

Exploring the Pathways to Mathematical Excellence: Enhancing Pupils' Performance through Arts in Math (AIM)

MARIA MECHEL B. ALANQUIHAN

RYAN K. ELARDE

CHITHRILL S. MAQUILING

KENT M. ADOLFO, EdD.

ELMA C. BETE

Miputak East Central School

Dipolog City Division

Email: ryan.elarde001@deped.gov.ph

Abstract — This study aimed to investigate the effectiveness of the Arts in Math (AIM) teaching strategy on the mathematics performance of Grade VI pupils with the following research questions (i) What is the baseline level of pupils' Mathematics performance as measured by the pre-test in both class sections in Jade and Diamond? (ii) What is the impact of the intervention period on pupils' Mathematics performance as measured by the post-test in both class sections in Jade and Diamond? (iii) What is the significant difference between the pupils' Mathematics performance during pre-test and post-test in both class sections in Jade and Diamond?

The research utilized a quasi-experimental design, with two sections of Grade VI pupils from Miputak East Central School: Jade (experimental group) and Diamond (control group). The intervention period lasted for eight weeks, during which the experimental group received instruction using the AIM strategy, while the control group followed traditional math instruction. Pre-test and post-test assessments were conducted using 40-item test papers.

The data were analyzed using paired samples t-test to determine the significant difference between pre-test and post-test scores. The results revealed a statistically significant improvement in the experimental group's mathematics performance, as indicated by a higher mean post-test score compared to the pre-test score. In contrast, the control group's performance showed a relatively smaller increase. These findings highlight the effectiveness of the AIM teaching strategy in enhancing students' mathematical abilities. The study suggests that incorporating arts-based approaches in mathematics instruction can contribute to a more enjoyable and meaningful learning experience, reducing math anxiety and promoting better mastery of key concepts.

Keywords — *Mathematics Performance, AIM, Mathematical Excellence, Excellence, Math Instruction*

I. Introduction

Mathematics plays a fundamental role in shaping a student's mathematical foundation and overall academic development. It serves as the building blocks upon which more advanced mathematical concepts and skills are built. The importance of elementary mathematics lies in its

ability to develop critical thinking, problem-solving abilities, logical reasoning, and numeracy skills from an early age.

One of the key aspects of elementary mathematics is the development of numeracy skills, which involves understanding numbers, number sense, and basic arithmetic operations. These skills form the basis for more complex mathematical operations and concepts later in a pupil's educational journey. A strong foundation in elementary mathematics enables students to perform calculations accurately, estimate quantities, and make sense of numerical information in real-life situations.

The COVID-19 pandemic has undoubtedly had a significant impact on the education sector in the Philippines, particularly in the field of mathematics. As schools were forced to close and shift to distance learning modality to ensure the safety of pupils and teachers, many challenges arose that hindered the learning progress of pupils across the country.

As face-to-face classes gradually resumed in the Philippines after the prolonged period of remote learning due to the COVID-19 pandemic, it became evident that many pupils were struggling in mathematics. The transition back to physical classrooms presented its own set of challenges that affected students' performance and engagement in the subject.

Teachers had to adapt their teaching methods to accommodate the varying needs and learning gaps of their pupils, including those struggling with mathematics. This transition period posed a significant challenge for teachers to effectively address the diverse learning needs of their pupils

In the context of Miputak East Central School, earnest endeavors were undertaken to address learning gaps and help pupils regain their momentum in mathematics following the disruptions caused by the pandemic. However, the transition back to face-to-face classes unveiled a disconcerting reality: numerous pupils were encountering difficulties with the subject. Data analysis of the Grade six pupils' first grading test in Mathematics revealed that 51% Minimum Passing Score (MPS), which significantly fell short of the desired 75% target.

Recognizing the on-going challenge of low performance in mathematics among pupils, researchers have decided to conduct a study aimed at addressing this issue. The objective of this study is to assess the effectiveness of the Arts in Math (AIM) teaching strategy in addressing the difficulties faced by pupils in the area of Mathematics. By implementing the AIM approach, we aim to provide targeted support and intervention to pupils who are struggling in this subject. The study seeks to evaluate the impact of the AIM strategy on pupils' performance and identify its potential to improve mathematical proficiency and learning outcomes.

INNOVATION, INTERVENTION, AND STRATEGY

The Arts in Math (AIM) strategy is widely recognized as an excellent approach to mathematics instruction, as supported by several sources. AIM utilizes instructional approaches that aim to make the learning process in mathematics more enjoyable, exciting, and meaningful. It has been found to have a significant positive impact on pupils' mastery of key concepts and vocabulary.

According to a study by Kao, Leatham, and Lindeman (2014), incorporating the arts into mathematics instruction, including visual arts, music, and kinesthetic activities, promotes a deeper understanding of mathematical concepts and enhances students' engagement and motivation. The study found that pupils who participated in AIM activities showed improved performance in mathematics and displayed a more positive attitude towards the subject.

In the research article by Schott, Helfeldt, and Theis (2017) emphasizes that the use of arts in mathematics instruction helps reduce pupils' math anxiety and creates a more relaxed learning environment. Math anxiety is a common issue among pupils, and it can hinder their learning and performance in mathematics. By integrating the arts, which provide a creative and expressive outlet, AIM helps alleviate stress and anxiety associated with the subject.

Furthermore the Arts in Math (AIM) strategy is an excellent approach to teaching mathematics. Supported by research and educational organizations, AIM makes learning mathematics more enjoyable, enhances mastery of key concepts and vocabulary, reduces math anxiety, and promotes a deeper understanding of the subject. By incorporating visual arts, music, literature, and collaborative projects, teachers can create a dynamic and engaging learning environment that benefits students' mathematical learning and overall educational experience.

Here are the activities and lesson ideas using Arts in Math:

- Color My Petals
- My Cutie Puppy
- Answer, Find and Color
- Solve, Find and Shade:
- Funny Tweety
- My Chubby Pooh
- Treasure Hunting
- Food Delivery Maze

ACTION RESEARCH QUESTIONS

The action research aims to determine the effectiveness of implementing the Arts in Math (AIM) strategy in improving pupils' performance in mathematics. Specifically, ask the following research questions:

1. What is the baseline level of pupils' Mathematics performance as measured by the pre-test in both class sections in Jade and Diamond?
2. What is the impact of the intervention period on pupils' Mathematics performance as measured by the post-test in both class sections in Jade and Diamond?
3. What is the significant difference between the pupils' Mathematics performance during pre-test and post-test in both class sections in Jade and Diamond?

II. Methodology

The research design for this study utilizes a combination of quasi-experimental and descriptive methods to interpret the data. Quasi-experimental design allows for comparisons between groups, while descriptive analysis provides a detailed understanding of the data.

In this study, the researchers implemented the Arts in Math (AIM) strategy as an intervention to improve pupils' performance in mathematics. The quasi-experimental design involved selecting two groups: an experimental group that received the AIM intervention and a control group that received traditional mathematics instruction.

Both groups underwent a pre-test to assess their baseline level of mathematical performance before the intervention. This pre-test served as a measure of the pupils' initial abilities in mathematics. After the intervention period, both groups completed a post-test to measure any changes in their mathematical performance.

The data collected from the pre-test and post-test will be analyzed using descriptive statistics to provide a comprehensive summary of the pupils' performance.. This descriptive analysis will enable researchers to gain insights into the overall performance of both groups before and after the intervention.

Furthermore, the quasi-experimental design allows for a comparative analysis between the experimental and control groups. T-tests will be employed to determine if there is a significant difference in the mathematical performance between the two groups. This analysis will help assess the effectiveness of the AIM intervention in improving pupils' mathematics performance compared to traditional instruction.

A. Participants and/or other Sources of Data and Information

This quasi-experimental study will focus on two sections, Diamond and Jade, in Grade VI class of Miputak East Central School. The study will be conducted under the supervision of Ritzell A. Forinas and Berlina B. Valencia, who are the advisors for the respective sections. The total number of respondents for this study will be limited to 34 pupils from the Diamond section and 34 pupils from the Jade section. By focusing on these specific sections and their respective advisors, the study aims to gather data and assess the impact of the Arts in Math (AIM) intervention on the mathematical performance of the identified student groups.

B. Data Gathering Methods

The data gathering process involved administering a pre-test using the 3rd quarter test papers, which was checked and reviewed by the master teacher Mr. Edgar C. Dingal and approved by the school principal, Mr. Kent M. Adolfo, to ensure the validity and reliability of the assessment. The pre-test will serve as a baseline measure of the pupils' mathematical performance prior to the intervention.

The implementation of the Arts in Math (AIM) teaching strategy will span over duration of 8 weeks. The intervention was implemented during the period of February 13, 2023 to April 14, 2023. Within this period the teacher will allocate 50 minutes a day to conduct intervention using AIM strategy in delivering Mathematics lesson.

During this period, the Grade VI - Diamond section under the supervision of Ms. Ritzell A. Forinas will serve as the control group, receiving traditional math instruction without the AIM strategy. On the other hand, the Grade VI - Jade section under the guidance of Mrs. Berlina B. Valencia will be the experimental group, where the AIM strategy will be implemented in teaching mathematics.

After the 8-week implementation stage, a post-test will be conducted for both the Diamond and Jade sections still using the approved 3rd quarter Mathematics test papers. The post-test will assess the pupils' mathematical performance after the intervention and allow for a comparison between the control and experimental groups.

To analyze the data collected, a t-test will be employed. This statistical test will help determine if there are significant differences in the mathematical performance between the control and experimental groups, specifically by comparing their pre-test and post-test scores.

The study aims to evaluate the effectiveness of the AIM teaching strategy in enhancing pupils' mathematical performance. The pre-test and post-test, along with the t-test analysis, will provide valuable insights into the impact of the AIM intervention on the selected sections of Grade VI at Miputak East Central School, under the advisory of Ms. Ritzell A. Forinas and Mrs. Berlina B. Valencia.

III. Results and Discussion

This deal the results of the study will be systematically presented and discussed, following a structured approach that addresses the research questions in a comprehensive manner. The data will be organized in a manner that aligns with the research problem in an attempt to answer them accordingly.

Table 1 Level of pupils' Mathematics performance (pre – test)

Grade VI – Jade (experimental group)			Grade VI – Diamond (control group)		
No. of items	MPS	Achievement Level	No. of items	MPS	Achievement Level
40	48.05%	Average	40	47.98%	Average

Legend:

96 – 100%	Mastered
86 – 95%	Closely Approximating Mastery
66 – 85%	Moving Towards Mastery
35 – 65 %	Average
15 – 34%	Low
5 – 14%	Very Low
0 - 4%	Absolutely No Mastery

The data provided compares the performance of Grade VI pupils in two groups the experimental group (Grade VI -Jade) and the control group (Grade VI - Diamond). The results show the number of items, the Mean Percentage Score (MPS), and the Achievement Level for each group.

For the experimental group (Grade VI - Jade), the pupils had 40 items in total. They achieved an MPS of 48.05%, which falls within the "Average" achievement level. This suggests that, on average, these students are performing at an intermediate level in their mathematics skills.

Similarly, the control group (Grade VI - Diamond) also had 40 items. They attained an MPS of 47.98%, which also falls within the "Average" achievement level. This indicates that, on average, the students in this group are performing at a similar level to those in the experimental group.

Table 2 Level of pupils' Mathematics performance (post – test)

Grade VI – Jade (experimental group)			Grade VI – Diamond (control group)		
No. of items	MPS	Achievement Level	No. of items	MPS	Achievement Level
40	71%	Moving Towards Mastery	40	64.15%	Average

Legend:

96 – 100%	Mastered
86 – 95%	Closely Approximating Mastery
66 – 85%	Moving Towards Mastery
35 – 65 %	Average
15 – 34%	Low
5 – 14%	Very Low
0 - 4%	Absolutely No Mastery

Table 2 shows the performance of Grade VI pupils in two groups: the experimental group (Grade VI - Jade) and the control group (Grade VI - Diamond). The data includes the number of items, the Mean Percentage Score (MPS), and the corresponding Achievement Level for each group.

In the experimental group (Grade VI - Jade), there were 40 items assessed. The students achieved an MPS of 71%, indicating that they are "Moving Towards Mastery" according to the given Achievement Level categories. This suggests that the pupils in this group are demonstrating progress and are approaching a higher level of proficiency in mathematics.

On the other hand, the control group (Grade VI - Diamond) also had 40 items assessed. They attained an MPS of 64.15%, which falls within the "Average" achievement level. This indicates that, on average, the students in this group are performing adequately in mathematics, but there is room for improvement to reach higher levels of mastery.

Table 3 the significant difference between the pupils' Mathematics performance during pre-test and post-test in both class sections in Jade and Diamond

Section	Mean	Standard Deviation	95% Confidence Interval of Difference		t	Sig. (2-tailed)
			Lower	Upper		
Grade VI- Jade (Experimental)	-9.14	6.52	-11.35	-6.93	-8.41	.000
Grade VI- Diamond (control)	-6.47	3.99	-7.01	-5.03	-9.17	.000

The provided data presents the results of a statistical analysis comparing the mean scores, standard deviations, confidence intervals, t-values, and significance levels for two groups: Grade VI- Jade (experimental group) and Grade VI- Diamond (control group).

In the Grade VI- Jade (experimental) group, the mean score was -9.14, with a standard deviation of 6.52. The 95% confidence interval for the mean difference between the experimental group and the control group ranges from -11.35 to -6.93. The t-value associated with this comparison was -8.41, which is highly significant with a p-value of .000.

Similarly, in the Grade VI- Diamond (control) group, the mean score was -6.47, with a standard deviation of 3.99. The 95% confidence interval for the mean difference between the control group and the experimental group ranges from -7.01 to -5.03. The t-value associated with this comparison was -9.17, also indicating high significance with a p-value of .000.

The data indicates that both the experimental and control groups had negative mean differences, indicating a decrease in scores from the pretest to the posttest. The t-values and the associated significance levels suggest that these differences are highly significant, suggesting that the intervention or teaching strategy used in the experimental group had a significant impact on the students' performance compared to the control group.

REFERENCES

- [1] Kao, L., Leatham, K., & Lindeman, L. M. (2014). The effects of arts integration on long-term retention of mathematics concepts. *Journal for Learning through the Arts*, 10(1). Retrieved from <https://eric.ed.gov/?id=EJ1056566>
- [2] Schott, G. D., Helfeldt, J., & Theis, L. R. (2017). The effects of arts integration on mathematical achievement and anxiety. *Journal of Mathematics Education*, 10(2), 73-87. Retrieved from https://www.researchgate.net/publication/320101632_The_Effects_of_Arts_Integration_on_Mathematical_Achievement_and_Anxiety