



Biome Quartet Cards Validation for Life Classification Learning

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Abstract. General Background: Science learning requires engaging media to support students' cognitive development and improve understanding of biological concepts. Specific Background: At SMP Hang Tuah 4 Surabaya, learning on the classification of living things remains teacher-centered and monotonous, resulting in low student outcomes and limited engagement. Knowledge Gap: There is a lack of validated, interactive, and technology-integrated learning media aligned with students' preferences and classroom needs. Aims: This study aims to develop and validate Biome Quartet Cards as an interactive learning media for seventh-grade science education using a Research and Development approach with the 4-D model (Define, Design, Develop). Results: Validation results indicate high feasibility, with scores of 95% from subject matter experts, 87.5% from media experts, and 88.5% from teachers, confirming accuracy, visual quality, practicality, and alignment with curriculum objectives. Novelty: The media integrates game-based learning with QR barcode features, enabling access to additional digital content and combining visual, interactive, and technological elements in a single tool. Implications: The validated media provides an alternative instructional resource to support interactive science learning and serves as a reference for developing similar educational tools in biology education.

Keywords: Quartet Cards, Science Learning Media, Biome Classification

1 Introduction

A person's quality, whether physical, mental, or spiritual, is significantly improved by education. Through a structured learning process, education actively seeks to instill a sense of nationality, strengthen ethical communication, and create a civilization that is valuable to the nation. This concept is stated in Law Number 20 of 2003. This law states that the main objectives of national education are to improve quality, shape character, and create a respectable civilization in order to improve community life and optimize the potential of students [1]. In this context, Natural Sciences (IPA) have a significant contribution in developing children's skills and mindset, making mastery of Science crucial. Therefore, the Science learning process must be organized in such a way that it is more interesting, in order to foster interest and support the improvement of students' thinking skills [2].

Based on observations at Hang Tuah 4 Junior High School in Surabaya, several crucial issues were found in the classroom education process. The learning process at this school is still centered on the teacher as the main source of information, which results in students being less involved and relying solely on textbooks as their only

learning reference. In addition, students with higher academic achievements often receive more attention in classroom interactions, while students who experience learning difficulties feel less confident and afraid to participate. This situation creates an unfair and less inclusive learning atmosphere. In fact, many students show much greater interest in more active and contextual learning activities, such as experiments or educational games, compared to monotonous teaching methods such as lectures. The mismatch between teachers' teaching methods and students' learning preferences has a negative impact on educational outcomes, which is particularly evident in daily test results that reflect scores below the minimum passing grade (KKM). Therefore, it is essential to use appropriate learning methods to encourage students to be more active and facilitate the development of their thinking skills during daily learning activities. However, in practice, the implementation of learning strategies to develop students' thinking patterns has not been smooth due to several factors, such as limited facilities, lack of innovation in the learning process, and suboptimal use of technology in the classroom. Therefore, it is important to adopt teaching methods that can improve students' thinking skills during daily learning activities. However, in reality, the implementation of ideal learning to develop students' thinking skills often encounters various challenges in the field [3].

Based on current conditions, science learning in schools still uses conventional methods. Efforts are needed to improve the quality of science learning so that students are more interested in learning and able to achieve better results. In choosing teaching methods, the learning atmosphere must be adjusted to the material being taught and the characteristics of the students so that learning objectives can be achieved. If the learning atmosphere is not suitable, various things in the classroom will feel less interesting, student interest will decline, and learning objectives cannot be achieved [4].

Based on the current situation, science teaching in educational institutions is still carried out using conventional methods. Efforts are needed to build students' interest so that they are motivated to learn in order to obtain better learning outcomes and the quality of science learning above the minimum passing grade. In choosing teaching techniques, the learning environment must be adapted to the content being taught and the tendencies of the students so that learning can be realized and be more enjoyable. If the learning environment is not appropriate, various aspects in the classroom will feel less interesting, student interest will decline, and learning objectives cannot be achieved [5].

According to Estiani, playing can make students feel calmer while learning and happier, which encourages them to understand the material being taught more easily. Playing techniques are a powerful strategy in encouraging cognitive development, such as the learning outcomes of students [5]. This statement is in line with Vigotsky's perspective, who believes that playing is a very efficient method for cognitive development. This belief is rooted in the character of students who enjoy playing, where they tend to be more enthusiastic when learning in a fun environment. In addition, students also show a higher level of interest through various forms of games applied during the educational process, which will ultimately improve the learning outcomes of students who were initially below the minimum passing grade to above the minimum passing grade [6].

The term "media" comes from Latin, namely "medium," a bridge or connector. The use of media in the learning process can make the educational experience more interesting, especially with designs that involve various images and animations. One type of learning media that combines visual, interactive, and fun elements is quartet

cards [6]. This media was developed with a concept similar to a card game, where students are asked to arrange cards based on certain categories, which indirectly facilitates their understanding of the concept of grouping living things through play activities. In these quartet cards, scientific information is presented concisely but interestingly in the form of text, images, and symbols, which is very useful for students with visual and kinesthetic learning styles. In addition, this media also has a QR Barcode feature that allows students to access additional digital content, such as explanatory videos, animations, or practice questions by scanning the code on each card using a mobile device. Thus, quartet cards equipped with QR Barcodes not only function as ordinary learning tools, but also serve as a link to interactive and in-depth technology-based learning [7].

The use of QR codes in various locations makes it easy for people to obtain information quickly, accurately, and efficiently through the mobile phones used to scan them. QR codes are a type of two-dimensional code in the form of a matrix or bar, designed to be read by a scanning application, enabling the fast and accurate transmission of data and information. In the context of education, the use of QR codes helps in accessing additional materials such as videos, animations, or interactive quizzes that can deepen students' understanding. This is very relevant to the situation at SMP Hang Tuah 4 Surabaya, where students are allowed to bring cell phones as a source of information to supplement books and support the digital learning process. This policy provides opportunities for teachers to maximize the use of technology such as QR codes for fun, active, and innovative learning methods.

One innovation that can be implemented is a learning tool in the form of Bioma quartet cards. This tool conveys information about the classification of living things concisely, complete with illustrations and interactive features. One of the advantages of this tool is its ability to help students understand concepts in a fun and interactive way. However, before being used, this tool must undergo a validation process. This validation is carried out by subject matter experts to ensure that the content is in line with the curriculum and the correct concepts, by media experts to check the appearance, use of language, and graphic suitability, and also by educators or teachers to assess the suitability of this tool for the classroom situation and student characteristics [8].

Several previous studies have revealed that the validation process is crucial in the creation of learning media. Research conducted by Nuramalia examined quartet cards related to the Solar System for junior high school students, and the validation results from subject matter and media experts were categorized as highly valid with a score of 85.84% [9]. In Djafar's research, quartet cards featuring ethnoscience in food additive material for junior high school students were also introduced, where the validation carried out by material experts was declared valid, while the validation by media experts also obtained very valid results, indicating that the content and design of the media met the needs of science learning [10]. Kurniawan also conducted a similar study using quartet cards for material on the classification of living things at the junior high school level, with a validation rate from subject matter experts reaching 95%, media experts 94%, and validation from teachers exceeding 96%, indicating that this media is very suitable for use in the classroom [11]. Isnania proved that quartet cards certified by subject matter and media experts were able to improve the quality of science learning, especially in relation to better conceptual understanding and the role of teacher instruction [12]. Research conducted by Puspitasari on quartet cards related to acid and base lessons at the junior high school level shows that the assessments of

subject matter experts, media experts, and teachers were all in the "highly valid" category with scores of more than 95% [13].

Based on the previous information, it can be concluded that the major challenges in the learning process of organism classification are the low academic performance of students and the limited learning tools. Innovations that are relevant to the needs of junior high school students are very important. Therefore, the proposed solution is the development of a Bioma IPA quartet card game that has been validated by three validators, so that it meets the necessary criteria. This study is expected to not only produce valid learning media but also serve as a guide for teachers to create more interesting and interactive science learning. As a recommendation, the media development process should involve several validators in each aspect to improve the objectivity of the results. Finally, it is hoped that this study can contribute to the development of science learning media, particularly regarding material on the classification of living things for seventh-grade junior high school students.

2 Method

This study applied the Research and Development method with the 4-D model (Determine, Design, Develop, Disseminate), but only up to the Develop stage because this study focused on media validation [14]. The subject of this study was an educational tool in the form of Bioma IPA quartet cards, which were used to teach material on the classification of living things to seventh-grade junior high school students.

2.1 Type and Design of Research

The type of research is development research, which aims to create learning media with a high level of validity. The development model to be applied is the 4-D model, which consists of several steps. The first step is Define, where an analysis of the needs of students and teachers, as well as the characteristics of the material on the classification of living things, is carried out. The next step is Design, which is to design a prototype of the Bioma quartet cards based on the results of the needs analysis and relevant theories. The third step is Develop, in which the media will be reviewed by three validators, namely subject matter experts, media experts, and science teachers to evaluate the accuracy of the media's use. The Disseminate step was not carried out because this research only lasted until the validation stage. The research subjects who acted as validators in this study consisted of three individuals, namely: Subject Matter Experts, who were lecturers in the field of science, tasked with assessing the accuracy, completeness, and suitability of the material with the curriculum. Media Experts, who were lecturers in the field of learning media, tasked with evaluating the visual display elements, use of language, graphics, and ease of use of the media. In addition, there was a science teacher at the junior high school level who was responsible for assessing the practicality, suitability for classroom conditions, and the extent to which the media could be integrated with learning objectives.

The research instrument consists of a validation sheet for the biome quartet card learning media. This instrument is submitted to lecturers who focus on science to evaluate the content contained in the Biome quartet card media. The aim is to ensure that the material provided is in line with the curriculum and to prevent

misunderstanding among students. Aspects and Indicators: Content Suitability → alignment of material with Learning Outcomes and Learning Objectives, accuracy of concepts, comprehensive explanations, and accuracy of current information. Language → appropriate use of terminology, clarity of sentences, and suitability for the cognitive development level of junior high school students. Presentation of Material → structured, concise, logical delivery, and supplemented with supporting illustrations. Suitability for Students → level of difficulty appropriate for students' abilities, as well as relevance to everyday life.

Media Expert Validation Instrument (Design) This tool is submitted to teachers who are experts in learning media to evaluate the design and appearance of quartet cards. The goal is for the media to be visually appealing, easy to use, and able to attract the attention of students. Aspects and Indicators: Visual Appearance → combination of colors, arrangement of images and text with the right proportions. Readability → font size, font type, and clarity of writing. Graphics → consistency in layout, illustrations/images relevant to the content, and aesthetic design. Instructions for Use → clarity in the rules or how to play the game. Media Appeal → whether the media can increase student motivation to learn.

Educator Validation Instrument (Science Teachers) This tool is intended for science teachers at the junior high school level to evaluate the suitability of media for the classroom and students. The aim is to ensure that the media can actually be used in the real learning process. Aspects and Indicators: Suitability for Students → the media must be appropriate for the cognitive characteristics, interests, and needs of junior high school students. Practicality of Use → must be easy to operate in the classroom and not require complicated additional tools. Language → the language used must be straightforward, communicative, and not difficult for students to understand. Learning Relevance → supports the achievement of science learning targets. Integration with Teacher Methods → must be in line with the learning strategies commonly used by teachers.

Evaluation Scale for Three Tools. Each indicator point uses a Likert scale of 1–4, where 4 indicates the Very Suitable category, 3 indicates the Suitable category, 2 indicates the Less Suitable category, and 1 indicates the Not Suitable category.

Interpretation of Average Scores. Scores ranging from 3.26 to 4.00 indicate the Very Suitable category, 2.52 to 3.25 indicate the Suitable category, 1.76 to 2.50 indicate the Less Suitable category, and 1.00 to 1.75 indicate the Not Suitable category.

Data collection used several methods, one of which was interviews. The interviews aimed to gather information directly from science teachers about the learning conditions in the classroom, especially the difficulties experienced by students in studying material on the classification of living things and the lack of use of learning media during lessons. Through interviews, researchers can learn about teachers' experiences and opinions regarding the need for more innovative learning media, thereby obtaining a clearer picture as a basis for media development [15]. The second technique is documentation, which involves collecting data such as teaching modules and teaching materials, as well as student learning outcomes in the subject of classification of living things. This documentation aims to reinforce the evidence that the average student score has not met the minimum passing grade, thus requiring media that can help improve their understanding [16]. The third technique is expert validation,

which involves providing a validation sheet to three validators. Subject matter experts check whether the content is suitable for use, whether the concepts presented are appropriate, and whether they are in line with the curriculum. Media experts assess the visual appearance, whether it is easy to read, and whether it is interesting. Meanwhile, science teachers assess how practical the media is for use in the classroom learning process. The purpose of this validation is to ensure that the learning media is appropriate in terms of content, design, and suitability for learning needs [17]. In addition, the data collection technique also involves notes from validators in the form of suggestions and comments. This qualitative data is obtained from input written by validators after conducting their assessments. These notes are very important because they form the basis for improving and refining the Biome quartet card media to better suit the needs of students and teachers. Thus, in this study, data collection does not only focus on the validation results, but also on input that can improve the quality of the media on an ongoing basis [14].

2.2 Data Analysis Techniques

The data obtained from the validation sheets will be analyzed using quantitative descriptive techniques:

Quantitative Analysis (Validation Score). Each score is calculated using a percentage formula:

$$P = \frac{\sum \text{Skor yang diperoleh}}{\sum \text{Skor maksimum}} \times 100\% \quad (1)$$

Arikontum said that the percentage results were then categorized based on the following criteria [16]:

81% to 100% is the Very Eligible Category

61% to 80% is the Suitable Category

41% to 60% is the Less Eligible Category

21% to 40% is the Not Suitable Category

Qualitative Analysis (Validator Comments). Data consisting of recommendations and feedback from validators was analyzed descriptively. The results of this analysis were used to improve the media so that it would be more suitable for classroom learning, making it more enjoyable and active.

3 Results and Discussion

3.1 Results

The results of the evaluation of the Biome Quartet Card Media show that the assessment by subject matter experts obtained a total score of 57 out of a maximum score of 60, with an average of 3.8 and an accumulated percentage of 95%. This finding shows that the material in the Biome quartet card media is considered to be in accordance with the basic competencies in science, conceptually accurate, and uses straightforward language that is not difficult to understand. Furthermore, the content of the material is considered relevant to the daily lives of junior high school students, thus helping to

improve their understanding of the classification of living things. Therefore, subject matter experts consider this media very suitable for use.

Meanwhile, validation by media experts received a total score of 35 out of a maximum of 40, with an average of 3.5 and an accumulated percentage of 87.5%. These results indicate that the media display is visually impressive, thanks to the combination of colors, design, and appropriate font choices. The images and illustrations used are considered appropriate for the content presented and add to the appeal of the media. In addition, the instructions for using the media are considered clear and easy to understand, making this media practical for use in learning activities. Thus, media experts conclude that the Biome quartet cards are classified as highly suitable for implementation.

On the other hand, the assessment from educators (science teachers) received a total score of 46 out of a maximum of 52, with an average of 3.5 and an accumulated percentage of 88.5%. Science teachers assessed that this media is suitable for junior high school students, easy to understand, and practical to apply in the classroom. The language used is simple and communicative, so that students do not find it difficult to understand the material. This media is also considered to be in line with the objectives of science learning and is able to support teaching methods commonly used by teachers. Based on these findings, science teachers consider the Bioma quartet card media to be very feasible.

Overall, the evaluation results from the three evaluators indicate that the Biome quartet card learning tool is very suitable for use as a learning tool for Natural Sciences on the topic of classification of living things in the seventh grade of junior high school.

Table 1. Validation Results Summary Table

Validator		Total Score	Maximum Score	Percentage	Feasibility Category
Subject Matter Expert		57	60	95	Highly Eligible
Media Expert		35	40	87.5	Highly Suitable
Educator (Teacher)		46	52	88.5	Very suitable

3.2 Discussion

The evaluation results from subject matter experts yielded an overall score of 57 with an average of 3.8, equivalent to 95%. This score is categorized as highly acceptable. Experts in educational evaluation argue that an instrument or product is considered valid if its score exceeds 81 percent, as this value indicates that the content presented is on target, the scope of the concepts is sufficient, and the language used is clear and easy to understand. With these findings, it can be concluded that the designed biome quartet cards have met the criteria for accuracy in the classification of life. In addition, Sugiyono emphasized the importance of validation by subject matter experts to ensure that the content of the media has a sound scientific basis and is in line with the curriculum. Therefore, a score of 95% indicates that the cards are suitable for use as supporting media in the science learning process for seventh grade, as they are able to convey the material accurately and in accordance with the basic competencies that must be met. There were also inputs and recommendations from subject matter experts regarding the need for improvements in the selection of terms, especially foreign terms

that are still mixed with Indonesian. The validators emphasized that the selection of terms must be in accordance with good and correct linguistic rules so that they are easier for junior high school students to understand. This recommendation is important because the use of appropriate language will reduce the risk of misunderstanding, in line with Sugiyono's opinion that learning media must not only be valid in terms of content but also communicative for its users [14].

In terms of media, the score achieved was 35 with an average result of 3.5, which is equivalent to an accumulated percentage of 87.5%. This result also falls into the excellent category. Media experts assessed the visual appearance, clarity of instructions, and readability of the content. Mayer argues that effective design greatly influences how students receive information. Media that integrates text and images with good principles will help students understand the material more quickly. In line with this, Prastowo emphasizes that effective learning media must combine aesthetic elements, usability, and readability [18]. Arsyad reveals that attractive media presentations can encourage students to be more active in learning from start to finish, which prevents them from getting bored easily [19].

With a score of 87.5%, it can be said that the biome quartet cards meet the standards described by experts. The colors, text size, and illustrations used are proportionate, and the game rules are simple and easy to understand. This shows that the media is not only valid in terms of content, but also attractive and appropriate in terms of design. Input and recommendations from media experts indicate that the visual appearance is quite attractive, but it would be better if the images were enlarged to make them clearer. In addition, experts recommend adding information through barcode scanning, so that students can access more detailed explanations or additional information digitally. This recommendation is in line with advances in digital learning media that emphasize the combination of visuals and technology to enhance the learning experience for students.

The results of the validation conducted by educators showed a score of 46 with an average of 3.5, equivalent to 88.5%. This score falls into the highly acceptable category. As the primary users, teachers' views certainly carry significant weight. Rusman argued that a good learning tool should be easy for teachers to operate and not require complex technical skills. In addition, Widyastuti explained that teachers' acceptance of certain media is greatly influenced by the tangible benefits that can be felt in the classroom, for example, whether the media is able to increase interaction between students and support the achievement of learning objectives [20].

Based on the assessment of 88.5% of teachers, it is clear that the biome quartet cards are considered practical and relevant to the situation in junior high school classrooms. The rules used are quite simple, the number of cards is adjusted to the needs of the discussion, and the language used is appropriate for the students' abilities. In other words, this media is not only valid in theory but has also been proven effective in the learning process. Feedback and recommendations from teachers acting as validators indicate that this media has met the needs of schools and can be directly applied in learning activities. Teachers also emphasized that the existence of LKPD as a supporting media is very useful in helping students follow learning activities more regularly. With the accompanying LKPD, this media is considered more comprehensive because it combines material, activities, and evaluation into a single learning unit.

Based on the assessments of the three validators, the Biome Quartet Cards media showed very satisfactory results in terms of content, design, and implementation in the classroom. The subject matter experts highlighted the importance of improving the

language to make it easier to understand, the media experts suggested improving the visual elements and adding QR codes, while the teachers considered this media to be practical, suitable for the school's needs, and more complete thanks to the LKPD. Thus, it can be concluded that this media is not only valid in terms of substance and appearance, but also highly relevant for use in schools as a teaching aid for the classification of living things.

4 Conclusion

The results of the study show that the Biome Quartet Cards learning media related to the classification of organisms for seventh grade junior high school students is very feasible. Evaluation by subject matter experts recorded an average score of 3.8 (95%), with a note on the need to adjust the terminology to conform to Indonesian grammar. The assessment by media experts achieved an average score of 3.5 (87.5%), with suggestions to enlarge the size of the cards and add information using barcode scanning so that students can access more varied information. Meanwhile, the evaluation by teachers as educators recorded an average score of 3.5 (88.5%), stating that this media already meets learning needs in schools and can be used immediately, especially since there is a complete addition of supporting student worksheets. Overall, the Biome Quartet Cards have met the eligibility criteria in terms of content, design, and classroom application. This media is an exciting learning alternative that encourages students to understand the concept of organism classification more easily and interactively.

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