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Research Paper

A Descriptive Study on the Needs for Biology Learning Media at SMA Negeri 6 Batanghari

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ABSTRACT

This research provides a comprehensive analysis of the requirements for biology learning media at SMA Negeri 6 Batanghari, with the overarching goal of enhancing the quality and effectiveness of biology education. Employing a descriptive research design that integrates both quantitative and qualitative methodologies, the study engaged biology teachers and eleventh-grade students as key informants. Data were systematically collected through direct observation, structured interviews, and validated questionnaires, and subsequently analyzed using descriptive statistical and thematic approaches. The findings reveal a significant shortfall in the availability of biology learning media, particularly for abstract subject matter such as the circulatory system and cellular structures. Teachers consistently highlighted the indispensable role of learning media in fostering conceptual understanding and stimulating student motivation. In contrast, students reported that the presence of visual and interactive media rendered the learning process more engaging and accessible. The study highlights the urgent need for the strategic procurement and development of learning media that are closely aligned with curricular objectives and responsive to the diverse needs of learners. It is recommended that collaborative efforts between educators and school administrators be intensified to design and implement cost-effective, locally sourced biology learning media, thereby promoting a more contextualized and impactful biology learning experience.

Keywords: needs assessment; instructional media; biology education; science pedagogy.

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INTRODUCTION

The pursuit of excellence in biology education is predicated upon the active engagement of students in hands-on, practical activities that transform abstract scientific concepts into tangible learning experiences. The integration of learning media and well-equipped laboratory facilities is widely recognized as a cornerstone of effective science instruction, facilitating experiential and inquiry-based learning that cultivates both conceptual mastery and scientific process skills. A robust body of literature supports the efficacy of concrete instructional media in enhancing student interest, participation, and academic achievement across various biology topics (Abdollah et al., 2022).

Despite these well-documented benefits, a pronounced disparity exists in the distribution and quality of laboratory resources and biology learning materials among secondary schools. While certain institutions can meet or exceed the minimum standards set by educational authorities, many others continue to struggle with significant resource deficits that hinder the delivery of high-quality biology instruction. This persistent gap between policy expectations and on-the-ground realities highlights the imperative for systematic needs assessments and resource mapping, which can inform more targeted and equitable procurement strategies. Recent comparative analyses and laboratory audits have further illuminated these discrepancies, reinforcing the call for data-driven policy interventions (Saputri et al., 2025).

Empirical investigations, including action research and developmental studies, have consistently demonstrated that the design and utilization of innovative biology learning media—such as three-dimensional models and contextually relevant instructional tools—can substantially elevate student engagement, motivation, and conceptual understanding. These positive outcomes are most pronounced when learning media are closely aligned with curricular content and are accessible for both teachers and students. Nevertheless, the widespread adoption of such media is frequently hampered by constraints related to material availability, time, financial resources, and insufficient professional development opportunities for teachers. These challenges highlight the importance of conducting context-sensitive needs analyses as a prerequisite for the effective planning and implementation of learning media procurement and development initiatives (Atikah, 2023).

The pedagogical value of manipulative biology learning media has been substantiated by numerous studies, which report significant gains in student motivation and learning outcomes. For example, Retnosari, Amrianto, and Karim (2021) documented a marked increase in student motivation following the introduction of manipulative learning media, with effect sizes indicating substantial educational impact. Such findings

suggest that learning media serve not only as vehicles for conceptual clarification but also as catalysts for enhancing affective dimensions of learning, including interest and motivation.

Moreover, the positive influence of biology learning media extends to measurable improvements in academic performance. Research by Boruk, Daud, and Mete (2023) demonstrated that the use of contextually grounded learning media contributed to significant gains in students' cognitive, affective, and psychomotor domains. Similarly, the deployment of three-dimensional models in the instruction of sensory systems has been shown to foster deeper conceptual understanding and greater student engagement.

In the Indonesian context, the challenges associated with selecting and utilizing appropriate biology learning media are further compounded by the diverse characteristics of students and the complexity of the subject matter. Studies, such as those by Aritonang, Sidabutar, and Simajuntak (2023), have highlighted the superior learning outcomes achieved by students exposed to learning media compared to those taught using conventional methods. Additional research at MTsS Mardhatillah Kota Subulussalam corroborates these findings, indicating that the integration of learning media in the instruction of respiratory systems leads to heightened student engagement relative to traditional pedagogical approaches.

Against this backdrop, the present study seeks to conduct a nuanced and contextually grounded analysis of the needs for biology learning media at SMA Negeri 6 Batanghari. The specific objectives are threefold: (1) to systematically document the availability and typology of existing learning media and laboratory equipment; (2) to identify priority learning media as perceived by teachers and in accordance with curricular mandates; and (3) to elucidate the principal challenges associated with the utilization of learning media, thereby informing the development of practical and contextually relevant recommendations for resource procurement and instructional innovation. The study also integrates insights from the broader literature, which underscores the critical importance of both the frequency and quality of learning media utilization in shaping student learning outcomes. This highlights the need for a holistic approach that encompasses not only resource provision but also sustained teacher professional development (Jeptoo *et al.*, 2024).

LITERATURE REVIEW

The Role and Importance of Learning Media in Science Education

Learning media are widely recognized as essential components in the educational process, serving not only as tools for information delivery but also as catalysts for student engagement, motivation, and conceptual understanding (Febrina & Setiawan, 2024; Maulana, Harahap, & Safitri, 2022). In the context of science and biology education, integrating appropriate learning media can transform abstract concepts into tangible experiences, thereby facilitating deeper comprehension and retention (Astuti & Nurcahyo, 2019; Jannah *et al.*,

2024). Febrina and Setiawan (2024) emphasize that the correct selection and application of learning media—such as PowerPoint presentations, YouTube videos, interactive quizzes, and concrete objects—can significantly increase students' interest and active participation in learning activities.

Development and Innovation in Biology Learning Media

Recent years have witnessed a surge in the development of innovative learning media tailored to the needs of science education. Game-based media, such as the Snakes and Ladders board game, have been shown to enhance student participation, interest, and learning outcomes in elementary social studies (Syawaluddin, Afriani Rachman, & Khaerunnisa, 2020). In the realm of science, Hardiansyah and Wahdian (2023) developed the Magic Card Box for teaching the water cycle, which was validated by experts and demonstrated to be both practical and effective in improving students' cognitive understanding.

The use of technology-driven media is also gaining prominence. Ikhsan, Akhyar, and Nais (2024) found that science-on-web learning media significantly improved junior high school students' learning independence and outcomes in the excretion system topic. Similarly, Susanto et al. (2022) reported that Android-based mobile learning media for the nervous system not only received high feasibility ratings from experts but also led to substantial gains in students' conceptual understanding, as evidenced by improved pre-test and post-test scores.

Contextual and Localized Media Development

The development of learning media that is contextually relevant and locally grounded has also been highlighted as a best practice in science education. Sofianti, Sunandar, and Qurbaniah (2024) created an encyclopedia based on local vegetable biodiversity, which was validated as highly effective and well-received by both experts and students. Such localized resources not only support curriculum objectives but also foster connections between scientific knowledge and students' everyday environments.

Design Thinking and Student-Centered Approaches

Effective learning media development increasingly incorporates design thinking and student-centered methodologies. Jannah *et al.* (2024) employed a design thinking framework—empathize, define, ideate, prototype, and test—to develop biology learning posters that were iteratively refined based on student feedback and observer suggestions. This approach ensures that learning media are not only visually appealing but also tailored to the specific needs and characteristics of learners, thereby enhancing their effectiveness and efficiency.

Impact on Student Motivation, Interest, and Learning Outcomes

A consistent finding across the literature is the positive impact of well-designed learning media on student motivation, interest, and academic achievement. Astuti and Nurcahyo (2019) demonstrated that interactive media based on Adobe Flash for the human reproduction system increased both student interest and conceptual understanding. Febrina and Setiawan (2024) observed that the use of diverse media in science classes led to greater enthusiasm, attention, and active participation among students. These outcomes are echoed by Maulana *et al.* (2022), who found that the use of technology-based learning media among biology education students enhanced motivation, effectiveness, and overall learning experiences.

Challenges and Barriers

Despite the documented benefits, several challenges persist in implementing biology learning media. Common barriers include limited funding, inadequate storage and maintenance, lack of dedicated laboratory personnel, and difficulties in sourcing or creating suitable materials (Astuti & Nurcahyo, 2019; Maulana *et al.*, 2022). Addressing these challenges requires not only increased investment and resource allocation but also ongoing professional development for teachers and collaborative efforts among stakeholders.

METHOD

This study adopted a descriptive research design, integrating quantitative data with qualitative insights to provide a comprehensive overview of the current condition and needs regarding biology learning media. The research was conducted at SMA Negeri 6 Batanghari, located in Batanghari Regency, Jambi Province. The site was purposively selected due to its limited laboratory infrastructure and the absence of detailed data on learning media requirements.

Participants

Participants comprised biology teachers and tenth-grade students, with the primary focus on assessing the needs for learning media as dictated by the prevailing curriculum. Teachers were selected as principal informants due to their pivotal role in planning, implementing, and evaluating instructional media (Rahmawati & Suryaningsih, 2023).

Data analysis

Data collection employed a triangulated approach, encompassing: (1) direct observation of laboratory facilities and available learning media; (2) structured interviews with biology teachers to elicit in-depth perspectives on needs and challenges; and (3) administration of a needs assessment questionnaire, adapted from Fitriani and Rahayu (2021), which addressed indicators such as availability, utilization, and perceived urgency of learning media.

Quantitative data were analyzed using descriptive statistics, including measures of central tendency and reliability analysis (Cronbach's Alpha). In contrast, qualitative data from interviews were subjected to thematic analysis to identify recurrent patterns and salient themes.

RESULT

Analysis of Student Questionnaire Data

The analysis of questionnaire responses revealed a moderately positive perception of the current condition of learning media, with an overall mean score of 3.54. The highest ratings were observed in the dimension of Design and Quality (mean = 3.68), suggesting that students value well-designed and high-quality teaching aids. Conversely, the dimension of Effectiveness and Ease of Use received the lowest mean score (3.42), indicating potential areas for improvement in the usability and instructional impact of available aids. The reliability of the instrument was generally robust (Cronbach's Alpha = 0.84), although the Content Needs dimension exhibited lower internal consistency, warranting further refinement of questionnaire items.

Statistically significant correlations were identified between content needs and teaching aid design, as well as between effectiveness and ease of use, underscoring the interconnectedness of these factors in shaping student perceptions and experiences.

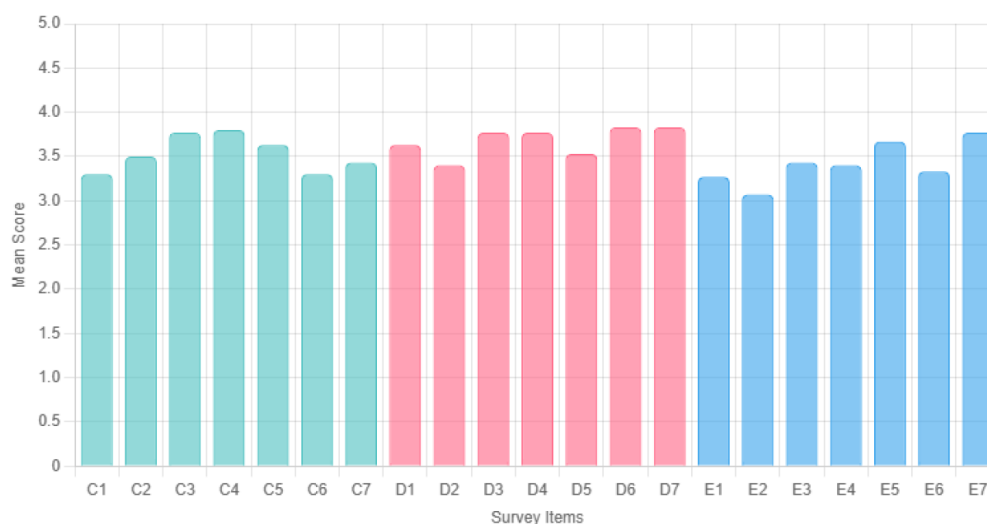


Figure 1. Score of survey items

Thematic Insights from Teacher Interviews

Thematic analysis of teacher interviews revealed several critical insights. The biology laboratory at SMA Negeri 6 Batanghari is equipped with basic teaching aids, including anatomical torso models, illustrative charts, and microscopes, which primarily support foundational learning activities. For more abstract or complex topics, teachers frequently supplement instruction with alternative media, such as animated videos,

textbook illustrations, or digital resources. However, the inventory of specialized physical teaching aids—such as models of viruses, protists, or apparatus for metabolic experiments—remains notably deficient.

Teachers reported that the quality of existing teaching aids is suboptimal, with issues such as outdated or incomplete equipment (e.g., microscopes with substandard lenses, charts lacking detail) impeding the effectiveness of practical activities. While teachers endeavor to conduct simple laboratory exercises, the limited functionality of available aids constrains students' ability to achieve the intended learning outcomes.

Priority needs identified by teachers include the establishment of a dedicated biology laboratory furnished with a comprehensive array of teaching aids, particularly for challenging topics such as virology, protistology, metabolism, and immunology. Teachers also expressed a desire for aids that align with the Merdeka Curriculum, including resources for environmental projects and innovative instructional strategies such as gamification and hands-on experimentation. Key challenges cited include inadequate facilities, variability in student abilities, and passive student engagement, all of which undermine the potential benefits of teaching aids.

Availability and Utilization of Biology Learning Media

Observational data indicated that only approximately 40% of the 35 types of teaching aids recommended by the national biology curriculum are available and in serviceable condition at SMA Negeri 6 Batanghari. While basic aids, such as human anatomy models, are available, resources for topics like the excretory system, circulatory system, and plant physiology are severely lacking. This finding is consistent with prior research documenting widespread deficiencies in teaching aid provision across secondary schools in the region (Saputri et al., 2025).

The limited availability of teaching aids is attributable not only to budgetary constraints but also to a lack of teacher initiative in developing low-cost, locally sourced instructional materials. Some teachers perceive the creation of teaching aids as prohibitively time-consuming and expensive, despite evidence that the use of natural and recycled materials can offer practical and contextually relevant solutions (Herlina & Maulana, 2023).

Identification of Priority Teaching Aids

Both teachers and students identified several categories of teaching aids as particularly urgent, including models of viruses (93%), models of the circulatory system (90%), respiratory system simulators (87%), digestive organ models (82%), and basic genetics kits (79%). These priorities reflect the curricular emphasis on conceptual mastery through visual exploration and practical engagement, as articulated in the Merdeka Curriculum. Teachers affirmed that such aids are instrumental in clarifying complex concepts, mitigating misconceptions, and fostering active student participation.

Patterns of Teaching Aid Utilization

Despite the presence of some teaching aids, their utilization remains suboptimal, with teachers reporting that aids are typically employed only during mandatory laboratory sessions rather than as integral components of routine classroom instruction. Contributing factors include time constraints, limited teacher proficiency in operating the aids, and large class sizes. The study highlights the critical need for targeted professional development to enhance teachers' capacity to integrate teaching aids into their pedagogical practice effectively.

Direct student interaction with models and simulations was found to promote higher-order thinking skills, including observation, hypothesis generation, and evidence-based reasoning, particularly in relation to abstract biological phenomena.

Barriers to the Use and Procurement of Learning Media

The study identified several systemic barriers that hinder the effective use and procurement of biology learning media. One major obstacle is insufficient school funding, which limits the acquisition of new and updated learning media. Additionally, equipment deterioration often occurs due to inadequate storage and maintenance practices, further reducing the availability of functional resources. The absence of dedicated laboratory personnel also contributes to poor inventory management, making it difficult to track and maintain existing media. Moreover, there is a limited availability of local materials suitable for constructing simple, contextually relevant learning media. In response to these challenges, teachers advocated for the adoption of locally produced, cost-effective learning kits, stressing the importance of aligning learning media with both curricular objectives and the specific needs of students. These findings underscore the crucial need for ongoing teacher training in the design, selection, and effective use of instructional media to fully realize their pedagogical potential and improve the quality of biology education.

DISCUSSION

The findings of this study align with a growing body of research emphasizing the pivotal role of learning media in improving science education outcomes. The limited availability and utilization of biology learning media at SMA Negeri 6 Batanghari reflect broader challenges identified in the literature, including resource constraints, lack of teacher training, and insufficient alignment with curricular objectives (Astuti & Nurcahyo, 2019; Febrina & Setiawan, 2024; Hardiansyah & Wahdian, 2023).

Empirical evidence suggests that integrating innovative and interactive learning media can significantly enhance student motivation, participation, and conceptual understanding. For instance, Syawaluddin et al. (2020) found that the use of snakes and ladders as a learning medium in social studies not only increased student interest but also improved learning outcomes, as evidenced by high participation rates and mastery of learning objectives. Similarly, Hardiansyah and Wahdian (2023) reported that the

development of the Magic Card Box for science learning resulted in high levels of student engagement and cognitive achievement, with validation scores from experts and field trials indicating the media's effectiveness and practicality.

The adoption of technology-based learning media, such as science-on-web platforms and Android-based mobile applications, has also been shown to foster greater learning independence and improve outcomes in complex topics like the excretory and nervous systems (Ikhsan et al., 2024; Susanto et al., 2022). These digital resources provide students with flexible, accessible, and engaging learning experiences, which are particularly valuable in contexts where traditional resources are limited.

Furthermore, the use of locally relevant and contextually designed media—such as encyclopedias based on local biodiversity and posters tailored to student needs—has been validated as both effective and practical for supporting biology instruction (Sofianti et al., 2024; Jannah et al., 2024). These resources not only facilitate the understanding of scientific concepts but also promote connections between classroom learning and students' everyday environments, thereby enhancing the relevance and impact of biology education. The importance of aligning learning media with student characteristics and curricular requirements is further underscored by studies highlighting the need for design thinking and user-centered approaches in media development (Jannah et al., 2024). By involving students in the design process and incorporating feedback from both learners and observers, educators can create media that are more engaging, effective, and responsive to diverse learning needs.

Despite the demonstrated benefits, several barriers to the effective use and procurement of biology learning media remain. These include limited funding, inadequate storage and maintenance, lack of dedicated laboratory personnel, and challenges in sourcing or creating appropriate materials (Astuti & Nurcahyo, 2019; Maulana et al., 2022). Addressing these challenges requires a multifaceted approach, including increased investment in resource development, ongoing professional development for teachers, and the promotion of collaborative efforts among educators, administrators, and local communities.

In conclusion, the results of this study reinforce the critical role of biology learning media in supporting student engagement, motivation, and achievement. The strategic development and implementation of diverse, contextually relevant, and technologically integrated learning media—supported by robust teacher training and resource management—are essential for advancing the quality of biology education at SMA Negeri 6 Batanghari and similar educational settings.

CONCLUSION

This study provides compelling evidence that the availability and utilization of biology learning media at SMA Negeri 6 Batanghari remain significantly below the standards required to support effective and engaging science education. Key barriers include limited funding, poor maintenance, a lack of laboratory staff,

and insufficient local materials. To address these issues, schools should prioritize the development and procurement of diverse, innovative, and locally sourced learning media, while fostering collaboration among teachers, administrators, and the community. Ongoing teacher training in the effective use of instructional media is also essential.

Implementing these recommendations will not only enhance biology learning at SMA Negeri 6 Batanghari but can also serve as a model for other schools. Improving access to and utilization of quality learning media is crucial for fostering student engagement, understanding, and scientific literacy in today's educational landscape.

DATA AVAILABILITY STATEMENT

The data of this study are restricted and available only by request.

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