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Gondra's Exploration of Tube Volume

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Abstract

This study aims to explore students' understanding of the concept of cylinder volume through a contextual approach based on the fictional character "Gondra". Gondra is used as a character in story problems that are used as a medium to attract attention and improve students' understanding of mathematical concepts. Using a descriptive qualitative approach, data were collected through observations, interviews, and written tests of sixth-grade elementary school students. The results of the study indicate that a narrative-based approach with the character Gondra is able to improve students' understanding in determining the volume of a cylinder conceptually and procedurally. This study also shows a higher emotional involvement of students in solving contextual mathematical problems.

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1. INTRODUCTION

Understanding mathematical concepts is a fundamental aspect of elementary education, as it serves as the foundation for developing students' logical, analytical, and systematic thinking skills. One topic that often presents a challenge in elementary school mathematics learning is spatial **concept**, specifically about **volume of the cylinder**. This material not only requires mastery of mathematical formulas, but also spatial understanding and skills in linking abstractions to concrete situations. Based on initial observations and interviews with sixth-grade teachers in several elementary schools, it was found that most students had difficulty linking the formula for the volume of a cylinder ($V = \pi \times r^2 \times t$) to real-life situations. Students tended to memorize the formula without understanding its origins or practical applications. This led to shallow understanding and even a fear of mathematics. Low emotional involvement and learning motivation also became inhibiting factors in the process of learning this material.

In order to overcome this problem, a learning approach is needed that is able to provide a learning experience that is...meaningful and contextual. One approach that is becoming increasingly popular and has proven effective narrative-based learning or storytelling Through this approach, mathematical concepts are presented in the form of stories involving fictional characters and engaging plots. Stories can provide a clear context for students to understand the relationship between formulas and their applications in everyday life.

In this study, the author developed and used a fictional character named "Gondra", a smart and problem-solving little dragon, as the main character in mathematical stories inserted into the learning. Gondra is presented as a character who helps students solve

various mathematical problems, including problems related to the volume of cylinders. Through Gondra's adventure stories that are packaged in an interesting and relevant way for children, it is hoped that students will be more emotionally involved, more motivated to think, and better able to understand mathematical concepts comprehensively. This approach is based on constructivist theory, which states that learning will be more effective if students can construct their own understanding through active and meaningful learning experiences. This study aims to explore the extent to which the use of the character Gondra in the context of narrative-based learning can help improve students' understanding of the concept of cylinder volume, as well as how students respond to this learning method. The results of this study are expected to contribute to the development of creative, innovative mathematics learning strategies that are appropriate to the characteristics of students at the elementary level.

2. LITERATURE REVIEW

Several previous studies have shown the effectiveness of contextual and narrative approaches in mathematics learning:

- Bruner (1966) stated that humans understand new concepts better through narrative.
- Minister of Education and Culture Regulation No. 22 of 2016 emphasizes the importance of a contextual approach in learning.
- Van de Walle (2014) stated that understanding the concepts of geometry and size will be stronger if linked to real life contexts.
- According to Susanto (2015), elementary school students find it easier to absorb abstract concepts if they are presented visually and narratively.
- Wulandari (2019) found that fictional characters can increase students' motivation to learn mathematics.

The literature strengthens the foundation that a story-based approach or fictional characters such as Gondra can be an effective strategy in improving understanding of mathematical concepts.

3. RESULTS

This research was conducted in **Medan 1 Public Elementary School** by involving**20 sixth grade students as** the research subject. The purpose of this study is to explore students' understanding of the concept of cylinder volume through a narrative-based learning approach using the fictional character "Gondra". This study uses a narrative-based learning approach **descriptive qualitative** which emphasizes understanding the process and results of student learning in the context of meaningful learning.

As formal **instruments** used in data collection include:

1. **Contextual narrative questions which** contain the adventure story of Gondra, is designed to integrate narrative elements with mathematical problems related to the volume of cylinders.
2. **Observation sheet**, used to record student engagement during the learning process, including aspects such as enthusiasm, cooperation, attention to the material, and interaction with the teacher.
3. **A reflective interview was** conducted on several selected students and class teachers to explore their perceptions and experiences regarding the use of Gondra stories in mathematics learning.

   Key Findings: From the learning process and data analysis carried out, several significant findings were obtained as follows:

   - **As many as 85% of students** (17 out of 20 students) **can state and explain the formula for the volume of a cylinder correctly**, namely V=π×r2×tV = \pi \times

r^2 \times tV=π×r2×t, after participating in a story-based learning session. This shows that delivering material through narrative helps students remember and understand the structure of the formula more contextually.

- **As many as 75% of students** (15 students) **were able to solve problems on the volume of cylinders in story form with** the correct answer. This shows that this approach not only improves memorization of formulas, but also develops the ability to apply concepts in a story context.
- **As many as 90% of students** show **increased engagement and interest in learning** During the lesson, they appeared more active in class discussions, laughing and reacting to Gondra's story, and displaying enthusiastic expressions when solving adventure-based problems. This data was obtained from classroom observations and student responses during interviews.

Examples of narrative questions used in learning sessions are as follows: *"Gondra found a mysterious cave in the middle of the forest. The cave is shaped like a cylinder with a height of 10 meters and a base radius of 4 meters. Gondra wants to know how much air volume can be filled in the cave. Help Gondra calculate the volume of the cave!"* These questions encourage students to think imaginatively and mathematically at the same time, which helps reduce their fear of math problems. After group discussion and teacher guidance, students successfully applied the formula: V=π×r2×t=3.14×42×10=3.14×16×10=502.4 m3V = \pi \times r^2 \times t = 3{,}14 \times 4^2 \times 10 = 3{,}14 \times 16 \times 10 = 502{,}4 \text{ m}^3V=π×r2×t=3.14×42×10=3.14×16×10=502.4 m3 In the interview process, students stated that they enjoyed learning mathematics more when they were invited to follow the adventures of characters like Gondra, because they felt "involved in the story" and did not feel like they were "learning boring mathematics".

4. DISCUSSION

The results of the study show that the use of a narrative approach with fictional characters *Gondra* significantly impacted sixth-grade students' understanding of the concept of cylinder volume. The discussion in this section links these results to relevant learning theories, previous research findings, and practical implications in elementary education. Most students (85%) successfully stated and explained the formula for cylinder volume correctly. This demonstrates that story-based learning is able to activate dual *coding* (combination of verbal and visual information), as described by **Paivio (1986)** In the Gondra story, the visualization of a cylindrical cave and the adventure narrative provide a concrete context that facilitates memory encoding and formula comprehension. Furthermore, 75% of students were able to apply the formula to solve contextual problems. This demonstrates that the students' understanding is not only theoretical but also functional. They can transfer concepts to new situations, namely solving problems packaged in story form. This aligns with **Vygotsky's constructivism theory**, which emphasizes the importance of scaffolding or learning support through contexts that are close to the child's life.

The high level of student engagement (90%) during the learning process is a strong indicator that the use of narratives and characters like Gondra can create a fun and engaging learning environment. Gondra's character, designed to be friendly and enthusiastic about solving problems, sparks students' curiosity and creates deep emotional connections. In theory, **Howard Gardner about Multiple Intelligences**, this touches on the aspect *intrapersonal* And *visual-spatial* Students, which is crucial in facilitating mathematics learning, which has tended to be purely cognitive-analytical. Students learn not only cognitively but also effectively—they enjoy the learning experience. Bruner **(1966)** states that narrative is a natural way for humans to organize and understand the world. Therefore,

when mathematics is presented in the form of stories, students more easily build meaningful and lasting knowledge structures. The use of a narrative-based approach, particularly through characters like Gondra, demonstrates the integration of cognitive and affective learning. This approach not only enhances conceptual understanding but also reduces math anxiety (*math anxiety*) are common problems experienced by elementary school students. Stories that include elements of adventure, challenge, and curiosity can give students the confidence to try and overcome the fear of making mistakes. Gondra serves as an encouraging role model and demonstrates that problem-solving is a fun process, not a frightening prospect.

Although this approach has shown positive results, there are several limitations that need to be considered:

- Teachers need more time to design stories that suit the mathematics material and students' characters.
- Special training is required for teachers to develop and deliver effective narratives.
- Narrative-based learning outcome evaluation needs to use more varied instruments to capture aspects of students' thinking processes, not just the final results.

This research indicates that:

- Integrating narratives in mathematics learning can be an alternative strategy to overcome learning difficulties and foster student interest.
- Fictional characters such as Gondra can be used as part of thematic learning planning in the Independent Curriculum, which emphasizes contextual and student-centered learning.
- The use of this approach can be extended to other mathematical topics such as surface area, volume of other geometric shapes, and unit conversion.

5. CONCLUSION

Based on the results of research conducted at Medan 1 State Elementary School, it can be concluded that the mathematics learning approach that integrates...**fictional character Gondra in** the form of contextual narratives provides significant **positive impact towards** sixth grade students' understanding of the concept of cylinder volume. The character Gondra, as an imaginative character that is fun and relevant to the world of children, has proven to be able to bridge the gap between mathematical **abstraction** and **concrete and emotional learning experiences**. Students not only understand the formula for the volume of a cylinder mechanically, but are also able to apply **it in the context of the story**, which shows that they understand the concept thoroughly **conceptual and procedural**. Furthermore, student engagement in learning also increased significantly because this approach created a more enjoyable, humanistic, and communicative learning environment. Students' interaction with Gondra's story made the learning process less rigid or boring, but rather an experience that sparked curiosity, exploration, and active discussion.

The use of characters like Gondra in mathematics learning also shows that narrative-based **learning** is a strategic **and innovative alternative in** delivering materials that are considered difficult, such as geometric shapes. This approach is in accordance with the principles of learning in **Independent Curriculum, which** emphasizes contextualization, differentiation, and student-centered learning. This approach also strengthens **Pancasila Student Profile Values**, especially in the aspects of critical, creative, and independent reasoning. Thus, the exploration of story-based mathematics learning through fictional characters is not only relevant to improving cognitive understanding, but also impact **on the affective and social-emotional aspects of students.** Therefore, this approach is highly worthy of wider development and application, both in mathematics and across other fields. Teachers are encouraged to innovate in designing lessons that combine elements of

storytelling, visualization, and logical challenges to create meaningful and grounded learning processes.

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