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Flipbook food chain in an ecosystem to improve learning outcomes in elementary school

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Abstract

The lack of ability of teachers to develop technology-based learning media and low interaction with learning tasks negatively affect students' learning outcomes. The study aims to determine the feasibility and effectiveness of a web-based Fiborampae (Flip Book Food Chain in Ecosystems) course on IPAS material. The research method used is the RnD model Borg and Gall which consists of several stages, namely: potential and problems; data collection; product design; design validation; design revision; product trials; product revision; trial use in which the data collection methods include questionnaires and test. Based on the validation team's assessment, Fiborampae media is included in the most appropriate category, which is also a finding in this research. The evaluation results for the content were 93%, and the media factor was 90.8%. The results of the N-Gain test on the pre-and post-test values showed a mean difference of 0.739 under a moderate criterion and an effectiveness value of 73.95 under a highly effective definition. Meanwhile, the reference category reached a value of 0.425 under moderate criteria and had an efficiency of 42.35 under the low-efficiency definition. The interpretation of the data shows that classrooms using Fiborampae media achieve higher learning outcomes with more effective standards. The implications of this research are expected to apply this medium to simpler devices with a simple and attractive appearance that can be used in various teaching situations and support character development within the new curriculum.

INTRODUCTION

Background of the Study

As an alternative curriculum, the Merdeka curriculum bridges the learning gap during the pandemic and provides the freedom of "independent learning". During implementation, teachers and school leaders prepare the learning process and implement a curriculum that considers students' needs and capabilities. (Alimuddin, 2023); (Andari, 2022). (Ardianti & Amalia, 2022) It stated that this curriculum change encourages changes in curriculum paradigms, learning developments, and innovations in increasingly diverse media and learning methods.

Choosing the right teaching tool is one of the ways to bring innovation and creativity into the world of education. An instructional medium is a tool, medium, instrument, or connector used to convey a message or idea that captures students' emotions, thoughts, attention, and interest in learning. (Febriarti, 2021; Rahayu et al., 2021).

The food chain is one of the science teaching materials for 5th-grade primary school students and is included in the 5th-grade science book, Chapter 2, Food and Nutrition, Ecosystem Harmony. Food chain content is incorporated into the learning outcome in which students consider how interactions between biotic and abiotic components affect the stability of ecosystems in the environment (Muttaqiin et al., 2019a). The learning outcome achieved in this lesson is for students to explore how interdependencies between living and non-living components affect the stability of ecosystems within the environment (Ardianti & Amalia, 2022). Learning objectives for topic A: Students can describe the relationships between organisms related to nutrients in the form of food chains, determine how organisms change within the ecosystem, and explain the relationships between large organisms. Additionally, students can create a food chain diorama to demonstrate their understanding (Istyasiwi et al., 2021; Mursidi et al., 2022; Pradipta et al., 2022).

Innovative learning models are learning strategies that can foster creative thinking in students. Innovative learning models cannot be separated from constructivism in learning (Handayani, 2022; Ummah et al., 2019). This constructivist understanding teaches students to discover things themselves and grapple with ideas. One learning model that is suitable for this is the Project Based Learning Model (PjBL).

Learning processes can be implemented and developed by considering students' intellectual potential and different intellectual abilities. All students are

different in terms of intelligence. Some people have only one intelligence, while others have two or more primary intelligence (Davis et al., 2017; Novita Rupa Lobemato et al., 2022). Various bits of intelligence can be trained in the food chain material, such as naturalist intelligence in the subject matter, interpersonal and intrapersonal intelligence in optimizing problem-solving abilities and delivering solutions, and other intelligence that can be developed according to the food chain material (Rahmah et al., 2023).

The Problem of The Study

The observation results showed that teachers needed to optimally utilize interactive learning media and the Project Learning model at state elementary school Bedug 01, state elementary school Pecabean 02, and Muhamadiyah Bedug Elementary School. Meanwhile, other schools have integrated learning media into learning activities, even though they are simple. Teachers mainly use textbooks and manuals provided by the state. Schools offer limited books, and many students use uncolored copies.

Teachers also strive to use teacher-centered in the learning process. Teacher-centered learning has a negative effect on students because they focus only on the teacher and are less engaged in learning. Such teaching is ineffective because the teaching aids are based solely on the teacher's explanations and textbooks. Therefore, students need to learn knowledge more effectively, which leads to a decrease in learning outcomes and an increase in students' intelligence.

The main objective for SD Negeri Bedug 01 Class V was that students' learning outcomes in science and multiple intelligences should be high in science and science subjects. Science and science results show that there are still many students with low KKTP (Learning Objectives Standards) scores, namely 70, as indicated by daily test results in the cognitive domain of students. Of 20 students, 16 (80%) have yet to pass the KKTP, and only 4 (20%) have passed. The same was found with students' multiple intelligences. Learning activities can be ideal for developing many skills acquired through observing continuous learning processes that reflect only natural intelligence, linguistics, and interpersonal communication.

Research's State of the Art

Previous research carried out by Septiaseh et al. (2022) developed research on using interactive learning media in food chain material. Research has shown that interactive learning tools can capture students' attention, make learning more

interactive, and make better use of study time, improving students' learning outcomes. Similar studies have been conducted to show that the use of web-based learning media is based on validation and trial results (Mukaromah et al., 2024; Mulder et al., 2023). The media gets a good response from students with a very high level of validity. Media can improve student learning outcomes by up to 30 percent with very effective criteria at a gain score of 0.73.

Discovering the influence of applying Multiple intelligences in the learning process is beneficial for students in growing their abilities both cognitively, affectively, and psychomotorically (Muttaqiin et al., 2019b; Wardani & Setiawan, 2016). The application of Multiple intelligences can also be developed in various teaching materials, media, and learning methods. Wardani & Sumarni (2023) pour Multiple intelligences into LKPD as a learning component and improve learning outcomes and students' multiple intelligences. Based on the problem description and previous research, the development of learning media that integrates Multiple intelligences needs to be pursued and applied to the process of learning activities in elementary schools.

Novelty, Research Gap, & Objective

The novelty of this research is Fibormapae on the food chain in ecosystem material for elementary school students that can be accessed on digital devices, cellphones, laptops, or tablets, so it can be used anywhere and media can improve learning outcomes and students' multiple intelligence in the food chain material of science and science subjects.

The type of flipbook media such as Fiborampae which specifically discusses the material is certainly a research gap in this study. Flipbooks are a medium that can help teachers present interactive learning. They can be developed to contain elements of Multiple Intelligences, including activity flow and food chain material. Multiple Intelligences that can be trained include natural, interpersonal, intrapersonal, spatial, kinesthetic, and musical intelligence.

The research aims to determine the feasibility and effectiveness of Web-based Fiborampae learning on IPAS content. The benefits of this research are the development of web-based Fiborampae learning media and the integration of multiple intelligences, The media is designed with Canva and integrated into the web, making it easy for teachers and students to access.

METHOD

Type and Design

This study uses Borg and Gall's developmental model. The Development model consists of several stages, namely: 1) potential and problems; 2) data collection; 3) product design; 4) design validation; 5) design revision; 6) product trials; 7) product revision; 8) trial use (Raihan et al., 2023).

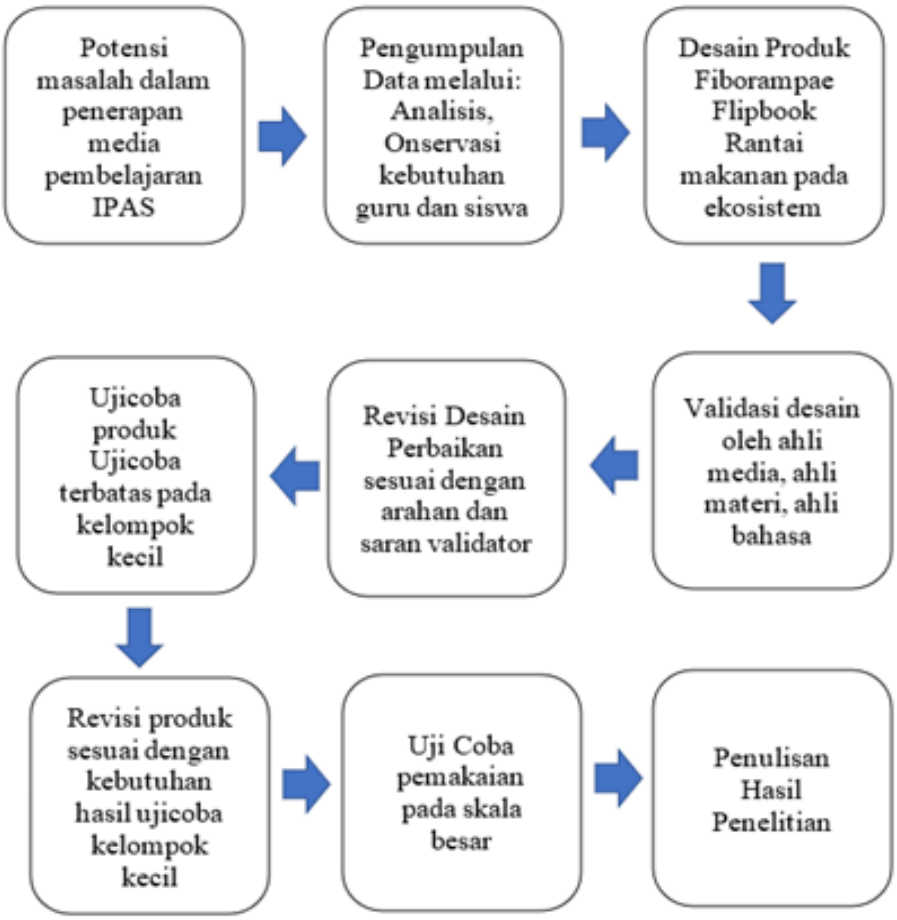

Figure 1. The Flow of Research Methods

Data and Data Sources

The collection of research data related to the development of Fiborampae learning media was done through direct observation in class 5 of SD Negeri Bedug 01. The observation showed poor science learning achievement of students, lack of development of learning media, and innovation in the use of learning media. The population of this study consisted of 40 students, including 20 from the VA class and 20 from the VB class.

Data Collection Technique

Data analysis techniques use questionnaire instruments to prove the results of media use and assess the suitability of the media, and test instruments to measure cognitive learning outcomes. The instruments used included a validation questionnaire for media suitability, which was assessed by two media development experts regarding appearance and material aspects. Then, a written test using a pre-test and post-test was given to 20 experimental class students and 20 control class students to measure the effectiveness of using media and documentation to strengthen data presentation.

RESULTS

The research and development of web-based Fiborampae learning media, which incorporates project-based learning, aimed to enhance creativity and learning outcomes in food chain content for fifth-grade science students. Key outcomes include 1) the design of the Fiborampae web-based learning media, 2) the feasibility evaluation of the Fiborampae web-based learning media, and 3) the assessment of learning outcomes and creativity in fifth-grade science students using the Fiborampae web-based learning media.

Potential Problems and Data Collection

The observation results showed that teachers needed to optimally utilize interactive learning media and the Project Learning model at state elementary school Bedug 01, state elementary schoolPecabean 02, and Muhamadiyah Bedug Elementary School. Meanwhile, other schools have integrated learning media into learning activities, even though they are simple. Teachers mainly use textbooks and manuals provided by the state. Schools offer limited books, and many students use uncolored copies.

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Product Design

Fiborampae is a web-based learning media that uses electronic tools in the form of computers and gadgets. The Fiborampae web media creation was created using Canva as the initial design. The character designs, appearances, backgrounds, colors, and other small objects are developed using Canva in the early stages of the multimedia production. We provide high-resolution images with original designs. The next step is to deploy the pages and content we have prepared. Once everything is done, the result of the media creation is uploaded to the site. Below is the development result of Fiborampae web media:

Figure 2. Cover

Figure 3. Instructions

Figure 4. Materials

Figure 5. Quis

Figure 6. Let's Try Session **Figure 7.** Author Profile

To access Fiborampae web media, you can use a computer, mobile phone, or tablet by opening an existing browser such as Safari, Google Chrome, or Firefox. We recommend that you access this media from a computer for easy access. However, if you are using a mobile phone or tablet, we recommend using landscape mode so that the menus and displays appear clear and easy to read. The user can then type https://heyzine.com/flip-book/9bbc4f3562 html at the top of the browser. When you open the multimedia, you will be taken to a home page that contains information about the Fiborampae web media.

The Web version of Fiborampae Media Validation helps researchers validate the products intended for use in school educational activities. The technical and economic assessment will be carried out by an expert group consisting of material scientists and media experts. In addition to feasibility studies, the evaluation team also provides data to help researchers improve the products they develop.

Design Validation

The quality of the material in the web-based Fiborampae media developed is known through expert testing and validation. The validation aims to determine the suitability of ecosystem and food web material according to students' needs.

The feasibility of developing web-based Fiborampae learning media can be seen from experts' testing and validation. The validation is useful for determining the suitability of the media needed for students.

Table 1. Validity Result

Assessment Validation	Media percentage	Material Percentage	Category
Expert Validation 1	93,2%	96%	Very suitable
Expert Validation 2	88,4%	90%	Very suitable
Average	90.8%	93%	Very suitable

Based on the description in Table 1, the feasibility of the web-based Fiborampae media (flipbook of food chain in ecosystems) obtained an average score from both validators in the media aspect of 90.8% and the material aspect of 93%. The web-based Fiborampae media (flipbook of the food chain in ecosystems) can be valid and suitable for use in the learning process

Design Revision

After validation, the media expert is revised according to the suggestions given on the material aspect. The validator suggests adding elements to the ecosystem components and media evaluation. Then, the expert media validator gives suggestions on appearance, color selection, and font size to adjust the format according to the child's developmental age. The results of the revision are presented in the following figure.

Figure7. Revision Media Flipbook of The Food Chain in Ecosystems

Trial Use

The media effectiveness test was carried out in the experimental class and control class to compare the increase in learning outcomes after using the web-based Fiborampae media. A pretest was carried out before use, and a posttest was carried

out after implementation. The results of the normality test on the data taken are shown in the following table.

Table 2. Normality Test

Class	N	Sig	Category
Experiment class	20	0.57	Normal
Controll Class	20	0.192	Normal

The results of the Normality Test on the experimental class and control class data obtained scores of 0.057 and 0.192. Data is said to be normal if the sig value is > 0.05, so it can be concluded that the experimental and control class data are normal. After the data is declared Normal, the Ngain test continues.

Table 3. N-Gain Test

Experimental Class N-Gain Test

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
n-gain	20	.64	.88	.7396	.05627
n-gain_persen	20	64.29	88.00	73.9592	5.62690
Valid N (listwise)	20				

Control Class N-Gain Test

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
n-gain	20	.38	.47	.4254	.02340
n-gain_persen	20	37.50	47.17	42.5371	2.34037
Valid N (listwise)	20				

The results of the Ngain test in the experimental class obtained a score of 0.739 with medium criteria and an effectiveness level of 73.95 with a very effective interpretation. Meanwhile, the control class obtained a score of 0.425 with medium criteria and effectiveness level. 42.35 in the interpretation of being less effective.

In addition to the cognitive learning outcomes in the experimental class, the practice of making food chain dioramas was also given to train students' creativity. The observations show that students' creativity is experiencing development, and they can compose and design dioramas according to the food chain theme. The results of the student's work can be seen in the following table:

Figure 7. Student Work Results in Making Dioramas

DISCUSSIONS

Web-based Fiborampae media has been developed to understand: (1) Product Design. (2) Feasibility of web-based Fiborampae media. (3) The effectiveness of web-based Fiborampae media. The web-based Fiborampae media was designed using the Canva platform. During the development stage, various design elements such as character designs, cover appearance, colors, and additional visual components were created in Canva. The initial design outputs were in the form of high-resolution images. Once the design process was completed, the resulting designs were integrated into a web-based flipbook format to facilitate student access and learning. According to research conducted by Sinta *et al*., (2021), the development of educational media can enhance the learning process and improve student learning outcomes. The flipbook format was selected for its user-friendly nature, allowing students to engage with the learning materials and achieve better learning outcomes.

The web-based Fiborampae media was assessed based on the results of expert validation from the validator team. (Hanifah, 2024; Rahayu et al., 2021; Setiadi et al., 2021). The feasibility study of the validation team aims to measure the feasibility

of developing a web-based Fiborampae for grade V food chain materials as a learning environment for social sciences and to provide information and recommendations for media development. Based on the validation results obtained by the validation expert team, the overall assessment, which was used as a percentage during the media aspect test, was 90.8%. In contrast, the material aspect was 93%, indicating that the web version of Fiborampae is very suitable for use as a learning environment. According to the study. (Gravel et al., 2013; Nugroho, 2020)

According to the report, the average pre- and post-test score for the experimental class was 28.3, and for the control class, it was 20.0, with significant values of 0.00<0.05, indicating an increase in the mean of 28. In the experimental class, the % was associated with higher academic performance. It shows that the web media Fiborampae is an effective learning tool. The improvement of student learning outcomes through the use of the web media Fiborampe is consistent with several previous studies showing that using a learning media flipbook improves student learning outcomes.

Supporting research has been conducted by Darmayanti & Surya Abadi, (2021) according to the research results, based on expert evaluation of teaching materials, learning media development reaches 90.00%, and expert evaluation in learning design reaches 92.00%. And they received a rating of over 95.00 from learning media experts. The personal exam result was 92.00%. The study concluded that the online learning medium for Virtual Comic falls into the "very good" category and is suitable for learning Indonesian language content, main ideas, and supporting ideas. This study aims to help teachers use the online learning media 'virtual comics' as a teaching tool to increase students' interest in learning.

CONCLUSION

This study uses Research and Development (RnD). The product developed in this research is Fiborampae Media, which is based on web development using Canva and can be converted into a web flipbook. Development goes through the Borg and Gall stages: potential and problems, data collection, product design, design validation, design revision, product trials, product revision, trial use. The result of the research indicates that the Fiborampae web medium is valid and effectively used as a teaching material and medium.

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