



Contents lists available at [Journal IICET](#)  
**Jurnal EDUCATIO (Jurnal Pendidikan Indonesia)**  
ISSN: 2476-9886 (Print) ISSN: 2477-0302 (Electronic)  
Journal homepage: <https://jurnal.iicet.org/index.php/jppi>



## Development of creativity-based learner worksheets in science subjects at elementary school

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### Article Info

#### Article history:

Received Jun 07<sup>th</sup>, 2024  
Revised Jun 10<sup>th</sup>, 2024  
Accepted Jun 12<sup>th</sup>, 2024

#### Keywords:

Creative thinking  
Photosynthesis  
Science  
Creativity  
Learner worksheets

### ABSTRACT

Creativity is a very important skill to have, without creativity a person will not be able to adapt to the developments that occur in the current era of globalization. The ability to think creatively is very important for students because through creative thinking, students are expected to understand, manage, and solve the problems they face. The creativity that students have can be a skill they have to face every opportunity and difficulty they will face. The method applied in this research is *Research and Development (R&D)*. The development of this Learner Worksheets refers to the development model proposed by Robert Maribe Brach with the ADDIE approach. ADDIE stands for *Analysis, Design, Development, Implementation, and Evaluation*. Learning by using Learner Worksheets based on creativity is effective and can be used in the learning process in grade IV elementary school students. The feasibility of learning media has been reviewed by subject matter experts, media experts, and trials on grade IV elementary school students. Validation assessed by material experts and media experts, shows that creativity-based Learner Worksheets is included in valid criteria and is suitable for use as teaching materials for teachers and students. It can be concluded that creativity-based Learner Worksheets is effective for science learning on photosynthesis material. For future researchers, they can develop better and better Learner Worksheets, besides based on creativity, Learner Worksheets can be developed based on other 4C skills, such as collaboration, communication, critical thinking, innovation.



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## Introduction

Creativity is the ability to provide answers based on the originality of one's own thinking (Sitorus et al., 2019). Meanwhile, according to (Lestari & Zakiah, 2019) creativity is a collection of abilities and characteristics that cause creative thinking. Creative thinking ability is an ability related to creativity which can be interpreted as a way of thinking to change or develop a problem, see situations or problems from different sides, be open to various ideas and ideas even those that are not common (Suardipa, 2019). Creative thinking is a process that gives birth to new thoughts and creates new ideas or ideas based on the principles that influence it in solving a problem (Agustin et al., 2023). According to (Guilford, 1950) creative thinking is the ability to organize existing ideas with their own point of view on a problem. A person can be said to be creative if he has behavior that includes activities such as creating, designing, composing, and planning at a certain level. Based on the above opinion, it can be concluded that creative thinking is the ability of a person to think in developing ideas, which

are different from others and produce new thoughts. Creativity is one of the skills that are needed in the 21st century. The 21st century is considered a century of knowledge, a century of knowledge-based economy, a century of news technology, globalization, industrial revolution 4.0, and so on, in this century there are changes that are very fast and difficult to predict in all aspects of life in the fields of economy, transportation, technology, communication, info, and others (Nurhayati et al., 2023). It is said to be the 21st century, because this century asks for the quality of human resources. Therefore, institutions must be able to develop existing potentials, so that it becomes a distinctive feature in the institution, and is able to produce superior output (Hasibuan & Prastowo, 2019). To be able to survive amid the complexity of challenges and the complexity of life in the 21st century, there are several skills that must be possessed by the 21st century generation (Syaputra & Sariyatun, 2019). 21st century skills are everyone mastering the 4Cs which are the means to achieve success in life in society in the 21st century. The 4C skills in question are *Communication, Collaboration, Critical Thinking and Problem Solving*, and *Creativity and Innovation* skills (Arnyana, 2019). 21st century learning is learning that prepares the next generation to become a generation that has 21st century skills (Hasibuan, 2022).

Education is no longer just about delivering facts and information to students, it is now more about developing creative and innovative skills that will help students succeed in the ever-changing world of the 21st century. One of the student potentials that should be developed is creativity (Nur et al., 2021), as one of the 21st century skills. Skills such as critical thinking, communication and cooperation are often enhanced through the creative process. These are essential skills for success in the modern world. In an ever-changing world, students need to be able to adapt and innovate to face unprecedented challenges. Giving students real problems to solve can stimulate creativity and innovation. It involves critical thinking, research, and unique solutions. Collaboration with peers allows students to combine their ideas, create better solutions, and develop communication and teamwork skills. A classroom environment that stimulates creativity with a variety of tools, resources, and challenges will help students feel inspired to think creatively. Giving students the autonomy to explore their personal interests and projects will help them feel more engaged in the learning process. Creativity and innovation often come with the risk of failure. Educators need to create an environment where students feel comfortable trying and failing, and learning from the experience. The future of 21st century education will be dominated by creativity and innovation. Educators, parents and policymakers must work together to create an environment where students feel supported in pursuing their creative ideas. Thus, we can prepare future generations to face unprecedented challenges and contribute to the progress of the world in unique and innovative ways. creative thinking skills are very important for students because through creative thinking it is expected that students can understand, manage, and solve the problems faced (Fakhirah et al., 2023). If there are students who are lazy to be creative, it means that their thinking must be moved because moving the mind is not in the form of daydreaming and fantasizing but moving consumption to create a form of planning that is very likely to be applied effectively and productively, that way the minds of students will be trained to think creatively (Rambe et al., 2024). Creative thinking is a thinking skill that students must do and have (Ramadhani & Khairuna, 2022). By developing these skills in learning, it is expected that each individual has the skills to live in the 21st century with the various opportunities and challenges that will be faced. Creative thinking is needed because it is used as an important element to determine students' understanding of the material by providing continuous practice problems to train students' brain abilities and help solve tasks can be done with many ways of solving. It is intended that students can complete the task in many ways. Research on creative thinking is very important to do because of the low ability of students in creative thinking so it is important to do. when students gave the same answers, none of the answers came from the development of their ideas, and the scores obtained were below 75 (Minimum Completion Criteria).

From the results of The Global Creativity Index in 2022, released at the World Intellectual Property Organization (WIPO), Indonesia is ranked 75 out of 132 countries. Regarding students' creative thinking skills, in research (Hervyanti & Muchlis, 2021) explained that students' creative thinking skills were low with the results of 41.67% in the originality and flexibility indicators, 38.89% in the elaboration indicator, 44.44% in the fluency indicator. This is also in line with research conducted by (Handayani et al., 2023).

Based on the creative thinking test conducted in class 4 of SD Negeri 010140 in the science subject of photosynthesis material, it was found that 61% of students had not reached the level of creative thinking skills. The low level of students' creative thinking skills is suspected because the learning method used is still conventional, namely teacher centered, when delivering material the teacher only explains then writes it on the board and students are asked to take notes. After that the teacher will give questions based on the material written on the board. Because of the method used, students only read the material taught, without knowing how the photosynthesis process actually occurs. So, when students are asked to explain in their own language what photosynthesis is and how the process works, students find it difficult because they have not really understood the material. Creativity does not just appear, but needs activities that stimulate the growth of creativity and exercises that increase it Kurniasih & Kusainun, 2023). Students' creative thinking skills can be formed by

directly involving students in scientific work. Learner Worksheets can be used as a supporting tool in scientific activities (Hervyanti & Muchlis, 2021). Through the use of Learner Worksheets, students are given the opportunity to be more active and creative (Luthfi & Rakhmawati, 2022).

Learner Worksheets is a form of printed media teaching material which is expected to be an alternative to support the learning process (Krisgiyanti & Pratama, 2023). According to (Hendri, 2023) Learner Worksheets are sheets containing tasks that must be done by learners or students, where the Learner Worksheets contains information and instructions from the teacher to students so that they can carry out a learning activity themselves, through practice or application of learning outcomes to achieve learning objectives. Meanwhile, according to (Oktapia & Siregar, 2023) Learner Worksheets is a tool to help increase activity and shape students' efforts to do learning activities in achieving learning achievements. Based on the above definition, it is concluded that Learner Worksheets are sheets as teaching materials that contain activities for students to do in solving problems equipped with work instructions in achieving learning objectives.

Science learning requires an active role from students through experiments or practicum activities (Nasution et al., 2023). The use of Learner Worksheets is very important especially in subjects that require experimental or practical activities, such as science subjects (Aini et al., 2019). Science is a subject that requires discovery activities, reasoning, and good concept understanding (Diana et al., 2022). According to (Astawan & Agustiana, 2020) Science is related to how to find out about nature systematically, so science is not only the mastery of a collection of knowledge in the form of facts, concepts, or principles but also a discovery process. Science learning can be completed using Learner Worksheets as a guide for students to find or determine concepts based on direct experience. In Learner Worksheets, students will get material, summaries and tasks related to the material (Andriani et al., 2015)(Andriani et al., 2019). Students get the opportunity to actually do something with the topics and problems they learn in the Learner Worksheets (Jannah et al., 2024).. Creative thinking skills can be possessed by students by directly involving students in scientific work activities in the Learner Worksheets to solve a problem (Hervyanti & Muchlis, 2021)(Hervyanti & Muchlis, 2021)..

Research that examines the development of Learner Worksheets based on creativity in science subjects has been carried out, but there are still few who develop photosynthesis material at the elementary school level, such as in research (Saleh et al., 2023) with the title "Creativity-Based Learner Worksheets ". In other studies there are those who develop Learner Worksheets on photosynthesis material in junior or senior high school, but the Learner Worksheets's they develop are not creativity-based, but based on Guided Inquiry conducted by (Maulida & Yuliani, 2023) with the title "Electronic Learner Activity Sheet E- Learner Worksheets Based on Guided Inquiry: Practicing Integrated Science Process Skills on Photosynthesis Material Class XII SMA". Based on this, researchers create and develop creativity-based Learner Worksheets's in photosynthesis science subjects that can help students construct their knowledge based on experience, and can develop their creative thinking skills. The purpose of this study is to improve students' creative thinking skills in learning science photosynthesis material in elementary school and whether learning using creativity-based Learner Worksheets is effective and can be used in the learning process in grade IV elementary school students.

## Method

The method applied in this research is Research and Development (R&D) which can be translated into research and development. The R&D method is a research technique used to make certain goods and evaluate their efficacy. Borg and Gall in (Sugiyono, 2019) defines that research and development is a research method used to develop and validate products used in learning. In the field of education, research and development methods can be used to develop books, modules, learning media, evaluation instruments, curriculum models, evaluations, and others. This research was conducted at SD Negeri 010140 Perk. Gunung Melayu on grade IV students in the 2023-2024 academic year. The subjects in this study were fourth grade students of SD Negeri 010140 Perk. Gunung Melayu with a total of 18 students, while the sample in this study was one class taken by purposive sampling obtained class IV. According to Sugiyono (2016) that: "purposive sampling" is a data source sampling technique with certain considerations. The reason for using purposive sampling technique is because not all samples have criteria that match the phenomenon under study. Therefore, researchers chose the Purposive Sampling technique which sets certain considerations or criteria that must be met by the samples used in this study.

In this study, we will develop a product in the form of creativity-based Science Learner Worksheets. The development of this Learner Worksheets refers to the development model proposed by Robert Maribe Brach with the ADDIE approach. ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation. The stages of this research are: (1) Analysis, analysis is carried out to provide an overview of the needs of the Learner Worksheets to be developed. The analyses carried out to support this development process

include analysis of the scope of the material and analysis of the existing curriculum; (2) Design, the next stage is the initial design of Learner Worksheets by collecting data in the form of information and concepts related to creativity-based Learner Worksheets and compiling assessment instruments. Design on Learner Worksheets is compiled using the Canva application, Learner Worksheets is presented with attractive appearance and animation, and language that is easy for students to understand; (3) Development, Learner Worksheets that has been designed is then validated by expert validators, the validation process is carried out to produce teaching materials with good feasibility to be applied in elementary schools; (4) Implementation, then conduct trials to students, the application of Learner Worksheets is carried out in class IV SD Negeri 010140 Perk. Gunung Melayu. Students use Learner Worksheets teaching materials in groups, then students in each group follow the directions in working on the creativity-based Learner Worksheets provided; (5) Evaluation, the evaluation stage is carried out to determine the success of the development of Creativity-based Learner Worksheets in science subjects on photosynthesis material. Evaluation is a process to see whether the product made can be used or not. Evaluation plays a very important role in improving the Learner Worksheets products developed. The procedure for developing Learner Worksheets based on creativity with the ADDIE model can be seen in Figure 1.

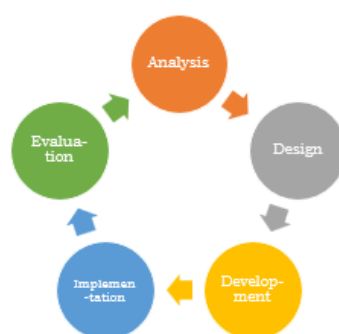


Figure 1 <ADDIE Model>

### Data Collection Technique

Data collection techniques used by researchers in this study are interviews, creative thinking skills rubrics, validation sheets, creative thinking tests, and student response questionnaires. (1) Interviews were conducted before the research to the subject teacher and principal, this was done to obtain the information needed in developing an Learner Worksheets. The information needed is in the form of material and curriculum used in the learning process at SD Negeri 010140 Perk. Gunung Melayu; (2) Rubric of creative thinking skills is an assessment instrument used to measure the level of creative thinking of students; (3) The validation sheet is intended for media and material experts to test the validity of the product developed. This validation sheet is the result of comments and suggestions on the Learner Worksheets that has been made to make the Learner Worksheets feasible to be implemented into the field trial; (4) Creative thinking test to determine the effectiveness of the creativity-based Learner Worksheets that has been developed. (5) Student response questionnaire is used to determine the practicality of creativity-based Learner Worksheets from the responses/comments given by students on the questionnaire sheet.

### Data Analysis Technique

In this study, the data obtained were analyzed qualitatively and quantitatively. Qualitative analysis was used to describe the product development process. Quantitative analysis was used to describe the product quality assessment, response questionnaire and creative thinking skills test. The results of the data analysis were used for product improvement.

## Results and Discussion

### Results

This research produces a product in the form of creativity-based Learner Worksheets in science subjects on photosynthesis material for class IV elementary school students, as for the stages that have been carried out by the author including;

#### *Analysis Stage*

This stage is the first step for researchers in designing the developed creativity-based Learner Worksheets. This Learner Worksheets was developed based on creativity in order to increase the level of creative thinking of students. All information needed in the preparation of creativity-based Learner Worksheets ranging from the

curriculum used, to the learning resources used by teachers in teaching photosynthesis material in class IV is collected. Researchers collect information by directly interviewing the fourth grade homeroom teacher at one of the State Elementary Schools in Asahan Regency, and making physical observations related to the learning resources used. For the curriculum used by the school is the Merdeka Curriculum, and the learning resource used by the teacher in teaching photosynthesis material is the Natural and Social Science book for Elementary School Grade IV. In this book, photosynthesis material is located in the first chapter and is the initial learning for grade IV students in semester 1.

This information is the initial reference for researchers in designing creativity-based Learner Worksheets. After that, researchers began to determine learning objectives, as well as assessment instruments in the form of a rubric of creative thinking skills used to measure the level of creative thinking of students.

The student creative thinking skills instrument was prepared based on 4 characteristics of creative thinking, namely: 1) *Fluency* thinking skills, 2) *Flexibility*, 3) *Originality*, and 4) *Elaboration*. The indicator assessed in the *fluency* aspect is giving ideas or answers that are relevant to the problem, in the *flexibility* aspect is giving ideas or answers in more than one way, the *elaboration* aspect is being able to provide details of the answers expressed so that they are clearer, and the *originality* aspect is being able to provide ideas or answers that are different from their friends. For more details, the rubric of creative thinking skills can be seen in table 5.

Table 1. Creative Thinking Skills Rubric

Aspects	Indicator	Answer Criteria
<i>Fluency</i>	Gives ideas or answers that are relevant to the problem	Provides ideas or answers that fit the problem completely and clearly Gives an idea or answer that fits the problem but is incomplete and unclear. Gives ideas or answers that do not fit the problem Does not answer or give ideas related to the problem
<i>Flexibility</i>	Provides ideas or answers in more than one way	Gives more than 2 ideas or answers Provides 2 ideas or answers Gives less than 2 ideas or answers Does not provide any ideas or answers
<i>Elaboration</i>	Able to provide details of the answers expressed so that it is clearer	Provides correct and detailed answers There are errors in the answer but it is accompanied by a detailed breakdown. There are errors in the answer and no details
<i>Originality</i>	Able to provide ideas or answers that are different from their friends	Did not answer and/or gave the wrong answer Gives ideas or answers that are different from their friends well and correctly Gives an idea or answer that is different from his/her friend's but there are errors Gives an idea or answer that is different from their friends but wrong Gives ideas or answers like their friend's

The student creative thinking skills instrument was prepared based on 4 characteristics of creative thinking, namely: 1) *Fluency*, 2) *Flexibility*, 3) *Originality*, and 4) *Elaboration*. The indicator assessed in the *fluency* aspect is giving ideas or answers that are relevant to the problem, in the *flexibility* aspect is giving ideas or answers in more than one way, the *elaboration* aspect is being able to provide details of the answers expressed so that they are clearer, and the *originality* aspect is being able to provide ideas or answers that are different from their friends.

### Design Stage

The design stage is the stage of preparing the Learner Worksheets. Learner Worksheets is prepared using the canva application, apart from being easily accessible, the canva application also provides a variety of image features, designs, animations, etc., making it easier for researchers to design Learner Worksheets. Learner Worksheets is designed as interesting as possible in accordance with the stage of cognitive development of children, so that students are interested in working on it. The use of images or animations that are adapted to the material, the font on the Learner Worksheets is written in a varied and colorful manner, and the use of language on the Learner Worksheets is easy for students to understand. After the curriculum and student learning resources are known, at this stage the creativity-based Learner Worksheets begins to be designed with the syntax of creativity, the content of the Learner Worksheets includes: (1) indicators of creative thinking; (2)

photosynthesis material contained in the Natural and Social Sciences book for Grade 4 Elementary School, and (3) steps of experimental activities related to photosynthesis.



Figure 2 <Cover of Creativity-based Learner Worksheets>



Figure 3 <Initial Display of Instructions for Use of Creativity-Based Learner Worksheets>

At this stage, the preparation of Learner Worksheets is adjusted to the stage of the creative thinking process, this is the reason this Learner Worksheets is called creativity-based. The creative thinking processes according to Graham Wallas include four stages, namely (1) Preparation, this *preparation* stage according to Wallas is the initial stage where humans first collect information by learning everything through their lives; (2) *Incubation*, the incubation phase is a state where experiences, data, and information that are read and observed are then consciously thought about and then precipitated. In this phase, all experiences, data and information obtained in the previous preparation stage are precipitated until they finally give rise to inspiration; (3) *Illumination*, the illumination phase is the phase of idea expression or expression. This phase is also referred to as the *insight* phase. Insight itself arises when there is inspiration, new ideas along with the psychological processes that initiate and at the same time follow the emergence of inspiration. This illumination stage is a bright spot in terms of the ability to respond to, resolve and express the information received in a creative way; and (4) *Verification*, this stage or phase is basically a testing phase. Through these four stages, the Learner Worksheets is structured to help develop students' creative thinking skills. Because the content of the Learner Worksheets is adjusted to the stage of the creative thinking process, and there are aspects of creative thinking that will be achieved.

Each stage of creative thinking in the Learner Worksheets for more details can be seen in table 6. and the pictures below.

Table 2 <Creativity Syntax>

	Stages	Activities	Aspects of Creative Thinking Achieved
Preparation	Formulate a problem & make an initial attempt to solve it	Students read the "Question" on page 3 as the initial problem to be solved.	<i>Fluency</i>
Incubation	Digesting facts and processing them in the mind	<ul style="list-style-type: none"> <li>Students read the material "The Process of Photosynthesis" found on page 4 as their initial source of knowledge.</li> <li>Students gather their further knowledge through the "Simple Experiment" on page 5 and record the results of the experiment on the observation sheet on page 6.</li> </ul>	<i>Flexibility</i>
Illumination	Come up with an idea	Students design their own experiment on page 7 to prove the process of photosynthesis that occurs in plants.	<i>Flexibility &amp; Originality</i>
Verification	Determine whether the solution can solve the problem	Students prove the process of photosynthesis that occurs in plants by making conclusions that are recorded on page 8 based on their first simple experiment with their second experiment.	<i>Elaboration</i>



Figure 4 <Preparation stage in the Learner Worksheets>



Figure 5 <First Incubation Stage in the Learner Worksheets>

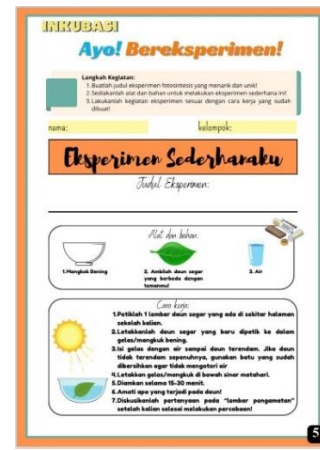


Figure 6 <2nd Incubation Stage in Learner Worksheets>

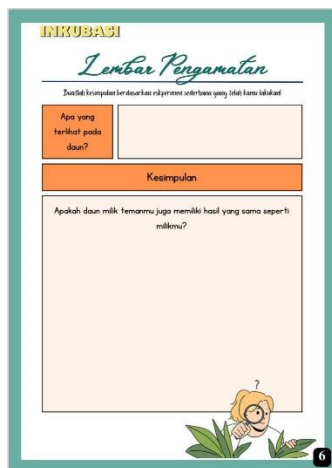


Figure 7 <3rd Incubation Stage in the Learner Worksheets>

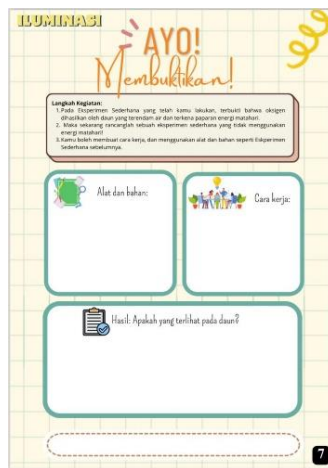


Figure 8 <Illumination stage in the Learner Worksheets>

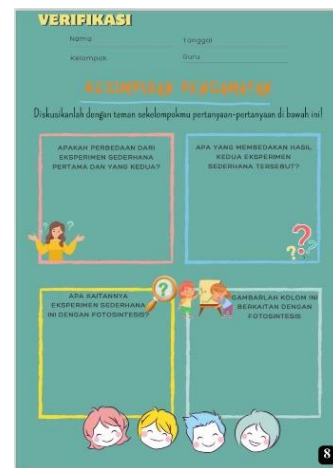


Figure 9 <Verification stage in the Learner Worksheets>

**Development Stage**

The third stage is *development*, the Learner Worksheets that has been designed is then validated by 2 expert validators to determine the feasibility of the Learner Worksheets that has been made. The feasibility of Learner Worksheets consists of media and material feasibility. The aspects assessed by media experts are aspects of presentation and accessibility, while the aspects assessed by material experts are aspects of learning and material content.

**Media Feasibility**

The feasibility of creativity-based Learner Worksheets media is known from media expert validation. The results of validation by media experts can be seen in table 7.

Media validation resulted in a total score of 60 with a score percentage of 100%, this places the classification in a very valid category with an interval of 81% - 100%. Media revisions that have been made are in the form of using images that are in accordance with the material, and changing some writing fonts so that they look more attractive.

Table 3 &lt;Media Expert Validation Results&gt;

No.	Aspects	Indicator	Score		
1.	Presentation	<i>The cover is well-designed and designed</i>	4		
		The Learner Worksheets page is well designed	4		
		The color selection on the Creativity-Based Learner Worksheets is good and looks harmonious.	4		
		The text presented in the Creativity-Based Learner Worksheets is well designed, making it easier to understand the text.	4		
		Consistent and attractive use of <i>fonts</i> (variety of types, sizes, and shapes of letters)	4		
		Consistent use of spacing (in the title and material)	4		
		Clarity of instructions or directions in the Creativity-Based Learner Worksheets that are appropriate and good	4		
		The order of presentation of the Creativity-Based Learner Worksheets is clear and sequential	4		
		The layout of the Creativity-Based Learner Worksheets is well designed and attractive.	4		
		The illustration design presented is interesting and communicative	4		
		Presentation of Creativity-Based Learner Worksheets is equipped with attractive images and illustrations	4		
		2.	Accessibility	The images presented are in accordance with the material	4
				The layout of the material is sequential and interesting	4
				Ability of Learner Worksheets to facilitate students in learning	4
Ease of accessing Learner Worksheets	4				
		Total Score	60		
		Percentage	100%		

*Material Feasibility*

The feasibility of Learner Worksheets material based on creativity is known from the validation of material experts. The results of validation by material experts can be seen in table 8 below.

Table 4 &lt;Material Expert Validation Results&gt;

No.	Aspects	Indicator	Score
1.	Learning	Suitability of Basic Competencies with material	4
		The material is presented systematically	3
		Accuracy of sentence structure and language that is easy to understand	3
2.	Content	The material is as formulated	3
		Suitability of material with cognitive development / children's ability level	3
		Clarity of description of photosynthesis material	3
		The material presented is clear and specific	4
		Total Score	19
		Percentage	68%

Based on the results of the total material validation score of 19 with a percentage of 68% including the valid category with the classification in the interval 61% - 80%, the results on the feasibility of materials on creativity-based Learner Worksheets are feasible to use with minor revisions. The revision of the material that has been done is the use of language on Learner Worksheets which is adjusted to the level of children's abilities, and the writing of material on Learner Worksheets is written more clearly and in more detail so that students can understand it well.

Table 5 &lt;Recapitulation of Assessment from Validators&gt;

No.	Validator Type	Validation Score (%)	Criteria
1.	Media Expert	100%	Very Valid
2.	Material Expert	68%	Valid
Average		83,9%	Very Valid

Based on the recapitulation of assessments and suggestions by validators, several improvements were made to the Learner Worksheets, the results of the creativity-based Learner Worksheets can be seen in the pictures below.



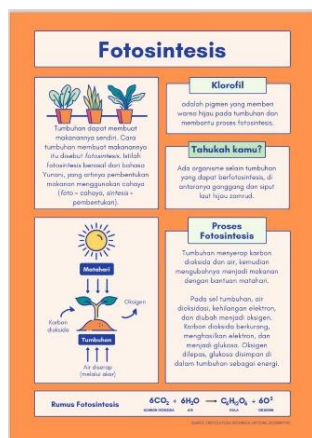


Figure 10 <Display of Material on Learner Worksheets before Revised>

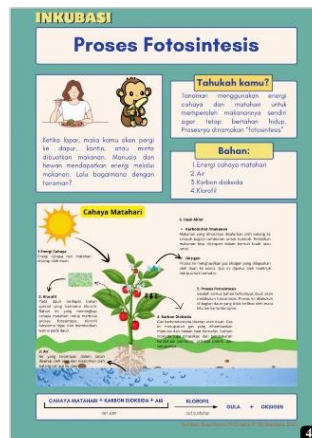


Figure 11 <Display of Material on Learner Worksheets after Revised>

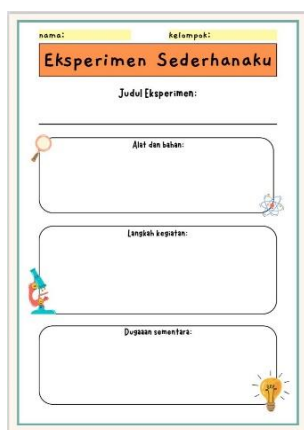


Figure 12 <Simple Experiment Activity Page before Revision>



Figure 13 <Simple Experiment Activity Page after Revised>

Based on the picture above, it can be seen that in the Learner Worksheets before being revised, the creative thinking skills of students to be developed are not clear how the process is, the steps of how students can achieve these skills are not listed in the Learner Worksheets. After being revised, it is clear the stages of the process that students go through in developing their creative thinking skills. The activities in the revised Learner Worksheets are accompanied by the stages of the creative thinking process and which aspects of creative thinking are to be achieved. After working on this creativity-based Learner Worksheets, students have been able to develop their creative thinking skills.

**Implementation Stage**

The fourth step is *implementation*, Learner Worksheets that has been developed and is suitable for use, then tested in learning science material photosynthesis class IV SD. The practicality of creativity-based Learner Worksheets can be assessed based on the value of the student response questionnaire, as well as the effectiveness of Learner Worksheets based on the results of the *pre-test* and *post-test*, the test used is a description test.

*Practicality of Creativity-based Learner Worksheets.*

During learning, students seemed very enthusiastic in working on creativity-based Learner Worksheets. Because, the Learner Worksheets contains simple experiments related to photosynthesis material, and contains questions that provoke student curiosity. Students looked very excited when preparing materials for experiments, carrying out experimental activities, and when filling in the questions in the Learner Worksheets students also looked very productive.

Practicality is measured using an assessment instrument in the form of a student response questionnaire. Giving questionnaires to students is used to determine the level of practicality in the creativity-based Learner Worksheets trials that have been developed. The results of the data obtained can be seen in table 10.

Table 6 &lt;Recapitulation of Student Response Questionnaire&gt;

No.	Aspects	Score	Percentage
1.	Interest	383	91%
2.	Material	232	97%
3.	Language	234	98%
	Average		95%
	Category		Very Practical

Based on table 10. the results of the overall student response questionnaire assessment obtained an average percentage of 95% with the category "very practical".

#### *Effectiveness of Creativity-based Learner Worksheets*

The results of the recapitulation of students' *pre-test* and *post-test* scores can be seen in table 11 below.

Table 11. Recapitulation of Pre-test and Post-test Values

No.	Subject	Average Score Acquisition	
		<i>Pre-Test Score</i>	<i>Post-Test Score</i>
1.	18 Class IV students	36,1	63,9
	Average <i>N-Gain</i> (g)		0,43
	Average <i>N-Gain</i> (g) percent		43%

Based on table 11. the number of students who took the *pre-test* and *post-test* was 18 students. The average value obtained from the *pre-test* is 36.1. While the average value of the *post-test* amounted to 63.9 which means the average value is at the "creative" level of thinking. There is an increase in students' creative thinking level of 0.43. This shows that the level of students' creative thinking has increased after the use of creativity-based Learner Worksheets in learning, by referring to the *pre-test* and *post-test values*, the n-gain value is 0.43 and meets the range of  $0.3 \leq n\text{-gain} \leq 0.7$  with a moderate category, with fairly effective criteria.

#### **Evaluation Stage**

The fifth stage is *evaluation*, at this time we are already at the evaluation stage, the creativity-based Learner Worksheets that has been validated is then tested to see the level of effectiveness and practicality to be applied in learning IPA photosynthesis material. After the trial use, there are no specific suggestions and input or criticism from users that can be used as revisions to improve the product. Based on the evaluation carried out, the creativity-based Learner Worksheets is valid according to a team of expert validators, assessed by positive responses by students on the Learner Worksheets product trial so that the Learner Worksheets does not undergo revision for the implementation stage.

#### **Discussion**

The findings in this study indicate that creativity-based Learner Worksheets can improve creative thinking skills in learning science photosynthesis material in elementary schools. Students can hone their creative thinking skills by working on student activity sheets that have included instructions and the process of making them. In research (Hervyanti & Muchlis, 2021) also explained that creativity-based Learner Worksheets can help students to improve creative thinking skills as well as carry out scientific work activities and guide students to think creatively. In their research, they found that the creativity-based Learner Worksheets developed can guide students to think creatively in identifying problems, exploring, elaborating creative ideas to evaluating the process and results, and making students enthusiastic during learning. These findings are in line with the findings in this study which are shown in its implementation that students seem enthusiastic in working on creativity-based Learner Worksheets developed by researchers because this Learner Worksheets contains simple experiments related to photosynthesis material, and contains questions that can provoke curiosity in students which can lead them to think creatively. The results of the pre-test and post-test also showed that the level of creative thinking of students increased after the application of the creativity-based Learner Worksheets developed by the researcher and included in the moderately effective category.

Creative thinking indicators are used as a reference to see the achievement of students' creative thinking skills. The same thing was also said by (Hervyanti & Muchlis, 2021) that the creative thinking indicators achieved after using Learner Worksheets include aspects of fluency, flexibility, elaboration, and originality. Indicators of creative thinking skills are analyzed to see the achievement of the skills that are trained. The Learner Worksheets in this study is prepared based on the aspects to be achieved in the indicators so that it can help students to develop and apply their knowledge, understand learning materials in depth, and provide opportunities to

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elaborate concepts based on the solution to a problem so that it can trigger the development of students' creative thinking skills.

Learner Worksheets based on this creativity activity is accompanied by relevant images so that it can stimulate students' interest in learning. This is in accordance with the opinion of (Sabaniah et al., 2019) one of the components that support efforts to improve students' creative thinking skills through learning by using teaching materials that are tailored to the characteristics and needs of students. Described in research (Rismiyyenti, 2018) the use of images can increase student learning motivation, because images can stimulate student learning or help students, especially to concretize various abstract concepts. This is also in line with research ((Pawestri & Zulfiati, 2020), the presentation of material with the help of attractive images aims to make it easier for students to understand the material. Students with learning abilities at the level of assistance and frustration will be helped more by presenting material in the form of images that can provide clearer information not only limited to writing. In research (Widodo, 2017) also explained that students seemed eager to answer the questions in the Learner Worksheets, because in it there were various interesting picture illustrations. The above studies suggest that the use of images in Learner Worksheets can stimulate students in learning, and students more easily understand the material presented in Learner Worksheets so that it can help students develop their creative thinking skills.

The design of Learner Worksheets in this study is adjusted to the creative thinking process stage that encourages students to develop their creative thinking skills. The creative thinking process stage consists of 4 aspects, namely preparation, incubation, illumination and verification. Wallas' creative thinking stages are used to measure creative thinking skills and to find out at what stage it is difficult for students to do. Basically, students are not accustomed to doing the stages of creative thinking thoroughly. Students are used to thinking instantly and relying on the help of others. According to (Mashitoh et al., 2019), creative thinking skills can be improved if students are accustomed to doing each stage of creative thinking. Therefore, researchers used the stages of the creative thinking process based on Wallas' theory in developing creativity-based Learner Worksheets. Wallas' creative thinking stages are used to measure creative thinking skills and to find out at what stage it is difficult for students to do. The creative thinking process stage consists of 4 aspects, namely preparation, incubation, illumination and verification (Sadler-Smith, 2015). The stages are explained as follows (1) in the preparation stage students formulate a problem and make an initial attempt to solve it, (2) in the incubation stage students will digest the facts and process them in the mind, (3) in the illumination stage students get ideas or ideas that arise in the incubation stage, (4) in the verification stage students test the stage or check the answer results, and ascertain whether the solution can solve the problem (Savic, 2016). Creativity-based Learner Worksheets based on the 4 stages is explained as follows, (1) the preparation stage, students will read the question text related to photosynthesis on the Learner Worksheets as the initial problem to be solved; (2) at the incubation stage, students will read the photosynthesis material on the Learner Worksheets as an initial source of their knowledge. Then students collect their further knowledge through experiments whose steps have been written in the creativity-based Learner Worksheets and record the results of these experiments on the Learner Worksheets; (3) at the illumination stage, students' creative thinking skills begin to be developed, because students are asked to design their own experiments, where their experiments must be different from the previous experiments; (4) the last stage is verification, students will compare the results of the two experiments and make conclusions, then students will be able to solve the initial problem in the preparation stage. Through these four stages, the Learner Worksheets is structured to help develop students' creative thinking skills.

At the Learner Worksheets development stage validated by 2 expert validators, the feasibility of creativity-based Learner Worksheets media gets a very feasible category with a score percentage of 100%. While the feasibility of creativity-based Learner Worksheets material gets a score percentage of 68% and is included in the feasible category. This shows that this creativity-based Learner Worksheets is suitable for use as additional teaching materials for teachers in the process of learning science on photosynthesis material in elementary schools. In connection with this, (Dewi et al., 2021) revealed that a good or feasible assessment from the validator after the revision of the development product was carried out showed that the development product was suitable for use in the learning process.

At the evaluation stage, researchers can find out how far the understanding of the material that students master after using the creativity-based Learner Worksheets developed in this study after making revisions based on input obtained from the validator. Then, from the results of the trials carried out, researchers received a good assessment so that it was concluded that the creativity-based Learner Worksheets developed had been completed and obtained the final product. This is evidenced by the increase in students' post-test scores, students' creative thinking skills in the pre-test, which on average were still in the less creative category, rose to a very creative and creative category after using creativity-based Learner Worksheets in learning science photosynthesis material.

Based on the results of the above research, it can be seen that there is success in learning science after using creativity-based Learner Worksheets on photosynthesis material. This shows that creativity-based Learner Worksheets is feasible and can be used by teachers in learning because it can improve students' creative thinking skills.

## Conclusion

Based on the data presented above, it can be concluded that learning by using creativity-based Learner Worksheets is effective and can be used in the learning process in grade IV elementary school students. This is evidenced by the increase in students' post-test scores, students' creative thinking skills in the pre-test, which on average were still in the less creative category, rose to a very creative and creative category after using creativity-based Learner Worksheets in learning science photosynthesis material. The feasibility of learning media has been reviewed by subject matter experts, media experts, and fourth grade students of SD Negeri 010140 Perk. Gunung Melayu for the 2023-2024 school year. This shows that creativity-based Learner Worksheets is included in valid criteria and is suitable for use as teaching materials for teachers and students. So it can be concluded that creativity-based Learner Worksheets is effective for science learning on photosynthesis material.

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