might influence the relationship between hands-on learning with manipulatives and numeracy development. This could offer insights into refining the application of these tools or identifying specific contexts where their impact might be more pronounced. In essence, while these results challenge conventional assumptions, they open up avenues for more targeted and evidence-driven approaches to resource allocation and educational interventions within early childhood education, ultimately aiming for more effective ways to support numeracy development among young learners.

Conclusion and Recommendation

The findings for teacher experience and educational attainment indicate a considerable presence of new educators in the 1-5 year range, followed by a stable population within the 6-10 year bracket. However, there's a decline in experienced teachers beyond a decade. This suggests a need to support and retain experienced educators while providing resources for newcomers. The diverse educational qualifications highlight the necessity of tailored strategies for addressing various academic levels and aspirations. San Diego Elementary School could benefit from mentoring programs for new teachers and professional development opportunities for experienced educators to ensure a balanced teaching workforce. The findings highlight their substantial impact on enhancing students' problem-solving abilities and conceptual retention. However, the study doesn't establish a significant correlation between hands-on learning with manipulatives and numeracy development. This challenges presumptions about the direct impact of manipulatives on numerical skills. Administrators at San Diego Elementary School might reassess resource allocation, exploring alternative interventions or areas where resources could be more impactful. Additionally, further research could investigate moderating factors to refine the application of manipulatives effectively.

The recommendation regarding teacher experience and educational attainment depict similar trends of a concentration of new educators in the 1-5 year range and a stable presence within the 6-10 year bracket. However, a decline in experienced teachers beyond a decade necessitates strategies to retain seasoned educators. The diverse educational qualifications underscore the need for tailored educational interventions to cater to varying academic levels and aspirations. President Corazon Aquino Elementary School could benefit from mentorship programs for new teachers and initiatives for ongoing professional development for experienced educators. Further research could explore moderating factors to optimize the application of manipulatives effectively.

The research recommendations for this research are, first, Implement mentorship initiatives and professional development opportunities to retain experienced teachers and support newcomers entering the profession. Additionally, Design curriculum and teaching methods that accommodate diverse educational qualifications among teachers, ensuring inclusive and effective education delivery. Develop flexible curriculum strategies to address the diverse educational qualifications among teachers, promoting inclusive and effective teaching practices. And lastly, Foster platforms for collaborative learning among educators to exchange insights and best practices, promoting a culture of continuous improvement and innovation in teaching methodologies.

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