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Integrated Project-Based Learning (PjBL) Learning Tools STEM: Improving Students' Creative Thinking Skills

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ABSTRACT

Integrated STEM-based PjBL learning devices are a learning context designed by teachers to motivate students to take part in learning activities so they can boost their creative thinking skills and discover new ideas. The goal of this study was to examine a learning tool that combines STEM with Project-Based Learning. It looks at whether this tool is suitable, effective, and easy to use in order to help improve creative thinking skills of fourth-grade students of Santo Paulus Martubung Elementary School - Medan. This type of research uses the Research and Development (R&D) development model. The results of the study revealed that the devices developed had significantly improved students' creative thinking skills. The increase in creative thinking skills can be seen from the average n-gain score of 0.49 (moderate increase category). The learning devices developed on the 'Care for the Environment' material are effective in significantly improving students' scientific literacy. The increase in scientific literacy can be seen from the average score of 0.64 (moderate increase category) and increased interest in science and technology, active participation in discovery activities (practice and projects), and responsible management of natural resources and the the area around us after using a project-based learning tool along with a specific method.

KEYWORDS

Learning devices; PjBL; STEAM; creative thinking skills

INTRODUCTION

Permendiknas No. 24 of 2016 states that learning in elementary schools needs to be given to students so that they have curiosity, honesty, logic, criticality, creativity, and discipline (Depdiknas, 2016). Everyone has the ability to think creatively. 2013: 92) Being able to think creatively means a person can come up with new ideas or create things that are different from what has been made before (Noviyana, 2017: 69). Being able to think creatively is an important part of how we learn (Antika & Nawawi, 2017: 69). In simple words, we can say that being creative means a person can come up with new ideas when they think and learn.

The ability to think creatively can be developed through the Project-Based Learning (PjBL) learning model (Annisa et al. 2018: 52). The PjBL learning model is a learning model that uses projects in core activities (Furi et al. 2018: 104). In line with the above, it states that PjBL is a student-centered learning model and provides meaningful learning experiences to students (Afriana et al., 2016: 85). Students can learn by experiencing things or by understanding ideas based on the final results of what they created while

learning. One of the things created in education includes Science, Technology, Engineering, and Mathematics (STEM).

STEM is an approach that involves students in metacognitive activities (Afifah et al. 2019: 86). STEM is a field that is very connected to each other (Astuti, 2019: 68). The STEM integration program is a way of learning that brings together different subjects in STEM, which stands for Science, Technology, Engineering, and Mathematics. STEM is a way of teaching that helps teachers show students how science, technology, engineering, and math connect to everyday things. It helps students understand how these subjects work together in real life. STEM is a way of learning that combines science, technology, engineering, and math. It helps students see how these subjects connect to real life, jobs, and the world around them. So, learning STEM helps students be ready to join the new world (Listiana et al. 2019: 86).

STEM is important to be applied in 21st-century learning to provide learning experiences that can help students face new challenges. So in this case, the ability of students through an approach can encourage them to be positive in academics so that they are trained to think creatively as demanded by the 21st century (Han et al. 2016; Mu'minah & Aripin, 2019: 54). In line with the objectives of STEM, This helps students get ready for important science tests in high school and teaches them to use what they learn in real-life situations they encounter, especially in today's world. (Fikri et al.) 2019; Nuraziza & Suwarma, 2018: 104). Integrated STEM learning helps students think creatively and solve problems in today's world.

The steps in working with different methods can be explored, such as the STEM approach that uses Project-Based Learning (PjBL). (Afriana et al. 2016: 34) The STEM approach in PjBL is a way for students to learn by working on real projects. It helps them learn in a hands-on way by planning activities together, working as a team, and creating a finished product. 2017: 73) PjBL-STEM is a way of learning that focuses on projects and includes science, technology, engineering, and math (Annisa, 2018: 83). STEM learning helps students develop a good attitude towards their studies. In simple words, we can say that science, technology, and other subjects are all connected in learning. Science uses math to work with data, while technology and engineering are ways to use science.

The STEM-integrated PjBL learning model is a teaching method created by teachers to help students take part in learning activities. In 2015, it was 85. To help improve thinking skills and explore new ideas. Previous studies have shown that project-based learning using STEM can help students become more creative in their thinking (Lestari et al. 2018: 54) The PjBL model can improve how motivated students feel about learning, boost their creativity, enhance their critical thinking skills, and develop their thinking abilities (Insyasiska et al. 2015) Sure However, it seems like you've provided only a partial text. Could you please provide the complete text you would like me to simplify. Using the STEM method can help students get better at thinking creatively (Almuharomah et al. 2019: 73) Project-based learning can help make creative thinking better. It can improve skills like coming up with many ideas, being unique, adding details, and being adaptable (Suryandari et al. 2016: 27)

Based on the results of unstructured interviews with ten fourth-grade teachers in the Medan Labuhan sub-district, information was obtained that in implementing learning, they found it difficult to develop learning and the lack of variety of learning models used in learning activities. So in this case, the researcher will develop related learning devices; the existence of learning activities actually begins with the creation of learning devices, including syllabuses, lesson plans, textbooks, and supporting practice questions. The level of student understanding of the subject matter is still low. This can be seen in examples of

student practice questions on learning themes that tend to measure abilities in the LOTs-MODs category. The presentation of questions tends to be on the cognitive aspects of students about remembering, mentioning, completing, and simple explanations.

Students' thinking abilities need to be improved again through the development of learning devices, including syllabuses, lesson plans, student books, and creative thinking ability test questions in science learning. Observations made that classical completeness at SD Santo Paulus Martubung-Medan, which was to be studied, had not reached 50% with the results of the final semester assessment (PAS) in class IV, where the students' science scores were still relatively low with the minimum completeness criteria (KKM) of 70; only 11 students, 28.20%, achieved KKM, and 28 students, 71.79%, had not achieved KKM. SD Santo Paulus Martubung Medan only had 7 students, 35%, achieve KKM, and 13 students, 65%, had not achieved KKM.

Researchers see from the existing problems that there will be a development related to learning devices, namely the development of STEM-integrated project-based learning devices. Students are expected to be able to understand the material in the student's book and motivate teachers to use and develop interesting learning devices that are in accordance with the needs of environmental conditions, both from the perspective of students and teachers, in order to have updates in implementing learning activities.

The development of STEM-integrated PjBL learning devices based on e-learning is expected to improve students' creative thinking skills in learning energy sources. The researcher intends to develop a product on "Development of Integrated STEM PjBL Learning Devices to Improve Students' Creative Thinking Skills.". The formulation of the problem in this study, among others, is: (1) Is the STEM-integrated PjBL learning device suitable for use to improve students' creative thinking skills? (2) Is the STEM-integrated PjBL learning device practical to use to improve students' creative thinking skills? (3) Is the STEM-integrated PjBL learning device effective for improving students' creative thinking skills?

RESEARCH METHODS

This type of research is research that uses the Research and Development (R&D) development model. This development research was conducted at Santo Paulus Martubung Elementary School-Medan in Class IV of Elementary School in the 2023/2024 academic year. This investigation took place in December 2023.

The ten steps of the researcher in its implementation include:

1. Information Search and Collection Stage At this point, the researcher collects information to find out what is needed for the upcoming learning. The steps required at this stage are literature studies and field studies: (a) Literature studies are intended to find out information on research results related to the material and characteristics of STEM-integrated PjBL learning devices that will be developed; (b) Field studies are conducted to find information regarding the needs of developing STEM-integrated PjBL learning devices. Field studies are also intended to find several similar media products that have been developed.
2. Planning At this stage, it can be done through several stages, including: (a) determining the objectives and benefits of making STEM-integrated PjBL learning devices; (b) determining core competencies and basic competencies; (c) creating a research instrument grid that is a quality criterion for learning resources; (d) creating research instruments.
3. Development of Initial Product Form: (a) Preparing materials, namely the genggong cricket culture in Sidomulyo Village; (b) Designing STEM-integrated PjBL learning

devices by preparing images.

4. Sure However, it seems like you didn't include the text you'd like me to simplify. Please provide the text, and I'll be happy to help. First Field Test The next step after creating the first version of the product is to get feedback from material experts, media experts, and classroom teachers. Validation is a process where experts check and evaluate a product to make sure it meets certain standards. The validation process is meant to check if the learning resource product is practical and useful.
5. Revision of Initial Field Trial Results At this stage, the aim is to obtain good media before conducting a field trial.
6. Main Field Trial At the trial stage, it was carried out on grade IV n students, and then the data was collected and analyzed. The trial on these students aims to determine students' creative thinking abilities.
7. Revision of Operational Products At this stage, it was carried out after the main field trial, and the results of the trial were used to make improvements.
8. Operational field testing. After going through two tests and revisions, which have also been carried out twice, We can test how well a new product for children's learning works after using it in their lessons.
9. Sure Please provide the text you want rewritten in simple words. Last look at the final product. Before the product is shared with more users, a final check must be done to fix any issues that aren't good yet.
10. Sure Please provide the text you would like me to simplify. Sharing and Putting into Action. The final step of this research is to share the results at a seminar and publish them in a scientific journal.

In this research process, a research instrument is needed to observe plant morphology, consisting of instrument tools and materials and plant morphology indicators.

Table 1. Research Tools

No.	Tool name	Usefulness
1.	Stationery	To record observation results
2.	Knife	To cut the required sample parts
3.	White manila paper	For background photos of observed samples
4.	Camera	To document research results
5.	Plant morphology book	For guidance and reference in the characterization proces

Table 2. Research Materials

No.	Material name	Usefulness
1.	Medicinal plants	For research samples to be observed

Table 3. Instruments for Observed Plant Morphology Indicators

Observed Parts	Code	Observation Aspect	Plant 1	Etc.
Leaf	D1	Single leaf / Compound		
	D2	Leaf tip		
	D3	Leaf base		
	D4	Leaf surface		
	D5	Leaf completeness		
Stem	B1	Stem growth direction		
	B2	Stem / Stemless		
	B3	Stem shape		
	B4	Clear type of stem		
	B5	Stem surface		

Root	A1	Root system

Table 4. Expert Material Instrument Grid

Aspect	Indicator	Description
Content Feasibility	Accuracy of concepts and definitions.	The concepts and definitions presented do not give rise to many interpretations and are in accordance with the concept of the applicable definition in the field of Biology.
	Suitability of size with content material	The facts and information shown are true and help students understand better.
	Image Accuracy	The pictures shown are real and helpful for students to understand better.
	Term Accuracy	Terms are in accordance with the prevailing customs in the field of biology
Material Feasibility	Grammar	Use of grammar with EYD rules
	Material Scientific Accuracy	Writing of scientific names is in accordance with the prevailing customs in the field of biology
	Material Explanation Accuracy	The material explained is in the form of a description of the images presented, namely about the morphology of leaves, stems and roots in medicinal plants
	Content Coherence of Material	The material presented in the development through plant blog-based learning media is in accordance with the order in the table of contents
Presentation Feasibility	Concept Sequence	The ideas are shown step by step, starting with easy ones and moving to harder ones, going from clear examples to more general ideas, and from simple things to more complicated ones.

Table 5. Material Expert Assessment Instrument

No.	Assessment items		Alternative choices			
			Less Feasible	Quite Feasible	Feasible	Very Feasible
Content Feasibility Aspect						
1.	Accuracy of concepts and definitions					
2.	Accuracy of facts and data					
3.	Accuracy of images					
4.	Accuracy of terms					
Material Feasibility Aspect						
5.	Grammar					
6.	Accuracy of scientific names					
7.	Accuracy of material explanation					
8.	Coherence of material content					
Presentation Feasibility Aspect						
9.	Coherence of concepts					

Table 6. Media Expert Instrument Grid

Indicator	Description
Suitability of blog size to ISO standards	The size of the blog is made according to the device used to open it.
Suitability of size to content material	Size selection is adjusted to the material, this will affect the layout of the content section
The layout of the front and back covers looks good together. It has a nice flow and is balanced and consistent.	The initial design of the page is a complete unit. Color, illustration, and typography elements are displayed harmoniously and interrelated with each other.
Displaying the center of view	The main appeal of the module comes from how well it puts together the elements or design materials you want to show off. This helps make text, pictures, and decorations clearer and easier to see.
The color of the layout elements is harmonious and clarifies the function	Pay attention to the overall color display that can provide A specific detail can help explain the topic or subject of the blog better.
Title Font Size is More Dominant and Proportional Compared to Author's Name	The title of the catalog should give a quick idea about what the blog is about.
Blog Title Color Contrasts with Background Color	The blog title is displayed more prominently than the background color
Do Not Use Too Many Font Combinations	Use 2-3 fonts to be more communicative in conveying the information to be conveyed. To differentiate and get a combination of letter displays, can use variations and letter series.
Describes Content / Teaching Material and Expresses Object	Describes Content / Teaching Material and Shows Object Features Can quickly summarize some teaching materials and can visually show what kind of illustration is used based on the teaching material.
The way things are arranged on each page follows a set pattern and rhythm.	The way elements are arranged on each page sticks to a set pattern and flow.
Use different types of fonts (like bold, italic, all capital letters, and small capital letters), but don't use them too much.	It's used to show the importance of a title and to highlight important text by making it bold and italic.
Creative and Dynamic	Showing pictures from different angles, not just from the front, helps students see things in a more active way. This can make it easier for them to understand and learn.

Table 7. Media Expert Assessment Instrument

No.	Assessment Items
1.	How well a blog fits with ISO size standards.
2.	Match the size with the content.
3.	The design of the front and back covers looks good together and feels balanced and matching
4.	Shows the center of what you're looking at.
5.	The colors of the layout parts work well together and make their purpose clear.
6.	The title is bigger and more noticeable than the author's name.
7.	The color of the blog title is different from the background color.
8.	Doesn't use too many different types of fonts.
9.	Explains what the teaching materials are about and shows what the object is like.
10.	The arrangement of layout elements follows the same pattern.

11.	Don't use too many different styles of letters (like bold, italic, all caps, or small caps).
12.	Creative and lively

Table 8. Grid of Student Trial Subject Instruments

Aspects	Assessment Items
Appearance Aspect	- Text or writing on this Blog is easy to read - The images presented are clear or not blurry - The images presented are appropriate (not too many and not too few) - There is a description on each image presented in this catalog - The images presented are interesting - The images presented are in accordance with the material - Material The blog on characterization and utilization of medicinal plants can be easily understood
Aspect of Material Presentation	- The material presented in the blog is coherent - The sentences used in the blog characterization and utilization of medicinal plants are easy to understand - There are no sentences that cause double meanings in this blog - The symbols used in the blog characterization and utilization of medicinal plants can be easily understood - The terms used in the blog characterization and utilization of medicinal plants can be easily understood
Benefit Aspect	- With the existence of a blog characterization and utilization of medicinal plants, it is easier to learn about plant morphology - The creation of a blog characterization and utilization of medicinal plants can attract interest in learning Biology Tadris students - With the existence of a blog characterization and utilization of medicinal plants, it can provide motivation to study plant morphology material

Table 9. Percentage Scale According to Arikunto (1996: 244)

Percentage of Ideality (%)	Criteria
76% ≤ score ≤ 100%	Very feasible
51% ≤ score ≤ 75%	Feasible
26% ≤ score ≤ 50%	Quite Feasible
0% ≤ score ≤ 25%	Less Feasible

Interpret the data based on the following table:

$$\text{level of practicality} = \frac{\textbf{Total Score Obtained}}{\textbf{Total Highest Score}} \times 100\%$$

Table 10. Interpretation of Learning Device Practicality Data

Percentage of Ideality (%)	Criteria
$80 \leq V \leq 100$	Very Practical
$60 \leq V < 80$	Practical
$40 \leq V < 60$	Quite Practical
$20 \leq V < 40$	Less Practical
$0 \leq V < 20$	Not Practical

The developed learning device is categorized as practical with a minimum ideal

percentage in the practical criteria, namely at an ideal percentage of $60 \leq V < 80$. The effectiveness of the developed science learning device is determined from the difference in the average posttest in the experimental class and the average posttest in the control class. The results of the posttest will be tested for normality, homogeneity, and t-test to determine its effectiveness. The type of research that researchers will use To find out how well the product works, we will use a type of research called quasi-experimental, which compares a group that uses the product with a group that does not, and we will only test them after using the product. This design looks at the experimental group and the control group side by side. The design summary can be seen in table 11

Table 11. The Nonequivalent Posttest-Only Control Group Design

X	O
Provision of learning devices Control	Posttest to measure students' final abilities
STEM-based PjBL learning devices	Posttest to measure students' final abilities

Description:
X = Treatment given (independent variable)
O = Posttest (observed dependent variable)

The t-test is a method used to check if there is a meaningful difference between the averages of two groups we are comparing. Before using the t-test to look at data, you need to check two things: first, the normality test, and second, the homogeneity test.

The normality test checks if the samples in the study are spread out in a typical way. The normality test used is called the Kolmogorov Smirnov test. If the significance value is greater than 0. 05, it means the data is normally distributed.

Homogeneity Test: This is a statistical test used to check if two groups of samples have the same level of variation. In this study, we checked for similarity by comparing the data from the experimental group and the control group. Testing for similarity using the Levene test with the SPSS 23 program. If the initial data calculation produces $F_{\text{count}} < F_{table}$, then the sample is said to have the same variance or homogeneous. The F_{table} is obtained by first determining $db_{\text{ numerator}}$ and $db_{\text{ denominator}}$. The value of $db_{\text{ numerator}} = n - 1$ and $db_{\text{ denominator}} = n - 1$. With a significance level of 5%. To test the effectiveness hypothesis, the t-test formula is used as follows.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S^2 \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

The statistical hypotheses tested are:
For the feasibility of learning devices
Ho: $\mu < 3.0$ assumed not feasible
Ha: $\mu \geq 3.0$ assumed feasible
For the effectiveness of Learning Devices
Ho: $\mu 1 \leq \mu 2$ assumed not Effective
Ha: $\mu 1 > \mu 2$ assumed Effective
For the Practicality of Learning Devices
Ho: $\mu < 60$ assumed not practical
Ha: $\mu \geq 60$ assumed practical
Where:
$\mu 1$ = Average creative thinking ability of the experimental class
$\mu 2$ = Average creative thinking ability of the Control class

RESULTS AND DISCUSSION

The assessment of learning devices by practitioners was carried out by class teachers and grade IV elementary school students. The PjBL model learning devices integrated with the STEM approach developed were assessed by two teachers of Santo Paulus Martubung Elementary School - Medan. Aspects assessed by grade IV teachers and colleagues included the format of the learning device, material/content, language learning process, and assessment. "The results of the assessment by grade IV teachers can be seen in table 12.

Table 12. Results of assessment of Learning Devices of the PjBL model integrated with the STEM approach by grade IV teachers and peers

No. Code	Indicator Assessment	Score	Criteria
1 – 2	Learning Device Format	3,5	Very Practical
3 - 9	Learning Material	3,71	Very Practical
10 – 14	Learning Process	3,67	Very Practical
15 – 17	Language	3,50	Very Practical
18 – 20	Assessment	3,83	Very Practical
	Average	3,68	Very Practical

The assessment of LKPD by grade IV elementary school students was conducted by giving a questionnaire to 26 grade IV students of Santo Paulus Martubung-Medan Elementary School". The questionnaire contained statements categorized into four aspects, namely learning activities, appearance, language, and availability of space/instructions. "The results of the assessment by grade IV elementary school students can be seen in table 13".

Table 13. Results of LKPD assessment by grade IV Elementary School students

No. Code	Indicator Assessment	Score	Criteria
1 - 3	Learning Activities	3,68	Very Practical
4 - 5	Appearance	3,51	Very Practical
6 - 8	Language	3,20	Practical
9 - 10	Availability of room/instructions for use	3,33	Practical
	Average	3,43	Very Practical

How well learning tools help improve creative thinking skills. The assessment results are shown in Table 14.

Table 14. Data on creative thinking skills in control and experimental classes

No	Description	Problem Solving Skills			
		Control Class		Experimental Class	
		Pretest	Posttest	Pretest	Posttest
1	Minimum	40,00	52,00	27,50	57,00
2	Maximum	82,00	82,50	100.00	100.00
3	Mean	61,00	72,77	68,07	81,52
4	Std. Deviation	12,12	8,35	16,93	14,58

The parametric prerequisite test in this study began with a normality test. The normality test of creative thinking ability used Kolmogorov-Sminov. The results of the normality test can be seen in table 15.

Table 15. Normality Test Results

		Kolmogrov-Smirnov[a]			Shapiro-Wilk		
	KPM Class	Statistic	df	Sig.	Statistic	df	Sig.
KPM Pretest Results	Experiment	.125	21	.200*	.965	21	.615
	Control	.117	20	.200*	.960	20	.536

From table 15, readers can see that the sig value in both the experimental class and the control class is 0.200, which is greater than 0.05 These results show that the two classes think creatively in different ways. Also, it can be understood that the questions about creative thinking skills in this study follow a normal distribution.

Table 16. Homogeneity Test Results

Levene Statistic	**df1**	**df2**	**Sig.**
1.491	1	39	.229

Data is called homogeneous if the significance level is consistent. value is greater than 0.05 From table 16, we can see that the importance value of creative thinking ability is 0.229, which is greater than 0.05 The data indicates that the control and experimental classes have similar levels of variation. The researcher made a conclusion by looking at the data from tests on normality and homogeneity related to problem-solving skills.

Parametric tests can only be done if the data is normal and homogeneous. In this study, we used an independent sample t-test, which is a type of parametric test. The sample t-test is used to find out which class helps students improve their creative thinking skills more. Classes that use integrated project-based learning devices with the STEM approach or classes with other learning model devices. Readers can see the differences between the two classes in table 17.

Table 17. Independent sample t test results

		Leven's Test for Equality of Variances		t-test for Equality of Means					
								95 % Confidence Interval of the Difference	
		F	Sig.	t	df	Sig.(2-tailed)	Mean Difference	Lower	Upper
KPM Results	Equal variances assumed	6.45	.015	2.34	39	.024	8.75	1.19	16.31
	Equal variances not assumed			2.37	32.11	.024	8.75	1.23	16.26

After The independent sample t-test was done, and here are the important results. The ability for creative thinking had a score of 0.024 on a two-tailed test. This value is less than 0.05. This value means that there is a difference in creative thinking ability between classes that implement PjBL-based learning devices integrated with the STEM approach and classes that do not implement it. The strong effect seen between the control class and the experimental class shows that using the PjBL learning model combined with the STEM approach helps improve students' creative thinking skills. The amount of improvement can be seen in the n-gain score in table 18.

Table 18. Creative Thinking Ability Data

Class	Creative Thinking		Skor *n-gain*	Category
	Pretest	Posttest		
Control	61.00	72.77	0.26	Low
Experiment	68.07	81.52	0.49	Medium

The n-gain score of creative thinking ability is 0.26 for classes that do not use the developed learning tools and 0.49 for classes that do. The control class score is categorized as low, The experimental class is in the middle level. The n-gain scores are not the same in the two classes.

Table 19. Results of Assessment of Material Aspects of Elementary School Science Experts

No. Code	Indicator Assessment	Score	Criteria
1 – 7	Technique Feasibility/Correctness of Material	2,57	Feasible
8 – 13	Presentation of Material	3,33	Very Feasible
14 – 15	Language	3,00	Feasible
16 – 18	Suitability of Evaluation Form	1,67	Very Less Feasible
	Average	2,76	Feasible

Tabel 20. Results of the RPP Feasibility Assessment by Learning Devices experts

No. Code	Indicator Assessment	Score	Criteria
1 – 6	Quality of learning objectives	4	Very Good
7 – 22	Quality of content	3,81	Very Good
23 – 25	Quality of language	3,70	Very Good
	Average	3,84	Very Good

Next is the assessment of the feasibility of LKPD by learning device experts. The assessment of the feasibility of LKPD is reviewed from the quality of content, didactic feasibility, technical assessment, and construction. The results of the LKPD feasibility assessment can be seen in table 21.

Table 21. Results of LKPD Feasibility Assessment by Learning Devices experts

No. Code	Indicator Assessment	Score	Criteria
1 – 7	Content quality	3,71	Very Feasible
8 – 12	Didactic feasibility quality	3,60	Very Feasible
13 – 19	Technical Assessment	3,57	Very Feasible
20 – 25	Construction	3,67	Very Feasible
	Average	3,64	Very Feasible

"Experts check if the teaching materials can be used with learning devices. " "We check how good the teaching materials are based on their content, how they are presented, the language used, and the images". The results of the evaluation of teaching materials can be seen in table 22.

Table 22. Results of the assessment of the feasibility of Teaching Materials by Learning Device Experts

No. Code	Indicator Assessment	Score	Criteria
1 – 9	Content quality	3,62	Very Feasible
10 – 16	Presentation feasibility quality	3,71	Very Feasible
17 – 20	Language	3,75	Very Feasible
21 – 28	Graphics	3,78	Very Feasible
	Average	3,71	Very Feasible

The use of LKPD model PjBL integrated with STEM approach in learning activities is applied to the experimental class consisting of 21 students". Student responses to the use of LKPD model PjBL integrated with STEM approach "Based on the graph in Figure 7, it can be explained that as many as" 76% (16 students) strongly agree with the use of LKPD model PjBL integrated with STEM approach in thematic learning, 24% agree (5 students)". "Based on these results, it can be concluded that students responded positively to the development of LKPD model PjBL integrated with STEM approach".

Discussion

The product development in this study is in the form of project-based learning devices combined with a Science, Technology, Engineering, and Mathematics (STEM) approach to the material 'Caring for the Environment. The purpose of developing the product is to improve the creative thinking skills of fourth-grade elementary school students. The researcher used a research and development model that has important components in the process of creating instructional design, namely: (1) the stage of finding obstacles in the field, analyzing each aspect of learning, and determining the product; (2) the product design stage; (3) the product manufacturing stage; and (4) the advanced stage to distribute the product on a wide scale (Thiagarajan et al. 1974: 5).

According to material experts, the learning devices developed in terms of content and presentation of the material are good, but the evaluation given or included in the learning devices has not been able to involve students in challenging activities. Meanwhile, learning device experts wrote that the learning devices developed are good in terms of format, completeness, accuracy of content, and presentation in LKPD and teaching materials that attract students with the presence of colored pictures included in the material.

Based on these results, it can be concluded that students are interested in the learning activities implemented, so that students' interest in science and technology also increases. While it seems that some students have not been able to reflect an attitude of responsibility towards the surrounding environment as expected. "The integrated PjBL learning device with the STEM approach is effective in improving science literacy because it presents various materials and learning project activities that are packaged in an attractive way, both in the form of text, images, and videos". One aspect assessed in science literacy is the aspect of interest.

The learning device in this case is LKPD, which is arranged systematically, attractively, and easily understood to foster students' positive attitudes towards learning. Not only that, this is supported by the theory of situational interest (Hidi & Baird, 1988: 469), which states that environmental quality in this case can be in the form of good facilities and infrastructure that can foster student interest. For example, fourth-grade elementary school students will be interested in learning something if the teacher creatively displays varied learning activities, using interesting media in the classroom.

Students who are more often accustomed to scientific activities tend to be more capable and able to solve problems in simple or complex forms "This is supported by the use of the integrated PjBL model with a STEM approach that involves the use of technology as part of classroom learning." It is undeniable that students in the modern era today prefer learning that uses technology.

The resulting impact is also said to be good for developing creative thinking as a requirement for being able to solve problems. Meanwhile, scientific literacy, which includes aspects of attitudes, can be improved through scientific activities such as conducting experiments (Ainley et al., 2002: 424-425). Scientific literacy consists of aspects of knowledge, skills, and attitudes. One aspect of attitude in the achievement of scientific literacy is interest (Hidi, 1990: 553)". Mursid, R. et al. (2022) stated that improving learning outcomes is very helpful in achieving quality science and knowledge in the field, problem solving, developing interests and talents, as well as the application of technology in the 21st century in the ability to think creatively through the application of holistic and effective learning strategies.

These scientific activities can also attract students' interest in learning. With the interest or attraction to learning, students are more enthusiastic and focused and strive to understand the learning (Hidi & Renninger, 2006: 113). "Fundamentally, integrated project-based learning devices in the four-scientific approach (science, technology, engineering, and thematic) that are developed are not only intended for students' skills in solving problems and scientific literacy attitudes but also make it easier for teachers to design learning that involves students in scientific activities. Moreover, the integrated PjBL learning device with the STEM approach supports students' learning independence effectively". "They can learn in different ways through simple practice and project creation. It is common in research that every study certainly has limitations among the existing advantages. Some of the advantages that can be considered are: (a) the suitability and completeness of the material presented in teaching materials and LKPD make it easier for students to develop skills and knowledge; (b) providing creative and varied learning; (c) students can do many practical activities and projects with teacher guidance that can help students develop scientific literacy and problem-solving skills; (d) teachers and students are directly involved in problem-solving, practice, and project creation activities.

CONCLUSION

The conclusions that can be put forward are as follows:

1. The learning devices developed, especially LKPD and teaching materials, are considered feasible in terms of appearance and presentation techniques. Experts and teachers stated that the devices developed are feasible and easy for students to understand.
2. The learning devices developed on the material 'Caring for the Environment' practically increase students' scientific literacy significantly.
3. The learning devices developed have proven to be effective in increasing students' creative thinking skills significantly. The increase in creative thinking skills can be seen from the average n-gain score of 0.49 (moderate increase category).

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