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Smart Box Media Development for Teaching Food Chains and Webs in Grade 5

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Abstract. Challenges in delivering instructional materials—particularly on the topics of food chains and webs in science—and limited media variation, as well as low participation and activity among fifth-grade students at SDN X Semarang City, motivated this research. The study focuses on developing the "Doraemon Smart Box," an innovative learning medium tailored to food chain and web concepts in science subjects. This research aims to enhance student participation, offer a more diverse range of educational tools, and facilitate conceptual understanding, creativity, and active engagement in the learning process. The research adopts the Research and Development (RnD) methodology, utilizing the ADDIE development model, which comprises analysis, design, development, implementation, and evaluation stages. Validity tests demonstrated excellent feasibility, with material experts awarding a score of 97.33% and media experts 94.66%. The material is presented in a clear, systematic manner, with new concepts delivered engagingly through visually appealing features, high-quality images, balanced color composition, and user-friendly operation—all contributing to increased student interest and motivation. Feedback from teacher and student response questionnaires further supports the effectiveness of the media, with scores of 100% and 88.5% respectively, both classified as very good.

Keywords: Doraemon; Food Chain; Food Web; Media; Smart Box.

1. Introduction

Education is now crucial for everyone, as it can transform a person's life from now to the future. Education aims to develop and utilize the various potentials and abilities of each individual in society, thereby improving their future lives (Yayuk et al., 2025). Education is not only a future goal but also a lifelong benefit, meaning that when someone pursues education, the potential they develop will benefit them throughout their lives. Furthermore, education is an effort to realize students' potential and benefit them throughout their lives. Therefore, education is designed to develop physical and mental potential (Samsul et al., 2024).

Education in Indonesia currently adopts a curriculum called the Independent Curriculum. The independent curriculum offers a variety of intracurricular learning to optimize student learning and foster ideas for developing natural talents. Teachers are free to choose appropriate teaching materials for their students, tailored to each individual's learning needs and interests. Therefore, teachers, as class leaders, can create appropriate learning tools for their classes (Kemendikbudristek, 2022, cited in Faridahtul et al., 2022). The independent curriculum, on the other hand, is a learning design that provides students with the opportunity to learn in a calm, relaxed, enjoyable, and pressure-free manner, allowing them to demonstrate their potential (Nara et al., 2024). This allows students to express themselves freely through a calm, relaxed, and enjoyable learning environment, utilizing a variety of teaching materials. One such teaching material is Natural Sciences (IPAS), which combines natural sciences and social sciences. The Independent Curriculum combines Natural Sciences (IPA) and Social Sciences (IPS) into Natural and Social Sciences (IPAS) in elementary schools (Purnawanto, 2022 in Nara et al., 2024). This integration is based on the consideration that students at the elementary school level tend to see things as a whole and integrated. Furthermore, they are still in the concrete/simple, holistic, and comprehensive thinking stage (seeing things as a whole, not yet breaking them down into smaller parts). The implementation of the Independent Curriculum

brings science learning at the elementary school level can be a positive contribution in building students' skills, developing enthusiasm and curiosity, and can connect classroom learning with the context of students' daily lives (Rahmania and Fuad, 2023). Meanwhile, science-based learning in elementary schools is an approach that facilitates students in developing a holistic understanding of the world around them. This approach combines natural science and social science as an integrated part of the educational curriculum (Asti and Nana, 2024).

To understand real things, which can be seen, touched, or experienced directly, concrete learning media are needed. Concrete learning media can help students more easily understand material that is generally abstract. The use of concrete learning media, such as real objects, leads to increased student activeness in learning, curiosity, and creates enthusiasm for the material being taught (Puji and Fajritarul, 2023). Elementary school children's age, based on Piaget's cognitive development theory, is at the concrete operational stage, which is considered relevant or appropriate for the need to use concrete media in learning activities (Nainggolan & Daeli, 2021 in Vindy et al., 2023). Based on the results of pre-research in grade V of SDN X Semarang City, problems were found including the lack of use of more diverse and innovative learning media and limited learning resources. In addition, students experienced learning difficulties in Science subjects, particularly the material "Food Chains and Food Webs," because teachers had never used innovative learning media in this material. Therefore, innovative learning media are needed to increase student enthusiasm in learning and understanding the material.

1.1. Problem Statement

Learning media are used to facilitate and create an effective classroom learning environment. Learning materials sometimes contain abstract or unclear concepts, which can be clarified using concrete media as a channel or delivery tool. One benefit of learning media is clarifying abstract concepts. This abstract material can be explained or simplified through learning media. These media can facilitate the learning process, which is one of the keys to creating effective learning conditions (Nengsih et al., 2021 in Rijal et al., 2024). Learning using media certainly makes students more interested and pay more attention to the material during the teaching and learning process, creating a conducive and effective learning environment for students in the classroom. The use of concrete learning media can attract students to actively participate in the learning process, making it easier for them to understand the concepts presented during the delivery of the material. The use of concrete learning media can play a very important role in increasing student interest or enthusiasm for learning and can easily assist teachers in explaining learning materials so that students can more easily accept the content discussed (Yanuar et al., 2023).

In the learning process, teachers experience difficulties in creating innovative learning media for each material taught, so teachers use media that are easily available in the form of images or learning videos from the internet. This causes students to feel bored, not paying attention to learning, and engaging in other activities that do not support the learning process due to a lack of interest in the material being taught. Many students do not focus on the material presented by the teacher during class, students also have difficulty expressing ideas and opinions. Sometimes teachers also use learning media in the form of videos from YouTube or PowerPoint media, but students remain less active and interactive during learning because learning activities only consist of observation. In fact, the use of concrete or real learning media makes students more active and participate because they are involved in the learning process (Yanuar et al., 2023).

Therefore, this research aims to create innovative learning media, increase media variety, and assist teachers in delivering materials. Innovative learning media are concrete media that can explain material more easily understood by students. In addition, innovative and concrete learning media can encourage students to actively participate in the learning process, which can later provide direct impressions and experiences using concrete media so that the material is more easily absorbed by students. One of these innovative and concrete media is the smart box media, which contains materials with full color delivery, images, even pop-up books and of course student participation during learning.

1.2. Related Research

This research was conducted by Ayu Sukaryanti, Murjainah, and Sylvia Lara Syaflin (2023) to develop smart box learning media on the subject of Diversity in Indonesia, especially traditional houses for fourth grade elementary school students, with the aim of producing learning media that is valid, practical, and has the potential to have an effect in supporting the learning process.

This research was conducted by Firli Maulidiana, Ludfi Arya Wardana, and Faridahtul Jannah (2024) to develop Smart Box media in learning about plants and energy in science subjects in grade IV of Public Elementary Schools with the aim of overcoming students' lack of understanding of certain concepts, especially science, and overcoming teachers' difficulties in delivering learning in classes with limited facilities.

This research was conducted by Mira Santika and Nourma Oktaviarini (2025) in developing Smart Box Games for Science Subjects about the Human Body Organ System for Grade V Elementary Schools with the aim of overcoming the low interest of students in learning Science subjects caused by the lack of variety of learning media used in schools.

Based on the three previous studies, there are several differences and novelties in this study. First, the media in the previous study can only be opened on one side and the learning material focuses on diversity in Indonesia, especially traditional houses, while the media in this study can be opened on all four sides so that all parts of the media can be seen, with learning material that focuses on food chains and food webs. Second, in the previous study, the development of Smart Box media in learning about plants and energy in fourth-grade science subjects did not explain the design, while this study developed media in fourth-grade science subjects on the Food Chain and Food Web material with a design that can be explained clearly with plywood material, so it is stronger and more durable. Third, the previous study developed Smart Box Games Smart Science Subjects on the Human Organ System Material for Grade V which studied human organs that only displayed images on the background of the media and images that were quite prominent in the overall part of the internal organ material, while this study integrates educational games in the form of activities to arrange food chains and food webs according to the material and is equipped with pop-up book techniques as visual examples, thus helping to improve student understanding.

1.3. Research Objectives

The purpose of this study is to develop and assess the feasibility of Doraemon-themed smart box learning media in Science, Food Chains and Food Webs subjects for grade V elementary schools. This media is designed to help students understand the relationship between living things in an ecosystem through activities of composing food chains and food webs as well as pop-up visualizations, so as to improve conceptual understanding, creativity, and active involvement of students in the learning process, and make it easier for teachers to deliver material contextually with more innovative media.

2. Theoretical Framework

2.1. Learning Media Theory

Learning media is crucial as a supporting tool in the teaching and learning process. In every educational activity, learning media must always accompany each learning process (Elsa et al., 2023). The crucial role of learning media is to present learning materials in a more detailed, clear, and engaging manner. Developing learning media has become one effort to improve the learning process, ultimately improving student learning outcomes.

The main function of learning media is to create conditions so that students can absorb new knowledge. based on accurate and in-depth teaching materials, develop cognitive capacity, and shape better student characteristics. In the teaching and learning process, teaching aids have been shown to play an important role in all stages of student learning, creating motivation and interest (Sahib et al., 2023).

Based on the opinion above, learning media is very useful and necessary in the learning process, which not only makes it easier for teachers to convey material information but also makes students more motivated and increases their interest in learning during the learning process, so that media must always be present in every learning process.

2.2. Smart Box Theory

Smart box is the meaning of the word box which means a rectangular storage container that can be opened by lifting, sliding, or moving the lid, with various materials ranging from cardboard to wood, and the word smart which means the ability that comes from the process and actions through several stages to learn something in a certain period of time until finally being able to understand what has been learned (Ayu et al., 2023). So, it can be interpreted that a smart box is a rectangular container that can be opened and contains information or knowledge in it to be studied until finally the information or knowledge can be understood.

One of the innovations in learning media is smart box media which can be interpreted as a teaching aid or box-shaped media, containing images and words used by teachers in delivering teaching materials to attract students' attention in learning (Mira and Nourma, 2025). In addition, there are games listed in smart box media with the aim of facilitating the learning process for students and allowing students to participate by playing or learning in class, which can train students to observe surrounding conditions such as observing and studying the conditions of various study groups who are discussing or can practice working on the questions given.

Based on the opinion above, learning media or teaching aids, smart boxes or smart boxes are media in the form of boxes or rectangles that contain information or knowledge that will be conveyed by teachers to students and can be filled according to material needs, as well as creativity in the form of pictures or words, and others with the aim that students can understand the material and be active in the learning process.

3. Method

3.1. Research Design

This study applies a Research and Development (R&D) approach. The R&D method chosen in this study aims to enable researchers to develop practical solutions to the limitations of the use of concrete learning media at SDN X Semarang City, with a coherently structured research approach to generate up-to-date knowledge, provide solutions to real and actual problems, and can develop or produce valuable products in the field of education (Arif et al., 2024). The development model used in this study is ADDIE, which includes the stages of analysis, design, development, implementation, and evaluation. The ADDIE research model is one of the development models that is widely and frequently used in development research because it is considered to provide structured or orderly stages in designing products used in learning (Cahyadi, 2019 in Fitri et al., 2023).

3.2. Participants

Participants in this study included one teacher and 26 fifth-grade students at SDN X, Semarang City (Table 1). Sampling used a census technique, where all members of the population were sampled. Table 1 shows Respondent characteristics show a sample consisting of a total of 26 fifth grade elementary school students, with 15 male students and 11 female students in the age range of 10–11 years. and one class teacher (male) was also involved in filling out a questionnaire about teacher needs and providing feedback on the learning media that would later be used in this study, to determine whether There are shortcomings in the teaching media used with smart box media and whether the media is suitable for use or not.

Table 1. Respondent Characteristics

Characteristics	Category	Age	Frequency	Percentage (%)
Gender	Male (student)	10-11	15	57.69
	Female (student i)	10-11	11	42.3
Gender	Male (teacher)	32	1	3.7

3.3. Data Collection

Data collection techniques in this study included the use of student and teacher needs questionnaires, validation questionnaires for media experts and material experts, interviews with class teachers and observations, questionnaires responding to learning media created by students and teachers, and documentation. Research data from class teacher interviews showed problems with the new curriculum, a lack of learning resources and learning media, students easily feel bored because the media is not diverse. From the results of observations, learning in the classroom showed problems with student activities in learning activities, students looked bored and busy doing activities that did not support the learning process. From the results of expert evaluations, the smart box media showed its high quality through clear content, attractive visuals, and appropriate language for students to increase contribution and practicality in the learning process. From the results of the teacher needs questionnaire showed difficulties in delivering material, especially about the science subject matter of webs and food chains, difficulties in selecting learning media, and using innovative media. From the results of the questionnaire, it is clear that students need the use of learning media that can foster enthusiasm for learning in class. More innovative learning media will make it easier for students to understand the material, and media such as media with lots of colors and images will be preferred.

This study involved one practicing teacher as an assessor who is the primary educator in terms of his or her own pedagogical and psychological understanding of students in the classroom used in the study, by involving one teacher who can adequately understand the quality characteristics and constraints of students in the study in a real way. Expert validation was carried out by material and media experts who have special expertise in the field of learning materials and media. The selection of material and media experts has met the research standards carried out because it focuses on quality and technical criticism in media use. Expert validity accountability is stronger with the combination of theoretical input from experts and practical input from practicing teachers in the field so that the results are more comprehensive, including the suitability of the material at the right time and ease of application in real learning activities.

3.4. Data Analysis

This development research uses qualitative and quantitative descriptive analysis. This research was conducted in class V of SDN X Semarang City, with pre-research data collection based on the results of interviews with class V teachers, classroom observations, filling out teacher needs questionnaires, and filling out student needs questionnaires which were used to collect initial data, find problem formulations and initial conditions of the research object to be implemented.

Then, data obtained from media validation questionnaires, material validation, as well as teacher and student response questionnaires were analyzed descriptively quantitatively to assess the feasibility of the media based on the scores obtained. The values obtained from the questionnaire research instrument were calculated using the Likert scale and Guttman scale as a guide, the results of which were used to identify the feasibility of the media design before being used in the study, as well as for teacher and student response questionnaires used to determine the response after using the Doraemon box media developed to determine whether the media was feasible or not.

3.5. Validity and Reliability

This study used a student response questionnaire as a data collection instrument. In accordance with the descriptive research design, data validity was not measured through empirical validity tests using statistical formulas, but rather through content validity by ensuring that each item in the questionnaire was structured based on indicators relevant to the research objective, namely to determine students' responses to the use of learning media that had been used during the study. In addition, the language and form of statements in the response questionnaire were adapted to the characteristics of elementary school students, making them easier for them to understand, so that the data obtained accurately described the conditions of student responses in reality and in accordance with the research conducted. Data validity checking techniques consist of data triangulation, one of which is method triangulation which is carried out by comparing information or data in different ways, such as researchers using interview, observation, and survey methods (Dedi et al., 2023).

The validity of the instrument was measured through expert assessment with field expertise that guaranteed the instrument's quality. Based on the assessment results, the data obtained from the material validator gave a score of 73 out of a maximum score of 75 or 97.33% with a very good category. This assessment includes the suitability of the questionnaire items with learning achievement indicators. Then, the media validator gave a score of 71 out of a maximum score of 75 resulting in a percentage of 94.66% with a "very good" category. This assessment includes aspects of reading activity and instrument stability in measuring student interest in the Smart Box design.

To ensure the accuracy of the data obtained after the research, the reliability of the questionnaire instrument was tested using Cronbach's Alpha. This reliability test aims to determine the level of data consistency between items in the student response questionnaire. According to Fakhri et al., 2023, the determination of the instrument reliability coefficient to calculate the dichotomous item score uses the KR-20 formula, and the interpretation of the reliability value is a relative interpretation, where there is no absolute limit to the minimum value that can be achieved by a measurement to be declared reliable.

KR 20 Reliability Test.

$$r11 = \left(\frac{k}{k-1}\right)\left(\frac{St2-\sum pq}{St2}\right)$$

Information:

r11 = overall test reliability.

p = proportion of subjects who answered the item correctly

q = proportion of subjects who answered the item incorrectly (q = 1–p)

k = number of items

St = standard deviation of test results

Based on the Likert scale in **Table 5,** the reliability test was conducted using the KR-20 formula. The results obtained are as follows from the student questionnaire responses.

Total Variance	2,586,154
KR-20	0.68266
Criteria	**Tall**

Based on the results obtained, the KR-20 coefficient value is 0.68266, which refers to the High category testing criteria, so that the instrument is declared reliable and consistent for use in collecting research data.

4. Findings

Learning Media This research takes the form of developing Doraemon smart box media using the Canva application and discussing content related to "food chains and food webs." This finding is implemented based on the ADDIE R&D research method, producing learning products.

4.1. Analysis

The researchers conducting this study began with pre-research activities at SDN X in grade 5, through observations, distribution of needs questionnaires to classroom teachers and students, and interviews with teachers. Findings from these activities include:

Classroom observations indicated that student participation remained limited, with most students primarily observing the teacher rather than engaging actively or interactively in lessons. Many students exhibited signs of disengagement, often attending to tasks unrelated to learning objectives. The instructional media utilized in the classroom consisted of LCD screens displaying YouTube videos or images.

Interview data from class teachers identified several challenges associated with the implementation of a new curriculum that merges science and social studies into a single science subject. Teachers reported difficulties in adapting to this change due to insufficient learning resources and inadequate instructional media. These limitations have contributed to student disengagement, as the existing media are perceived as lacking diversity and effectiveness. The inclusion of varied media formats, such as stickers for student activities, was noted as a potential improvement.

Table 2. Teacher Interviews

No	Question	Answer
1	How long have you been teaching 5th grade?	5 years
2	How many 5th grade students do you teach?	The total is 26 divided into 15 boys and 11 girls.
3	What curriculum only applies to SDN X?	Already using Independent Curriculum for everything.
4	Are there any problems that you often encounter in the learning process in grade 5?	1. About the new curriculum 2. Source study Still not enough 3. Lack of learning media
5	Does science learning in grade 5 also use the same curriculum?	Okay, that's it, then use the Independent Curriculum.
6	How is the learning process at SDN X?	Use independent curriculum, learning methods, learning time, and assessment.
7	All obstacles in the science process and science learning at SDN	Suboptimal use of learning media, or more specifically, lack of variation in learning.
8	How do you deal with it? Limit it?	Usually take advantage of the surrounding environment so that students don't get bored.
9	What methods are only applied in science learning at SDN X?	Lectures, discussions, Q&A, and presentations.

10	Do you change your study methods often?	No, because we more often use media that already exists or is available (digital era).
11	Are students' abilities in accordance with the expected indicators in face-to-face lessons at SDN X?	Evaluation results showed that over 50% of the participants met or were in accordance with the indicators. However, on average, many were still lacking and needed improvement.
12	Have you ever used Moment Teach learning media? If so, what kind of learning media do you typically use?	More widely used in the surrounding environment, word boards, videos using LCD projectors.
13	Do you know the media "Doraemon Box"?	Not yet
14	What do you think about the "Doraemon Box" media?	Interesting and worth a try
15	Do you recommend it? Using Doraemon Box as a solution to science learning problems at SDN X?	Highly recommended, as it looks very interesting.

From the interview results in Table 2, it is known that with the new curriculum, it is necessary to adapt learning resources, learning media, and student motivation towards various media, especially interactive media models, for student teaching activities in the learning process.

Table 3. Results of Teacher Needs Analysis

No	Aspect	Yes	NO
1.	Is the learning of "food chains and food webs" in accordance with the objective curriculum?	1	
2.	Have you ever experienced difficulties in conveying "food supply chains and food webs" to education participants?	1	
3.	Have you ever had difficulty choosing interesting learning media to educate participants?	1	
4.	Do you, sir/madam, use innovative learning media in the material "food chains and food webs"?		1
5.	Have you ever used concrete media?		1
6.	Do you support the use of modified concrete as a Doraemon Box for "food chain and food web materials"?	1	

(N = 1)

From the results of the questionnaire Table 3 shows the results of the teacher needs analysis, where the teacher needs indicate difficulties in delivering material specifically about science subject matter in the form of food webs and chains, difficulties in selecting learning media, and using innovative media.

Table 4. Results of Student Needs Analysis

NO	Aspect	Yes	No
1.	Learning Media Fosters Greater Enthusiasm for Learning	26	
2.	By using learning media, the material delivered by the teacher becomes easier to understand.	26	
3.	Concrete media has many colors, it will be preferred.	26	
4.	Concrete media has many animal images	26	
5.	Learning uses concrete learning media in the classroom.	26	

(N = 26)

From the results of the questionnaire Table 4 The results of the student needs analysis show that 26 students need to use learning media to increase enthusiasm in understanding the material and innovative media such as lots of colors and pictures.

4.2. Design

At this stage, the researcher designed a smart box learning media using the Canva application with learning materials about food webs and chains, including images, materials, media boxes, user instructions, pop-up books, and covers. Canva is a graphic design platform that can be used to meet teachers' needs in designing learning media. Furthermore, it functions as a learning media/multimedia produced to facilitate students and support technological needs (Nurhayati et al. 2022 in Elsa and Anwar, 2021).

The media box used measures 30 x 30 cm with a height of 41 cm and a roof covering measuring 32 x 32 cm made of plywood. According to Atikah et al., 2022, regarding the selection of strong materials Because the media aims to ensure that the media used is more durable, so it can be used repeatedly.

This box contains 5 parts, the first side contains the main material about "food chains and food webs", the second and fourth sides contain quizzes about food chains and food webs: the second side contains 14 food chain questions and 10 food web questions. The second side of the food chain quiz contains 3 marine ecosystems with 5 images, forests 5 images, and tundra 4 images. The third side contains two quiz answer pockets and a guide to using the media, this is shown in Figure 1 and Figure 2 contains the first, second, and fourth parts. Media equipped with variations in the form of interactive quizzes is expected to reduce boredom or increase activity in the learning process (Fitria et al., 2022). With the presence of quiz media that is also equipped with interactive materials, the media will appear more real and interesting than if it is only done by reading and working on questions in text form only.

The other side is a pop-up book containing material depicting the food chain in rice fields and rivers, presented in pop-up format. Pop-up books themselves are a form of media that can provide a sense of entertainment and enjoyment, and directly engage students when they open, view, and read the material (Desy, 2021, cited in Aisyah et al., 2024).

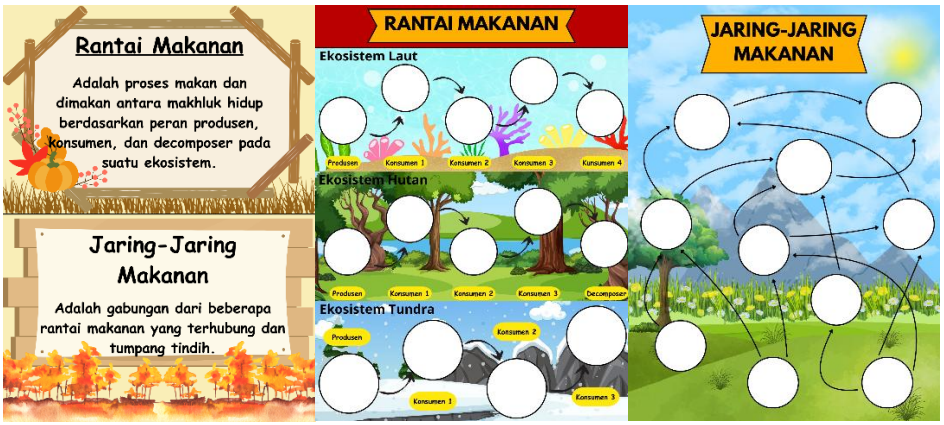

Figure 1. Media Smart Box

Figure 2. Quiz Answer Contents

4.3. Development

After designing the Doraemon-themed smart box learning media, the researchers conducted validation by material and media experts to test the feasibility of the media before using it in elementary school research using the Likert Scale as a score assessment in Table 5 with 5 score criteria. The Likert scale is used to measure the attitudes, opinions, and perceptions of individuals or groups of people regarding social conditions because this technique is considered effective in proving the effectiveness of the field or problem being discussed or researched and, with available respondents, can produce good research results (Desu and Rimsky, 2022).

Table 5. Criteria Assessment Scores

Score	Criteria
1	Not feasible
2	Less than worthy
3	Quite Decent
4	Worthy
5	Very Worthy

The total score is the sum obtained from each aspect assessed using the following formula calculation.

$$\text{Precentage value} = \frac{\text{Total score}}{\text{Maximum score}} \times 100\%$$

Table 6. Material Validation Instruments

NO.	Indicator	Score
1	Material compliance with CP and TP	5
2	Conformity of meaning in each vocabulary presented	5
3	Ease of understanding the material	5
4	All the information presented in media learning is clear.	5
5	The instructions for using the Doraemon Box media are very clear.	4
6	The order of the arrangement of the material presented	5
7	Completeness of information in the Doraemon Box media used	5
8	The language used in Doraemon Box media is easy to understand.	4
9	Compliance in using good and correct Indonesian language rules.	5
10	The sentences used are simple (easy to understand).	5
11	Effective and efficient use of language	5
12	Learning materials that use Doraemon box media can improve students' conceptual understanding.	5
13	The material in the media used can develop students' cognitive domain (knowledge).	5
14	The quality and sharpness of the images on the Doraemon Box media	5
15	Ease of understanding images on Doraemon Box media	5

Table 7. Media Validation Instrument

NO.	Rated aspect	Score
1	The appeal of Doraemon's box media	5
2	The sharpness of the images contained in the Doraemon Box media	5
3	Readability of writing contained in Doraemon Box media.	5
4	The image and text sizes are appropriate.	5
5	Accurate use of color in each image.	5
6	Suitability to students' abilities in using Doraemon Box media	4
7	The suitability of the image to the material being studied.	4
8	Suitability of media to the desired objectives	4
9	Ease of operation of Doraemon Box media	5
10	The order of the arrangement of the material presented	4
11	Doeraemon Box Media can increase students' attention.	5
12	Doraemon Box Media can contribute to creating meaningful learning.	5
13	Doraemon Box media is used practically in the learning process.	5

NO.	Rated aspect	Score
14	Doraemon Box Media is suitable for use during the learning process.	5
15	Doraemon Box Media can be used repeatedly.	5

Based on In Table 6 and Table 7, the validation instruments for the material and media used for the suitability and quality of the material content and the use of media with good results according to the score obtained by the experts. Meanwhile, in Table 8 shows the results of this expert validation through the assessment above with very good results.

Table 8. Expert Validation Results

Feasibility study	Total Score	Maximum Score	Percentage %	Criteria
Subject Matter Expert	73	75	97.33%	Very good
Media Expert	71	75	94.66%	Very good

4.4. Implementation

After obtaining satisfactory results, the researchers implemented the smart box media in schools, which showed high student participation in using the Doraemon smart box learning media. After implementation, the researchers distributed questionnaires to teachers and students to assess responses to the Doraemon smart box learning media.

Table 9. Teacher Response Questionnaire Instrument

NO.	Rated aspect	Score
1	Suitability of material with initial competencies	5
2	Clarity of meaning in every vocabulary delivered.	5
3	Clarity of learning objectives	5
4	Suitability of material to learning objectives	5
5	The material presented using Doraemon box media can help students' understanding in learning.	5
6	The material presented using Doraemon box media was able to attract students' attention.	5
7	The material presented using Doraemon box media is able to involve students in learning.	5
8	The sharpness of the image contained in the Doraemon media box	5
9	Readability of the writing contained in the Doraemon media box.	5
10	Accurate use of color in each image.	5

Based on Table 9, responses from teachers indicate that the Smart Box media has comprehensive advantages in terms of media that is considered very appropriate because the presentation of the material is consistent with the learning objectives, using simple language so that it is easy for students to understand. In addition, from visual aspects such as image sharpness and color accuracy, as well as features that are able to actively engage students and the use of media that can be done repeatedly, making this media aesthetically attractive and also effective in improving students' understanding of learning concepts. Table 10 presents the results of the questionnaire responses of teachers and students with the achievement of very good criteria.

Table 10. Results of the Teacher and Student Respondent Questionnaire

Response	Number of Respondents	Total Score	Maximum Score	Percentage (%)	Criteria
Teacher	1	50	50	100%	Very good
Student	26	231	260	88.5%	Very good

4.5. Evaluation

The evaluation phase is a step to ensure that every visual element, layout, and content developed is truly capable of addressing students' needs or concerns. Evaluation is conducted accurately to ensure final validation. This ensures that the media is not only aesthetically appealing but also effective in simplifying the presentation of the material, making it easier for students to understand.

5. Discussion

Discussion of the results of research that has been carried out with reference to the ADDIE development model on the Doraemon smart box learning media for science subjects on the material of food chains and food webs.

Based on pre-research findings regarding difficulties in delivering material, lack of media variety and participation and activities for less active students, appropriate learning media are needed to increase student participation, being diverse media, which have been created and used by students to focus learning, increase enthusiasm for learning in class, and will facilitate understanding of the material, as well as innovative media such as those with many colors and images will be preferred. With the design of the Canva application as an application to develop steps for creating learning media that really require the introduction of information from the content of learning materials that are known to be abstract, where the Canva application has provided many interesting features to make it easier for teachers to create learning media (Tri and Adam, 2022).

Figure 3. Pop-up Book

The media box measures 30 x 30 cm, 41 cm high, and the roof cover measures 32 x 32 cm to keep the contents maintained, a cover larger than the base is needed with plywood material, so that it is durable and strong but lighter to move. Materials derived from wood have stronger conditions and structures, are durable, easy to make, more affordable and safe for students to use, and wood materials are also often produced for use as learning media (Ine et al., 2023).

This box contains 5 parts in the form of main materials, the second and fourth sides contain quizzes attached with Velcro adhesive to attach the answers. The presence of interactive quizzes in the developed learning media can create students' desire to learn, but in developing creativity and innovation when creating interactive quizzes , it is necessary to pay attention to student development which can later create a fun learning situation in the classroom (Triatmaja et al., 2021 and Putri 2021 in Nico and Ika 2022). The base side contains material about the description of the food chain in rice fields and in rivers with a pop-up book display in Figure 3. Pop-up books themselves are media that can provide an impression of entertainment, fun, and make students immediately interested when they open, see, and read the material presented (Desy, 2021 in Aisyah et al., 2024).

The learning media product has been validated for material, obtaining a score of 97.33% in the "Very Adequate" category, with a note that the material needs further exploration, and the validation consisted of media experts and material experts (university lecturers). The media experts obtained a score of 94.66% in the "Very Adequate" category, without any notes. This indicates that the smart box media has high quality in terms of clear content, correct and appropriate language for students, material adds to students' knowledge, visual quality and is easy to understand, media use is appropriate for students in terms of material use and arrangement, increases student contribution, and repeated practical use. These results are in line with the definition of interactive media as media that allows users to interact and actively contribute to the material being studied through functions such as choices, exercises, simulations, and direct feedback, as well as interactive media as media that can provide opportunities for students to actively participate in the learning process through student-centered activities such as asking questions, discussing, and conducting experiments (Lika et al., 2023).

Figure 4. Doraemon Smart Box Media

This study involved 26 fifth-grade students as participants with learning tools from the teaching module, and at the stage of using learning media that implemented the smart box media in Figure 4 Doraemon smart box media. During the process of implementing the Doraemon smart box media, high enthusiasm and active participation from students were shown until the end of the learning process. Learning with media that includes games can foster interest in the subject, so that student learning participation towards the media used can be seen from positive responses to the learning experiences presented (Imarotun Nisa et al., and Wigati, 2019 in Yamaha et al., 2024). For example, students appeared more active, enthusiastic, and involved in learning. This involvement becomes a good cycle that can foster a sense of motivation and skills in solving problems and practicing the ideas that students have. Student responses and teacher responses to the media used indicate that this media is optimal, effective, and interesting, and can be a means of delivering material for teachers about food chains and webs more realistically. This finding supports the statement that the teaching and learning process will be effective if supported by good facilities, these facilities are in the form of teaching aids such as learning media, but if teachers cannot provide, select, and present effective media in the learning process, then the information or knowledge conveyed through learning media will not be well received by students (Hadi, 2017; Kurniawan, 2017 in St. Maizah

and Rinta, 2024). This has an impact on learning outcomes and student learning motivation in the classroom.

Overall, the use of Doraemon's smart box media has made a significant contribution to improving the quality and learning, especially in science. This media helps students understand food chains and webs in an interesting, relaxed, and interactive way, while supporting the implementation of the Independent Curriculum. The following is documentation of the implementation of the use of smart box media for food chains and webs. In contrast to previous studies that only showed potential effects that support the learning process from Ayu et al., 2023, learning about plants and energy in science for grade IV with the aim of overcoming students' lack of understanding of certain concepts (Firli et al., 2024), and human organ material related to low student interest (Mira et al., 2024).

Figure 5. Application of Learning Media

The results of the study show the suitability of the material to the learning objectives, the use of appropriate visual elements of good colors and images, systematic integration of material aspects, easy and interesting ways of use for students with interactive presentation of material, which has been proven to be able to increase attention, involvement, able to maintain concentration and motivation to learn actively in a meaningful learning process in the classroom, so that this media is worthy of use, the application of this learning media is carried out as in Figure 5 showing students involved in the application of the media. The benefits and needs of this media are very necessary in the learning process, which makes it easier for teachers to convey material information but also makes students more motivated and increases interest in learning during the learning process, so this media must always be present in every learning. As a supporting tool in the teaching and learning process, where in every educational activity learning media must always accompany every learning process (Elsa et al., 2023).

6. Conclusion

Based on the results of research and development of Doraemon-themed smart boxes that use strong and lightweight materials so that they can be used repeatedly, easy to move, and durable, as well as the use of visuals that are attractive to students and easy to use media. For the testing and development of Doraemon smart box media for fifth grade food chain and food web materials, it was declared "very feasible" to use, according to the results of assessments conducted by material experts (97.33%), media experts (94.66%) which were categorized as very feasible, and questionnaire responses from teachers produced a value (100%) and student responses (88.5%) which were categorized as very feasible, which can present material with simple and systematic language, and new concepts are presented more meaningfully and practically, have media visual features equipped with image sharpness, proportional color composition, and also ease of media operation so that it is proven to be able to increase attention, involvement, able to maintain concentration and motivation for active learning. Overall, the use of Doraemon smart box media has made a significant contribution in improving the quality and learning, especially in science, which can help

students understand food chains and webs in an interesting, relaxed and interactive way, while making it easier for teachers to deliver learning materials.

Limitations

The development of the Doraemon Smart Box media has several limitations that need to be acknowledged. First, the research was conducted in only one elementary school, so the results cannot be widely generalized. Second, the Doraemon Smart Box media was only used for science learning, specifically food chains and food webs in fifth grade. Third, the Doraemon Smart Box media has limitations in terms of storage. Fourth, the media is still concrete and has not been integrated with technology.

Recommendation

With this research, it is hoped that it can be used as reference and evaluation material for further research in developing teaching and learning products, such as facilitating teaching and learning activities, developing media that are integrated with concrete media or other materials other than the materials in this research not only at the elementary school level but also at various other levels, discussing more different materials and at various age levels, and can pay attention to the level of difficulty of students and classes in using large-sized media, as well as creating media related to new innovations in media such as technology for materials and further development of media research.

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Declaration on Generative AI and AI-Assisted Technologies

This manuscript was compiled with the help of Generative AI ChatGPT, Gemini, and Google Translator. AI was used to help refine words, select appropriate synonyms, and translate sentences. All intellectual contributions, critical analysis, and final revisions were made by the author. The author assumes full responsibility for the accuracy, originality, and integrity of the content presented in this work.

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