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Research Article

Improve Students' Critical Thinking Skills About Energy and Its Use Through the Society Technology Science Learning Model

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Abstract

This research aims to increase students' interest in science subjects regarding Energy and its use in utilizing natural resources, describing the use of concrete props in the science learning process to increase activeness and creativity in learningencourage students to think critically in Energy material and its use in utilizing natural resources and their solutions. From the results of this research, it is hoped that it can provide benefits in improving student learning outcomes optimally, increasing students' interest and motivation in quality science lessons which are considered difficult, increasing understanding of concepts, because students learn directly about themincreasing teacher creativity in carrying out the learning process, helping teachers develop their teaching abilities professionally, growing and increasing self-confidence, advancing school institutions as seen from increasing teacher professionalism in the learning processimproving and enhancing the learning process and outcomes of transfer students, creating a conducive school education situation. In the process of learning science for class IV on the subject of economic activities in Indonesia, the results of observations from colleagues, suggestions from supervisors, the author needs to carry out improvements to the learning of Natural

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Sciences (Science) subjects on the subject of energy sources and their use in the classroomIV(four). There were 20 students (71.43%) out of 28 students who had not met the KKM/score less than 75.in implementing learning improvements in Natural Sciences (Science) subjects starting from cycle I, it has shown an increase in students' mastery of the material with 15 students achieving completeness out of 28 students with an average score of 72.86.

Keywords: Improving, Skill, Critical Thinking, Energy, Learning Model, Society Technology Science

INTRODUCTION

Learning is a communication process between teachers and students, where teachers try to convey or transfer learning material as well as possible so that it can be easily understood and mastered by students. The purpose of providing science subjects in elementary schools (SD) is expected by elementary school graduates to have broad insight into changes that occur in the surrounding environment to the international level. Moreover, the development of the times has been so great, especially with the globalization that continues to roll.

Science subjects are one of the subjects that are considered difficult for some elementary school students. This is due to the existence of too wide a scope of material. Also for teachers it is rather difficult to achieve predetermined completeness, because the allocation of available time is also somewhat less. Therefore, teachers must really make the right learning scenario. To improve understanding and mastery of concepts, it is necessary to use learning tools and media, because as a means for teachers to help achieve the learning objectives to be achieved.

But the teacher's effort test has been maximized in the use of teaching aids, but sometimes it has not been completed in learning. This is due to the lack of optimization in using it. So the best solution is to implement a learning improvement program. Especially for grade IV students of SDN 01 Padangsidimpuan. With PTK (Classroom Action Research) teachers can diagnose about weaknesses in the way they teach. In order to be able to improve and improve their performance, improve student learning outcomes and be able to reflect on themselves and provide good feedback.

By knowing the weaknesses and shortcomings of the diagnostic results, the next step is to carry out learning improvements. Teachers must redesign the learning process from cycle I to the final cycle with enrichment. Through the implementation of learning improvements, namely with PTK (Classroom Action Research), it is hoped that student learning motivation will increase and in order to carry out the teaching and learning process more professionally, it will increase so that goals will be achieved faster.

METHOD

Research Subjects

1. Research Location : SDN 01 Padangsidimpuan.
2. Research Time :
   a. First cycle : Thursday, 18 February 2023
   b. Second cycle : Thursday, 25 February 2023
3. Subject

   The subject held improvement is Natural Science with the material "Energy and Its Use"

4. Class

   The class used by the study was grade IV students of SDN 01 Padangsidimpuan, academic year 2023/2024 with a total of 28 children.

5. Student characteristics

   According to Gibson and Mitchell (1981) the characteristics of elementary school children

   Some of the traits that are typical of SD children :

   a. Experiencing sustainable growth and development.
   b. Constantly integrate experiences.
   c. Have the ability to visualize something that is relatively limited.
   d. At this time children have reasoning power that is not fully developed.

e. Have limited concentration power in the short term.
f. Children easily have attitudes and interests towards something.
g. Already have decisions and goals that are more focused on achieving short-term goals.
h. Has the nature of displaying feelings that are already relatively open.

RESULT AND DISCUSSION

Description Per Cycle
Cycle I

1. Plan

In the learning process of Natural Sciences (Science) class IV on the material of economic activities in utilizing natural resources, the author plans to make a learning plan that is prepared systematically and in detail equipped with learning scenarios. In the cycle 1 learning plan, the author focuses on students' ability to think critically in completing material in the use of energy sources through the society technology science (STS) learning model.

By using this learning model, students are expected to be able to solve real problems about economic activities in utilizing natural resources. So that the results achieved can meet the KKM (Minimum completeness criteria) in accordance with SKBM (Minimum learning completeness standards). For students who have not been completed, teachers need to make learning improvements.

In improvement activities, students are guided to overcome the difficulties faced, by improving their learning attitudes and teachers reflecting on themselves to improve the way of delivering learning material. In planning improvement activities, teachers again make lesson plans according to the difficulties in accordance with the material to be taught. In addition, it must provide motivation so that students can think critically in solving practice problems.

2. Observation

In the process of learning science class IV on the material of economic activities in Indonesia, observations from colleagues were obtained, suggestions from supervisors, the author needs to carry out improvements in learning

Natural Sciences (IPA) subjects on energy source materials and their use in class IV (four).

In carrying out learning improvements in the subjects of Science AlAm (Science) starting from the first cycle has shown an increase in mastery of student material with the achievement of completeness of 15 students from 28 students with an average score of 72.86.

3. Refleksi

Based on the findings of colleagues recorded on the observation sheet and direction from the supervisor, the author carried out improvements in class IV natural science (IPA) learning with the subject matter of Energy and its use. Reflection in addition to being held at the end of each learning process, aims to find out weaknesses and shortcomings during the learning process, so that it can be used as a reference to improve the learning model.

Some findings in science learning that need to be improved:

a. Teachers pay less attention to the planned learning model that will be displayed during the learning process.
b. The lack of information about practice questions varies with students.
c. The use of teaching aids / learning media is less than optimal.
d. The implementation of guidance to students during the science learning process is still lacking.

From the results of the instrument, it causes students to master the subject matter, so that the evaluation results have not met the SKBM. So teachers need to make improvements in cycle I.

In the learning process on the material of economic activities in Indonesia and the use of natural resources in science subjects, several findings were found, including:

a. The learning model used during the learning process is in accordance with the learning plan.
b. The practice questions given to students have varied.
c. The teacher's information about the material is obvious.

But even so, the evaluation results given to students still did not achieve the expected results in accordance with SKBM. Then it is necessary to carry out cycle II improvements.

4. Success

In the Natural Sciences (Science) learning process, on energy materials and their use which was carried out on Thursday, February 18, 2023, the results turned out to be 13 of the 28 students who had completed. They can be successful due to:

a. Such students have been able to think creatively on problem solving.
b. Students have understood energy matter and its use with examples.
c. During the learning process the student is actively following the learning process.

5. Failure:
   a. Some students think that learning Natural Sciences (Science) is a lesson that focuses on rote memorization so that students are not interested in learning.
   b. There is a lack of interest in students to read, understand the material in the learning process.
   c. Some students lack concentration during the learning process.

Based on the learning process above, the results are presented in the attached tables and diagrams.

TABLE I Natural Science Test Results of Students Before PTK

No.	Student Name	Value	Ketuntasan		Information
			T	B	
1.	Dea Nafa Ilmia	60	-	✓	
2.	Misbahul Huda	50	-	✓	
3.	City of Qomariyah	50	-	✓	
4.	Ahmed Irfan Mazki	50	-	✓	
5.	Ahmed Daniyal Falah	70	-	✓	
6.	Aldi Rizki Setiawaan	75	✓	-	
7.	anequtool natural	70	-	✓	
8.	Ana Rahmawati	55	-	✓	
9.	and Latuzzahro	90	✓	-	
10.	M. Habi Balawi	70	-	✓	
11.	Angelica Candra Fingers	60	-	✓	
12.	Farisaidi	40	-	✓	
13.	Azanusrubbi Lutfianur	80	✓	-	
14.	Wahyu Aditia	70	-	✓	
15.	Maghfuroh City	90	✓	-	
16.	Syaifah Rizal	70	-	✓	
17.	Mardiyah City	70	-	✓	

18.	Sid Lailatul Fitriyah	50	-	✓	
19.	Ferandaek	70	-	✓	
20.	A. Safitri	70	-	✓	
21.	M. Almuktafi	50	-	✓	
22.	Dwi Rizki Ramadan	60	-	✓	
23.	Lutfil Hakim	70	-	✓	
24.	M. Dawin Nuha	85	✓	-	
25.	M. Zakiah Sani	90	✓	-	
26.	M. Ridwan	70	-	✓	
27.	Mr. Masruri Lutfilaziz	60	-	✓	
28.	Alfie Nurul Gopher	85	✓	-	
	Sum	1915	8	20	
	Tuntas	$\frac{8}{28} x100\% = 28,57\%$			
	Not yet	$\frac{20}{28} x100\% = 71,43\%$			

TABLE 2 Analysis of Natural Science Test Results before PTK

No.	Value Range (s)	Many students (f)	%	s x f
1.	40 – 50	5	17,86%	240
2.	51 – 60	5	17,86%	295
3.	61 – 70	10	35,71%	700
4.	71 – 80	2	7,14%	155
5.	81 – 90	6	21,43%	525
	Sum	28	100%	1915
Average score = 1915 : 28 = 68.39				

Graph 1 of science test results before PTK

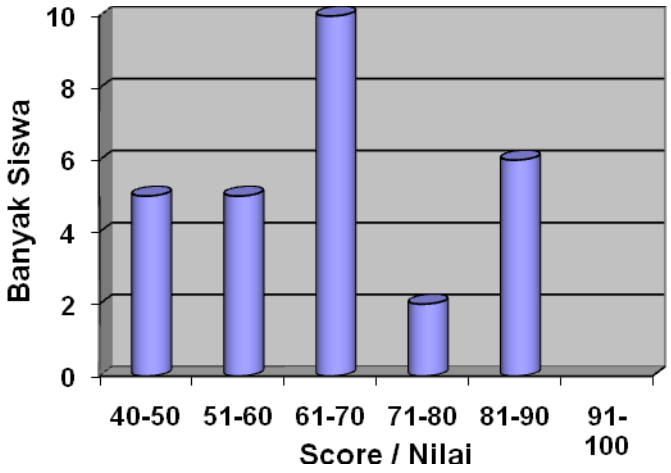


TABLE 3 Natural Science (IPA) Test Results After PTK Cycle I

No.	Student Name	Value	Ketuntasan		Information
			T	B	
1.	Dea Nafa Ilmia	70	-	✓	
2.	Misbahul Huda	60	-	✓	
3.	City of Qomariyah	60	-	✓	
4.	Ahmed Irfan Mazki	50	-	✓	
5.	Ahmed Daniyal Falah	65	-	✓	
6.	Aldi Rizki Setiawaan	75	✓	-	
7.	anequtool natural	75	✓	-	
8.	Ana Rahmawati	60	-	✓	
9.	and Latuzzahro	90	✓	-	
10.	M. Habi Balawi	80	✓	-	
11.	Angelica Candra Fingers	70	-	✓	
12.	Farisaidi	50	-	✓	
13.	Azanusrubbi Lutfianur	85	✓	-	
14.	Wahyu Aditia	75	✓	-	
15.	Maghfuroh City	90	✓	-	
16.	Syaifah Rizal	70	-	✓	
17.	Mardiyah City	70	-	✓	
18.	Sid Lailatul Fitriyah	60	-	✓	
19.	Ferandaek	80	✓	-	
20.	A. Safitri	80	✓	-	
21.	M. Almuktafi	90	✓	-	

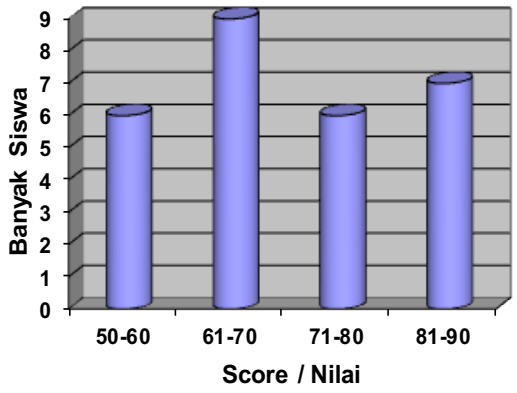
22.	Dwi Rizki Ramadan	70	-	✓	
23.	Lutfil Hakim	70	-	✓	
24.	M. Dawin Nuha	85	✓	-	
25.	M. Zakiah Sani	90	✓	-	
26.	M. Ridwan	70	-	✓	
27.	Mr. Masruri Lutfilaziz	65	-	✓	
28.	Alfie Nurul Gopher	85	✓	-	
	Sum	2.040	13	15	
	Tuntas	$\frac{13}{28} x100\% = 46{,}43\%$			
	Not yet	$\frac{15}{28} x100\% = 53{,}57\%$			

Based on TABLE 3 Analysis of Natural Science Test Results (IPA) after PTK cycle I

Table 4

No.	Value Range (s)	Many students (f)	%	s x f
1.	50 – 60	6	21,43	340
2.	61 – 70	9	32,14	620
3.	71 – 80	6	21,43	465
4.	81 – 90	7	25,00	615
	Sum	28	100%	2050
Average Score = 2040 : 28 = 72.86				

Graph 2 Science test results after PTK cycle I



Information:

- The results of learning Natural Sciences (Science) before the completion of PTK were only 8 students from 28 children (28.57%) while those who had not completed 20 students (71.43%). The grade point average was 68.39. Therefore, it is necessary to improve learning in cycle 1.
- In the first cycle of learning, the results achieved by students are also not satisfactory.
  Those who have reached completion are 13 children (46.43%) while those who have not completed have reached 15 students (53.57%) from 28 students Therefore, Cycle II improvements were carried out.

Cycle II

1. Plan

   In the first cycle learning process, the results obtained are not satisfactory, so the teacher makes improvements by carrying out cycle II learning. The activities carried out are:

   a. The teacher gives the society technology science (STS) in accordance with its principles.
   b. Teachers in delivering lesson material about energy and its use, accompanied by concrete examples.
   c. Teachers provide guidance and motivation to students in collecting lesson materials.
   d. Students are given a final test to find out the level of mastery of the material given by the teacher.

   In the learning process, students are expected to achieve completeness. Thus the author does not need to carry out the next cycle of learning activities. However, if there are still students whose scores have not met the minimum learning graduation standards (SKBM), they need to get special guidance.

2. Observation

   The results of the findings with colleagues as observers recorded on the observation sheet occurred during the learning process are:

   a. Teachers have improved learning through the society technology science (STS) learning model on energy materials and their use in science subjects.
   b. Teachers in delivering lesson material have been accompanied by examples that are easily understood by students.

c. Most students can already think critically in concluding the subject matter.

From the observations, the results achieved are satisfactory because many students have achieved completeness in the learning process.

3. Refleksi

Referring to the learning results of AlAm Science (Science) subjects about energy and its use, the author conducts self-reflection in the hope that the good results in cycle II can be a reference in learning other subject matter and also different subjects. However, there are still things that must be considered in the learning process in cycle II, namely:

a. The application of society technology science (STS) learning is more instilled in the principles of critical thinking students.
b. Efforts to explore and discover the values contained by science and technology for the benefit of society.
c. Teachers as much as possible to guide the students in understanding the subject matter.

4. Success

The results obtained during the process of learning Natural Sciences (Science) on energy materials and their use achieved progress with a success rate of 89.3% or 25 students out of 28 students. This can be obtained because:

a. Students are able to apply critical thinking skills in completing learning materials about energy and its use.
b. Students already have a strong interest in learning Natural Sciences about energy and its uses.
c. Teachers in the learning process, provide explanations accompanied by a summary of teaching aids and involve students to use them.
d. Students can carry out formative tests well and fluently.

5. Failure:

a. Some students still don't pay attention to the teacher's explanation.
b. Students do not want to read the subject matter being taught by the teacher.
c. Students respond less when the teacher gives explanations accompanied by props.
d. Students in taking formative tests do not / lack understanding of question commands.

Based on the learning process above, the results are presented in the form of tables and diagrams attached.

TABLE 5 Natural Science Test Results of Students after PTK Cycle 2

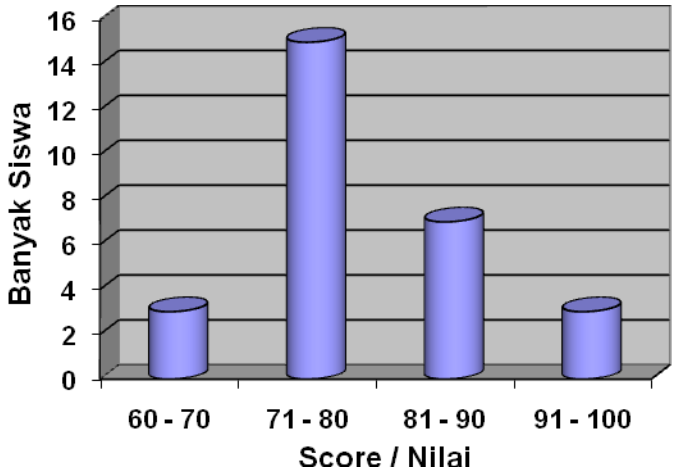
No.	Student Name	Value	Ketuntasan		Information
			T	B	
1.	Dea Nafa Ilmia	80	✓	-	
2.	Misbahul Huda	75	✓	-	
3.	City of Qomariyah	70	✓	-	
4.	Ahmed Irfan Mazki	65	-	✓	
5.	Ahmed Daniyal Falah	75	✓	-	
6.	Aldi Rizki Setiawaan	80	✓	-	
7.	anequtool natural	80	✓	-	
8.	Ana Rahmawati	75	✓	-	
9.	and Latuzzahro	95	✓	-	
10.	M. Habi Balawi	90	✓	-	
11.	Angelica Candra Fingers	75	✓	-	
12.	Farisaidi	70	-	✓	
13.	Azanusrubbi Lutfianur	90	✓	-	
14.	Wahyu Aditia	85	✓	-	
15.	Maghfuroh City	95	✓	-	
16.	Syaifah Rizal	80	✓	-	
17.	Mardiyah City	80	✓	-	
18.	Sid Lailatul Fitriyah	75	✓	-	
19.	Ferandaek	90	✓	-	
20.	A. Safitri	90	✓	-	
21.	M. Almuktafi	90	✓	-	
22.	Dwi Rizki Ramadan	75	✓	-	
23.	Lutfil Hakim	75	✓	-	
24.	M. Dawin Nuha	90	✓	-	
25.	M. Zakiah Sani	95	✓	-	
26.	M. Ridwan	80	✓	-	
27.	Mr. Masruri Lutfilaziz	75	✓	-	
28.	Alfie Nurul Gopher	80	✓	-	
	Sum	2.275	25	3	
	Tuntas	$\frac{25}{28} x100\% = 89,3\%$			
	Not yet	$\frac{3}{28} x100\% = 10,7\%$			

Based on TABLE 5 Analysis of Natural Science (IPA) Test Results after PTK cycle 2

No.	Value Range (s)	Many students (f)	%	s x f

1.	60 – 70	3	10,71%	205
2.	71 – 80	15	53,57%	1160
3.	81 – 90	7	25%	625
4.	91 – 100	3	10,7%	285
	Sum	28	100%	2.275
Average score = 2.275 : 28 = 81.25				

Graph 3 Natural Science Test Results After PTK II



Discussion of Cycle I

The learning process can be said to be a very interesting event, meaning that success is influenced by various factors. From various theoretical studies conducted by researchers, a very finding factor of the learning process is the ability of teachers. The ability of a teacher to compile a learning scenario in the form of a learning sequence is the main factor in the success of the learning process. Likewise, this classroom action research began with the unsuccess experienced by teachers in the learning process, through discussions with peers and consultation with supervisors, as well as through reflection on the learning process that has been carried out, and conducting literature reviews, researchers succeeded in making learning improvements in cycle I.

Learning improvements made by researchers using the Learning Model of Society Technology Science (STS) with the hope of:

a. Students can apply Natural Science learning to solve real-life problems in society.
b. Students can explore and discover the values contained by science and technology for the benefit of society.
c. A positive attitude can be formed in students towards science and technology and its problems.

It turns out that from the Learning Model of Society Technology Science (STS) which is the hope of the author, there are several findings in the learning process, namely:

a. Students are more active in solving problems that exist in the learning process.
b. Students are more critical in answering the questions asked by the teacher.
c. However, there are some students who are passive in answering formative test questions.

The above is in accordance with J Braner (2000) learning is an active process carried out by students clearly, meaning that students construct their own new ideas or new concepts on the basis of the concepts of knowledge and abilities possessed.

- Piager (William C Crain 1980 : 98)
  That learning is not necessarily teacher-centered but the child must be more active. Therefore, students must be guided to actively find something learned.

Cycle II Discussion

The success of a learning process, in each subject does not only depend on the teacher as a presenter, but is influenced by several factors.
Among them is the attitude of students when receiving or carrying out the learning process, the learning model used is in accordance or not with the material taught. And last but not least is the preparation made by the teacher during the learning process, starting from learning scenarios, learning plans that complement the media / props used in the learning process. In addition, what happens in classroom action research experienced by teachers in the learning process is the inactivity of students during the learning process. Through discussions with peers and consultation with supervisors, as well as expert reflection on the learning process that has been carried out, also through literature review researchers have succeeded in making learning improvements in cycle II.

Learning improvements made by researchers in cycle II which focused on adding teaching aids, this cannot be separated from the literature review that has been carried out. According to Sudjana (1998; 100) the benefits of props are:

a. Can increase students' interest and attention to learning.
b. Being able to do the real basics of thinking, therefore reduces the occurrence of verbalism.
c. Can do the basis for learning development, so that learning outcomes are more stable.
d. Provide real experience and can foster self-effort activities in students.
e. Grow organized and sustainable thinking.
f. Helps the growth of thinking and helps the development of language skills.

g. Provide experiences that are not easily obtained in other ways and help develop efficiency and a more perfect learning experience.

After the author carries out improvements in cycle II, it turns out that with the use of adequate teaching aids, plus the use of appropriate learning models can increase students' mastery of the material, namely about energy and its use, the results can increase, we can see

In table II of the format result data, that students who achieved a completeness score of 89.3% with an average score of 81.25

The above is in accordance with the opinion:

a. NEA (1969) defines learning media as a means of communication, both in print and listening views, including hardware.
b. Wilbur Sehramm (1977). defines learning media as messenger technology that can be utilized for the benefit of learning.
c. Miarso (1980) emphasized that learning media is everything that can be used to stimulate the thoughts, feelings, attention and willingness of students, so as to encourage the learning process in students.

CONCLUSION

Based on the results of improvements in the learning process of Natural Sciences class IV with energy materials and their use.

1. The learning model must match the subject matter.
2. Fostering students' interest and motivation in Natural Science lessons is essential.
3. The use of media or teaching aids should be increased so that students are clearer to understand the lesson.
4. The teacher's guidance and attention to students is indispensable.
5. The provision of information about the subject matter should be clear.

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