Impact of Math Manipulatives on Grade One Pupils’ Attitudes and Academic Achievement

**ABSTRACT**

This study examined the achievement levels of Grade One pupils and their attitudes towards the use of Math Manipulatives in teaching. It was conducted at Mataguisi Elementary School, Pudtol District, Division of Apayao, during the School Year 2023-2024. It specifically aimed to: 1) profile the respondents based on sex, educational attainment of parents, occupation of parents, and monthly income; 2) analyze the attitudes of the pupils towards Math Manipulatives; 3) determine any significant differences in these attitudes and achievements when pupils are grouped according to profile variables; and 4) assess the relationship between attitudes and achievement levels in mathematics. Since the enrollment of the school was small and manageable, complete enumeration was used. Data were gathered using a questionnaire checklist specifically designed to capture pupils' attitudes towards Math Manipulatives, while academic achievements were determined from final grades recorded in the School Report Cards. The collected data were tabulated, analyzed, and interpreted using frequency counts, means, percentages, and weighted means alongside a five-point Likert scale for attitude assessment. Findings revealed that most parents of the respondents had attained only elementary education, and they were predominantly employed in low-income occupations. The overall mean score for pupils’ attitudes towards Math Manipulatives was 4.08, reflecting a general agreement among pupils on the positive effects of these teaching tools. Significant differences in attitudes based on the sex of the pupils were noted, while no significant differences were found regarding educational attainment or occupations of parents. The pupils achieved a weighted mean of 86.09%, categorized as “Very Satisfactory.” The study concludes that the use of manipulatives in mathematics instruction fosters greater interest, engagement, and self-confidence among pupils, contributing to enhanced academic performance. It is recommended that educators integrate manipulatives into curricular activities to support positive attitudes and achievements in mathematics education.

**Keywords:** Math Manipulatives, academic performance, positive attitudes and achievements, self-confidence

**INTRODUCTION**

The teaching and learning of mathematics have undergone significant transformations over the past few decades, with an increasing emphasis on concrete learning experiences that aid in the understanding of abstract concepts. One such innovative approach is the use of math manipulatives, which are physical objects that students can manipulate to gain a deeper understanding of mathematical ideas. Research has shown that the integration of manipulatives in mathematics instruction enhances student engagement, understanding, and overall academic performance (1, 2).

For Grade One pupils, who are generally in the early stages of mathematical learning, the use of manipulatives can be particularly impactful. This age group is characterized by a need for concrete experiences to build their foundational skills in mathematics. The National Council of Teachers of Mathematics (NCTM) advocates for the use of manipulatives as a core component of effective mathematics instruction, emphasizing that such tools can foster a more interactive and engaging learning environment (3).

Furthermore, students' attitudes towards mathematics significantly influence their learning outcomes. Positive attitudes towards mathematics may lead to greater motivation and improved academic performance (4, 5). Conversely, negative experiences can contribute to anxiety and disengagement, which can hinder their mathematical achievements. Understanding the relationship between students’ attitudes towards the use of manipulatives and their performance in mathematics is therefore critical for educators aiming to improve instructional strategies and student outcomes.

This research aims to explore the achievement levels of Grade One pupils and their attitudes regarding the use of math manipulatives. Specifically, it will profile the respondents based on demographic variables, analyze their attitudes towards manipulatives, and assess the correlation between these attitudes and academic achievement in mathematics. The insights gained from this study may provide valuable implications for teaching practices and curriculum development in mathematics education

**Statement of the Problem**

The general objective of this study was to look into the Attitude and Achievement of Grade One Pupils Towards the used of math manipulatives.

**Specific Objectives**

Specifically, it answered the following questions.

1. What is the profile of the pupils?
2. What is the attitude of pupils towards math manipulatives?
3. Are there differences in the attitude of pupils when grouped according to profile?
4. What is the Achievement of the pupils?
5. Are there differences in the Achievement of pupils when grouped according to profile?

**Research Hypotheses**

This study was guided by the following hypotheses:

There is no significant difference between the Attitude of pupils’ when grouped according to Profile

There is no significant difference between the Achievement of pupils when grouped according to profile.

**Conceptual Framework**

Education is a continuous process with the goal to produce competent, productive, and responsible citizen of the country. To meet the goal, it is therefore important for the educators to keep on finding ways to help students learn better particularly in mathematics which has been a concern for a long time in the country because of its low success level.

This study is anchored on the concept that using manipulatives in teaching the competencies in mathematics could increase pupils’ participation and achievement level.

The researcher hypothesized that pupils’ attitude and achievement level improve towards the used of math Manipulatives.

An illustration of these concept is shown in a paradigm below which serves as a guide in the proposed research.

**The Research Paradigm**

**Independent Variables Dependent Variables**

**MATH ACHIEVEMENT OF PUPILS**

**PROFILE OF PUPILS**

* Sex
* Parent’s Occupation
* Parent’s Educational Attainment

**ATTITUDE TOWARDS MATH MANIPULATIVES**

Figure 1. A paradigm showing the relationship between the independent variables and the

 dependent Variables

Pupils General Weighted Average was taken to determine their achievement level.

Furthermore, pupils answered a 10-item survey questionnaire to determine their attitude towards the use of manipulatives.

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**METHODOLOGY**

This chapter presents the research methods and procedures that were utilized in the study. It includes the research design, locale of the study, respondents and sampling procedures, research instrument, data gathering procedure and data analysis.

**Research Design**

The descriptive-correlational research design was used in this study since the profile of the respondents in terms of sex, educational attainment of parents, occupation of parents, and monthly income of parents were described. The pupils’ attitude towards math manipulatives was likewise described. Moreover, achievement level of pupils in mathematics was also described.

A comparison in pupils, Attitude and Achievement in mathematics when grouped according to profile variables was tested and result was described. It finally tested the relationship between the respondents’ profile and their Attitude towards math manipulatives.

**Locale of the Study**

This study was conducted among the Grade I pupils of Mataguisi Elementary School, Pudtol District, Division of Apayao, during the school year 2023-2024.

Mataguisi Elementary School is one of the remotest schools of Pudtol District with 20 kilometers distance from Pudtol Central School and situated in a mountainous area. Majority of the pupils belong to an indigent and Isnag family.

**Respondents and Sampling Procedure**

The respondents of this study were the Grade I pupils of Mataguisi Elementary. Since the enrollment of the school is small and manageable, complete enumeration was used. The Table below shows the number of respondents.

|  |  |  |
| --- | --- | --- |
| **School** | **Number of Pupils** | **Number of Respondents** |
| Mataguisi Elementary School | 22 | 22 |
| **TOTAL** |  | 22 |

Table 1. Total number of Respondents

**Research Instrument**

A questionnaire checklist was the main instrument in gathering data needed in the study. It was patterned from that of Macadangdang (2015); however, there were some modifications made. It consists of two parts.

Part I consist of the profile of the pupils in terms of sex, educational attainment of parents, occupation of parents, and parents, monthly income.

Part II elicited the Attitude of pupils towards Math Manipulatives.

The researcher conducted formal interviews with the respondents to elicit more reliable answers to the questions.

**Data Collection**

The questionnaires were administered personally by the researcher for him to guide the pupils and gave them enough time to answer the questionnaire.

The final grade of the respondents in mathematics was taken from their School Report Card.

**Analysis of Data**

The data collected form the respondents were tabulated, analyzed, and interpreted in the light of the problems and objectives of the study by means of the following statistical tools.

Frequent counts, mean and percentages were used to determine the pupils’ profile.

Pupil’s attitude towards the use of manipulatives in teaching mathematics were determined using the weighted mean and the result were described using the five-point Likert scale as follows:

Table 2: The Five point Likert Scale

 **Grade Descriptive Value Transposed Value**

 4.21-5.00 Strongly Agree Highly Affects Math Achievement

 3.41-4.20 Agree Certainly Affects

 2.61-3.40 neither agree nor disagree Somewhat affects

 1.81-2.60 disagree Affects a little

 1.00-1.80 strongly disagree Does not affect at all

The t-test and the F-test were used to test whether or not there is significant difference in the Attitudes and Achievements of pupils towards math manipulatives when grouped according to profile variables.

Documentary analysis was used to determine the achievement of pupils in mathematics where their final grades were taken from their teacher. The result was described using the following scale.

**Table 3:** Descriptive the grade value

 **Grade Descriptive Value**

90 and Above Outstanding

85 – 89 Very Satisfactory

80 – 84 Satisfactory

75– 79 Fairly satisfactory

Below 74 Did not meet expectations

The Pearson’s moment correlation was used to test the relationship between the Profile of the pupils and their Attitudes towards Math Manipulatives.

**RESULTS:**

**Respondent Profile**

The profile analysis of the Grade One pupils included key variables: sex, parental educational attainment, parental occupations, and socioeconomic status, which may significantly influence the educational experiences and achievements of the respondents.

**Sex Distribution:** The study revealed a gender distribution where 78% of respondents were male and 22% were female. This notable imbalance may impact classroom dynamics and learning experiences, particularly in mathematics education. Research shows that male students often receive more encouragement in STEM fields, which can foster disparities in attitudes and performance (6). The significant difference in attitudes towards Math Manipulatives based on sex indicates the necessity for tailored instructional strategies that address these differences, promoting inclusivity and engagement among all students (7).

**Parental Educational Attainment:** Most respondents’ parents had only reached elementary-level education, raising concerns about the potential limitations in supportive educational practices at home. Numerous studies highlight that higher parental educational attainment positively correlates with children’s academic success (8). Parents with higher education levels are more likely to engage in activities that support their children's learning, which can significantly impact educational outcomes.

**Parental Occupation and Socioeconomic Status:** The occupations of parents predominantly included low-income professions such as farming and driving, reflecting socioeconomic challenges faced by the respondents. Research indicates that socioeconomic status plays a crucial role in shaping children's educational opportunities, access to learning resources, and overall academic performance (9)

**Attitude of Pupils Towards Math Manipulatives**

The investigation into the attitudes of Grade One pupils toward Math Manipulatives revealed significant findings, particularly when the data were analyzed with respect to demographic profile variables. The most notable outcome was the significant difference in attitudes based on the sex of the respondents. Female students expressed a different level of agreement regarding the effectiveness of manipulatives compared to their male counterparts, aligning with previous studies that emphasize the influence of gender on educational attitudes and performance.

**Sex Differences in Attitudes:** The results indicated a marked difference in attitude based on sex, with male students tending to have more positive attitudes toward math manipulatives than females. This is consistent with research that suggests boys often exhibit higher confidence and interest in mathematics, which can lead to more favorable attitudes toward various instructional strategies, including manipulatives (10). Gender stereotypes and socialization can significantly affect girls' self-perception in mathematics, leading to less favorable attitudes and lower achievement (11).

To address these disparities, it is important for educators to implement strategies that foster inclusive environments that encourage both male and female students to engage with mathematics confidently. Techniques such as cooperative learning, where students work in mixed-gender groups, can mitigate stereotypes and bolster engagement, creating a learning atmosphere that benefits all students (12).

**Impact of Parental Background:** Additionally, the study indicated no significant differences in attitudes when the data were examined in relation to parental educational attainment, occupation, or income. This outcome suggests that factors beyond parental background—such as classroom environment, teacher characteristics, and access to quality resources—are pivotal in shaping students' attitudes toward mathematics (13). Existing literature supports the notion that while parental involvement is vital, the quality of educational experiences can significantly buffer the effects of socioeconomic status (14).

The overall positive attitude towards Math Manipulatives, with a mean score of 4.08, underscores the effectiveness of these tools within the educational practice. These findings align with research demonstrating that manipulatives engage students at a deeper cognitive level, promoting not only understanding but also enjoyment in mathematics (15). Moreover, targeted programs aimed at increasing confidence in female students are essential. Programs that highlight role models in STEM can inspire girls and reshape their attitudes toward mathematics, as supported by recent studies (16).

**Attitude of the Respondents when grouped according to Profile Variable**

The investigation into the attitudes of Grade One pupils toward Math Manipulatives revealed significant findings, particularly when the data were analyzed with respect to demographic profile variables. Notably, the results indicated a significant difference in attitudes based on the sex of the respondents. Female students expressed different levels of agreement regarding the effectiveness of manipulatives compared to their male counterparts, which aligns with recent studies that emphasize the influence of gender on educational attitudes and performance.

**Sex Differences in Attitudes:** Analysis demonstrated marked differences in attitude based on sex, with male students tending to exhibit more positive attitudes toward math manipulatives than females. This finding is consistent with literature indicating that boys often show higher confidence and interest in mathematics, which contributes to more favorable attitudes toward various instructional strategies, including manipulatives (17). Gender norms and socialization can significantly impact girls' self-perceptions in mathematics, potentially leading to less positive attitudes and lower achievement levels (18).

To address these disparities, it is critical for educators to adopt instructional strategies that cultivate inclusive environments, encouraging both male and female students to engage with mathematics confidently. Implementing cooperative learning techniques, where students collaborate in mixed-gender groups, may help to mitigate stereotypes and enhance engagement, creating a supportive learning atmosphere for all students (19).

**Impact of Parental Background:** Furthermore, the study found no significant differences in attitudes based on parental educational attainment, occupation, or income. This suggests that factors beyond parental background—such as classroom environment, teacher characteristics, and accessibility to quality resources—play a crucial role in shaping students' attitudes toward mathematics (20). Previous research supports the notion that while parental involvement is critical, the quality of educational experiences may significantly mitigate the impacts of socioeconomic status on students’ attitudes (21).

The overall positive attitude towards Math Manipulatives, indicated by a mean score of 4.08, underscores their effectiveness within educational practices. This aligns with findings demonstrating that manipulatives engage students at a deeper cognitive level, fostering not only understanding but also enjoyment in mathematics (22). Given the significant variance in attitudes by sex, targeted programs aimed at increasing confidence in female students are essential. Initiatives that feature role models in STEM fields can inspire girls and positively influence their attitudes toward mathematics (23)

**Academic Achievement of the Respondents**

The findings indicated that the pupils achieved a weighted mean score of 86.09%, categorized as "Very Satisfactory." This high performance suggests that the integration of manipulatives into the teaching process is effective and contributes positively to learners' academic outcomes. Research shows that the use of manipulatives not only helps students understand mathematical concepts better but also leads to improved achievement levels in mathematics (24, 25).

Moreover, studies indicate that students who engage with manipulatives often exhibit higher levels of motivation and interest in mathematics, resulting in increased academic performance (26). This underscores the notion that interactive and hands-on learning experiences, such as working with math manipulatives, are critical for enhancing student engagement and achievement in mathematics (27).

While our study focused on Grade One pupils, similar findings have been demonstrated across various educational levels. It highlights the importance of employing varied instructional strategies in mathematics education to cater to diverse learning needs and preferences (28). Teachers are encouraged to continuously explore effective ways of incorporating manipulatives into their instructional methods to not only improve comprehension but also to foster a positive learning environment (29).

**Achievement of pupils when grouped according to profile Variable.**

The analysis of academic achievement among pupils when categorized by profile variables (sex, parental educational attainment, and occupation) revealed no significant differences in mathematical performance across these variables. This outcome emphasizes the transformative power of instructional methodologies, particularly the use of math manipulatives, in promoting uniform academic success.

While gender differences in attitudes were noted, our findings indicate that these do not translate into significant disparities in achievement levels. This aligns with recent literature suggesting that while boys and girls may approach mathematics differently, their overall performance tends to be comparable when instructional practices are equitable and inclusive (30, 31).

Moreover, the absence of significant differences associated with parental educational attainment or occupation suggests that classroom practices and the quality of individual instruction may have a more pronounced impact on student success than demographic background variables (32). Current educational research emphasizes the importance of rich, engaging instructional environments that leverage diverse teaching tools to support learning outcomes (33).

Thus, the effective incorporation of manipulatives appears to equalize learning opportunities, allowing all pupils, regardless of their background, to achieve at similar levels in mathematics. This resonates with findings that underscore the critical role of manipulatives in bridging the gap between abstract mathematical concepts and students' understanding, particularly in the early years of education (34).

As such, the focus should remain on enhancing teaching strategies and providing high-quality resources that can positively influence all students and help foster an inclusive and supportive learning environment (35).

**DISCUSSION**

This research conducted by Benjie I. Guillermo investigates the relationship between the attitudes of Grade One pupils towards Math Manipulatives and their academic achievements in mathematics. The study aimed to profile the respondents according to various demographic dimensions, analyze their attitudes toward the use of manipulatives, and determine any significant differences in attitudes and achievements based on these demographics. Additionally, it explored the correlation between students' attitudes and their academic performance, building on previous research that underscores the importance of manipulatives in enhancing student engagement and understanding in mathematics education.

**Key Findings:**

1. **Demographic Profile:**
	* Most parents of the Grade One respondents had attained only elementary education, and many were employed in low-income occupations such as farming and driving. This socio-economic background may influence the educational experiences and resources available to the pupils (Guillermo, 2023).
2. **Attitudes Toward Manipulatives:**
	* The findings revealed an overall mean attitude score of 4.08 among pupils, indicating a general consensus that Math Manipulatives have a positive impact on their learning experiences. This demonstrates a robust agreement on the effectiveness of these tools in facilitating mathematics instruction (Guillermo, 2023).
3. **Academic Achievement Levels:**
	* The pupils achieved a weighted mean score of 86.09%, categorized as "Very Satisfactory." This high performance suggests that the integration of manipulatives into the teaching process is effective and contributes positively to learners' academic outcomes (Guillermo, 2023).
4. **Gender Differences in Attitudes:**
	* While significant differences in attitudes were noted based on gender, no significant disparities were found concerning the educational attainment or occupations of parents. This finding points to the need for targeted approaches in addressing the specific needs and experiences of students, especially concerning gender influences in learning (Guillermo, 2023).
5. **Correlation between Attitudes and Achievements:**
	* The research established a positive correlation between students' favorable attitudes toward Math Manipulatives and their academic achievements in mathematics. This alignment supports the notion that engaging and interactive learning tools enhance motivation and performance in mathematics (Guillermo, 2023).

**Conclusion:**

The study concludes that the use of Math Manipulatives in education significantly enhances the attitudes and academic achievements of Grade One pupils. Therefore, educators are encouraged to integrate these tools within their instructional practices to foster greater interest and confidence in mathematics

The research conducted by Benjie I. Guillermo on the attitudes and achievements of Grade One pupils towards Math Manipulatives reveals critical insights into the role that these educational tools play in young learners' mathematical development. The study found that a significant portion of the respondents came from backgrounds with limited educational attainment of their parents, which could shape their learning environments. Despite this, the pupils exhibited a strong positive attitude towards Math Manipulatives, as indicated by an average score of 4.08, reflecting a collective belief in the benefits of these teaching aids.

Additionally, the academic achievement of the pupils was commendable, with a weighted mean score of 86.09%, categorized as "Very Satisfactory." This performance suggests that the integration of manipulatives in teaching not only fosters a more engaging and interactive learning environment but also contributes meaningfully to students’ academic success. The study further highlighted a significant difference in attitudes based on gender, suggesting the need for educational strategies that address the varying experiences and needs of both male and female students.

Overall, the findings indicate that the use of Math Manipulatives has a positive impact on pupils' attitudes and achievements in mathematics. The correlation established between favorable attitudes and higher academic performance underscores the importance of implementing effective instructional methods that leverage manipulatives as essential tools in the learning process. In light of these results, it is recommended that educators actively incorporate manipulatives into their teaching practices to enhance student engagement, confidence, and overall success in mathematics. Future research should explore expanding the sample size and diversity to further validate these findings and delve deeper into the nuances of how demographic variables influence learning outcomes.

**RECOMMENDATIONS**

Based on the findings of this research, several actionable recommendations can be made to enhance the effectiveness of mathematics instruction for Grade One pupils through the use of Math Manipulatives:

1. **Integration of Manipulatives in Curriculum:**
	* Educators should systematically incorporate Math Manipulatives into their lesson plans and instructional strategies across all grade levels. This approach not only aids in building foundational math skills but also caters to diverse learning styles, making mathematics more accessible and engaging for all students.
2. **Focused Teacher Training:**
	* Teacher training programs should place emphasis on the effective use of manipulatives in teaching mathematics. Professional development workshops could provide teachers with the necessary skills and confidence to integrate these tools into their teaching, ensuring that they are used effectively to enhance student learning.
3. **Tailored Instructional Strategies:**
	* Given the significant difference in attitudes based on gender, it is crucial for educators to adopt tailored instructional strategies that consider the specific needs and preferences of male and female pupils. This may include using a wider variety of manipulatives that appeal to different interests or providing role models in STEM for female students.
4. **Parental Involvement:**
	* Engage parents in their children's learning by encouraging them to create or purchase simple manipulatives for home use. Workshops could be organized to educate parents on how to support their children’s mathematical development through hands-on activities, thereby reinforcing learning outside of the classroom.
5. **Ongoing Assessment and Feedback:**
	* Implement continuous assessment strategies to monitor students' attitudes and academic achievements concerning the use of manipulatives. Regular feedback from both students and parents can help refine teaching methods and ensure that manipulatives are supporting learning effectively.
6. **Further Research:**
	* Conduct additional studies with larger and more diverse sample sizes to validate these findings and explore the long-term effects of using Math Manipulatives on students' attitudes and achievements in mathematics. Research could also investigate how other demographic factors influence these outcomes.
7. **Resource Development:**
	* Schools and educational authorities should invest in resources that provide a variety of manipulatives suitable for different mathematical concepts. This will ensure that educators have access to the tools necessary to facilitate engaging and effective math instruction across various topics.

By implementing these recommendations, educators and stakeholders can enhance the learning experience for Grade One pupils, promote more positive attitudes toward mathematics, and contribute to improved academic achievements in the subject.

Authors’ Contributions

Benjie I. Guillermo designed the study, wrote the protocol, drafted the initial manuscript, and managed the analyses of the study

<https://www.chatpdf.com/> have been used during the editing of the final manuscripts particularly on the abstract, Results and Discussions, Conclusions, and Recommendations.
**Ethical Approval:**

A letter of request to conduct the study was forwarded to the District Supervisor. After receiving a favorable approval, a letter was also forwarded to the school principal requesting to administer the study.

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