

Enhancing the Level of Understanding in Finding the Surface Area of a Sphere Through Interactive Learning Materials

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Abstract

This action research aimed to enhance the understanding of Grade 6 pupils in solving the surface area of a sphere through the use of interactive learning materials. A quantitative approach was used involving 32 learners who underwent a pretest-posttest procedure. The intervention consisted of activities using SWF files, concrete objects, PowerPoint presentations, and SMI (Solve-Measure-Identify) tasks.

Findings showed a significant improvement in pupils' performance after the intervention, with a shift from "fair" to "outstanding" in their level of understanding. A t-test result confirmed a statistically significant difference ($t = 24.17$, $p < 0.05$). These results support the use of interactive learning materials as an effective strategy for teaching complex mathematical concepts like surface area.

Keywords: *surface area, sphere, interactive learning, mathematics instruction, Grade 6, understanding enhancement*

1. Introduction

Mathematics plays a crucial role in developing logical thinking and problem-solving skills among learners (Leigh, 2004). However, many elementary pupils find Mathematics difficult, particularly when dealing with three-dimensional figures like spheres (Kirkey, 2005). At Paayas Elementary School, observations revealed that pupils had difficulty grasping the concept of surface area, particularly of a sphere, despite using 3-D models and traditional explanations.

Recognizing the challenge, the researcher implemented an interactive approach that engages pupils through technology and hands-on activities. The purpose of this study is to determine the effectiveness of interactive learning materials in improving pupils' conceptual understanding of the surface area of a sphere.

1.1 Research Objectives

1. To assess pupils' level of understanding in finding the surface area of a sphere before and after using interactive learning materials.

2. To determine if there is a significant difference in understanding before and after the intervention.
3. To evaluate the effectiveness of interactive learning materials in enhancing understanding.
4. To identify the percentage of pupils who improved in understanding after the intervention.

2. Methods

2.1 Research Design

This study used a **quantitative pretest-posttest design** to evaluate the effectiveness of interactive learning materials.

2.2 Participants

Thirty-two (32) Grade 6 pupils at Paayas Elementary School were selected based on observed difficulty in solving surface area problems.

2.3 Instruments

- A 20-item teacher-made test validated by the school head
- Learning materials including SWF files, real objects, PowerPoint presentations, and SMI (Solve-Measure-Identify) activities

2.4 Procedure

A pretest was conducted, followed by a week-long intervention using various interactive activities:

- **Day 1:** Discussion and Pretest
- **Day 2-5:** Implementation of SWF files, concrete object measurement, PowerPoint activities, and SMI tasks
- **Day 6:** Posttest

2.5 Data Analysis

- **Mean, percentage, and frequency count** were used for descriptive statistics.
- A **t-test** at 0.05 significance level with 31 degrees of freedom was used to determine statistical significance.

3. Results

3.1 Pretest Findings

The pretest mean score was **5.34**, interpreted as "Fair." Scores ranged from 1 to 12 out of 20. This indicated that pupils had difficulty understanding the concept prior to intervention.

3.2 Posttest Findings

The posttest mean score rose significantly to **18.16**, interpreted as "Outstanding." All pupils scored between 16 and 20.

3.3 T-test Analysis

Statistic	Pretest	Posttest
Mean	5.34	18.16
Standard Deviation	3.36	1.30
Mean Difference	12.81	—
Computed t-value	—	24.17
Critical t-value (0.05)	—	1.695

The computed t-value (24.17) is significantly higher than the critical value, indicating a **significant difference** in understanding before and after using the intervention.

3.4 Percentage of Enhanced Learners

- **Pretest:** 50% poor, 31.25% fair, 18.75% satisfactory
- **Posttest:** 87.5% outstanding, 12.5% very satisfactory
- **100%** of pupils showed improvement

4. Discussion

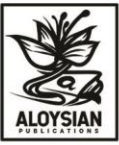
The study reveals that interactive learning materials significantly improve pupil understanding of surface area concepts, particularly spheres. This supports theories emphasizing active participation and multisensory learning (Eick & King, 2012). The increase from "fair" to "outstanding" performance, along with statistical evidence, validates the effectiveness of the intervention. Teachers should be encouraged to adopt interactive methods, especially in abstract Math topics.

5. Conclusion

Interactive learning materials substantially enhanced pupils' understanding in finding the surface area of a sphere. The shift from low to high comprehension levels and the positive statistical results confirm the strategy's effectiveness. Educators are encouraged to integrate similar approaches for other challenging Math lessons.

References

- Autio, O. (2011). Taking Part in Technology Education: Elements in Student Motivation. *International Journal of Technology and Design Education*, 21(3), 349–361.
- Bouck, E. (2010). Virtual Manipulatives: What They Are and How Teachers Can Use Them.



- Intervention in School and Clinic*, 45(3), 189–191.
- Eick, M., & King, R. (2012). The Cognitive Theory of Multimedia.
- Kirkey, T. (2005). Differentiated Instruction and Enrichment Opportunities: An Action Research Report. *Ontario Action Research*, 8(3), 10–13.
- Leigh, C. (2004). It's All in the Game. *ProQuest Education Journals*, 80(2), 59–64.
- Pascua, E. G. (2013). *Enhancing Skills in Problem Solving Through Cooperative Work*. Unpublished Research Study, Pinili District.