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Learning Motivation and Computational Thinking Ability of Elementary School Students in Learning Science

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Abstract: This research is motivated by the low learning outcomes of students in elementary schools, especially in science learning content. This study aims to: (1) analyze learning motivation and students' computational thinking skills in science learning; (2) knowing the relationship between learning motivation and computational thinking ability. This research method is a mixed method, namely research methods that communicate or combine quantitative methods and qualitative methods to be used together in a research activity. This research was conducted in Cluster II Koto Salak, which consists of five elementary schools and one Islamic elementary school. The number of students in grade V at SDa is 25 students for class A, and 26 students for class B, SD B has 26 students, SD C has 15 students, SD D has 10 students, and MI A has 21 students. So that the total number of research subjects is 123 students, plus 5 school principals, and 6 class teachers. Data collection techniques used are questionnaires, observation, structured interviews, and documentation. The qualitative data analysis technique in this study is to use interactive data analysis, namely (1) data reduction; (2) Data presentation; (3) Drawing conclusions. Quantitative data analysis is the Pearson correlation test using SPSS. The results showed that the learning motivation and computational thinking abilities of students in cluster II Koto Salak were still low, on average, still below 30%. Pearson correlation test results Sig 0.00 <0.05 so that H1 is accepted, meaning that learning motivation and computational thinking ability have a correlation. The form of the correlation is positive with a value of 0.99 which is at the perfect relationship level.

Keywords: Computation thinking skill; Learning motivation; Science

Introduction

Science learning often becomes learning content that students don't like, especially in elementary schools. Science lessons are less attractive to students because the subject matter is delivered using the lecture and question and answer method only so it is not fun for students (Marta et al., 2020; Taupik et al., 2022; Disurya & Ayu, 2022; Fitria, 2017). In addition, learning science is considered difficult because the content of the material is very broad, so students assume that science is learning that requires a lot of memorization.

Computational Thinking (CT) is one of the most important abilities to be trained from an early age because in the information age, industrial era 4.0 and society 5.0, humans live in the real world and the digital world as well as being digitally surrounded by IoT (*Internet of Things*), *Big Data*, ad *Artificial Intelligence. Computation Thinking* is *problem solving,* defining the root cause of the problem with a solution, then carefully thinking about whether the solution would be more effective if it involved a computer (Mulyanto et al., 2020). Computational thinking skills or CT are skills related to the way people think or learn. Fajri Yuniwati in (Mania, 2021) defines that computational thinking is the ability to think innovatively in identifying life phenomena in order to be able to provide practical solutions to the problems studied. So that with this computational thinking ability, students grow into individuals who are skilled and proficient in learning and are able to formulate their knowledge in life. Further explained (Augie & Priatna, 2021) explained that computational

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thinking skills are thought processes to solve problems by identifying, analyzing and implementing effective and efficient solutions. Thus, computational thinking skills are problem solving skills to achieve effective solutions.

Computational thinking is becoming an essential skill in the 21st century. Computational thinking is thinking logically, step by step, and making decisions when faced with two different choices, or it can also be interpreted as solving complex problems in simple ways (Lestari & Annizar, 2020). This ability can improve teacher performance in Computational Thinking in developing teaching materials for students. The importance of teachers in computational thinking in learning is one way to develop students' motor skills.

Motivation is an important element in supporting the development of computational thinking skills which in turn will also affect the success of the learning process. High or low motivation will affect the success of students in understanding the material being studied. The abilities and skills of students are directly proportional to the motivation of the students themselves, meaning that if the child's motivation is high, the child's understanding and skills will also increase. Motivation can be defined as a form of encouragement, passion and desire from within a person to do something and achieve a goal (Bahri, 2011; Hanafiah & Suhana, 2012). In education, motivation is a form of non-intellectual psychic movement that encourages someone to carry out learning activities that function to increase their knowledge and skills (Yamin, 2011; Arianti, 2019). Someone who has high enough intelligence can fail because of low motivation to learn (Arianti, 2019). So, learning motivation is created naturally from within students which becomes a force to support the learning process carried out by students. Learning motivation is the basic capital for adding and developing the knowledge and skills of students.

Low motivation to learn has become a common case and we often encounter in the world of education. Low learning motivation can be seen from the attitude of students who are not indifferent to the learning process, do not pay attention to the teacher when explaining, and do not do the assignments given by the teacher. This of course will lead to low knowledge and skills of students as well. As that learning motivation will determine the success of the learning process (Rohman & Karimah, 2018). Motivation and learning are two things that are very related to each other and influence each other (Kurnia Sari et al., 2020). Learning motivation can arise due to two factors, namely internal factors and external factors. These internal factors are the desire and desire or need to learn. While external factors in the form of recognition or appreciation of an achievement, a conducive, comfortable, and interesting learning environment (Kurnia Sari et al., 2020). So that learning motivation is an internal and external encouragement to students who play an important role in student learning success.

Method

This research method uses a combination research method, namely a research method that communicates or combines quantitative methods and qualitative methods to be used together in a research activity, in order to obtain data that is more comprehensive, valid, reliable, and objective. This combined research method is more interesting because the researcher can use two kinds of data at once, namely quantitative and qualitative data simultaneously, so that the research data is more complete and more accurate. wider sample with quantitative methods (Sudaryono, 2021).

This research was conducted in Cluster II Koto Salak, which consists of five elementary schools and one Islamic elementary school. The number of students in grade V at SDa is 25 students for class A, and 26 students for class B, SD B has 26 students, SD C has 15 students, SD D has 10 students, and MI A has 21 students. So that the total number of research subjects is 123 students, plus 5 school principals, and 6 class teachers. This research was conducted from May 15 to July 15, 2023. The aims of this study were (1) to obtain information on the reality of student learning motivation and computational thinking abilities of elementary school students in science learning in class V Cluster II Koto Salak; (2) Showing the relationship between learning motivation variables with students' computational thinking skill.

Data collection techniques used are questionnaires, observation, structured interviews, and documentation. Questionnaires were given to find out how the conditions for learning science science were at school. The questionnaire given is a closed questionnaire, which is a questionnaire that contains questions or questions that have been structured so that respondents are asked to choose one of the answers according to their characteristics by giving a cross or a checklist (Sudaryono, 2021). The measurement scale used is the Likert scale, which is a scale used to measure attitudes, opinions, and perceptions of a person or group about events or social phenomena in this study to measure students' learning motivation. Computing ability is measured using a test instrument. According to Sudaryono (2021) a test as a data collection instrument is a series of questions or exercises used to measure knowledge, intelligence, abilities, or talents possessed by individuals or groups.

The qualitative data analysis technique in this study is to use interactive data analysis, which is based on the data obtained referring to the opinions of Milles and Huberman, namely: (1) Data reduction, namely selecting, focusing and transforming data based on written notes in the field; (2) Data presentation; (3) Drawing conclusions. Quantitative data analysis technique is to use the Pearson correlation test, which is a correlation test that aims to determine the level of closeness of the relationship between variables expressed by the correlation coefficient (r) (Pratama, 2019). With the following hypothesis:

H_0 : There is no correlation between the learning motivation variables and the computational thinking skills of fifth grade students in science learning.

H_1 : There is a correlation between the variables of learning motivation and the variable of the computational thinking ability of fifth grade students in science learning.

With the provision that if the significance value is <0.05, then H_1 is accepted and H_0 is rejected, meaning that the motivation variable is correlated with the computational thinking ability variable. If the significance value is > 0.05 then H1 is rejected and H0 is accepted, which means that the motivational variable is not correlated with the computational thinking ability variable.

Result and Discussion

The research was conducted in five schools in Gugus II Koto Salak. There are five elementary schools and one elementary madrasah in this cluster. The following is a table of student data in Cluster II Koto Salak. The results showed that students' learning motivation and students' computational thinking skills in science learning were still low. Qualitative data obtained through a questionnaire distributed to fifth grade students in Gugus II Koto Salak:

Table 1. Data from Class V Gugus II Koto Salak Students

School	Student Count
SD 1	51
SD 2	26
SD 3	15
SD 4	10
MI 1	21
Total	123 students

The operational definition of learning motivation is motivation that encourages students to learn better than before or from other people through: (1) trying to excel in their group; (2) complete the task properly; (3) rational in learning; (4) likes challenges; (5) accept responsibility successfully; and (6) like the learning situation.

The results of interviews with fifth grade teachers regarding students' learning motivation in learning science and students' computational thinking abilities are as follows: 1) The teacher considers that students are less interested in learning science, this can be seen from the behavior of students who are careless, unfocused, and often go in and out of class when learning science takes place. 2) Students' interest in responding or asking questions related to learning material is very low. 3) The teacher realizes that the teaching method used tends to be watching and has not used learning media that attracts students' interest. 4) The teacher's ability to utilize technology for learning is very low, due to age and skills in using electronic devices that are lacking. 5) The learning process does not involve students actively because they rarely use LKPD and media that can invite children to participate actively in learning.

The results of data collection on science learning motivation using a questionnaire instrument were distributed to 123 students with a scale of 5 (strongly agree), 4 (agree), 3 (doubtful), 2 (disagree), and 1 (strongly disagree). After being recapitulated and calculated, the scores of students' motivation to learn science in Cluster II are as follows:

Table 2. Recapitulation of the Motivational Questionnaire on Learning Motivation

Item	5	4	3	2	1	Score
Love sciece	13	28	7	31	44	304
Trying to excel in science learning	20	27	11	34	31	340
Complete the task well	19	21	3	33	47	301
Always score above 80	7	11	14	27	64	239
Actively asking and answering teacher questions	11	10	11	41	50	260
Total	91	127	53	171	173	

Based on table 2, it is known that the majority of student groups do not like science learning, this is known by seeing that the number of children who are responsible (1) is 44 people. Of the five statement items contained in the questionnaire sheet, the following is the percentage of conclusions on science learning motivation in Cluster II.

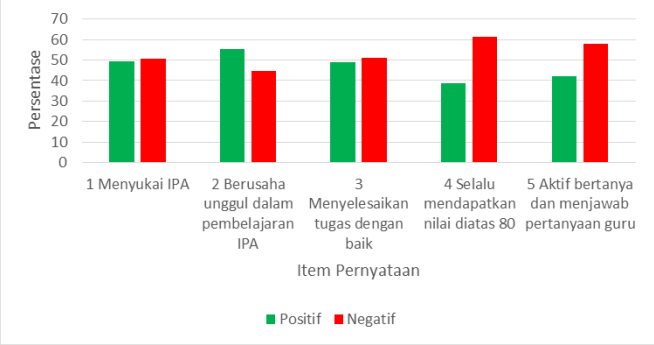

Figure 1. Comparison of the percentage of students" motivation to learn science in Cluster II Koto Salak

Based on Figure 1, it is known that the results of the questionnaire on students' motivation to learn science in class V gugu II show that students' motivation to learn science is still in the low category. From the total percentage of students' motivation of 1,444 compared to the ideal score of 3,075, it was obtained that the percentage of learning motivation of class V students in cluster II Koto Salak was 46.96%. This figure shows that the learning motivation of fifth grade students in learning science in gugu II Koto Salak is categorized as low.

Based on the description of the qualitative data and quantitative data above, it can be concluded that the learning motivation of fifth grade students in learning science is still very low. This of course will have a negative influence on the development of students' knowledge and skills. Low learning motivation will result in low computational thinking skills in students. As is known, that the ability to think computation is needed in education, especially in the current era. Computational Thinking (CT) is a very important skill in the information age, the current era of industry 4.0 and society 5.0. Currently, humans live in the real world and a digital and digital world surrounded by IoT (Internet of Things), Big Data, and Artificial Intelligence. Computation Thinking is problem solving, namely defining the root of the problem with the solution, then thinking as well as possible whether the solution will be more effective if it involves a computer (Mulyanto et al., 2020). For this reason, this computational thinking ability really needs to be trained from an early age.

In collecting data related to this computational thinking ability, the researcher designs questions according to indicators of computational thinking ability. There are several skills in computational thinking, namely: 1) the ability to solve problems using a computer or other device, 2) the ability to organize and analyze available data, 3) the ability to represent data through abstraction with the help of a model or simulation. 4) the ability to automate decisions by using algorithmic thinking, 5) the ability to find, analyze, and implement solutions in various ways and means that are efficient and effective, and 6) the ability to generalize solutions to various problems (Maksum et al., 2022).

Data obtained from the implementation of the computational thinking ability test were taken from item analysts on the results of the end-of-semester summative test in the even semester of the 2022/2023 academic year. This means that this is the result of a grade V student's test when they were in grade IV on science content that was taught in odd semesters. In the analysis of the questions used, there were 11 questions which tested the ability to think computationally with a problem solving background. The results of the analysis obtained the following results.

Table 3. Percentage of Correct Answers on the Computational Thinking Ability Test

Item Question	Percentage of Correct Answers (%)
Item 1	33.33333
Item 2	21.9512
Item 3	20.3252
Item 4	28.45528
Item 5	27.64228
Item 6	14.63415
Item 7	26.82927
Item 8	22.76423
Item 9	24.39024
Item 10	20.3252
Item 11	24.39024

The table above shows that the responses of students' correct answers in Cluster II Koto Salak to items containing computational thinking skills are still low. In item 1, the percentage of children who answered correctly was only 33.33% which means that out of 123 students only 41 students were able to answer correctly. Item 2 only 21.95% of students answered correctly, meaning that out of 123 students only 27 students answered correctly. Likewise with other question items, which generally show a percentage below 30%.

These results indicate that SD/MI need to pay attention to the development of students' computational thinking skills. This effort departs from the effectiveness of the learning process carried out. High learning motivation will also influence the development of computing abilities. For this reason, the use of learning media in class, especially in science learning, needs to be considered so that it can increase students' learning motivation.

Qualitative data related to computational thinking skills obtained through direct interviews with classroom teachers, are in line with the data obtained from the quantitative analysis above. The teacher stated that in general, children's computational thinking skills in science learning were still relatively low. Children are

not good at analyzing the meaning of the questions presented. In addition, the child's ability to relate one concept to another is also lacking. Thus, children cannot solve problems that contain computational skills with a good problem solving background. According to the teacher, the use of learning media is very important to improve this computing ability. This is the obstacle in several schools in cluster II Koto Salak, most of the teachers are not good at using technology-based learning media, especially for making their own learning media. The teachers hope that there will be technology-based learning media that is easy to access and implement.

Learning motivation and computational thinking skills are two elements that are interrelated and mutually support the success of the learning process. In the case of education further elaborated according to Yamin (2011) that motivation to learn is a movement that moves a non-intellectual psychic in a person to be able to carry out learning activities which function as an addition to skills and experience. A person who has high intelligence abilities will be able to experience failure if he is lacking or has low learning motivation (Afrianti, 2019). So, high learning motivation will examine the impetus for improving students' computational thinking skills.

To find out the relationship between learning motivation and computational thinking skills in Gugu II Koto Salak, researchers conducted a Pearson correlation test. Pearson correlation test aims to determine the level of closeness of the relationship between variables expressed by the correlation coefficient (r)(Pratama, 2019). The formulation of the problem to test the relationship between these variables is: Is there a relationship (a significant correlation) between learning motivation and the computational thinking skills of class V group II students in science learning? The research statistical hypothesis is:

H_0 : There is no significant relationship (correlation) between learning motivation and students' computational thinking abilities.

H_1: There is a significant relationship (correlation) between learning motivation and students' computational thinking skills.

The basis for the decision is: If the Significance value <0.05, H_1 is accepted and H_0 is rejected. If the Significance value is > 0.05, H_0 is accepted and H_1 is rejected. Guidelines for the degree of relationship can be seen in table 4

The research population was students of class V cluster II Koto Salak, which consisted of five educational units. The research population is the area to be studied (Sulistyono, 2013). The population is a generalization area which consists of: objects/subjects that have certain characteristics and qualities that are determined to be studied by researchers and then conclusions are drawn (Sugiyono, 2017). Researchers only determine a portion of what they want to explain, normalize, and control from the population, because if the number of subjects to be studied is limited (Sudaryono, 2021). In other words, the population is a generalized area consisting of objects or subjects that have certain qualities and characteristics determined by the researcher to be studied and then drawn conclusions.

Table 4. Guidelines for the Degree of Relationship Correlation Test (Aminah et al., 2023)

Relationship degree	Pearson correlation value
0.00 to 0,20	No correlation
0.21 to 0.40	Weak correlation
0.41 to 0.60	Medium correlation
0.61 to 0.80	Strong correlation
0.81 to 1.00	Perfect correlation

Researchers took research samples with Probably sampling technique. Probability sampling is a sampling technique that provides equal opportunities for each member of the population to be selected as part of the sample (Sugiyono, 2017; Sudaryono, 2021). There are several probability sampling methods, namely simple *random sampling, stratified random sampling, cluster sampling, systematic sampling, proportionate stratified random, and disproportionate stratified random*. The probability sampling technique used in this study is cluster random sampling or group sampling. Cluster Random Sampling is an area sampling technique used to determine samples when the object under study is very large (Sugiyono, 2017).Cluster random sampling is a probability sampling procedure that selects subpopulations called clusters. Then each element in the group (the cluster) is selected as a member of the sample (Susilana, 2015).

By following this technique, the result was that the sample used for the experimental class was the VA class at SDN 02 Koto Salak, which consisted of 25 people. Following are the results of the Pearson correlation test on the variable learning motivation with students' computational thinking skills in science learning in class V cluster II Koto Salak using SPSS:

Table 5. Pearson Correlation Test Results

Correlations			
		Motivation	Computing
Motivation	Pearson Correlation	1	.990**
	Sig. (2-tailed)		.000
	N	25	25
Computing	Pearson Correlation	.990**	1
	Sig. (2-tailed)	.000	
	N	25	25

**. Correlation is significant at the 0.01 level (2-tailed)

Based on the table above, it is known that the significance value is 0.000 <0.05, then H1 is accepted and H0 is rejected, meaning that there is a significant relationship (correlation) between learning motivation and students' computational thinking abilities.

The degree of correlation was obtained at 0.990, this means that the relationship or correlation between the variables of learning motivation and students' computational thinking skills is at the perfect correlation level because the value of 0.99 is in the range of 0.81 to 1.00. Then the sign of the Pearson correlation value is positive, meaning that the form of the relationship between learning motivation and computational thinking ability has a positive relationship. A positive relationship means that if the value of learning motivation increases, students' computational thinking skills will also increase.

Computational thinking skills or computational thinking skills are skills related to the way people think or learn. Fajri Yuniwati in (Sa'diyyah et al., 2021) defines that computational thinking is the ability to think innovatively in identifying life phenomena in order to be able to provide practical solutions to the problems studied. So that with this computational thinking ability, students grow into individuals who are skilled and proficient in learning and are able to formulate their knowledge in life. Further explained (Boom et al., 2022) explained that computational thinking skills are thought processes to solve problems by identifying, analyzing and implementing effective and efficient solutions. Thus, computational thinking skills are problem solving skills to achieve effective solutions.

To improve computational thinking skills, strong learning motivation is needed in students. Learning motivation is a form of encouragement in the form of passion and desire from within a person to learn. According to (Bahri, 2011), Motivation is an encouragement in a person who can change energy into a real form of activity in order to achieve the desired goals. The formation of a foundation for learning motivation for elementary school students is very important to increase the desire of students to participate in learning (Yelena et al., 2016).

One of the efforts to increase student motivation, especially in science learning, is to use learning media that are effective, interesting, and in accordance with the world of children. Learning media can help explain the complexity of the material that will be conveyed to students more simply so that it is easier for students to understand learning. Subject matter that is difficult to understand can be more easily understood by students with this learning media so that students do not feel bored or bored in learning and become more enthusiastic.

Conclusion

Based on the results of the research that has been described, it is concluded that (1) learning motivation is encouragement, enthusiasm, and a desire to learn from within students. Learning motivation can come from within the student naturally and can come from outside the child; (2) The ability to think computationally is a complex ability to solve problems and is very important for students to have and needs to be trained from an early age; (3) students' learning motivation and computational thinking skills in cluster II Koto Salak are still low; (4) Learning motivation and computational thinking skills are interrelated; and (5) The magnitude of the correlation of learning motivation and computational thinking skills of students in gugu II Koto Salak in science learning is 0.99, at the level of perfect relationship, and positive relationship.

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The authors declare no conflict of interest.

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