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Development of Interactive Media Integrated with Local Wisdom to Enhance Students' Concept Mastery and Creative Thinking

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Abstract

The integration of local wisdom into learning media is considered to make science lessons more contextual, engaging, and meaningful for students. This study aims to develop and assess an interactive learning medium that integrates local wisdom, based on the traditional game begasingan, to enhance students' conceptual understanding and creative thinking in science learning, particularly in the context of force and motion. The research used a 4D development model (Define, Design, Develop, Disseminate) involving expert validation, practicality testing with teachers and students, and effectiveness evaluation through a quasi-experimental design. The sample consisted of 60 junior high school students, divided into an experimental and a control group. The media was validated with high results (Aiken's V = 0.83–0.92), considered highly practical by teachers (92.6%) and students (89.4%). The experimental group achieved higher N-Gain scores (0.68) than the control group (0.44), indicating better concept mastery. Creative thinking skills, including fluency, flexibility, and originality, also improved significantly in the experimental group. The results suggest that integrating cultural elements into interactive media effectively supports contextual science learning while preserving local identity.

Keywords: science learning, interactive media, local wisdom, creative thinking, begasingan.

INTRODUCTION

The development of science and technology in the digital age necessitates an education system that adapts through learning that focuses not only on factual knowledge but also on the development of 21st-century skills. Mastery of scientific concepts and creative thinking skills are two essential competencies that are highly sought after in addressing the challenges of the 21st century. Mastery of concepts enables students to understand scientific phenomena in depth, while creative thinking skills help them generate innovative solutions to real-world problems (Anderson & Krathwohl, 2001; Albab et al., 2020). In the context of science education, these two variables are crucial for encouraging active student engagement and promoting reflective and solution-oriented scientific thinking (Sudjana, 2015; Gunawan et al., 2015). Therefore, learning strategies that can optimally integrate both are needed.

Several studies indicate that mastery of concepts and creative thinking are mutually supportive in the science learning process. Interactive learning media have been proven not only to enhance conceptual understanding but also to stimulate aspects of creativity such as flexibility, originality, and idea elaboration (Guilford, 1967; Bolden et al., 2010). The use of contextual media, for example, that highlights local cultural values, can provide a more meaningful learning experience, increase student engagement, and bridge scientific concepts with daily life (Putra, 2017; Ferdianto & Setiyani, 2018). Thus, the development of interactive media that integrates local cultural elements has the potential to strengthen concept mastery while fostering scientific creativity among students (Dewa & Astari, 2022).

Although various learning innovations have been developed, the reality on the ground shows that science education in many schools remains theoretical, non-contextual, and lacks local cultural elements (Aini et al., 2023; Wang & Suwanthada, 2025). As a result, students struggle to understand concepts in depth and are poorly trained in creative thinking (Nisrina et al., 2016; Fan, 2017). This raises questions about the effectiveness of existing learning media, whether they are sufficient to respond to 21st-century competency needs, or whether new media that are more adaptive to the local context and student characteristics need to be developed.

Previous studies have developed various forms of interactive learning media, but few have systematically and authentically integrated local wisdom values. Hermansyah et al. (2015) found that virtual laboratory media can improve conceptual mastery but fail to stimulate creativity. Wardiyanti and Jayati (2018) developed a biology module based on local wisdom, emphasizing content validity, but did not explore its effects on creative thinking. Dewa and Astari (2022) demonstrated that e-modules based on local culture are cognitively effective; however, they have not yet targeted digital interactive media. Bakri et al. (2024) developed physics learning videos based on TPACK that foster 21st-century skills but did not include cultural context as part of the content. Furthermore, Annisha (2024) asserts that integrating local wisdom into the Merdeka Curriculum can strengthen the pillars of education, including character, cognitive, social-emotional, and

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aesthetic aspects, thereby making learning more inclusive and meaningful. Meanwhile, Yolida & Priadi (2021) showed that a guided inquiry model based on local wisdom can significantly improve students' creative thinking skills, particularly in terms of flexibility and originality of ideas. Unlike these studies, this study presents a novelty in the form of the development of interactive digital media based on begasingan games, which serves as a representation of local wisdom. This integration not only emphasizes the improvement of mastery of style and movement concepts but also designs learning activities that can sharpen students' creative thinking skills holistically. Thus, the main objective of this study is to develop and evaluate interactive learning media based on the traditional begasingan game that can improve students' mastery of concepts and creative thinking skills in a contextual, enjoyable, and meaningful way.

MATERIALS AND METHODS

Time and Place

The research was conducted in the even semester of the 2024/2025 academic year at one of the junior high schools in Mataram, which has a cultural connection with the traditional game of begasingan as a source of local wisdom.

Research Design

This is a research and development study that uses the 4D model (Define, Design, Develop, and Disseminate). This model was chosen because it is effective for systematically and gradually designing and developing learning products based on field needs. However, in this study, only the first three stages—define, design, and develop — were used.

Population and Sample

The research subjects consisted of an Experimental class of 30 students using interactive media based on Begasingan and a control class of 30 learners who used conventional media (without interactive media intervention).

Research Instrument

This research uses several types of instruments, namely:

1. Media validation sheet to assess the validity of content, construct, appearance, and integration of local wisdom content.
2. Practicality questionnaire for teachers and students to measure the use of media in authentic learning.
3. Concept mastery test, in the form of description questions that measure the understanding of the concepts of force and motion.
4. The creative thinking ability test was prepared based on indicators of *fluency, flexibility, originality*, and *elaboration*.
5. A scoring rubric, used to convert scores into qualitative values.

Data Collection and Analysis Techniques

- The validity data was analyzed using Aiken's V index to obtain the average value of validation from experts.
- Practicality data is analyzed using the percentage of the total score of the teacher and learner assessments of the practicality aspects of the media.
- Effectiveness data was obtained from the pretest and posttest results on the concept mastery test and creative thinking skills, then analyzed using the N-Gain formula:

$$\boldsymbol{N - Gain = \frac{S\,post - S\,pre}{S\,max - S\,pre}\ X\ 100\%}$$

With the following interpretation:

- N-Gain < 0.30 = Low
- 0.30 ≤ N-Gain < 0.70 = Moderate
- N-Gain ≥ 0.70 = High.

RESULT AND DISCUSSION

Result

Interactive Media Validation

Validation was conducted by three expert validators, who covered aspects of content, appearance, and media integration in relation to local wisdom values. The validation results indicate that the average score falls within the range of 0.83-0.92, which is considered a very valid category. This indicates that the media have met the eligibility criteria as contextual digital teaching materials.

The validity aspect is reinforced by the fact that this media:

- Present science material systematically and per learning outcomes (Arias et al., 2021).
- Incorporate local cultural elements that enrich the learning context (Serdyukov, 2017; Lee & Liu, 2022).
- It provides a visual and interactive stimulus that supports the formation of conceptual meaning (Moreno & Mayer, 2007).

Similar research by Kirschner & Van Merrienboer (2013) shows that content validity and visual design determine the effectiveness of learning in a technology-based context. The integration of local wisdom in the media, such as the game Begasingan, not only enhances the emotional closeness of learners to the material but also increases the socio-cultural relevance of science education (OECD, 2020).

Practicality of Media Use

Practicality is measured from the responses of teachers and students through Likert scale questionnaires. The results show that:

- 92.6% of teachers stated that the media is straightforward to use and implement in a limited time,
- 89.4% of learners felt that this media was fun, easy to use, and encouraged understanding of the concept of force and motion visually and contextually.

The teacher appreciates it because of the media:

- No special training required,
- Supports active learning approaches such as inquiry and PBL,
- Facilitate authentic assessment digitally (Bower et al., 2020).

Learners believe that the media offers a meaningful learning experience that is relevant to their daily lives, particularly due to the incorporation of local contexts. According to Mishra & Koehler (2006), media practicality is closely related to teachers' *Technological Pedagogical Content Knowledge* (TPACK) in designing digital learning activities.

This finding is consistent with a study by Cheng et al. (2022), which demonstrated that media with straightforward navigation, an attractive appearance, and local context adaptation will increase learner engagement and satisfaction.

Media Effectiveness on Concept Mastery

The effectiveness of the media was analyzed from the comparison of pretest and posttest scores between the experimental and control classes. The average scores are presented in Table 1:

Table1. Average Pretest and Posttest Scores

Class	Pre-t	Post-t	N-Gain	Category
Experiment	43,3	83,6	0,68	Medium-High
Control	47,5	70,4	0,44	Medium

The N-Gain score indicates that the media is more effective in improving concept mastery than conventional methods. According to Hake (1998), N-Gain values between 0.30 and 0.70 are categorized as moderate improvement, and those greater than 0.70 are categorized as high. The Nile score of 0.68 achieved by the experimental class indicates that the media is on the verge of significant improvement.

The media's ability reinforces this effectiveness:

- Provides visualization of force and motion dynamics (Mayer, 2009).
- Providing a real, culture-based context that enhances engagement (Yoon et al., 2014).
- Facilitate the process of meaning construction in science learning (Brensford et al., 2000).

Improved Creative Thinking Ability

In addition to concept mastery, this study also found that students who learned using interactive media showed better creative thinking skills. This was observed from the test results of *fluency, flexibility, originality*, and *elaboration* skills.

Learners are able:

- Design an experiment using a spinning top to demonstrate centripetal and centrifugal forces
- Propose a top design with an innovative shape to reduce friction
- Relate the variables of mass, shape, and style in the context of traditional games.

Research by Runco & Acar (2012) states that creativity in education develops through media that provide freedom of imagination, exploration, and problem solving. In the context of science, creative thinking is crucial for bridging scientific knowledge with real-life innovations (Beghetto, 2010; Kim, 2020). The media developed in this study were shown to encourage learners to think divergently and apply scientific principles contextually, an approach suggested in STEAM Education (Beers, 2011).

Discussion

The results of this study indicate that the interactive media is integrated with local wisdom:

- Valid based on expert review,
- Practical for use in real classroom conditions,
- Effective in improving mastery of science concepts and creative thinking skills.

The strength of this media lies in the combination of technological and cultural approaches, which makes it relevant in the context of implementing the regional curriculum and 21st-century competency-based learning. Thus, this media can be used as an innovative alternative in supporting contextual, creative, and meaningful science learning.

Integration of Local Wisdom in Interactive Media and Its Implications for Concept Mastery and Creative Thinking

The results of this study indicate that the development of interactive media based on traditional begasingan games can significantly improve students' conceptual mastery and creative thinking skills. This media has been validated as highly feasible, practical for use in real classrooms, and effective in improving learning outcomes. These findings align with the results of Bakri et al.'s (2014) study, which showed that TPACK-based instructional videos can enhance students' 21st-century skills. However, the key difference in this study lies in the integration of local cultural values as a learning context, which was not addressed in Bakri's research. Cultural context has been proven to provide additional meaning for students and strengthen the connection between science concepts and local reality (Putra, 2017; Wang & Suwanthada, 2025).

This study also shows that interactive media based on begasingan enhances aspects of creative thinking, such as flexibility and originality of ideas. This aligns with Trianggono's (2017) findings, which state that creativity can be fostered through contextual physics activities that link scientific concepts to daily activities. However, Trianggono did not use digital media or a game-based approach, whereas this study combines digital and cultural elements simultaneously to strengthen the impact of learning. When compared to the research by Dewa and Astari (2022), which developed e-modules based on local wisdom, there are similarities in the context of locality used. However, their approach still focuses on passive teaching materials (modules), while the media in this study is interactive digital, providing a more dynamic and exploratory learning experience.

Additionally, Hermansyah et al. (2015) demonstrated that virtual laboratories can enhance understanding of science concepts, but did not explicitly measure aspects related to creativity. This study contributes further by enhancing creative thinking skills through imaginative and exploratory activities based on local culture. This means that the developed media not only support cognitive aspects but also affective and psychomotor aspects of learners.

Another difference is evident in the aspect of cultural involvement. A study by Wardiyanti and Jayati (2018) emphasizes the validity of locally-based biology modules but does not utilize traditional games as a learning tool. This study demonstrates that traditional games are not merely a form of entertainment but can be transformed into engaging and meaningful scientific media, aligning with the STEAM approach and contextual learning (Beers, 2011).

Thus, the scientific novelty of this study lies in: (1) the integration of digital technology with traditional games as a form of educational media, (2) Comprehensive measurement encompassing conceptual mastery and creative thinking, and (3) A contextual approach aligned with the independent curriculum and principles of culture-based learning.

These findings indicate that integrating local culture into digital media can serve as an effective solution to bridge the pedagogical needs of the 21st century with the rich meaning and relevance of local wisdom.

CONCLUSION

This study produced interactive learning media based on the traditional game of begasingan, which has been proven to be valid, practical, and effective in supporting science learning on the subject of force and motion. Expert validation indicates that this media is highly suitable for use (Aiken's V index ranging from 0.83 to 0.92). The practicality of the media was rated very high by teachers (92.6%) and students (89.4%), as it is easy to use, engaging, and aligned with the local context.

Specifically, the use of this media had a significant impact on improving science concept mastery, as indicated by an N-Gain value of 0.68 (moderate-high category) in the experimental group, which was higher than that of the control group (0.44). Additionally, this media also significantly enhanced students' creative thinking skills, particularly in terms of fluency, flexibility, originality, and elaboration of ideas.

The integration of local cultural elements, such as traditional begasingan games, has proven to strengthen the connection between scientific concepts and students' real lives, while also serving as a means of preserving cultural values in education. These findings reinforce the argument that digital media-based learning and local wisdom are effective strategies for creating contextual, innovative, and meaningful learning experiences.

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