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Development of Collaborative Learning-Based Science Learning Tools to Train Critical Thinking Skills and Understanding the Concepts of Grade V Elementary Students

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Astract:- This research aims to develop ipa learning tools oriented by collaborative learning models to train critical thinking skills and understanding student concepts on the material influence of calorific influence on the changing form of objects in grade V elementary school.This type of research is development research. The development model used is a 4D model (Four –D Model) but only reaches the develop stage. The learning tools developed consist of RPP, Student Teaching Materials, LKPD, concept comprehension tests, and critical thinking skills tests. The device was tested on grade V students at SDN Banyu Urip VI Surabaya in the 2019-2020 school year.

The results showed that the validity of learning devices developed in good categories, the level of readability of student teaching materials and LKPD are well categorized, rpp implementation is well categorized, student acryvitas are improved centered on students, students give positive responses to the learning process, all students achieve complete understanding of critical concepts and thinking skills. Based on the results of the above research it can be concluded that collaborative learning-based science learning tools to train critical thinking skills and understanding the concepts of students in elementary school are worth using in learning activities.

Keywords:- *Science Learning, Colaborative Learning Based Learning Models, Concept Understanding, Critical Thinking Skills.*

I. INTRODUCTION

The development of the 21st century world is characterized by the use of information and communication technology in all aspects of life, including in the learning process. The 21st century is the century of knowledge, a century in which information develops and spreads rapidly. The development of information must be balanced with the ability to process and use it in a balanced area. So the progress of a nation is closely related to the quality of human resources of its inhabitants. One of the ways that the government is taking is to improve the quality of education. Improving the quality of education is expected to increase the dignity and dignity of indonesians. Therefore education is directed at improving the competitiveness of the nation in order to be able to be competence in the era of globalization. One of the important aspects in improving the quality of education is the importance of improving science learning, because indirectly science education implements scientific skills through critical thinking, creative, able to solve problems as well as being able to apply science in daily life.

The preliminary study conducted by Reza (2017) states that although there is a fairly encouraging improvement in the quality of education from year to year, but understanding the concepts and critical thinking skills of students at the elementary school level in some subject matter shows less satisfactory results. Learning at the elementary school level tends to be textbook-oriented and less related to the problems of students' daily lives. Understanding concepts tends to be abstract so that learning concepts are difficult for students to understand. While most teachers in teaching still pay little attention to students' critical thinking skills, the methods used are less varied, as a result the motivation of students' learning becomes difficult to grow, and students' learning patterns tend to memorize.

The purpose of the curriculum is to form students who are characterful, creative and innovative. The measure of successful implementation of curriculum 2013 includes several important factors: (1). school administration, (2). Teacher Creativity, (3). learning activities (4). Socialization, (5). Facilities and learning resources (6). conducive academic environment, and (7). community involvement. (Mulyasa, 2013: 36). In curriculum development in 2013, students, able to develop a mixture of knowledge and behavior that can be shown contextually learned by students as a form of understanding about building competencies and character.

From the results of the preliminary study conducted by Reza, in line with the preliminary study results conducted in class V SDN Banyu Urip VI/367. Through observations and interviews conducted researchers found: 1) Science learning

tends to be taught through lecture activities and textbook orientation, and very little involves students in its entirety, so learning is meaningless to students. Finally students easily forget about the concepts that have been learned; 2) learning is more likely to be teacher-centered; 3) teachers rarely use media or IPA props and are not involved in experiments so that the ability of students and teachers is low; 4) in discussing ipa material there has been a teacher's efforts to develop group discussion activities as well as classroom discussions, but the final conclusion tends to be the teacher's authority; 5) the target of successful science teaching implemented by teachers tends to be more likely to lead to skilled students working on test questions, both in teaching materials and on exam questions, as a result of understanding the concept of low students, critical thinking skills and scientific attitudes of students not growing; 6) students are passive, during the learning process, there is only a number of students who ask questions, not to dig into information about material concepts, but rather towards technical workmanship; 7) teachers and students use only one source book so that the depth of the material is limited to the material contained in the source book; 8) the assessment conducted by the teacher is derived from the assessment contained in the source book used by the teacher; 9) Rpp used by teachers has not been seen to use any of the destructive learning models; 10) LKPD used still uses LKPD contained in student books.

In the national education system, article 3 states that national education aims to develop students in order to become believers, to be faithful, to god almighty, noble, healthy, friendly, capable, creative, independent, and to support democratic and responsible citizens. The learning process in satuapendidikan is expected to improve the quality of Indonesian people who have competitiveness in the face of global challenges while still upholding the values of pancasila. Every learning process, students are expected to actively participate in order to develop themselves into qualified human beings so that national educational goals can be achieved.In addition, the provisions of the primary and secondary education curriculum must include: religious education, citizenship education, language, mathematics, Natural Sciences (IPPA), Social Sciences (IPS), arts and culture, physical and sports education, skills/vocational, and local content.

IPA or science is a collection of knowledge that is systematically organized and in its use is generally limited to natural symptoms. In Regulation of the Minister of National Education no. 22 of 2006 on the standard of content for basic and secondary education units that the standard of ipacomtension is the ability of at least students in the mastery of knowledge groups in the form of facts, concepts, or principles, and is also a process of discovery of the results of observation and research in daily life in the environment. This basic competency and competency standard is the basis for students to build skills, work scientifically, and seek their own knowledge facilitated by teachers (BSNP 2006:484).

Science learning in elementary school aims for students to have the ability to gain confidence in the greatness of The One True God based on the existence, beauty, and regularity of nature of His creation, develop knowledge, and understanding useful and workable science concepts in daily life, develop curiosity, develop process skills to investigate the environment, solve problems and make decisions, raise awareness to participate in nurturing, maintain and preserve the natural environment, raise awareness to appreciate nature and all its regularity as one of God's creations, acquire knowledge, concepts and science skills as the basis for continuing education to junior high school/MTs (BSNP 2006:485).

Science learning is not a science that students should accept and memorize, but a tool to enable students to a specific purpose. The process of obtaining ipa learning materials is not only limited to memorizing the opinions of experts, but must be obtained by practicing so as to stimulate students to conduct an investigation of problems related to the subject matter. Based on the statement, the understanding of concepts and thinking skills in the ipa learning process needs to be trained on students.The fundamental problem that until now has been very dilematised and often faced by elementary school teachers in the learning process is based on the fact that most students are unable to relate what they learn to how they are utilized in real life (Muslich, 2008:40). This is based because students' understanding of the material is only an abstract concept, has not touched their needs in the community.

According to Ibrahim (2012:9), understanding concepts is very important for every student, by mastering the concept well, broadly and deeply, allowing one to apply his mastery in various needs. According to Gagne, Brings, and Wagner (Ibrahim, 2012:9), concept mastery is an ability that allows a person to do something. This can mean that without mastering certain concepts, one cannot do much and perhaps his survival will be impaired.One of the mental process capabilities required in understanding concepts is critical thinking skills. Critical thinking skills are a cognitive process for acquiring knowledge. Arends (1997:20), reveals that critical thinking is the process of using the mind to (1) seek meaning and understanding of a cause seen, remembered, or read; (2) make considerations and decisions; (3) resolve the issue.

Improving understanding of students' critical thinking concepts and skills in this study, implemented using the Collaborative Learning model, a learning model used for high-level abilities by engaging students to solve problems with steps: (1) orienting students to problems; (2) organize students to learn; (3) assist with independent and group investigations; (4) develop and present works and exhibit them; (5) analyze and evaluate the troubleshooting process. PBM focuses on presenting a problem to students, then students are asked to find a solution through a series of activities based on the theories and concepts that have been studied by students (Siregar and Nara, 2010).

Ibrahim et al (2010) suggested that learning should start from actual, authentic, relevant, and meaningful problems for students, so that in learning, students can understand concepts while also solving problems. The ability to solve problems is more than just an accumulation of knowledge, law or theory, but it is the development of flexibility capabilities, cognitive strategies that help students analyze unexpected situations and be able to come up with meaningful solutions.

In building and maintaining the same conception of a problem, collaborative learning can be used as one of the efficient learning models, because in each student's learning group members are required to think interactively. To gain a higher level of understanding, teachers can share authority with students in using knowledge, how to work well together, understand things focusedly and be able to foster student reasoning, encourage comtension, responsibility, and be able to engage students in the entire learning process and can involve all aspects of the student's cognitive, affective, and psychomotor aspects. With this model, students have the freedom to think, argue, be active, and creative so that the learning process is student-centered.

The implementation of colaborative learning-based learning models requires learning that is not dominated by teachers, but rather students who dominate or actively conduct learning activities. Therefore one of the hallmarks of this learning is that all students become active. In a group students will communicate with each other naturally, and all students can learn from other students.

Based on the observations of researchers at SDN Banyu Urip VI Surabaya, existing learning tools do not facilitate the understanding of critical thinking concepts and skills through authentic problems well. So collaborative learning models are needed to improve understanding of students' critical thinking concepts and skills, through symptoms that exist in students' daily lives (authentic problems) in a structured way. The learning tools that teachers have are not yet using collaborative learning models. The learning process of teaching is not well structured so that the goal of learning has not been achieved to the maximum. Therefore, through the concept of Science learning oriented collaborative learning model, it is expected to facilitate teachers and students to improve understanding of critical thinking concepts and skills through authentic problems.

In order to realize a meaningful learning pattern, teachers should design a meaningful learning, so that students are able to improve understanding of critical thinking concepts and skills through the collaboration process. Teachers as implementers of learning at the education unit level are expected to be able to prepare and develop quality learning tools including: syllabus, Learning Implementation Plan (RPP), Student Activity Sheet (LKPD), Assessment Sheet (LP), and Student Teaching Materials (BAS) to achieve learning goals. In accordance with some of these descriptions, development research needs to be carried out to develop IPA oriented Collaborative Learning models to train understanding of students' critical thinking concepts and skills in elementary school.

The essence of science is to study the nature of events through a combination of processes called scientific processes. Science was established on the basis of a science curriculum based on the curriculum "integrated science" junior high school (Permendiknas, 2006). Integration is the merging or merging of two or more objects (Trianto, 2011). Therefore, integrated IPA learning is an IPA learning that combines several concepts and/or subject knowledge. Integrated IPA learning emphasizes providing first-hand experience to improve the Ability to explore and understand phenomena. Nature in daily life uses scientific methods (Puskur, 2006). In addition, "Standard Content" also mentions a group of science and technology disciplines (in this case, "comprehensive science"), which aims to acquire basic capabilities in science and technology as well as foster critical scientific thinking. Critical thinking is the evaluation of the evidence, hypotheses, logic, and language on which people speak (Johnson, 2012).

Based on the results of the interview, the evaluation of scientific learning shows that students of SDN Banyu Urip VI / 367 Surabaya are less understanding and less happy with essay questions that require analysis and reasoning, which indicates that students are less encouraged to develop critical thinking skills. Teachers also tend to use conventional methods, such as lectures and classroom discussions. This is due to a lack of motivation among students. Consistent with Djamarah and Zain's statement (2002), it is said that if the learning process in the classroom uses only conventional methods (lectures), students will become passive.

Learning tools were developed based on the 2013 curriculum standards in grade V of semester II that follow critical thinking skills and concept understanding. The core competencies and basic competencies of grade V elementary school developed in integrated learning colaborative learning are outlined as follows.The basic competencies developed are described in table 1. below.

Table 1. Basic Competency Data

Number	Subjects	Core Competencies	Basic Competencies
1	IPA	1.2 1.2 Accepting and living the teachings of the religion he embraces. 1.3 1.3 Have honest, disciplined, responsible, polite, caring, and confident behavior in interacting with family, friends, and teachers.. 1.4 Understanding factual knowledge by observing [hearing, seeing, reading] and questioning based on curiosity about him, God's creatures and	3.7 Analyzethe effect of ca temperature changes and of objects in daily life. 4.7 Report the results experiment on the effect of on objects.

	activities, and the objects he encounters at home and at school. 1.5 Presenting factual knowledge in clear and logical language, in aesthetic works, in movements that reflect a healthy child, and in actions that reflect the behavior of a child of faith and noble morality.				f. Use a question word or command that der answer. g. Petunjukcaramengerjakansoaldituliskanden s on how to work on the question are clearly w h. Communicatively presented language. i. Details about using the default Indonesian A. Number of questions 10.

Core competencies and basic competencies are then developed into RPP with the aim of developing critical thinking skills and understanding concepts. Integrated learning colaborative learning is implemented into individual, group and classical learning. In the determination of the group is formed heterogeneously based on the map of the ability of students in semester 1 and also pay attention to the balance between male and female students for each group.

Active student participation in the learning process allows students to receive more training in skill solving initiatives, critical thinking and reactions in daily life by adopting meaningful information. In addition, it can eliminate boredom and increase the pleasure of learning, which ultimately impacts on improving learning motivation (Susilo et al., 2012; Siregar& Nara, 2010).This development research results in learning device products. The components of the products developed are as follows.

Table 2. Learning Device Product Development Components

onent	Specifications
ng Implementation Plan	a. Using the 2013 curriculum
	B. Use collaborative learning models.
	c. Contains teaching learning activities that will be carried out by teachers that will be a learning experience for students
	d. Learning steps are systematically structured and detailed as possible so that learning goals can be achieved.
r Activity Sheet (LKPD)	A.Using the 2013 curriculum
	Instructions on how to work
	C. Basic Competencies
	d. Work Tasks and Steps
	e. Description question form
ng Materials	a. Scope of teaching materials by theme
	b. The language uses the default Indonesian language.
	C. The language spoken is communicative.
	d. Comes with images that support the subject matter.
Results Test (THB) to re critical thinking skills and t mastery.	A. Using the 2013 curriculum.
	b. Coverage of test questions based on
	c. The questionable material is in accordance with the purpose of learning.
	d. The subject matter is formulated clearly and firmly.
	e. The content of the question is adjusted to the school level or class level.

II. METHOD

The implementation of this study used one group pretest-posttest design, using one group of subjects (Sugiyono, 2014, p.340). The draft description of this study is as follows:

O1 X O2

Description:
O1 = is a pre test conducted to describe students' critical thinking skills and understanding of concepts.
X= is a treatment by applying collaborative learning model learning tools during learning.
O2= is a post test conducted to describe students' critical thinking skills and concept understanding after learning using collaborative learning model learning tools.

The trial was conducted at grade V students of SDN Banyu Urip VI / 367 Surabaya. To support the achievement of research objectives, the learning process of teaching is used in the form of syllabus, Learning Implementation Plan (RPP), Student Activity Sheet (LKPD), Assessment Sheet (LP), and Student Teaching Materials (BAS) to achieve learning goals developed by researchers adapting the development of Four-D model devices from Thiagarajan (1974). The learning device was then validated by two education experts. The data collection techniques in this study use validation, observation, questionnaire, and test techniques. The results of the implementation of learning devices are the implementation of RPP, student activities, student response, critical thinking skills of students and understanding concepts.

III. RESULTS AND DISCUSSION

The results of the study are based on data obtained from learning device development activities and the results of extensive trials that have been conducted at SDN Banyu Urip VI Surabaya. The subject of the study is collaborative learning-based learning tools. Before being tested the learning devices and instruments were validated by two expert lecturers to find out the feasibility of learning devices. The results of the extensive trial aim to find out data on the practicality and effectiveness of the learning tools developed.

This research is a development research designed to explain the quality (validity, practicality, and effectiveness) of IPA learning devices oriented collaborative learning models to train understanding of students' critical thinking concepts and skills. Based on the results of the analysis of

research data that has been presented in chapter IV, a discussion or discussion of the analysis is conducted. The results of the analysis relate to the quality of learning devices, the results of the implementation of the feasibility of the device in ipa learning, especially on the material influence of calorific influence on the change of the form of objects in elementary school.

A. Discussion about Quality Of IPA Learning Devices Oriented Collaborative Learning Model

1. Learning Device Validation Results

Discussion of validation results by experts on learning devices in the form of RPP, student teaching materials, LKPD, concept comprehension tests, and critical thinking skills tests can be explained as follows.

a. Validity of Learning Implementation Plan (RPP)

The learning plan (RPP) was developed as a teacher's guide in managing collaborative learning-oriented science teaching activities on the material of calorific influence on the changing form of objects in elementary school. The competency of knowledge developed in rpp is to understand the effect of the calorific on the change of the form of objects through observation and its association with the auditory senses. Rpp is designed to teach the effect of calorific on the change of form of objects during two meetings. At the first meeting, the material taught is various forms of objects while at the second meeting, the material taught is the effect of calorific on the change of form of objects.

Validation results show that the developed RPP has an average score of 3.84. Thus, rpp developed deserves to be used in ipa learning oriented collaborative learning model on material influence calorific on the change of form of objects, albeit with little revision. Revisions include 1) Correcting some grammatical and language errors in the purpose of learning skills; 2) Correct some grammatical and language errors in learning activities; and 3) RpP assessment rubrics are developed on each aspect assessed.

b. Student Teaching Materials (BAS)

Student Teaching Materials (BAS) contains a description of learning materials used as a guide or learning resource for students in learning the subject matter of calorific influence on changes in the form of objects in teaching and learning activities in the classroom. The student teaching book feasibility assessment by the validator shows an average of 3.91.

The results of the study show that the student teaching books developed deserve to be used as a guidebook in ipa learning oriented collaborative learning model on material influence calorific on the change of form of objects with good categories. The necessary revisions include altering the image of the material with its own image and improving the composition/editorial of sentences on the material with sentences that stimulate students' curiosity.

c. Learner Worksheet (LKPD)

The Student Worksheet (LKPD) was developed as a guide for students to conduct prison defense activities. The LKPD used contains components to perform problem-based learning models. LKPD developed consists of LKPD I and LKPD II. LKPD I contains activities to prove the change in the form of objects, but it's not the only one. Meanwhile, LKPD II contains activities to prove that calorific can affect the form of objects.

Assessment results by validators showed that the developed LKPD had an average score of 3.94. Thus, LKPD developed in a valid category and worth using, albeit with little revision. Revisions made are: 1) The main objectives of learning listed on the LKPD will only be achieved through the LKPD; 2) The substance of the activity of defining the term is limited to explaining the appropriate terms; 3) The substance on the LKPD is tailored to the purpose; 4) The answer key in the experiment/observation data table has been filled through experiments/observations conducted by researchers before the learning activities.

d. Validation of Concept Understanding Test

The concept comprehension test assessment sheet is used as an evaluation tool to measure students' achievement in mastering the concepts given during learning. Assessment results by validators showed that the developed concept understanding test instruments had an average of 3.75 for the validity of the content, and 3.70 for the validity of language and question writing. Thus, the concept understanding test instrument developed in a valid category (good) so that it is feasible to be used as a measuring instrument of student concept understanding test. The revisions made are the formulation of the question adjusted to the indicator and improve the formulation of meaningful questions.

e. Validation of Critical Thinking Skills Test

The critical thinking skills test is a test used to measure the learning results of students' critical thinking skills after participating in teaching and learning activities. Assessment results by validators obtained an average score of 3.70 for content validation, and 3.55 for language validation and question writing. The validation results show that students' critical thinking skills test instruments developed in categories are valid and worthy of use in learning. The revision is a formulation of the question adjusted with indicators.

B. Discussion of The Results of Implementation of IPA Learning Tools Oriented Collaborative Learning Model

1. Implementation of Learning Implementation Plan (RPP)

The implementation of the Learning Implementation Plan (RPP) can be seen from the results of the observer observation on the assessment sheet of the implementation plan of learning. Observation of the implementation of the learning implementation plan aims to know the success of teachers in implementing the planned stages of learning, so that it can be measured its effectiveness at the end of learning. Based on the observation of learning activities at the introductory stage, motivating students by presenting

phenomena and conveying the purpose of categorized learning is excellent, while in the aspect of providing problem orientation, and presenting a brief infromation of the material taught in a good category.

This stage of activity, the observed aspect of sharing student teaching materials, sharing LKPD, guiding students to carry out observations/experiments in accordance with LKPD, guiding students to answer questions contained in LKPD is well categorized. Meanwhile, as pek guides the results of discussions from experiment/observation results through group presentations and well-categorized class dissuctions.

At the closing stage of the activity, the aspect of concluding learning is already very well categorized. But on the aspect of giving exercise, and informing the next learning material in a good category. From preliminary activities, core activities, and closing activities can be concluded that rpp implementation is well categorized with an average score of 3.75. Rpp implementation is implemented 100%. This shows that learning plans using collaborative learning-oriented learning models as a whole have been implemented in the learning process in the classroom.

2. Student Activities

Student activities are observed during the learning activity using the instrument of the student's activity observation sheet. The results of observations of students' activities during the learning process using collaborative learning-based learning models can be seen in table 4.15.

In science learning oriented collaborative learning model, student activity at the first meeting in the form of 1) listening to/paying attention to teachers 12%, 2) recording and discussing between students /teachers 13%, 3) reading and working on LKPD/BAS 14%, 4) preparing experiment/observation tools and materials 13%, 5) working together in groups of 12%, 6) presenting group work 6%, 7) discussing between students and teachers in response to the presentation results of each group 10%, 8) asking/responding to questions of friends/other groups/teachers in class discussions 9%, 9) concluding lessons 7%, and 10) behaving irrelevantly 4%.

While the second meeting showed the active attitude of students including 1) listening to/paying attention to teachers 9%, 2) recording and discussing between students /teachers 8%, 3) reading and working on LKPD/BAS 14%, 4) preparing experiment/observation tools and materials 13%, 5) working together in groups 13%,6) presenting group work 8%, 7) discussing between students and teachers 8) responding to questions of friends/other groups/teachers in class discussions 11%, 9) concluded lesson 9%, and 10) behaved irrelevant 2%.

3. Student Response

Student response data on the components of collaborative learning-oriented IPA learning activities is collected through questionnaires. Based on the results of the analysis of student response questionnaires can be stated that most students respond to collaborative learning oriented IPA learning as interesting and easy to understand learning.

In addition, collaborative learning-oriented IPA learning can also be the ability of students to work on concept comprehension tests and critical thinking skills tests, although students feel something new about both types of tests. thus, in general students give a very positive response to collaborative learning oriented IPA learning on the material of calorific influence on the change of form of objects.

4. Concept Understanding Test

Understanding students' concepts is obtained through the concept comprehension test given during the learning process. The concept understanding test used is a multiple choice test with ten questions. This test is done in the time before the pre-test and after the post-test. The results of the analysis of the sensitivity of the question item showed a total of 0.34. This means that the questions tested are sensitive to problem-oriented IPA learning. This indicates from the ten questions that have been tested there are two students who achieved the minimum completeness criteria (7) at the time of pre-test, so that the understanding of the concept is classically 20%. Meanwhile, based on post-test results all students achieve minimal completeness criteria, so that classical concept understanding is 100%.

Based on the results of the concept comprehension test before and after learning, the increase in concept comprehension score is significant. This is seen from the correct answers of students in the pre-test improved, although the amount of improved understanding of the concept is not the same as each student. Based on the results of the calculation of the score increase (gain-score) stated that the understanding score of the concept of students is considered high. The score has an average score greater than 0.7 or 70% which is 0.76 or 76% (Savinainen& Scott, 2002). This shows that collaborative learning-based learning models applied in calorific influence materials to changes in the form of objects can significantly improve the understanding of student concepts.

A high understanding of student concepts after being given a problem-oriented IPA learning model shows that through the stages of problem-based learning, students can find their own concepts. According to Piaget, the stages in the problem-based learning model help students in accommodating and assimilating the concepts studied so that the knowledge construction process is more perfect (Dahar, 1989). Then according to Vygotsky, students' social interactions with students, students with teachers during the learning process can increase the level of potential development of students (Nur, 2008). Bruner said in the collaborative learning process students try themselves together with a team of groups to solve problems and gain knowledge collaboratively from their experiences so that the resulting knowledge is truly meaningful. Knowledge gained in collaboration-based learning is better so that concept understanding is more perfect (Nur, 2008). The results of

this study are also supported by information processing theory which states that active student involvement in learning can improve the storage of information in long-term memory (Slavin, 2009).

5. Critical Thinking Skills Test

The critical thinking skills test in this study is an instrument that aims to measure ten indicators namely 1) using a credible source; 2) write down reasons based on existing data or arguments; 3) accept or reject arguments, ideas, or decisions accompanied by clear and logical reasons; 4) develop and maintain opinions; 5) able to answer questions with logical reasons; 6) plan the experiment and its planning; 7) define the term using its own words; 8) be able to think openly; 9) provide proper information; and 10) make conclusions. The critical thinking skills test consists of ten questions in the form of a description.

Based on the data analysis results as outlined in chapter IV in table 4.19, the results of critical thinking skills tests improved from pre-test gaining an average of 4.6 and after collaborative learning based learning, post-test results obtained an average score of 7.8. Thus, there is a good increase in average value. Then the average sensitivity of the question item obtained an average of 0.32 classified in the sensitive category. In addition, based on the calculation of gain-score obtained that the increase score from pre-test to post-test is at a g-medium value of 0.59 or 59%. The gain score shows that problem-based learning can improve students' thinking skills.

The IPA learning process that implements collaborative learning models is proven to be able to develop reasoning and systematic thinking skills so as to improve students' thinking skills. This is in accordance with Piaget's theory, that the child can think at a high level if he has enough concrete experience and guidance that allows the development of concepts and relationships of necessary facts (Nur, 2008). Meanwhile, according to Vygotsky, learning through guidance occurs through interaction with teachers or students, both from themselves and from other students. Meanwhile according to Bruner, learning with discovery improves reasoning and ability to think freely, and trains cognitive skills to determine, and solve problems (Nur, 2008).

C. Obstacles or Obstacles Faced During the Learning Process

The obstacles that researchers face during the problem-based learning process are 1) too many experiments/observations so that students rush to experiment/observe; 2) limited time used to conduct experiment/observation activities; 3) some students have low learning motivation in conducting experiments/observations; 4) students are less accustomed to understanding experimental/observation procedures; and 5) there are some students who use experimental/observation tools and materials as toy tools.

These barriers can be overcome by means of 1) multiplying guidance and improving data retrieval strategies; 2) pay more attention to the allocation of time and make the most of the time; 3) motivate students by praising students' work and documenting them in a photographed way; 4) guide and train students to observe and understand experimental/observation procedures; 5) reprimand students for using experimental tools and materials according to their use and then ask students to return the tools and test materials that have been used to the teacher's desk.

D. Research Findings

Based on the data analysis and discussion of the results of the study, the following research findings are obtained:

1. Validity of IPA learning devices with collaborative learning models developed namely RPP, student teaching materials, LKPD, concept comprehension tests, and critical thinking skills tests of valid categories so that it is worth using in learning.
2. The level of readability of student teaching materials and student worksheets developed in a good category.
3. Implementation of collaboration-based learning model-based learning plan in good category.
4. Student activity during science learning based on collaborative learning model shows student centered learning.
5. Students show a positive response to IPA learning based on collaborative learning model..
6. All students show complete understanding of concepts with high improvement scores
7. Improved critical thinking skills of students show gain-score with moderate category.
8. The obstacles encountered at the initial meeting can be overcome at the next meeting.

IV. CONCLUSION

Based on the above findings, the following conclusions can be drawn.

1. Collaborative learning model-based learning tools developed are valid to train critical thinking skills and conceptual understanding on substance change materials.
2. LKPD and Developed student teaching books have low difficulty levels or are very easy for students to understand.
3. Collaborative learning model-based learning tools developed practically for the learning process.
4. Collaborative learning model-based learning tools developed effectively to train critical thinking skills and conceptual understanding on substance form change materials. The effectiveness of these developed wiring devices is known from the following.
5. Student activity during the learning process uses collaborative learning model-based learning tools that lead to critical thinking skills and understanding student concepts.
6. Students' response to learning with collaborative learning model-based learning to practice critical thinking skills and concept understanding shows positive responses.
7. Students' thinking skills after learning with collaborative learning model-based learning have shown improvement

8. Understanding student concepts after learning withkolaboratf learning model-based learning methods shows improvement.

SUGGESTION

Based on the conclusion of the results of the study, the researchers reviewed the learning tools developed in this study, which include RPP, BAS, and THB critical thinking and understanding of concepts in learning in the classroom, especially the material influence of calorific influence on changes in the form of objects to practice critical thinking skills and understanding student concepts. But the implementation should take into account several things so that the constraints encountered in this study can be minimized. Some of these are as follows:

1. Good time management until all stages of thekolabrative learning model can be optimally used.
2. Adequate availability of tools and materials to support the learning process, especially when experimenting
3. Teachers should have the ability to manage classes and guide highly so that the atmosphere of the classroom during learning is conducive.

Some suggestions that can be put forward by researchers based on research that has been done as follows:

1. In general, researchers have successfully developed learning tools that can improve the critical thinking skills of grade V elementary school students on the material of calorific influence on changes in the form of objects so that educators can use them so that learning is more effective.
2. For the use of Collaborative Learning learning model the management of time and number of students needs to be considered especially for classes or students who have never implemented collaborative learning model
3. Collaborative learning model IPA research tools that have been conducted in this study have been effective to train students' critical thinking skills on the material of calorific influence on changes in the form of objects, so it is expected that similar further research on other basic competencies.
4. Based on the constraints experienced during the study, the author advises:

a. Better prepare more tools and materials so that in the event of damage can be directly replaced with new tools and materials.
b. Further improve coordination with the school to pay attention to the lesson schedule and activities of students in the school so that during the implementation of research becomes more maximal.
c. At the first meeting after the pre test, the teacher gave a prior learning orientation about learning activities with collaborative learning models that may feel new to minimize difficulty while learning.

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