

# Implementation of External Motivation Towards Science Literacy and Critical Thinking Skills of Elementary School Students

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## ABSTRACT

Scientific literacy skills and critical thinking skills are two important skills that must be possessed by learners in the face of a challenging era of globalization and all the rapid and dynamic changes in the future. The application of external learning motivation in classroom learning is expected to have a positive influence on scientific literacy and critical thinking skills of students. This study aims to determine the influence of external learning motivation on the ability of science literacy and critical thinking skills of students and analyze the relationship between the ability of science literacy and critical thinking skills of students. The method used in this study is a qualitative research method with a descriptive approach to analysis. The location of this study in SD Shining Stars Mimika Papua Regency with a sample of 15 fifth grade students were taken randomly. The results showed that the application of external learning motivation in science learning in Class V has a positive effect on students' scientific literacy skills both on indicators of scientific knowledge and on indicators of scientific investigation, as seen from the results of post-test students are higher in pre-test scores of students. In addition, external learning motivation is also able to have a positive influence on students' critical thinking skills, as seen from the

increase in the average value of post-test students compared to pre-test students. The relationship between science literacy and critical thinking skills is positive and is in the category of strong enough. This is based on the results of correlation test with significance value of 0.41 and r value of 0.533.

**Keywords:** External Motivation, Scientific Literacy Skills, Critical Thinking Skills.

## INTRODUCTION

In the era of globalization and technological advances, the basic education system plays a major role in shaping the foundation of knowledge and skills of learners. At the elementary school (SD) level, scientific literacy is crucial as the main foundation in understanding the principles of science that underlie natural phenomena. Improving science literacy in elementary school students not only opens the door to a deeper understanding of their world, but also provides a solid foundation for the development of critical thinking skills (Dima et al., 2020).

Critical thinking as the ability to investigate, analyze, and evaluate information is an important component in education at the elementary school level (Primasarpi, 2020). Developing critical thinking skills at this level not only prepares learners to enter higher education, but also forms an

analytical and reflective mindset. In an era where information is widespread, the ability to critically assess and process information is becoming an increasingly important skill (Sarican & Gunes, 2021).

Scientific literacy and critical thinking not only provide benefits at the academic level, but also have an impact on the cognitive and social development of elementary school students (Sarican & Gunes, 2021). The process of scientific inquiry and critical evaluation spurs the development of abstract thinking skills, perseverance, and the ability to collaborate (Liu & Pásztor, 2023). Thus, science literacy and critical thinking form a holistic foundation that empowers primary school students to live their educational journey with increased confidence and ability (Magdalena, Auliya, et al., 2020).

PISA (Program for International Student Assessment) is a program that conducts research in various countries related to students' abilities in reading literacy, mathematics, and science. Based on the results of research conducted by PISA in 2018, Indonesia obtained a score of 396 in the field of scientific literacy. This value is still below the OECD average of 487 (OECD, 2019). From these results it can be said that the ability of science literacy of Indonesian students is still relatively low.

The main challenge facing education in Indonesia related to science literacy and critical thinking in elementary school (SD) students is the lack of adequate educational resources (Syahrial et al., 2019). Many schools, especially in rural areas, still struggle to provide textbooks, laboratory equipment, and science support facilities. As a result, teachers often face limitations in providing the practical learning experience necessary to build an in-depth understanding of science concepts. The second challenge lies in the lack of adequate teacher training in integrating science literacy and critical thinking in their teaching. Many teachers face difficulties in accessing quality training that can improve their skills in delivering science material

inspirationally and stimulate students' critical thinking (Daga et al., 2022). In addition, the influence of learning culture that is still traditional and focused on memorization rather than understanding concepts is also an obstacle. A change to a more interactive and creative learning culture is needed in order for students to effectively develop critical thinking skills (Yılmaz-özcan & Tabak, 2019). In addition, the involvement of parents and the community is also a determining factor in improving scientific literacy and critical thinking of elementary school students. Lack of support from parents in providing access and opportunities for science exploration outside of school can be a significant obstacle. It takes an active role of the community in supporting educational efforts by providing resources and creating an environment that supports learning. Synergies between government, schools, teachers, parents, and the community need to be improved to create a stronger educational foundation, ensure scientific literacy, and stimulate critical thinking into skills that are integrated in the development of elementary school students in Indonesia (Astria et al., 2022).

External learning motivation is an impulse or stimulus derived from factors outside the individual, which encourage him to learn or achieve success in the educational environment (Hornstra et al., 2023). These external factors can come from the social environment, teachers, parents, or gifts given as a form of appreciation (Harahap et al., 2023). External learning motivation can be one of the factors that help encourage individuals to achieve their learning goals (Tulyakul et al., 2022).

External learning motivation also plays a role in increasing students' focus and perseverance towards the subject matter. With an award or reward, students can feel more motivated to complete a complex science task or project. This external encouragement helps students overcome challenges and increase resilience to frustration, which in turn supports the

development of science literacy and critical thinking skills. Rewards can be thought of as incentives that positively reward students' effort and dedication in understanding science concepts.

The use of external motivation in this study was chosen because this study wanted to identify specific ways in which external motivation can have a direct influence on the scientific literacy and critical thinking of elementary school students. Thus, this study can provide specific insights into the effectiveness of external motivation strategies in improving critical thinking skills and science literacy among students, with the aim of providing concrete recommendations regarding the development of more effective learning approaches.

## **LITERATURE REVIEW**

### **1. External Learning Motivation**

According to Uno (2014) learning motivation is a psychological state that describes the desire, drive, or desire of students to perform learning activities. In his view, learning motivation is not only theoretical, but also strongly linked to educational practice in the field. Uno emphasizes that learning motivation is related to the student's desire to achieve the learning goals that have been set. This includes students' efforts to overcome barriers and obstacles in the learning process. Uno also considers factors such as needs, interests, and expectations as drivers of learning motivation.

In the framework of organism theory, Deci and Ryan (in Henny Christine Mamahit, & Dominic D. Biondi Situmorang, 2016) states that learning motivation arises when individuals feel they have autonomy (self-control), competence (ability to succeed), and are socially connected (interacting with others). Maslow (in Jambi, 2021) suggested that the need for self-actualization is the strongest impulse to achieve one's maximum potential. Learning motivation is related to the drive to develop and achieve the deepest abilities and creativity.

External motivation is one type of motivation that affects students in learning, which comes from factors outside the student, such as praise, reward, or punishment. External factors that affect learning motivation include the presence of rewards, second, a conducive learning environment, and third, interesting learning activities. So to achieve high learning motivation for students, it must be considered the factors that influence it both intrinsically and extrinsically. Students must be aware deliberately to carry out activities and learning needs to achieve goals (goals to be achieved). External factors must be accompanied by awards (praise) if students excel, a conducive learning environment and interesting learning activities are needed. In this case, the role of parents is needed to create a conducive atmosphere and help their children in learning.

### **2. Science Literacy Ability**

Wulandari & Wulandari (2016) stated that scientific literacy is the scientific ability of individuals to use their knowledge in the process of identifying problems, acquiring new knowledge, explaining scientific phenomena, and drawing conclusions based on evidence related to scientific issues. Scientific literacy is one of the keys to facing various challenges in the 21st century. Mastering and having the basic concepts of Science and technology will be very helpful in solving life problems.

The development of science literacy for elementary school students is basically to attract the involvement of students in the learning process and create a fun learning atmosphere. The process of learning science is done in an effort to understand concepts, meanings, and relationships through an intuitive process to finally come to a conclusion. The process of developing scientific literacy is carried out through observation, classification, measurement, prediction, determination, and inference.

Thus, it can be concluded that scientific literacy is the ability of students to use their knowledge in the process of identifying

problems, acquiring new knowledge, explaining scientific phenomena, and identifying questions, as well as taking conclusions based on facts.

### **3. Critical Thinking Skills**

Critical thinking arises from a problem, the teacher gives the problem and the learners process the problem into information or knowledge. Teachers are expected to present problems in the learning process so that students can receive new knowledge and information. Syntax provides an opportunity for learners to be productive and critical thinking skills can appear in learners. Tilaar (2011: 19) explained that (1) develop critical thinking by providing information and knowledge to learners (respect for the individual). This gives learners the opportunity to make informed decisions and solve problems. (2) critical thinking prepares learners for adult life. (3) the development of critical thinking ideals should be accompanied by additional scientific education and science that is able to develop critical thinking. (4) democracy, can flourish when citizens are able to think critically about political, social, and economic issues.

The ability to think critically is a skill that will be needed in the future because it helps us solve problems. Facione (Kurniasari & Setyaningsih, 2020) classifies critical thinking skills into six skills, namely interpretation, analysis, reasoning, evaluation, explanation, and self-regulation. (1) interpretation is understanding and redefining the meaning of the condition, information obtained (2) Analysis, information or message received by interpretation (3) draw conclusions and make correct decisions (4) evaluation is seeking and making better decisions (5) description/explanation is a picture of the process of self-regulation. (6) the results of the application of self-regulation, self-management skills, especially self-regulation, have the ability to manage themselves, the results, especially self-assessment analysis and evaluation skills.

Some explanations based on the discussion are that critical thinking skills are the ability to think logically, systematically and productively. Use ideas and information to find additional relevant information and reflections. Developing students' critical thinking skills can be done by the teacher providing problems to students during the learning process. Syntax provides an opportunity for learners to be proactive and critical thinking skills can appear in learners. Important indicators of critical thinking skills are, basic classification, justification of decisions, final clarification and further clarification.

Wade (in Magdalena, Hasna Aj, et al., 2020) identifies eight characteristics of critical thinking, including: (1) the activity of formulating questions, (2) delimiting problems, (3) examining data, (4) analyzing various opinions and biases, (5) avoiding highly emotional considerations, (6) avoiding oversimplification, (7) considering various interpretations, and (8) tolerating ambiguity.

### **MATERIALS & METHODS**

This research method uses a qualitative approach, the approach used in this study is an analytical descriptive approach. According to Issac as quoted by Umar (2003), that the descriptive approach aims to systematically describe the facts or characteristics of a particular population or a particular field in a factual and careful manner. In other words, a descriptive approach is a research method that looks at objects/conditions, images, systematically, factually, and accurately about the facts investigated and the results can be used for decision making in the future.

This study aims to describe the implementation of extrinsic learning motivation to the ability of science literacy and critical thinking skills elementary school. This study uses a qualitative approach and presented with descriptive. Then this study is a qualitative descriptive research. In this regard, research as a key instrument carries out a series of activities

in the field starting from initial observations, orientation studies, and continued with focused studies.

## RESULT

### Implementation of external learning motivation in classroom learning

Through the implementation of external learning motivation in Science Learning in

the fifth grade of SD Shining Stars, students can see the enthusiasm and enthusiasm during classroom learning. Based on the observation results show that most of the research items are at a percentage of 100% and there are only two research items that are at a percentage below 100%.

**Table 1: Results Of Student Motivation Observation**

No	Research Items	Number of students who answered yes		Percentase (%)	
		Day to day 1	Day to day 2	Day to day 1	Day to day 2
1.	Students focus and concentrate when working on problems from the teacher.	15	15	100	100
2.	When there are difficulties, students ask the teacher.	5	8	33	53
3.	Students learn in an orderly manner in class.	15	15	100	100
4.	Students have difficulty answering the teacher's questions, and the teacher directs students to read and look for answers in the student handbook.	6	9	40	60
5.	Students enjoy reading books related to the subject matter/about science.	15	15	100	100
6.	Students show interest in one particular science material.	15	15	100	100
7.	Students are happy when teachers give direct rewards when students behave well / actively.	15	15	100	100
8.	Students understand well the science material presented by the teacher when given questions.	15	15	100	100
9.	Students feel happy when the teacher gives praise when all students are actively answering questions.	15	15	100	100
10.	Students are happy when doing practice in science learning activities.	15	15	100	100
11.	If there are students who have difficulty in science material, teachers provide encouragement indirectly so that students remain active in learning.	15	15	100	100
12.	Students are active when the teacher provides games related to the material.	15	15	100	100

With the provision of external learning motivation in Science Learning, most students followed closely the teacher's exposure and interactivity in the question and answer process given by the teacher interrupted the delivery of the material. When the teacher throws questions to students in random, and students who are able to answer quickly then the teacher gives appreciation with praise and applause, siswapun excited, because for students who have high intlegensi can easily provide answers. If there are students who look less active still given a stimulus to be interactive

in answering questions and answers during the discussion. As for students who have difficulty in answering correctly, the teacher is directed to read for a moment the student's package book on the material being discussed. It also aims to improve literacy in science lessons, so as to foster a critical attitude by giving answers or responses in the question-and-answer process in the classroom.

The learning process conducted by the teacher is very interactive, students look focused when the teacher exposes the material. Students understand each

explanation of the material from the teacher and at the time of discussion in the classroom after the exposure of the material, students look enthusiastic in responding to also give answers to oral questions given by the teacher. If there are students who are not

active, the teacher will ask questions to find out if the student understands the material presented by the teacher. This is seen where a teacher seeks all students to participate and be active in the learning process.



**Figure 1: Implementation of external learning motivation in Science Learning by involving students in direct practical activities**

From the observation also described a teacher to motivate students very well, if there are students who deliver answers or responses during the learning process the teacher gave praise and applause to the students. This makes all students happy and eager to learn, even passive students can be motivated by the teacher to try to respond to the discussion presented by the teacher. Especially in science learning, namely about the ecosystem, the teacher gives questions to each student one question, to find out the understanding and critical thinking ability of the given problem. Almost all students are able to answer the questions given by the teacher, if there are one or two students who still can not answer the oral questions submitted by the teacher, the student is invited to find the answer by looking and reading the student handbook to find the exact answer.

In learning the teacher also provides games related to the material, with the aim of making students better understand the material. Students are very enthusiastic to follow the games, so that the purpose of understanding the material to students is conveyed well. The provision of games to students is indeed very well liked by students and at the end of the student-learner meeting, students are seen responding to the teacher so that the next

meeting is carried out again. With learning followed by students with enthusiasm to make learning take place in an orderly manner. In addition, with the provision of rewards or praise from teachers and science learning that is packed with interesting as the games and other fun learning, it will arise in students a feeling of pleasure when learning and interest in learning science.

The expression of students' happiness when participating in learning can also be seen in the interview results which show that most students feel happy and comfortable with the provision of external learning motivation from teachers. The feeling of pleasure and comfort in the students who can provide a positive influence for students so that students are always active, enthusiastic and enthusiastic when following the learning.

Strategies undertaken by teachers such as giving appreciation to students and invite students to read books to find answers to the questions asked by teachers are very effective in motivating students to have the spirit of learning and improving students' critical understanding in the process of learning science activities. The spirit and excitement that emerged from the expression of each student. Teachers also often provide time for students to play games at the end of the time the process of

meeting material activities, this is also a way for teachers to provide enthusiasm to students also this looks not boring the process of learning activities. The process of giving tests to students at the end of learning activities if there is a reward in the form of praise from the teacher this can provide good test results because students benefit from the praise given by teachers and students are able to absorb the delivery of science material, and also inseparable from the way of delivery or teacher's strategy during learning activities.

In the first and second observation, there is a difference. Where in the first observation seen a picture of students who respond a lot of answers to questions given by the teacher, also seen the criticality of students through questions that arise from students. In terms of students' literacy skills arise due to the efforts of teachers who direct students

during class discussions, if there is something that is not understood by the teacher convey to students to re-open and read the book penganggaran students to obtain answers from what is discussed. However, when the second observation did not appear, therefore students were not moved to read the book because the stimulus from the teacher was not sought.

### **The influence of external learning motivation on the ability of science literacy and critical thinking skills of students**

The provision of external learning motivation given by teachers at Shinning Star Elementary School, especially in learning science in Grade V, has a positive influence on students' science literacy skills.

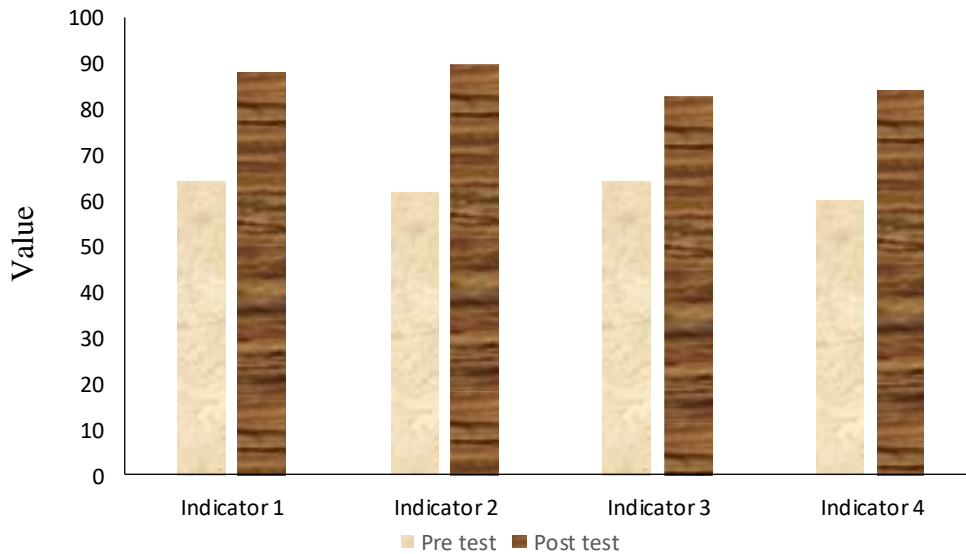
**Table 2: The results of the assessment of science literacy skills in learning with the implementation of external learning motivation**

Results	Indicators Of Science Literacy Ability			
	Science Knowledge		Science Research	
	Pre test	Post test	Pre test	Post test
Average value	64	97	60	90

Based on the results of the assessment of science literacy skills, it can be seen that there is an increase in the achievement of science literacy skills of students, both on indicators of science knowledge and science investigation. In the indicator of science knowledge, the average result of pre-test students only reached 64. While the average result of post test students reached 97. Likewise, in the indicator of Science Investigation, the average pre-test results obtained by students only reached 60. While the average post-test results obtained by students reached 90.

In addition to having a positive influence on students' science literacy skills, the provision of external learning motivation provided by teachers in SD Shining Stars, especially in learning science in Class V also has a positive influence on students'

critical thinking skills. It can be seen from the post-test results of students who showed that there was an increase in the achievement of critical thinking skills of students both in indicator1, indicator 2, indicator 3, and indicator 4. In Indicator 1, the average result of pre-test students only reached 64. While the average result of post test students reached 88. In Indicator 2, the average pre-test results obtained by students only reached 62. While the average post-test results obtained by students reached 90. In Indicator 3, the average pre-test results obtained by students only reached 64. While the average post-test results obtained by students reached 83. Likewise, on indicator 4, the average pre-test results obtained by students only reached 60. While the average post-test results obtained by students reached 84.



**Figure 2: Data on the average value of students' critical thinking skills in learning with the implementation of external learning motivation**

Thus, we can conclude that learning with the implementation of external learning motivation has a positive effect on students' critical thinking skills, namely the improvement of students' scientific literacy skills in Indicator 1, which formulates problem points, indicator 2, which reveals facts in solving problems, indicator 3, which chooses logical and accurate arguments, and indicator 4, which determines the consequences of a statement taken as a decision.

### Correlation Test Results

The results of the correlation test of the average value of post test students from questions that measure science literacy skills and the average value of post test students from questions that measure critical thinking skills. The results of the correlation test can be seen in the following table.

**Table 3: Pearson Product Moment Bivariate Correlation Test**

Variables	Description	Science Literacy	Critical Thinking
Science Literacy	Pearson Correlation	1	.533*
	Sig. (2-tailed)		.041
	N	15	15
Critical Thinking	Pearson Correlation	.533*	1
	Sig. (2-tailed)	.041	
	N	15	15

Based on Table 3, the results obtained that the value of significance obtained is 0.041. With this value, the significance value  $<0.05$  which means  $H_0$  is rejected, then the decision is accepted  $H_a$  which means there is a relationship between scientific literacy skills and critical thinking skills. With the

correlation coefficient value obtained is equal to 0.533, the relationship formed between science literacy skills and critical thinking skills is a positive relationship with the category is quite strong. As explained in the following table.



**Table 4: Table of interpretation of the Pearson r value correlation test analysis results**

Interval value r	Interpretation
0,001-0,200	Very weak correlation
0,201-0,400	Weak correlation
0,401-0,600	Correlation is quite strong
0,601-0,800	Strong correlation
0,801-1,000	Correlation is very strong

## CONCLUSION

Based on the description of the results of the study can be concluded related to the implementation of external learning motivation to literacy skills and critical thinking skills. As for the conclusion, it is as follows:

- 1) implementation of learning with external learning motivation applied to science learning in the fifth grade of Shinning Star Elementary School by using various techniques. The application of the technique is adjusted to the lesson plan and applied both to the preliminary activities, core activities and closing activities. The techniques used include: giving words of encouragement, praise, reward, the use of interesting learning media, the use of games in learning, the use of learning models that involve direct practice, as well as the attitude of teachers who are always patient, open and always motivate students, especially to students who still have difficulty understanding learning materials.
- 2) with the implementation of external learning motivation in science learning in the fifth grade of Shinning Star Elementary School, students can be seen focused, active, happy and full of enthusiasm during the learning process.
- 3) the implementation of external learning motivation in Science Learning Class V has a positive effect on students ' science literacy skills, namely an increase in the value of science literacy skills both in science knowledge indicators and science research. The increase in value is seen from the results of the post test is higher than the results of pre-test students.
- 4) the implementation of external learning motivation in Science Learning has a

positive effect on students ' critical thinking skills, namely an increase in grades after post-test compared to pre-test results. The increase in the value is seen in Indicator 1 is to formulate the main points of the problem, indicator 2 is to reveal the facts in solving the problem, indicator 3 is to choose a logical and accurate argument, and indicator 4 is to determine the consequences of a statement taken as a decision.

- 5) there is a positive relationship between science literacy skills and critical thinking skills. The better the science literacy skills of students, the better the critical thinking skills of students. Vice versa, the better the critical thinking skills of students, the better the science literacy skills of students. This can be seen from the results of the correlation Test between the two variables with a significance value of 0.041 and an r value of 0.533, which means that there is a strong and positive correlation between scientific literacy skills and critical thinking skills.

## Declaration by Authors

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