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STEAM-Based Science Student Worksheets to Improve Elementary School Students' Scientific Literacy

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ABSTRAK

Penelitian ini dilatarbelakangi dari rendahnya kemampuan literasi sains peserta didik, serta pembelajaran yang hanya menggunakan buku paket. Lembar kerja siswa berbasis STEAM diharapkan dapat menjadi alternatif dalam meningkatkan kemampuan literasi sains peserta didik. Penelitian ini bertujuan untuk mendeskripsikan lembar kerja siswa yang valid, praktis dan efektif untuk meningkatkan kemampuan literasi sains peserta didik. Penelitian ini merupakan penelitian Reseach & Development (R&D) yang didasarkan pada model pengembangan ADDIE (Analyze, Design, Develop, Implementation, Evaluation). Subjek penelitian ditentukan dengan simple random sampling yang terdiri dari 62 peserta didik kelas V Sekolah Dasar dan 2 orang guru kelas. Pengumpulan data dilakukan menggunakan metode wawancara, angket dan tes yang valid dan reliabel. Hasil uji validasi produk menunjukkan Indeks Aiken holistik kevalidan sebesar 0,802 kategori sangat valid. LKPD IPA berbasis STEAM yang valid adalah LKPD yang mengintegrasikan berbagai disiplin ilmu yaitu sains, teknologi, teknik, seni dan matematika, kontekstal dalam satu pendekatan pembelajaran yang utuh. Kepraktisan diukur melalui keterlaksanaan pembelajaran berbasis STEAM, dengan nilai rata-rata keterlaksanaan 4,91 respon pendidik dan 4,88 respon peserta didik kategori sangat praktis, artinya semua kegiatan pembelajarannya dapat terlaksana dengan baik sesuai dengan waktu yang diberikan. Uji paired t-test pencapaian literasi sains menghasilkan nilai signifikansi 0,020 < 0,05 dengan Sig. t-tail, artinya Ho ditolak. Berdasarkan hasil penelitian dapat disimpulkan bahwa LKPD IPA berbasis STEAM yang dikembangkan valid, praktis dan efektif meningkatkan kemampuan literasi sains peserta didik Sekolah Dasar.

ABSTRACT

This research was motivated by students' low scientific literacy skills and learning that only used textbooks. It is hoped that STEAM-based student worksheets can be an alternative to improving students' scientific literacy skills. This research aims to analyze student worksheets that are valid, practical, and effective for enhancing students' scientific literacy skills. Research and development (R&D) research on the ADDIE (Analyze, Design, Develop, Implementation, Evaluation) development model. The research subjects were determined by simple random sampling of 62 fifth-grade elementary school students and 2 class teachers. Data was collected using valid and reliable interviews, questionnaires, and tested methods. Product validation test results show that Aiken's overall validity index is 0.802, which belongs to the very effective category. Valid STEAM-based student worksheets that integrate various scientific disciplines, namely science, technology, engineering, art, and mathematics, contextually in one complete learning approach. Practicality is measured through STEAM-based learning, with an average implementation value of 4.91 teacher responses and 4.88 student responses in the practical category, implying that all learning activities can be completed effectively within the allotted time. The paired t-test for scientific literacy achievement produced a significance value of 0.020 < 0.05 with Sig. t-tail, meaning H_0 is rejected. Based on the research results, the STEAM-based science worksheet developed is valid, practical, and effective in improving the scientific literacy skills of elementary school students.

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1. INTRODUCTION

21st-century learning based on the partnership for 21st-century skills emphasizes that learning must aim at the 4 Cs skills: communication, collaboration, critical thinking, problem-solving, and creativity. Achieving the 4 Cs skills for students needs to be emphasized as a learning goal so that students are able to plan and apply their abilities to solve problems in the surrounding environment. Learning objectives that are oriented towards the 4 Cs skills are the basis for students to know about understanding scientific facts and the relationship between science, technology, and society and solving problems in real life, called scientific literacy skills (Pratiwi et al., 2019; Rini et al., 2021; Suparya et al., 2022). Scientific literacy abilities can be maximized in the implementation of learning science subjects. The science subject, one of the basic sciences in schools that allows interaction between students and environmental problems, includes knowledge of facts, concepts, principles, laws, postulates, and scientific theories and methodologies. Science is a way of thinking (affective), a way of investigating (process), and a body of knowledge (collection of knowledge) (Hanik et al., 2018; Hayat, 2018; Murdani, 2020). Based on the above concept, the science learning process expects students to experience the learning process as a whole, understanding natural phenomena through activities to discover new facts through investigating natural problems around them.

Problems found in the research report in PISA (Programme International Student Assessment) organized by the OECD (Organization for Economic Cooperation and Development). Indonesia's 2018 PISA achievements were in the bottom 10 of the 79 participating countries. The average reading ability of Indonesian students is 80 points below the OECD average (Azaly & Fitrihidajati, 2022; Schleicher, 2019).. This phenomenon can be interpreted as meaning that the average student's scientific literacy abilities are at the stage of being able to recognize basic facts but are not yet able to communicate and relate their abilities to various scientific topics, as well as their application, which makes Indonesia a country with a low level of scientific literacy. The condition of the problem above is relevant to the results of the researcher's observations of educators and fifth-grade elementary school students, data obtained showed that in-class learning, there are always students who lack understanding of the learning material, especially science or mathematics, sometimes students' suggestions are complex, students still have difficulty finding the substance of what the material is for. If the learning is learned, the benefits are in daily activities, which should understand natural phenomena through learning activities, which will provide experience in solving natural problems around us. The implementation of learning in science is dominated by learning to convey material, examples, and structured assignments. Learning uses textbooks from the Ministry of Education and Culture, which are pretty dense, and sometimes, there needs to be more time to complete the learning material. Educators have used student worksheets, which is effective because the material is short, and there are many worksheets so that students can practice more questions.

One science learning approach that can overcome the above problems is the science, technology, engineering, art, and mathematics model (Shofiyah et al., 2021; Singgih, 2020). STEAM is a learning approach that is integrated with various scientific disciplines. Students who engage with STEAM not only learn literacy in one field but become lifelong learners who are much better able to adapt and advance in a global society (Mejias et al., 2021; Yakman & Lee, 2012). STEAM-based learning also requires students to identify a problem, create something to solve the problem, collaborate with classmates to solve problems, and communicate effectively and respond to each other's ideas (Irving, 2006; Winarni et al., 2022). The quality of learning in class can be obtained from students' responses during learning. Student responses in learning can come from the students themselves, educators, learning resources, and the learning environment. The statement above shows that STEAM-based science LKPD needs to be developed. Previous studies have shown the success of developing STEAM-based science worksheet worksheets. STEAM-based learning provides the essential components that students and teachers need to create exciting learning activities (Nopiansyah et al., 2022; Rizki et al., 2022). STEAM learning can be implemented in elementary school education and has been proven to improve students' soft skills (Nuragnia et al., 2021; Widiyanti et al., 2021). STEAM learning is helpful in improving students' abilities in critical thinking and scientific literacy so that they can improve their competency development (Atiaturrahmaniah et al., 2022; Halili, 2019). Based on theoretical and needs analysis and interviews with classroom educators above, this research aims to describe STEAM-based science worksheet products that are valid, practical, and effective for improving students' scientific literacy skills. The aims of this study is to analyze student worksheets that are valid, practical, and effective for enhancing students' scientific literacy skills.

2. METHOD

This research is development research (Research and Development), referring to the ADDIE development model, which is carried out from the analysis, design, development (validation and revision), implementation, and evaluation stages by assessing product quality and the learning process (Branch, 2009). The research subjects were determined using a simple random sampling technique of 62 fifth-grade elementary school students and 2 class teachers. Data was collected using valid and reliable interviews, questionnaires, and test methods. This research procedure is presented in Figure 1. Specifically, the stages of development are described in Table 1.

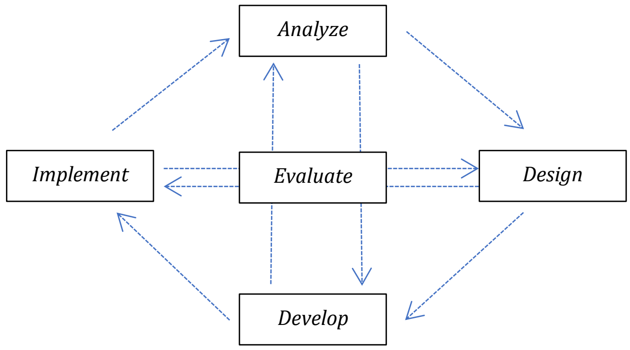


Figure 1. ADDIE Model Development Procedure

Table 1. Stages of ADDIE Development

ADDIE stages	Activity
Analyze	1. Analyze theoretically, 2. Analyze the problems and needs of student worksheets, and the wishes of educators and students in learning activities carried out in class. 3. Curriculum analysis.
Design	1. Make an instructional analysis consisting of learning objectives, mapping of core competencies, basic competencies, and indicators 2. Make an instructional analysis consisting of learning objectives, mapping of core competencies, Basic Competencies, and indicators. 3. Collect teaching materials following material sourced from books, as well as relevant electronic media; 4. Prepare a draft science student worksheet on hot material and its transfer for grade V Elementary School; draft a science student worksheet including titles, work instructions, basic competencies mapping, assignments, and supporting materials. 5. Design the display of the science student worksheet draft in Microsoft Word format. 6. Planning for the designed science student worksheet evaluation tools.
Develop	1. Product validation 2. Revision
Implement	1. Test the level of practicality by testing the implementation of learning using the product; 2. Revision.
Evaluate	1. Test the effectiveness of the product by carrying out formative tests in the experimental and control classes; 2. Revision.

The research instruments used included: (1) questionnaires for the needs of educators and students, (2) material expert validation sheets, (3) practicality questionnaire sheets in the form of implementation of lesson plans student worksheets, (4) sheets of ability assessment instruments scientific literacy. The level of validity is divided into three aspects of the assessment, namely aspects of material, media, and language, which 6 (six) experts tested. The level of validity is measured through the level of implementation of learning by 2 (two) class teachers and ten students. The developed product's effectiveness level is seen from the achievement of students' scientific literacy abilities. The research design was a post-test-only control group (Creswell & Poth, 2018). The paired t-test was used to answer the research hypothesis and determine whether there were differences in scientific literacy ability between students in the control and experimental classes. Material expert validation grid is show in Table 2, Table 3, and Table 4.

Table 2. Material Expert Validation Grid

No	Assessment Aspects	Indicators	Number of Items
1	Suitability of STEAM-based science student worksheets	a. Science Implementation	2
		b. Technology Implementation	2
		c. Engineering Implementation	2
		d. Mathematics Implementation	2
2	Content Quality	e. Material refers to basic competence	3
		f. Presenting material that makes it easy for students to interact with the material provided	5
		g. Provide experience in learning	2
		h. Evaluation is productive	3

Table 3. Media Expert Validation Grid.

No	Assessment Aspects	Indicators	Number of Items
1	Compatibility with didactic requirements	a. Drafting is universal	2
		b. Emphasizes the concept discovery process	2
		c. Invite students to be active in the learning process	2 4
2	Compatibility e with construction requirements	a. Develop social, emotional, moral, and aesthetic communication skills	2
		b. Use of language and sentences	3
3	Compatibility with technical requirements	a. Ease and clarity	3
		b. Writing	3
		c. Picture	3

Table 4. Linguist Validation Grid.

No	Assessment Aspects	Indicators	Number of Items
1	Compatibility with Indonesian Rules	Straightforward	3
		Communicative	2
		Dialogic and interactive	2
2	Compatibility with the development of students	Suitability with the level of development of students	2
		Consistency and integration of thought flow	2
3	Use of Terms, Notations and Symbols	Use of terms and symbols	1

Data from the assessment results from the validator team on student worksheet products were analyzed by looking for the Aiken index coefficient (Aiken, 1980). The validator provides suggestions and input for improvement. Suggestions and input provided by the validator form the basis for product revision. Interpretation of product validity index values is show in Table 5.

Table 5. Interpretation of Product Validity Index Values

Formula	Scale Range	Classification
$\bar{X} > \bar{X}_i + 1{,}8 \times S_{bi}$	*V*> 0,84	Very valid
$\bar{X}_i + 0{,}6 \times S_{bi} < \bar{X} \le \bar{X}_i + 1{,}8 \times S_{bi}$	*V*> 0,68 – 0,84	Valid
$\bar{X}_i - 0{,}6 \times S_{bi} < \bar{X} \le \bar{X}_i + 0{,}6 \times S_{bi}$	*V*> 0,52 – 0,68	Pretty valid
$\bar{X}_i - 1{,}8 \times S_{bi} < \bar{X} \le \bar{X}_i - 0{,}6 \times S_{bi}$	*V*> 0,36 – 0,52	Less valid
$\bar{X} \le \bar{X}_i - 1{,}8 \times S_{bi}$	*V*≤ 0,36	Invalid

Assessment of practicality through assessing the implementation of learning from educators and students in this study was analyzed using descriptive statistics. They are determining the average value coefficient and the percentage of responses of students and educators. The results are then interpreted with a Likert scale level (very practical, practical, reasonably practical, less practical, and impractical). Interpretation of product practicality is show in Table 6.

Table 6. Interpretation of Product Practicality

Formula	Scale Range	Classification
$\bar{X} > \bar{X}_i + 1{,}8 \times S_{bi}$	$\bar{X} > 4{,}2$	Very practical
$\bar{X}_i + 0{,}6 \times S_{bi} < \bar{X} \le \bar{X}_i + 1{,}8 \times S_{bi}$	$\bar{X} > 3{,}4 - 4{,}2$	Practical
$\bar{X}_i - 0{,}6 \times S_{bi} < \bar{X} \le \bar{X}_i + 0{,}6 \times S_{bi}$	$\bar{X} > 2{,}6 - 3{,}4$	Practical enough
$\bar{X}_i - 1{,}8 \times S_{bi} < \bar{X} \le \bar{X}_i - 0{,}6 \times S_{bi}$	$\bar{X} > 1{,}8 - 2{,}6$	Less practical
$\bar{X} \le \bar{X}_i - 1{,}8 \times S_{bi}$	$\bar{X} \le 1{,}8$	Not practical

The effectiveness test is used to measure and determine the effectiveness of STEAM-based science worksheets to improve students' scientific literacy skills. The effectiveness test results were analyzed using descriptive statistics on the average value of the experimental and control class students. The lattice of scientific literacy skills measured is shown in Table 7.

Table 7. Science Literacy Ability Grid

Indicators	Components
Science knowledge	Facts, concepts, principles, laws, hypotheses, theories, and models of science.
Science investigation	Using scientific methods and processes such as observation, measuring, classifying, concluding, recording, and analyzing data, communicate using various means such as writing, speaking, using graphs, tables, making calculations, and experimenting.
Science as a way of thinking	Emphasis on thinking, reasoning, and reflection in building scientific knowledge and the work of scientists; The empirical nature of science; and objective. Science; Use of assumptions in science; inductive and deductive reasoning; Causality; The relationship between evidence and evidence; The role of self-examination in science; Explain how scientists.
The interaction of science, technology and society	The impact of science on society; The relationship between science, society, and technology; Career; Social problems related to science; Personal use of science to make everyday decisions, solve everyday problems, and improve one's life; Science deals with moral and ethical issues.

The hypothesis test used in this research is the paired-t test because, in this test, the researcher will look for the difference in the mean of the two samples with the same number. The t-test is one of the parametric statistical test, so it must have assumptions that must be fulfilled, namely normality and homogeneity tests.

3. RESULT AND DISCUSSION

Result

The results of research on the development of STEAM-based science student worksheets to improve the scientific literacy skills of elementary school students based on the ADDIE development design are packaged into three parts: 1) introduction (analysis, design), 2) product development and revision (develop), 3) product trial and revision (implement and evaluate). The analysis stage involves theoretical analysis, problem analysis, and student worksheet needs. Educators carry out science learning dominated by learning to convey material, examples, and structured assignments. Learning uses thematic package books, which are dense and often require more time to complete the learning material. Educators have used student worksheets, which are effective because the material is short and there are many worksheets, so students practice more questions. Educators still need to be significantly updated regarding STEAM-based science learning and are optimistic that it will attract students' attention because information technology developments support it. Educators suggest that in developing STEAM-based student worksheets, pay attention to the clarity of material and examples related to daily activities and experiences by students. Furthermore, in the application of learning, there are individual and group activities.

Analysis of students on the need to develop worksheets for science students showed that 64% stated that learning was dominated by lectures, 24% by discussions, and 12% by assignments. The percentage of students' interest response to the cover color is 36% choosing blue, 28% red, 20% green, 12% yellow, and 4% other colors. Interest in this type of evaluation, 28% chose multiple choice, 24% essay, 20% practicum, 16% matching, and 12% others. Curriculum analysis science student worksheet products refer to Table 8.

Table 8. Basic Competencies and Indicators

Basic Competencies	Indicators	
3.6 Applying the concept of heat transfer in everyday life.	3.6.1	Identify ways of heat transfer in everyday life.
	3.6.2	Make a concept map, to distinguish the ways of heat transfer.
	3.6.3	Find phenomena and technologies in the surrounding environment that use the concept of heat transfer.
4.6 Report the results of observations about heat transfer	4.6.1	Conduct experiments on heat transfer.
	4.6.2	Performing an analysis of the experimental data.
	4.6.3	Interpret the experimental data.
	4.6.4	Summarize the concept of heat transfer based on the experimental results
	4.6.5	Make a trial report based on the results of the analysis, interpretation and conclusions correctly.
	4.6.6	Applying and creating the concept of heat transfer in solving problems in everyday life.

The design stage is by designing the display of science student worksheets. The process of designing the appearance of a science student worksheet in Microsoft Word includes: (1) designing the format of a science student worksheet and determining the components to be presented from the cover to the end of the contents of the science student worksheet; (2) selection and placement of layouts, writing, pictures, shapes, colors and also designs that will appear on the later display of science student worksheets; (3) and contains the contents of each component and material that has been prepared into the layout design. The result of the display of the display of science student worksheets are show in Figure 2, Figure 3, and Figure 4.

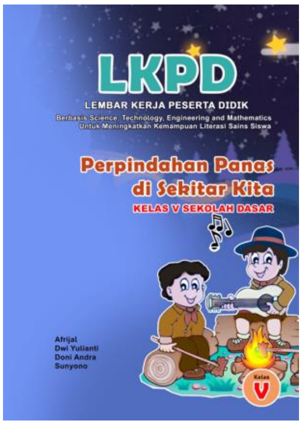


Figure 2. *Cover*

Figure 3. User Identity

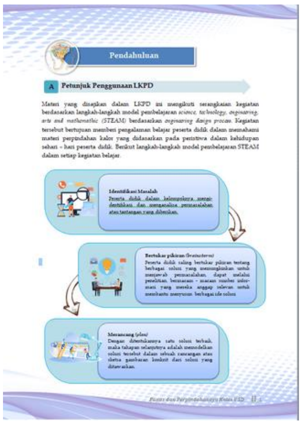


Figure 4. Instructions for use

The development stage conducts a STEAM-based science worksheet product validity test to improve the scientific literacy skills of elementary school students. Products are tested from the material, language, and media aspects. The results of the validator's assessment were analyzed using the Aiken index coefficient on each aspect. In detail, the results of the due diligence of the products in this study can be explained in Figure 5.

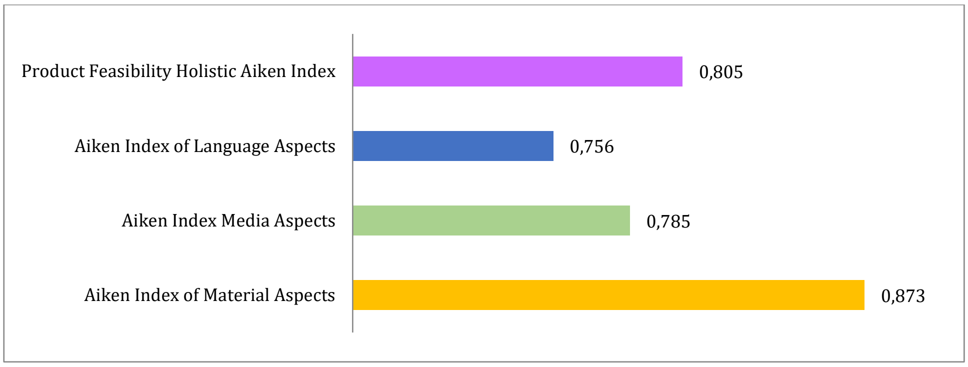


Figure 5. Results of the Holistic Consensus Analysis of the Feasibility of STEAM-based Science Student Worksheets

Based on Figure 5, he results of the holistic feasibility analysis on STEAM-based science student worksheets are represented through the holistic Aiken index of 0.805, which means that STEAM-based science student worksheets are valid/feasible to use. The implementation stage of STEAM-based science student worksheets was implemented in an experimental class of 31 students. Furthermore, ten students were randomly selected, and 2 class V educators were to provide an assessment. The aim is to test the level of implementation of learning using STEAM-based science student worksheets. The results of implementing the science student worksheets in this study are shown in Figure 6 and Figure 7.

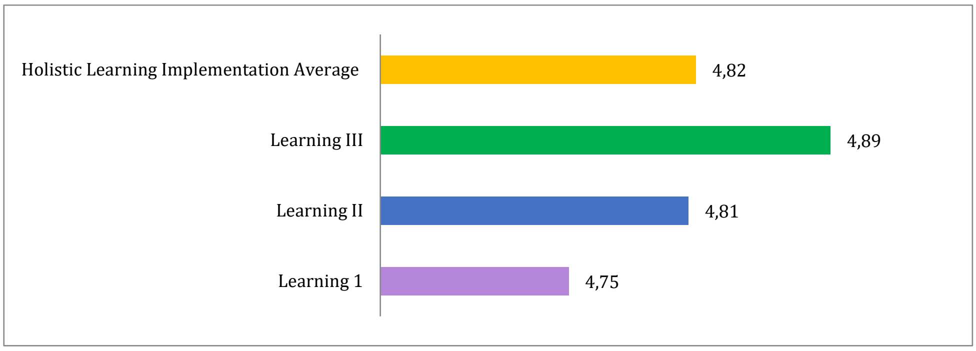


Figure 6. STEAM-Based Science Worksheet Learning Implementation Results Student Responses

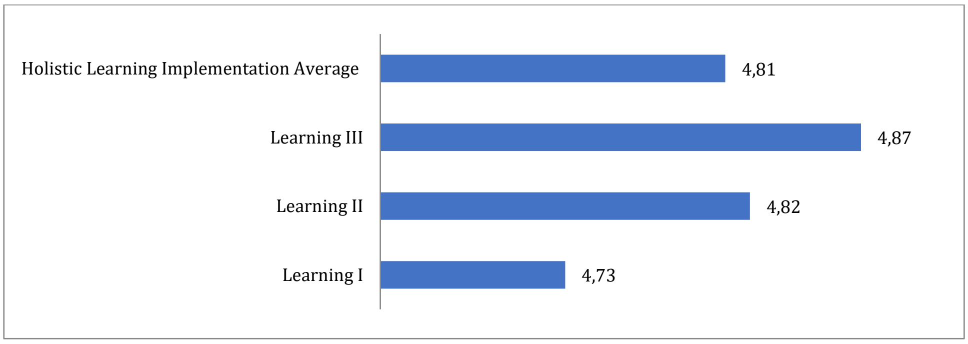
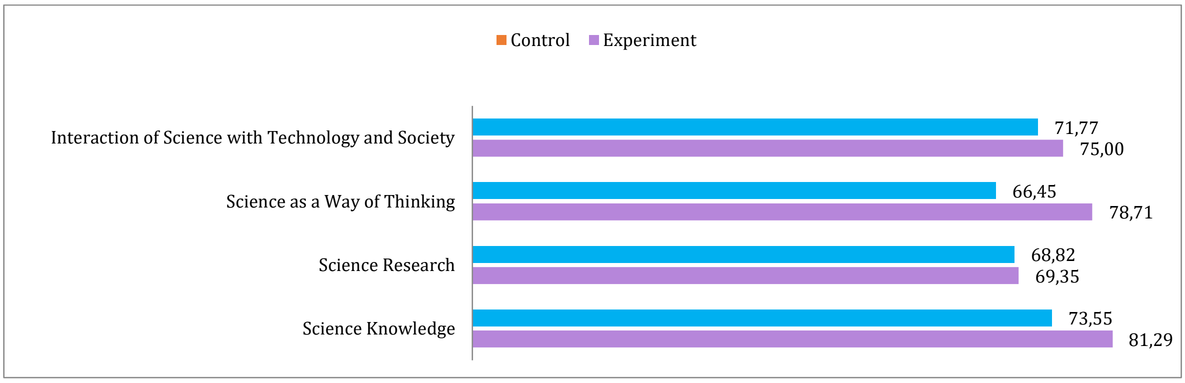


Figure 7. STEAM-Based Science Worksheet Learning Implementation Results Teacher Responses

Figure 6 and Figure 7 show that the average coefficient of learning implementation is 4.82 student responses and 4.81 teacher responses. The results of the implementation assessment are interpreted that STEAM-based science worksheets have very practical criteria used in learning. The evaluation stage tests the effectiveness of STEAM-based science worksheets to improve the scientific literacy skills of elementary school students. The effectiveness test involved 62 fifth-grade elementary school students divided into two experimental and control classes. The normality of scientific literacy ability data in the experimental and control classes based on the Kolmogorov-Smirnov test, respectively, is 0.200 and 0.058, which is greater than 0.05, so it can be said that the data in the experimental and control classes are normally distributed. The results of the homogeneity test show that the significance value (Sig.) of the scientific literacy ability data variable of students in the experimental class and control class is 0.841 at a significance level of 5%, so it can be concluded that the data variance of scientific literacy abilities of students in the experimental class and control class is homogeneous. Hypothesis testing using paired t-test analysis. The results of the t-test analysis of students' scientific literacy abilities with SPSS 20 show that the 2-way (t-tailed) significance value is 0.000 <0.05, so it can be interpreted that H0 is rejected. The results of this test indicate that STEAM-based science worksheets are effective in increasing the scientific literacy skills of elementary school students. The graph of the comparison of the average value of the achievement aspect of the scientific literacy ability assessment obtained through the tests in this study can be seen Figure 8.



Gambar 8. Comparison of the Average Scores of Scientific Literacy in the Experimental and Control Class

Discussion

The results of this development research are discussed in three main points, namely describing the STEAM-based science worksheet to improve the scientific literacy skills of elementary school students in a valid, practical, and effective manner. Judging from the validity of the product in this research, the valid STEAM-based science worksheet for improving the scientific literacy skills of elementary school students is the worksheet that integrates various scientific disciplines, namely science, technology, engineering, art, and mathematics, in one complete learning approach. These results are supported by previous research, which states that STEAM is an integration of various disciplines of science, technology, engineering, arts, and mathematics in one unified learning approach interpreted through engineering and arts learning to solve a problem (Juškevičienė et al., 2021; Nasrah et al., 2021; Utami et al., 2018). A valid STEAM-based science worksheet in which there are instructions for the correct use of technology products, collaborative activities between technology and art through the use of QR codes connected to learning videos on YouTube as part of audio-visual works of art, carrying out various projects to prove theories through practice and experiments. In line with that, collaborative learning in STEAM involves practical (hands-on) activities, such as experiments, projects, or simulations, helping students learn through direct experience through experimental projects (Rahayuningsih et al., 2022; Siregar, 2023). The validity of the STEAM-based science worksheet developed in it provides students with the opportunity to communicate and conclude learning topics logically and rationally. The ability to think logically and rationally is one of the principles of mathematical thinking. Student worksheets, which are developed in accordance with the Curriculum and Competency Standards, are easy to understand, relevant to the needs, and experienced in students' real lives (Henriksen et al., 2019; Long & Davis, 2017).

Practical STEAM-based science student worksheets mean that all learning activities can be carried out well in the time allotted. Practicality can be measured through an assessment of the implementation of a learning design that contains elements of a learning approach (Nurhikmayati, 2019; Supiase et al., 2023). Learning using student worksheets science based on the STEAM approach can be done through the project-based learning (PjBL) learning model. PjBL learning activities include identifying various problems, answering basic questions, observing surrounding phenomena, studying related material through reading materials, and showing learning videos carried out individually and in groups (Dinda & Sukma, 2021; Rizki et al., 2022). The time for working on projects and worksheets is appropriate at the end of the lesson, the whole group communicates the results of their work through presentations and together draws conclusions from the learning topic. All learning activities pay attention to the integration of STEAM into one learning approach. Completing projects and worksheets on time and at the end of learning, the entire group can communicate the results of their work through presentations and together draw conclusions from the learning topic (Apriyanti, 2020; Wijaya et al., 2019). The highest average value of learning implementation occurred in learning process III, this was due to the familiarity factor of educators and students learning using STEAM-based science student worksheets. These findings support that study habits have a significant influence on delay avoidance (study habits) on student learning achievement. STEAM-based science student worksheets that are effectively used to improve students' scientific literacy skills must contain elements of science, technology, engineering, art, and mathematics that are contextual based on phenomena or community activities in the students' environment, integrated with scientific literacy indicators. In the scientific knowledge indicator, students are given an understanding of concepts, theories, principles, and laws of science and are tested with questions related to understanding concepts and theories related to learning material. Indicators of scientific inquiry are reflected in the behavior of students who identify questions explored in a given scientific study that illustrate and evaluate how to ensure the truth of scientific theories. This is in line with research which states that scientific investigations are able to use scientific methods and processes such as observing, measuring, classifying, concluding, recording and analyzing data, communicating using various methods such as writing, speaking, using graphs, tables and making calculations, and experimenting (Sari & Koto, 2023; Sumarno et al., 2021). Science as a way of thinking is a continuation of indicators of scientific literacy abilities, materials and projects in student worksheets can stimulate participants students to be able to utilize the concept of heat transfer in everyday technology in an empirical and objective manner. Emphasis on thinking, reasoning, and reflection in building scientific knowledge and the work of scientists; the empirical nature of science; and objective (Sutardi et al., 2022; Sutrisna, 2021). The next indicator is the interaction of science, technology, and society, stimulating students to interact with science and technology in society. The developed Science student worksheets contain activities that enable students to be able to use technology products correctly.

The effectiveness of STEAM-based science student worksheets in improving students' scientific literacy skills in this research supports previous research. The STEAM approach improves critical thinking skills, collaboration, and communication skills and is able to analyze all forms of information that have been obtained, thus forming students with character and students are also able to increase their interest in scientific literacy in looking for various considerations between existing facts and reality so that they can find solutions to problems. The problems they found (Atiaturrahmaniah et al., 2022; Lestari et al., 2023; Mang et al., 2021). The STEAM approach can emerge when presented through project-based learning (Adriyawati et al., 2020; Nuraini et al., 2023) and contextual learning, where students are asked to interpret phenomena that occur around them so that they can directly connect science with the problem to be solved (Long & Davis, 2017; Rahmawati et al., 2021; Rizki et al., 2022; Wandraini et al., 2022). The implication of STEAM-based science student worksheet products that effectively improve students' scientific literacy skills focus on elements of science, technology, engineering, art and mathematics that are contextual based on phenomena or community activities in the students' environment, integrated with scientific literacy indicators. There are certainly limitations in this research, but with these limitations it is hoped that improvements can be made with ongoing research. Research involving larger research subjects, paying attention to integrating various scientific disciplines, practical (hands-on), project-based and contextual learning activities.

4. CONCLUSION

This research is research into the development of STEAM-based science worksheet worksheets to improve the scientific literacy skills of elementary school students in a valid, practical and effective manner. Referring to the results and discussion in this research, several conclusions can be expressed as follows; A valid STEAM-based science student worksheet product for improving scientific literacy skills is a student worksheet that integrates various scientific disciplines, namely science, technology, engineering, art and mathematics in one contextual learning approach, there are instructions for the correct use of technology products, collaborative activities between technology and art through the use of QR codes connected to learning videos, proving theories through experiments, communicating and concluding learning topics logically and rationally. STEAM-based science student worksheet product practically used to improve scientific literacy skills means that all learning activities can be carried out well in the allotted time.

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