Ann PUBLISHER Journal of Education Sciences (Edusci)
e-ISSN 3047-2296
p-ISSN 3032-7393

Development of A Joyful Learning E-Module Based on Discovery Learning on The Topic Of Interactions Among Living Organisms

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Abstract:
Background. The growing need for captivating, student-centered digital learning highlights the need for educational resources that combine pedagogical innovation with interactive technology. Even though e-modules and discovery learning have been extensively studied, it is still difficult to combine joyful learning and discovery learning in a single digital learning module, especially when educating junior high school students about interactions between living things.
Aims. This study aimed to develop and evaluate the validity and practicality of a joyful learning e-module based on discovery learning for seventh-grade science learning.
Methods. The study used a Research and Development (R&D) approach based on the 4D model, limited to the define, design, and develop stages. The participants were seventh-grade students at SMPN 2 Krui. Data were collected using material and media expert validation sheets and teacher and student response questionnaires and were analyzed using descriptive quantitative techniques.
Result. The results demonstrated that the developed e-module achieved a high level of validity, with average validation scores of 94.25% for material quality and 93.75% for media quality. User evaluations also indicated high practicality and acceptance, with the teacher response reaching 100% and the mean student response reaching 3.84 on a four-point scale.
Conclusion. These results show that a legitimate, useful, engaging, and student-centered digital learning resource may be created by combining joyful learning principles with discovery learning in an e-module. The study offers a promising digital resource for science education by providing an integrated pedagogical framework that blends engaging learning activities with active concept discovery. However, more research needed look at how well the e-module improves students' motivation, conceptual understanding, critical thinking, and learning accomplishment because the study concentrated on validity and practicality rather than experimental learning outcomes.

Keywords: discovery learning; e-module; interactions among living organisms; joyful learning; science education

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INTRODUCTION

A key prerequisite for increasing student engagement and learning quality is incorporating digital technologies into the classroom. To meet the challenges of the twenty-first century, Indonesia's education policy also incorporates digital learning transformation (Aditomo & Ratnasari, 2022). Nonetheless, traditional teacher-centered approaches continue to dominate junior high school science instruction, which lowers student engagement and learning motivation (Larasati & Sujarwanta, 2020). Because students actively participate in information discovery, discovery learning is a particularly successful method for enhancing critical thinking abilities and conceptual understanding (Rusmalinda & Syaifudin, 2022). Meanwhile, the joyful learning approach highlights how crucial a fun learning environment is for boosting students' motivation and emotional engagement (Mulyani et al., 2023). Earlier research also shows that e-modules can enhance students' scientific literacy and learning independence (Ramdani & Gunawan, 2021; Pradana & Handayani, 2024). Additionally, research shows that incorporating technologies like augmented reality and QR codes improves students' learning outcomes (Zelvia, 2025; Indriyani et al., 2023). Nevertheless, joyful learning and discovery learning are still rarely integrated in a single educational medium. Thus, this study aimed to create a reliable and useful e-module to raise the standard of science education.

To support students' active learning, scientific literacy, learning independence, and conceptual understanding, prior research has extensively developed digital e-modules and instructional materials based on discovery learning. However, the systematic integration of the inquiry-oriented processes of discovery learning with the emotive dimension of joyful learning within a single e-module has received little attention, especially for the topic of interactions among living organisms at the junior high school level. As a result, there is still a demand for a digital learning tool that encourages active concept exploration and a fun, interesting learning process. This study's new contribution is the systematic integration of joyful learning principles and discovery learning processes into a single digital e-module to teach junior high school pupils about interactions among living entities. The proposed e-module blends active idea discovery with entertaining and captivating learning experiences, unlike earlier e-module designs that primarily focus on discovery-oriented cognitive exercises or digital engagement. In student-centered science learning, this integration offers

DOI: 10.62885/edusci.v3i3.1331

a pedagogical design that concurrently addresses pleasant learning experiences and cognitive engagement.

Most current developments have focused on either digital interactivity or the cognitive process of concept discovery, despite prior research showing the potential of e-modules and discovery learning to support active learning, scientific literacy, learning independence, and conceptual understanding. Joyful learning, on the other hand, has been acknowledged as a strategy that encourages students' emotional engagement and delightful learning experiences. However, no systematic integration of happy learning and discovery learning exists in a single digital learning resource, especially for junior high school science instruction. This limitation constitutes a significant research gap, since effective digital learning should offer an engaging and enjoyable learning environment while supporting students' active development of scientific knowledge. Therefore, this study's novel contribution is the creation of a joyful learning e-module based on discovery learning for the topic of interactions among living organisms, combining structured concept-discovery activities with positive learning experiences in a single student-centered digital learning environment. Therefore, this study aimed to create and assess the validity and usefulness of the proposed e-module for seventh-grade science instruction.

METHOD

This study used the research and development (R&D) method, which aims to create a specific product and verify its viability before general use. This approach focuses on designing, developing, validating, and updating the product to meet user demands, in addition to data collection. By using the R&D process, researchers can ensure the final

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product is excellent, efficient, and appropriate for use in the learning context (Sugiyono, 2019).

Research Design

This development study employed the 4D development model, which includes the following stages, along with the Research and Development (R&D) approach.

1. Describe. This step examined issues with science learning activities at the school where the study was conducted to assess requirements and issues in the area.
2. Design. In this phase, the first draft of the e-module was designed.
3. Develop: The goal of this stage was to create the e-module, which was then updated, validated by media and material specialists, and tested on a small number of teachers and students to gather reaction data.
4. Spread. This step entails distributing the finished product more widely; it was not done in the current study and is suggested for future investigation.

Research Subjects

Students from SMPN 2 Krui's seventh grade served as the study's subjects and respondents during the data gathering phase. The themes were chosen because they were pertinent to the study's goal of creating and evaluating the viability of an e-module for junior high school science instruction. This study provided a clear picture of the acceptability, usefulness, and efficacy of using the e-module in a realistic learning situation by involving seventh-grade students.

Research Instruments

The study used teacher and student questionnaires, along with material and media expert validation sheets. While the instructor and student response surveys gathered information on the e-module's usefulness, the validation sheets evaluated its viability. These tools were designed to gather detailed information that gives a broad view of the generated product's quality.

Data Analysis Technique

Descriptive quantitative methods were utilized to examine the data, and percentages were employed to assess the new product's viability. After processing user responses and expert validation scores, the analysis converted them into percentages for easier understanding. This method divided the e-module's viability into three categories: very viable, feasible, and less feasible. Based on the collected data, descriptive quantitative analysis thus offered a methodical and impartial description of the product's quality.

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RESULTS AND DISCUSSION

With scores of 95% for material relevance, 93% for material depth, and 94% for language, for an average of 94.25%, material expert validation revealed that every evaluated feature fell into the highly possible category (Figure 1). The e-module content aligns with the curriculum and intended learning objectives, as shown by the excellent material relevance score. This demonstrates that the content can enhance students' conceptual understanding and is both pertinent and contextual to their requirements. Furthermore, the high material depth score suggests the learning material is well-structured and can promote higher-order thinking processes, a crucial aspect of discovery learning (Rusmalinda & Syaifudin, 2022).

Material Expert Validation

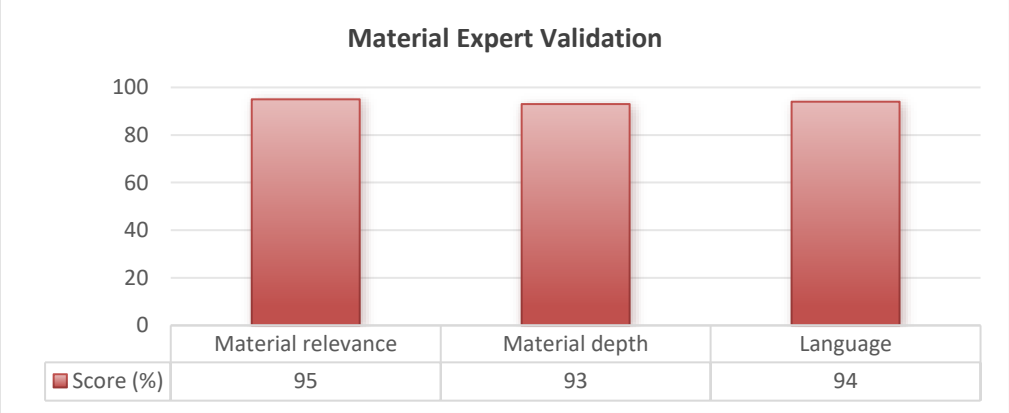


Figure 1. Results of material expert validation

Additionally, the language component, which received a very feasible rating, demonstrates that the e-module's language is communicative, methodical, and simple for pupils to comprehend. Because it directly impacts the efficiency of information delivery and students' learning independence, language clarity is an essential component of digital teaching materials. This aligns with guidelines for creating digital teaching resources, which prioritize coherence between text and media and message clarity to promote the best possible learning (Mayer, 2014). Therefore, high-quality language enhances the e-module's ability to serve as a stand-alone learning tool. The designed e-module meets high practicality standards as a teaching resource, as shown by an average validation score of 94.25%. This result aligns with earlier research (Ramdani & Gunawan, 2021; Pradana & Handayani, 2024) showing that methodically created e-modules based on specific learning methodologies have

DOI: 10.62885/edusci.v3i3.1331

high validity and support the learning process. Thus, the content quality of this e-module is not only theoretically possible but also has a strong chance of being applied in science education to enhance students' conceptual understanding and active participation.

Media Expert Validation

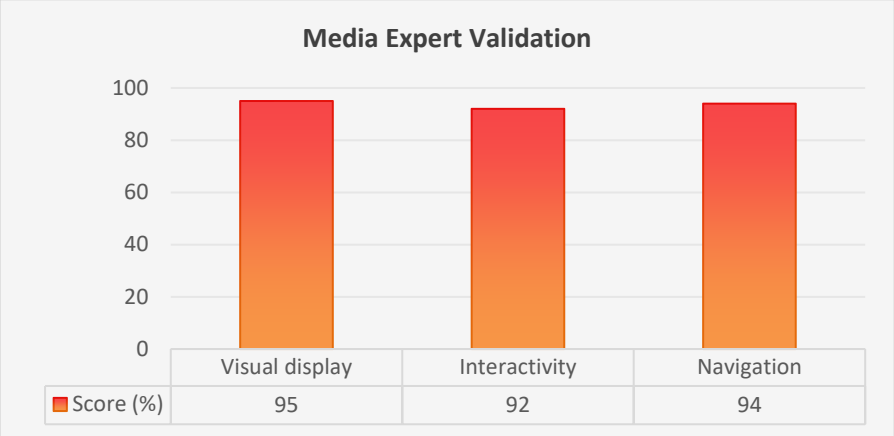


Figure 2. Results of media expert validation

With scores of 95% for visual presentation, 92% for interactivity, and 94% for navigation, for an average of 93.75%, media expert validation revealed that every evaluated aspect fell into the extremely practical category (Figure 2). The e-module's strong visual display score suggests it was created with aesthetic principles and clear information presentation in mind, including the use of color, drawings, and a visually appealing layout. Beyond aesthetics, strong visual design is crucial for improving students' comprehension through visual aids that support cognitive functions (Mayer, 2014). Additionally, the e-module can encourage students' active participation in the learning process because of its highly practical interaction features. Practice questions, instant feedback, and exploratory exercises are examples of interactive elements that motivate students to actively create understanding rather than just passively absorb it. This aligns with discovery learning, which emphasizes students' participation in concept exploration and discovery (Rusmalinda & Syaifudin, 2022). Furthermore, interactive digital media has been shown to enhance learning autonomy and access to educational resources (Pradana & Handayani, 2024). Meanwhile, the good navigation score indicates that the e-module is user-friendly and has a methodical structure. Clear navigation helps students access content independently and without difficulty, which enhances learning effectiveness. Because it directly relates to the

DOI: 10.62885/edusci.v3i3.1331

user experience during the learning process, ease of use is a crucial factor for creating high-quality digital teaching materials. Additionally, a well-designed navigation framework supports cohesive, directed integration of different learning components (Ramdani & Gunawan, 2021). The designed e-module satisfies extremely high feasible standards for a digital learning medium, as confirmed by the average score of 93.75%. This result supports other research showing that methodically and interactively developed digital learning materials can greatly enhance student engagement and learning quality (Pradana & Handayani, 2024; Mayer, 2014). As a result, our e-module is not only practical but also has a great chance of facilitating more interesting, dynamic, and successful science education.

User Responses

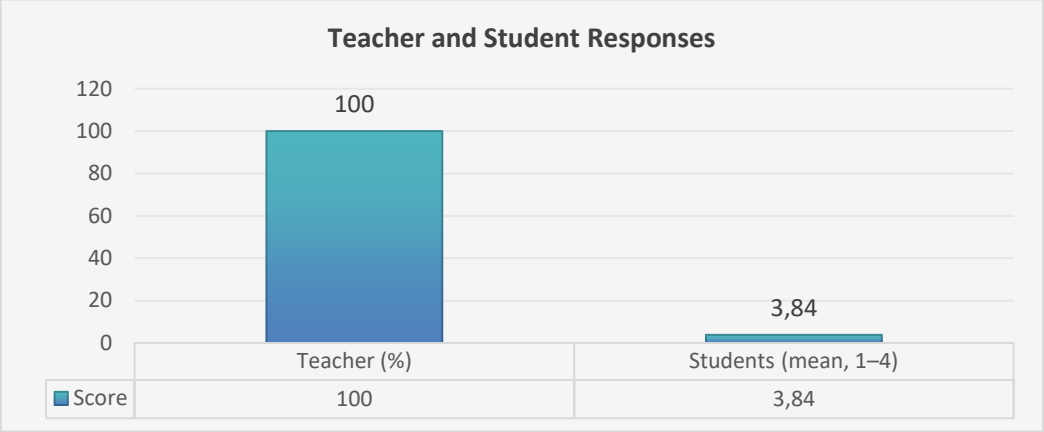


Figure 3. Teacher and student responses to the e-module

Both the teacher and the students gave the generated e-module extremely high ratings, with the teacher scoring 100% (very feasible) and the students scoring an average of 3.84 (very good), according to the user replies (Figure 3). The e-module meets practical learning demands, including ease of use, alignment with learning objectives, and usefulness in supporting instruction, as shown by the teacher's excellent rating. This demonstrates that the created product is both theoretically and practically viable in the classroom. When creating instructional materials, practicality is crucial since effective media should be usable by educators without requiring intricate modifications (Sugiyono, 2019). However, students in the very good group reported that the e-module provides a good educational experience. When students use interactive and engaging learning materials, they are typically more engaged and motivated. This aligns with the joyful learning method, which highlights the importance of a fun learning environment in boosting students'

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motivation and emotional engagement (Mulyani et al., 2023). Additionally, the digital e-module gives students the freedom to learn on their own, helping them become more autonomous and responsible learners (Pradana & Handayani, 2024). Additionally, the overwhelmingly favorable user feedback suggests that incorporating the discovery learning approach into the e-module can promote students' active participation in their education. Instead of only receiving knowledge, students investigate and uncover ideas, which enhances their comprehension and learning process (Rusmalinda & Syaifudin, 2022). Research demonstrates that inquiry- and discovery-based learning can greatly enhance students' conceptual knowledge and critical thinking abilities (Hmelo-Silver et al., 2007; Lazonder & Harmsen, 2016).

Overall, teachers' and students' responses indicate that the constructed e-module has a very high degree of acceptability and usefulness. This result supports earlier studies showing that interactive digital teaching resources created with users' requirements in mind can enhance student engagement and learning quality (Ramdani & Gunawan, 2021). As a result, our e-module has the potential to create more interesting, meaningful, and student-centered learning experiences while remaining practical to use. According to Yulianti et al. (2025), teachers want a more adaptable, user-friendly, and accessible learning paradigm. Ongoing training, providing digital devices in classrooms, and a curriculum that adapts to discovery models are all necessary forms of support. To achieve more efficient and equitable learning, the government and educational institutions must cooperate. Educational technology greatly enhances the learning process and the experiences of students and teachers in language acquisition, especially for producing fantasy writing in junior high school. In the classroom, the discovery paradigm can help kids become more creative, critical thinkers, and engaged learners. Fifty-one percent of students believe it to be highly practical. In a small-scale test, 40% of students believe it is very effective and 60% believe it is effective; in a large-scale test, 66% believe it is very effective and 34% believe it is effective. As a learning tool, the E-module structure and function of plant tissue based on discovery learning is workable, useful, and efficient (Aulia & Ridyatmi, 2023). Discovery-learning-based e-module flipbook products are legitimate, useful, and effective in raising students' motivation to learn and achieving learning objectives (Fitriyah & Sahda, 2023). The discovery-based e-module is considered a viable learning tool for enhancing students' science process abilities. This is illustrated by the average eligibility acquisition percentage for discovery learning-based E-Modules, which ranges from 0.71% in the

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intermediate category. The analysis shows that the Sig value indicates the strong effectiveness of discovery-based E-Modules. A significant difference between the pretests and posttests is indicated by a 2-tailed p-value of 0.00 < 0.05. According to Khairunisa et al. (2024), the impact of discovery-based E-modules varies notably between the pretest and posttest.

CONCLUSION

The e-module built on joyful learning and discovery learning was shown to be of extremely high quality based on the findings and discussion. Both the material expert validation (average of 94.25%) and the media expert validation (average of 93.75%) fall into the highly feasible group. Additionally, user feedback was overwhelmingly favorable, with the teacher's response reaching 100% (extremely feasible) and the students' average response at 3.84 (very good), showing that the e-module is not only theoretically sound but also useful and easy to use for learning. These results suggest that incorporating the joyful learning method and the discovery learning model into the e-module can produce more interesting, interactive, and student-centered learning. As a result, the e-module has the potential to increase students' motivation, independence, and conceptual comprehension, and it is practical for use as a digital teaching resource in science education.

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