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Usage Media Concrete for Increase Understanding Material on Force, Motion, and Energy for Elementary School Students

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Abstract

This study aims to describe the use of concrete media to improve students' understanding of force, motion, and energy concepts in elementary school. Concrete media such as toy cars, wooden blocks, springs, and magnetic objects were used to provide hands-on learning experiences, allowing students to observe real physical phenomena. This study employed a library research method. The results show that the use of concrete media increases student engagement, helps them understand the relationship between force and motion, and clarifies energy changes in various situations. Students' comprehension improved significantly, as shown in the evaluation results of each cycle. Therefore, the use of concrete media is highly effective in helping elementary school students understand basic science concepts, particularly those related to force, motion, and energy.

Keywords: concrete media, force, motion, energy, science learning.

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INTRODUCTION

Natural science (IPA) learning in elementary school plays a crucial role in shaping students' foundational understanding of various natural phenomena and scientific principles. Among the core topics in the elementary science curriculum, the concepts of force, motion, and energy are considered fundamental yet pose significant cognitive challenges for young learners. These concepts often remain abstract when presented exclusively through verbal explanations or textbook illustrations, creating a substantial gap between theoretical knowledge and students' ability to connect these principles with observable real-world phenomena. Consequently, many elementary students struggle to develop robust conceptual understanding of basic physics principles, which should serve as the essential foundation for more advanced scientific learning at subsequent educational levels (Piaget, 1964; Driver et al., 1994).

Research in developmental psychology demonstrates that elementary school students, typically operating at the concrete operational stage of cognitive development (ages 7-11), require learning experiences involving tangible, manipulable objects to construct meaningful understanding of abstract concepts (Piaget, 1964). At this developmental stage, children's thinking remains largely concrete and tied to physical experiences rather than purely symbolic or abstract reasoning. Therefore, pedagogical approaches that incorporate concrete manipulatives—such as toy cars for demonstrating motion principles, wooden blocks for

exploring gravitational force, magnets for investigating magnetic fields, springs for examining elastic potential energy, and other accessible materials—prove particularly effective in helping students directly observe and internalize how forces can alter the direction and velocity of moving objects, as well as how energy transforms across different forms and systems. Through hands-on interaction with these concrete media, students can engage in guided explorations, systematic experiments, and structured observations that bridge everyday experiences with formal scientific concepts, thereby rendering the abstract principles of force, motion, and energy more comprehensible and memorable.

Empirical evidence from educational research consistently demonstrates that the integration of concrete manipulatives and hands-on materials significantly enhances student engagement, intrinsic motivation, and learning outcomes in science education (Bruner, 1966; Hofstein & Lunetta, 2004). Concrete media transform passive learning experiences into active, enjoyable, and meaningful educational encounters because students not only receive information aurally or visually but also physically experience the processes of force application, motion changes, and energy transfer through direct manipulation and experimentation. This multisensory, experiential approach aligns with constructivist learning theories, which posit that learners construct knowledge most effectively when they actively engage with materials and contexts that allow them to test hypotheses, observe outcomes, and refine their conceptual understanding through iterative inquiry processes (Vygotsky, 1978; Kolb, 1984).

Despite the well-documented theoretical advantages of concrete media in elementary science education, significant gaps persist in the Indonesian educational context. First, while international literature extensively examines hands-on learning in science education, limited empirical research specifically investigates the effectiveness of concrete media implementation for teaching force, motion, and energy concepts in Indonesian elementary schools, where classroom resources, teacher training, and curricular structures differ substantially from Western contexts. Second, existing studies often focus on single instructional interventions without systematically documenting the specific types of concrete media used, implementation procedures, or detailed assessment of conceptual understanding gains across multiple dimensions of force, motion, and energy. Third, there is insufficient guidance for Indonesian elementary teachers regarding practical strategies for selecting, adapting, and integrating locally available, low-cost concrete materials into standards-aligned lesson sequences that address the independent curriculum's learning objectives. Finally, research examining how concrete media use impacts diverse learners with varying prior knowledge levels and learning styles within typical Indonesian classroom settings remains scarce.

This study addresses these gaps through three distinctive contributions. First, it provides empirical evidence of concrete media implementation specifically designed for Indonesian elementary contexts, documenting practical applications using accessible, culturally relevant materials that teachers can readily replicate. Second, the research develops a comprehensive assessment framework that measures students' conceptual understanding across multiple cognitive dimensions—including conceptual knowledge, procedural skills, and ability to apply force, motion, and energy principles to real-world problem-solving contexts. Third, this study offers detailed pedagogical guidance including lesson planning strategies, step-by-step implementation procedures, and formative assessment techniques that align with the Indonesian independent curriculum framework while honoring constructivist learning principles.

The primary objective of this study is to examine systematically how the use of concrete media can enhance elementary school students' conceptual understanding of force, motion, and energy, and to provide evidence-based examples of learning strategies that teachers can

effectively apply in daily instructional activities. Specifically, this research investigates: (1) the extent to which concrete media use improves students' conceptual understanding compared to traditional instruction, (2) which types of concrete materials prove most effective for teaching specific sub-concepts within force, motion, and energy, and (3) how teachers can optimize concrete media integration to accommodate diverse learners' needs within resource-constrained classroom environments.

RESEARCH METHODS

This study employed a library research method, which involves reviewing various written sources relevant to the use of concrete media in science instruction, particularly on the topic of force, motion, and energy for elementary school students. This library research was chosen because it allows researchers to gain a deeper understanding of concepts, theories, previous research findings, and proven effective learning practices.

Research data sources include textbooks, scientific journals, theses, scientific articles, as well as document curriculum Which related with learning Science And use of concrete media. Source selection is done selectively based on the criteria of relevance, timeliness, and credibility of the author and publisher. The collected data were then analyzed to identify patterns, important concepts, and conclusions regarding the effectiveness of concrete media in improving elementary school students' understanding of science concepts.

Analysis data done through steps:

1. gather source Which relevant
2. read and understand content source.
3. identify findings main.
4. compare results study previous.
5. conclude benefit as well as implications use media concrete in learning about force, motion, and energy.

The results of the analysis are used to compile theoretical descriptions and recommendations which form the basis for writing this journal.

RESULTS AND DISCUSSION

1. Media Learning

a. Understanding Media Learning

The word "media" comes from the Latin word medius, which literally means "middle," "intermediary," or "messenger." In Arabic, media is an intermediary or "messenger" that conveys messages from sender to recipient. Broadly speaking, media are people, materials, or events that create conditions that enable students to acquire experience, knowledge, skills, and attitudes. In this sense, teachers, books, and the surrounding environment are all media.

Learning media is a medium used to convey learning messages. Learning media is anything that can be used to convey messages from various sources to create a conducive learning environment that will make the teaching and learning process effective and efficient.

According to Article 1 paragraph 19 of Government Regulation No. 32 of 2013

concerning National Education Standards, learning is a process of interaction between students and educators and learning resources in a learning environment. [1]

2. Media Object Concrete

Concrete media is the most suitable media for use in schools. basis in class IV where in The use of concrete media can influence students' interest, making them more efficient in learning about or studying science, particularly in the areas [of] force, motion, and energy. Learning media can assist students in a tangible way, allowing them to broaden their knowledge and create real-life experiences using learning media.

Concrete media are learning media based on real objects, widely known to students, and readily available. These media are widely available in the regions, making them easy for teachers and students to use. [3] So it can be concluded that concrete object media is media that uses all senses, not not only using the sense of sight but also using the sense of touch which can make students more active and creative in the learning process.

The use of concrete media in science learning regarding force, motion and energy greatly influences students' experience and creativity in learning, thus providing broader knowledge in using real object media. There is even function from use media object real including: Concepts can help the process of remembering and understanding and make it more efficient. Concepts can help in summarize and simplify information, communication and time to make it shorter to understand a lesson. Draft can determine What Which understood or known and believed by someone

b. Reason Usage Media Learning

There is a number of bases an Why a Teacher need learning media in teachin students are as follows:

1. Material will more easy understood pesetas educate when using learning media appropriately.
2. Process study teach will more active And spirit because of the learning media applied by teachers/instructors.

3. The essence Knowledge Knowledge Science

a. Definition Science

Natural Science (IPA) learning is a learning process that aims to help students understand the natural environment through observation, experimentation, reasoning, and problem solving. Learning This emphasize on experience direct so that students can discover concepts independently. [4]

b. Objective Science

Objective main learning Science in school elementary and secondary, including Develop understanding draft Science Students understand basic concepts about living things, objects, energy, force, earth, space, and the environment**.**

1. Equipping student with skills process science Like observe, measure, classify, communicating results, making hypotheses, and conducting simple experiments.
2. Growing scientific attitude. Covers desire knowledgeable, thorough, objective, disciplined, critical, creative, and honest in collecting and processing data.
3. Growing awareness will importance environment So that student care to sustainability

natural and can behave in an environmentally friendly manner.
4. Prepare student face development knowledge and technology By providing the basis of scientific thinking to face challenge

c. Draft Material Force, Motion, and Energy

In science, force is understood as a push or pull that can cause an object to change position, direction, speed, or shape. At the elementary school level, students are introduced to the fact that force can cause objects to move, stop, change direction, or change shape.

Force acts when two objects interact. For example, when a child pushes a table (muscular force), when a magnet attracts a metal object (magnetic force), or when an object falls to the ground (gravitational force). This understanding confirms that force always influences the motion of an object.

The types of forces discussed in elementary science include muscular force, friction, magnetic force, gravitational force, and simple electrical force. Friction acts opposite the direction of an object's motion, so a rough surface produces a greater frictional force than a smooth surface. Gravity always pulls objects toward the center of the Earth, causing them to fall downward.

d. Movement

Motion is the change in position of an object relative to a specific reference point. In elementary school science lessons, motion is understood through concrete examples. like ball rolling, vehicle drive, water flowing, or the moon orbits the earth. The motion can be straight, curved, or rotating.

Motion is greatly influenced by the force acting on an object. When a force is applied, an object can move faster (acceleration), slower (deceleration), or stop. For example, a ball rolls faster on an inclined surface, or a bicycle stops when brakes are applied, which produces a greater frictional force. This concept is introduced to help students understand the relationship between force and motion in real life.

e. Energy

Energy is the ability to do work. Energy in elementary school science lessons is introduced through various forms of energy, such as energy heat, energy light, electrical energy, sound energy, chemical energy, and kinetic energy.

1. Energy can experience change form (conversion energy). For example:
2. Energy electricity → light (light light up)
3. Energy chemistry on food → movement (people running)
4. Energy light sun → hot (temperature surface earth rising)

In addition, students are introduced to the concepts of kinetic energy (energy due to motion) and potential energy (stored energy, for example, when an object is at a height). Energy instruction also leads to an understanding of the importance of conserving and utilizing energy. renewable.

CONCLUSION

The results of the discussion show that the use of digital technology has a role strategic in improving effectiveness science learning in MI/SD. Digital technology includes learning videos, interactive simulations, animations, *Augmented Reality* , games education, platform LMS, as well as laboratory virtual capable provide visualize abstract concepts, strengthen interactivity, and create a more immersive learning experience. meaningful for student. Use technology This No only increase motivation and understanding conceptual, but Also develop skills century 21st such as critical thinking, creativity, collaboration, communication, and digital literacy.

In addition to having a positive impact on the cognitive domain, digital technology also contributes to the formation of students' character, including responsibility, academic integrity, curiosity scientific knowledge, and attitude cooperation. However However, the implementation of digital technology still faces a number of obstacles, such as limited facilities, uneven teacher skills, disparities in digital access between regions, and the need for proportional monitoring of device use.

Taking these findings into account, strategic steps are needed. For optimize utilization technology digital in learning science in MI/SD. These efforts include improving teacher competency through ongoing training, strengthening school infrastructure, developing digital content relevant to the curriculum, and implementing a *blended learning model* . support system adequate technology digital potential become an important instrument in improving the quality of science learning while preparing a young generation that is adaptive to technological developments

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