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Teaching Material: Design of Learning Device Research to Train the Skills of Science Process with Inquiry Learning Model on Elementary School Students

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Abstract: This study aims to produce a natural science learning device inquiry model that is valid, practical and effective for train student's science process skills. This study was conducted using three stages of the 4-D model, namely defining, designing and developing, deployment. Distribution stage is not implemented because the research is limited to development stage. Learning tools developed are tested in grade 4 of elementary school with one group pretest-posttest design. The result of the research shows that 1) the data of practicality of learning can be seen from the average of the value of learning implementation is categorized well, the LKS legibility results show 100% of students stated the contents of the LKS interesting, easy to understand and clear and students stated that the book of students interesting and easy to understand and 3) the effectiveness of instructional tools in terms of the improvement of science learning skill learning achieves N-gain 0.78 high category and supported by positive student response data to the learning that has been implemented. Overall, it was concluded that the natural science learning device by applying the inquiry model is appropriate to be used to train students of science process skills.

INTRODUCTION

Learning is able to develop student's competence to find out and do, so that, it can help students to gain a deeper understanding of the natural surroundings. Learning in natural science is a complex process because students not only receive and absorb information provided by teachers but also students participate in the learning process to get the knowledge itself. Natural Science is a science that studies about events or events that occur in this universe. According to Einstein in his book states that "Science is the attempt to make the logical uniform system of thought" which can be interpreted that Natural Science is an effort that makes Experiences become systems of logical thinking patterns. According to Julianto[1], essentially Natural Science can be viewed in terms of products, processes and aspects of attitude development. These three things are interrelated. Teaching Natural Sciences means giving students the opportunity to get the teaching of Natural Sciences by doing their own or direct experience to the students through the skills of the science process and not just information. The importance of this science process skill teaches students active in scientific inquiry. The

importance of science process skills is in line with the objectives of natural science learning in elementary school that is developing the process skills to investigate the natural surroundings, solve problems and make decisions.

The nature of science has 3 components, namely product, process and attitude[2]. Science as a product has a meaning as a collection of facts, concepts, principles and laws about natural phenomena. Science as a process is a structured and systematic set of ways to discover natural concepts, principles, laws and phenomena. Science as an attitude is expected to form a character. Based on the essence of this science is implied that what is desired in the learning is how students are able to show the character possessed. Invite students to learn something that leads to a responsibility-based engagement to deal with and overcome problems in learning. Engage students actively to develop the ability to observe interpret, predict, apply concepts, plan and conduct research and communicate the findings. This is in line with the society of the XXI century is increasingly aware to meet the future needs and prepare a young generation that is flexible, creative and proactive. It is increasingly recognized that the need to form young people who are skilled at solving problems, wise in making decisions, creative thinking, consensual, able to communicate ideas effectively and able to work efficiently both individually and in groups[3].

Various researches in a number of countries prove the need for a learning approach that is able to bind students to be active in learning, make learning more fun, relevant and present learning that generates motivation for student learning. The book, titled 21st century skills published, balances the implementation of teacher-based learning with student-based learning is a wise learning step.

In the analysis conducted on the improvement of mindset point a, Teacher Implementation Training Material 2013 Curriculum Year 2014 SD grade 4, the learning process from teacher-centered to become student-centered[4]. Learning done in the learning process is not only focused on students but also centered on the teacher as well. This is in line with the opinion of Arends[4] which states that

In inquiry-based or discovery learning, the rules, “concepts, “or” principles “that are the focus of the inquiry are well and an appropriate amount of guidance seems to be required. Students learn better when they are active but their activity requires guidance.

It can be interpreted that the first point in the study of inquiry or learning with discovery, some students did not learn the “concepts,” “rules” or “principles” that became the focus of the investigation well and so, needed guidance. The second point means that students learn better when they are active but their activities require guidance. Based on the opinion that the research conducted not only centered on the students but there is a role of teachers in the learning process so that learning can run smoothly.

An alternative test is needed to assist teachers in assessing student’s abilities that cannot be measured by conventional tests. One alternative test that can be used is performance appraisal (Performance assessment). Performance appraisal is an authentic assessment that is able to assess student’s real ability in relation to daily life. Arifin[5] pointed out that of the umpteenth way of assessment used in the learning process, process or performance assessment (performance) has advantages is 94% that can link between cognitive, affective and psychomotor domains. This is in accordance with the characteristics of a performance appraisal that requires students to use a variety of skills, attitudes and knowledge. Written tests are not only glued to objective tests, then performance appraisals better reflect the ability of students who are shown directly in front of the teacher. Through this assessment, teachers increasingly have an opportunity to observe student performance and the assessment process become valid. With performance appraisal, teachers can improve and enhance the quality of learning because the teacher has to know in detail about what capabilities have not been achieved by students.

Skills in the science process are appropriate when assessed using performance appraisals in the form of learning methods but it would be more appropriate to look at student’s science process skills when teachers use active learning methods in which one form is learning by practicum. This is because the lab provides an opportunity for students to show the activity of science in conducting the scientific process and produce the product of scientific work.

Teacher training material curriculum implementation 2013 2014 SD Class IV requires students to achieve high-level thinking skills. Natural science essentially as a structured and systematic science, as a human activity through an active, dynamic and generative process and as a science that develops a critical, objective and open-minded attitude, becomes very important to be mastered by learners in the face of the pace changes in science and technology are so rapid. Thinking here is not just to think for no apparent reason but here it invites us to think by learning our way of thinking to be directed and can be used to answer future challenges, especially future challenges in education.

Permendiknas Number 41 Year 2007 states that the learning process in every elementary and secondary education unit must be interactive inspirational, fun, challenging and motivate learners to participate actively and provide sufficient space for initiative, creativity and independence according to talents interests and physical

and psychological development of learners. The 2013 curriculum has the characteristics of intact personal building and aims to produce productive, creative innovative and effective Indonesian people through strengthening attitudes, skills and integrated knowledge. The two important aspects in the implementation of Curriculum 2013 is the ability of teachers to apply innovative learning approaches along with their assessment and assignment of teaching materials[6]. In reality the teacher and student handbooks that have been analyzed are still lacking in engaging in high-level thinking skills in students such as science process skills, critical thinking, creative thinking, problem-solving skills and decision-making skills.

Based on the above background the researcher would like to propose the research by developing the design of learning device of natural science grade 4 elementary school by using the inquiry learning model to trace the skill of science process by using PhET.

The formulation of the problem in this study is does the learning device IPA by applying Inquiry learning model can trap the science process skills of elementary school students? Based on the formulation of the main problem, the following is the formulation of special problems in this study: How is the validity of learning devices IPA by applying the model of inquiry learning can trap the science process skills of elementary school students?. How is the practicality of IPA learning device by applying inquiry model to train the science process of elementary school students?. How is the effectiveness of IPA learning apparatus by applying inquiry learning model able to skill science process skill of elementary school student?.

Conceptual framework

Science process skill: The process of science derived from the steps that scientists do when doing scientific research, these steps are called process skills. Scientific process skills can also be defined as the ability or ability to perform an action in learning science so as to produce concepts, theories, principles, laws or facts or evidence. Below is described the science process skills trained in this study[7].

Development of hypothesis: Hypothesis is a guess about what effect will be given variable manipulation to response variable. Therefore in the hypothesis formulation there should be variable manipulation and response variables. The hypothesis is formulated in the form of a statement.

Variable control: A variable is a quantity that can vary or change in a given situation. Each experiment involves several variables or factors that can change. The modified variables are called manipulation variables. Factors that can change as a result of manipulated variables are called response variables. Controlling variables means keeping the whole condition the same except for manipulation variables. The control variable is a variable that is kept so as not to affect the experimental results.

Experiment: Experimenting is a skill to test ideas derived from facts, concepts and principles of science so that information can be obtained that accepts or rejects the ideas.

Obtain and present the data: Data obtained from the experiments are recorded, arranged systematically and presented in the form of tables, graphs or drawings according to the type of data.

Analyze data: Analyzing the data is to explain the meaning of the data collected from the experimental results. Some student behaviors are: compilation of data, identify patterns or relationships of existing data, formulate appropriate inferences using data, summarize correctly.

Make a conclusion: Making a conclusion means making a statement that summarizes what has been learned from an experiment or observation. The conclusions of these experiments generally relate to temporary answers (hypothesis). After experimenting, recording observations and analyzing the data, it can ultimately be determined whether the experiment shows the answer while (the hypothesis) was accepted or rejected.

Physics Education Technology (PhET): Utilization of computers as a means of education development today has become a major requirement. Computers in science learning can be used as experimental aids, simulations, demonstrations and calculators. In this research, the simulation used is PhET simulation.

Physics Education Technology (PhET) is a simulation created and developed by a team from the University of Colorado at Boulder America (University of Colorado at Boulder). This simulation was developed in order to provide teaching and learning media of science-based virtual laboratory (virtual laboratory) that facilitate teachers and students in learning.

PhET interactive simulation is very interesting because it is very easy and fun to use. In addition to direct online, PhET interactive simulations can also be used offline in class or at home. This simulation is written in Java and Flash, can be run using the default web browser as long as Flash and Java plug-ins are installed. PhET itself provides PhET software downloads, Flash and Java. In other words, PhET interactive simulations are user

friendly and free to download for the benefit of classroom teaching or can be used for individual learning purposes. PhET interactive simulations are moving images (animated) interactive and made just like games where students can learn by exploring. The simulations emphasize the correspondence between real phenomena and computer simulations and then present them in physically conceptual models easily understood by the students. PhET's highly interative simulation invites students to learn by exploring directly.

PhET simulations also animate what the eye does not see such as atoms, electrons, photons, electric fields and so on through the use of graphics. As for quantitative explorations such as experiments in real laboratories, PhET interactive simulations have measurement instruments such as rulers, stopwatch, voltmeter, ampere-meter, thermometer, pH meter and so on. When measuring tools are used interactively, the results of measurements are instantly displayed or animated, effectively depicting causal relationships and related representations of experimental parameters (such as motion of objects, graphs, number display, etc.). We really like having our own science labs even though all we have is a virtual lab.

Inquiry: According Widiowati in a journal entitled HOT Learning Science by Applying Inquiry Laboratory states that inquiry is something that is done to find answers in accordance with the questions tested. When students are faced with the questions presented in the question, the student prefers the question if it is associated with a series of directives in the inquiry activity.

Seeing some understanding from the experts, it can be concluded that the learning of inquiry is a learning that teaches students in the process of thinking to study scientific investigation by finding an experience as scientists who find and develop science and involve students in mental processes in the framework of his invention.

The main targets of inquiry model are maximal student involvement in learning process; logical and systematic activity harassment; develop an attitude of confidence in students about what is found in the inquiry process, Trianto. From the above understanding it can be concluded that inquiry learning is student-centered learning and emphasizes providing students with experience to find out, research, formulate problems and test the truth and summarize the problem.

Inquiry is used if the purpose of learning in the form of high-level skills development and not just the understanding of the material alone. Understanding the material needs to be possessed by students but the mastery of or development of high-level thinking skills needs to be a focus in learning. Inquiry model is implemented in 6 stages.

MATERIALS AND METHODS

Research design: This research is a research design to produce prototype learning devices that meet the criteria of high quality intervention. Learning device developed is a learning device that incorporates inquiry model and PhET simulation to trace the science process skills of elementary students. Plomp and Nieveen[8] states that research design is a systematic study to design, develop and evaluate educational interventions with the aim of solving complex educational problems and deepening our knowledge of the characteristics of interventions and the process of designing and developing those characteristics and processes.

Research design study of instructional devices conducted refers to Plomp and Nieveen[8]. The research stages of Plomp and Nieveen[8] can be related to the phases according to Thiagarajan[9] using 4-D (Four D-models) models consisting of 4 stages, definitions or define, development (development) and the stage of dissemination (disseminate). Researchers used preliminary research and prototype phase stages of Plomp and Nieveen[8] which are parallel to 3 stages of development, define, design stage, development stage of Thiagarajan[9]. Assessment phase and disseminate phase are not done because of the limitations. Design research adapts the design of One-Group Pretest-Posttest design[10].

Data collection instruments: The research instruments used in this research include the learning device validation sheet instructional learning observation sheet, student's book readiness sheet and LKS, science process skill test, product assessment sheet and student response questionnaire. The result of the student's science skill test was analyzed using N-gain to know the improvement of student's science process skill after following the learning by using the developed learning device.

RESULTS AND DISCUSSION

Learning tools validity: The learning tools developed are adapted to the needs of the 2013 Curriculum and are designed based on state-of-the art. Ratumanan and Laurens[11] stated that the learning device is considered feasible to use if the minimum validity level reached the valid category with a minimum score of 2.6. The results of the learning device validation recapitulation are presented in Table 1.

Assessment results from validators indicate that learning tools developed can be implemented or used in the pilot phase. This is because the learning device developed in the category is very valid for syllabus, RPP scenario, LKS and student book and declared valid on pretest and post-test of learning result.

Table 1: The syntax of inquiry learning

Phases	Teacher behavior
Phase one	
Get attention and explain the process of inquiry or the Inquiry process	Teachers prepare students to learn and describe the learning process that will be implemented
Phase two	
Presents an Inquiry or corresponding event	Teacher indicates the problem or event appropriate to the student
Phase three	
Ask students to formulate hypotheses to explain problems or events	The teacher asks the students to question the problem situation and hypothesize what will happen
Phase four	
Encourage students to collect data to test hypotheses	The teacher asks students how they can collect data to test their hypotheses. On the same problem in the experimental class can be done
Phase five	
Formulate explanations and/or conclusions	The teacher directs students to find solutions by drawing conclusions or generalizing
Phase six	
Reflects on the problem situation and thought process used to investigate it	The teacher asks students to think according to their own thought processes and reflect the Inquiry process

Arends[4]

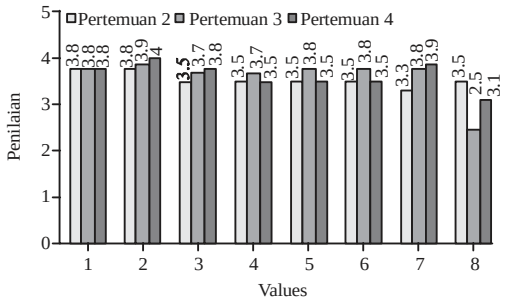

Fig. 1: The result of learning implementation observation on tryout 2; Keterangan: 1-6 = Phases of inquiry learning; 7 = class athmosphere; 8 = time allocation

Learning implementation: Implementation of learning is the level of achievement of learning steps in RPP to trace the skills of the science process based on the observation of two observers. Observation of the implementation of learning is done on limited Trial (1) and extensive Test (2). Observations were made during three meetings on the implementation of RPP 2 scenarios, RPP scenarios 3 and RPP scenarios 4. The results of the observations of the implementation of the lesson are shown in Fig. 1.

Learning tools effectiveness: The effectiveness of instructional tools can be determined from the results of student's science process skill tests, student cognitive product LP results and student responses.

The implementation of learning devices with inquiry learning model also has an impact on the improvement of science process skills. Science process skills are categorized very low at the beginning of learning that is known at the time of giving pretest increased after applied inquiry learning model. This has the meaning that the implementation of inquiry learning model is able to train and teaches students to improve the science process skills. Activities taught to trace the skills of the process of science are to formulate hypotheses, identify variables, conduct investigations, analyze data and draw conclusions.

The result of handout development feasibility: The data of practicality of PPP modeling at the first meeting can be seen in the attachment of documentation (documentation attachment). This is in accordance with the modeling theory proposed by Albert Bandura. The results of modeling or imitation tend to resemble even the same behavior with the behavior of the person imitated. At the meeting 1 was modeled by the teacher in using the science process skills in the investigation activities so that the next meeting could be used well. Students are trained to carry out the scientific method of LKS 1 on the effect of many batteries on lamp lamps containing electrical energy materials. Students are so enthusiastic to follow the learning, can be seen in photo documentation meeting 1 introduction of PPP.

Description of the learning steps of the RPP scenario refers to the inquiry learning phase. In the learning activities carried out there are six phases. The first phase is getting attention and explaining the inquiry process to the students. In this phase students are given motivation to attract attention and students can follow the learning with the spirit, so that, the learning obtained meaningful and can improve student achievement. This is in line with the opinion of Slavin, Glynn *et al*.[12] which states that if motivating at the time of learning then student achievement can increase. It is also in line with Nur[7] opinion that students who are motivated to learn something will use a higher cognitive process in learning the material, so that, the student will absorb and listen to the material better.

In the first phase of the teacher not only provide motivation but also provide an explanation of the inquiry process if previously not applied inquiry learning[4] . This is so that, students can follow the learning well because The learning developed by this research using inquiry learning model Based on the data of the implementation of RPP Ujicoba 1, the implementation of this first phase is assessed by 2 observers have good enough category while the data of the implementation of RPP Ujicoba II, The implementation of this first phase is assessed by 2 observers have good category with value The average

Table 2: The result of learning tools validity

Learning tools	Average	Categories	R (%)
Syllabus and scenario RPP	3.7	SV	93.24
LKS	3.6	SV	92.11
Students book	3.9	SV	96.20
Science process skill test	2.9	V	96.00
Product cognitive test	2.8	V	80.00

Table 3: The result of science process skill test

Science process skill indicators	Tryout 1		Tryout 2	
	Pre-test	Post-test	Pre-test	Post-test
Making hypotheses	0.08	0.77	0.26	0.96
Identifying variable	0.00	0.73	0.20	0.93
Filling the observation table	0.00	0.88	0.60	0.96
Analyzing data	0.00	0.85	0.16	0.96
Drawing conclusion	0.00	0.69	0.20	0.96

percentage match is 97.8%. The motivation at the beginning of learning can affect the learning environment in the classroom, this is related to the implementation of learning seen from the aspect of the classroom atmosphere The classroom atmosphere observed by two observers consists of the relevance of KBM With the aim of the learner , Connecting around with the material to the students. The classroom atmosphere observed by 2 observers has a good category with the average value presented Test I the percentage of match is 82.5% and the trial II is a match percentage of 92.5%. This can be seen from the response about student's interest in the learning process in Table 2. Overall as many as 100% of students are happy with the science learning that has been followed by the students.

The second phase of the teacher explains the steps of discovery and organizing student learning. In phase 2 students form groups and obtain LKS to conduct investigation activities. LKS provided by teachers is equipped with a problem formulation that can assist students in conducting the experiment. The formulation of the problem is a form of scaffolding that teachers give to students to conduct experiments. Scaffolding can assist students in the process of investigation and problem solving so as to reflect on learning. The formulation of the problem given by the teacher can encourage the student to do the pengeldikan to find the answer. Table 3 with an average score 3.2 in the category is good enough and get a match score of 71.7% (Test 1) and also seen in Test II Table 2 with an average score of 3.9 with good category and get a match score of 97%. According to the theory of cognitive learning, learning is seen as an attempt to understand something. Learn more than just remembering. For students, to truly understand and apply science, brands must learn to solve problems, find something for themselves and always grapple with ideas.

The third phase which asks students to formulate hypotheses to explain the problem or event. In this phase, students are guided to formulate hypotheses (temporary answers) of the problem formulation that has been provided. Students are not only guided to formulate hypotheses but also guided identifying variables. In this phase, the role of the teacher as a mediator is to provide assistance to students in the form of explanations and directional questions. The teacher explains the purpose of the hypothesis and how to hypothesis, explains the variables and how to identify the variables. Teachers can provide explanations using the commonly used language in this study.

The implementation of the third phase is assessed by 2 observers having good category with the average value presented in Table 3 of 3.2 and the percentage of matching is 76.7%. The implementation of the third phase with good category is supported by the student response questionnaire presented in Table 2 and 3 which states that 100% of students feel newly formulated hypotheses.

The fourth phase, encouraging students to collect data to test the hypothesis. By doing experiments students can collect data to test the hypothesis that has been formulated. During the experiment, the teacher guides students to experiment. Teacher guidance in data acquisition causes students to focus more on the content being studied. The implementation of the fourth phase was assessed by 2 observers having a very good category with the average score presented in Test I (Table 2) of 2.8 and the percentage of matches of 76.1%. The implementation of the fourth phase of the category is quite good.

This data is supported by the percentage of student activity in discussing, giving opinions, asking questions and making observations and experiments has shown a good percentage, meaning those activities appear in the observation of student activities. It is intended to familiarize themselves with conveying opinions and constructing knowledge through the investigation and discovery of the students themselves (with teacher guidance). Ausubel states that the primary function of formal education is to organize various information for students and to present ideas clearly and appropriately[4]. Good pedagogy should involve students with the student's own situations that do the experiments. The above description also shows that learning tools are developed by linking learning with an authentic inquiry as needed (need) Curriculum 2013. Curriculum Requirements 2013 is a learning carried out in schools should teach students or engage students in an authentic inquiry process. The fifth phase, formulating explanations and/or conclusions. After the students get data from ekeprimen done then the students analyze the data obtained from the experiment with given scaffolding in the form of questions to analyze the data. After analyzing the data, students are guided to conclude the experimental data and the conclusions made are related to the hypothesis formulated in the third phase.

A conclusion means making a statement that summarizes what you have learned from an experiment or observation[7]. The implementation of the fifth phase is assessed by 2 observers having a fairly good category with an average grade of 3.0 and 3.6.

The implementation of the lessons implemented in both Test I and II was done very well. This supports a positive impact on student's cognitive learning outcomes. The cognitive learning outcomes consist of LP 2.1 cognitive products and LP 2.2 cognitive processes of science.

The impact of inquiry model on improving skills of science learning process: An increase in posttest results in Test 1 and 2. This means that students experience an increase in the science process skills after the implementation of Inquiry learning model in learning. The increase can be measured using N-gain. This is in accordance with Hake, students are said to be able if there is an increase in test results before treatment is given (pretest) and after the treatment (posttest). Improved results of science process skill tests are also caused by the application of Inquiry learning model in learning that is trained to students to stimulate student's science process skills during the learning process. This is in line with Filsaime's statement which states that the process of forming the student science process does not arise by itself but through a preparation and practice. According to Langrer, to train the science process students should be encouraged to answer questions relating to the following: determine the consequences of a decision or event; identify the assumptions used in a statement; to formulate the main issues; causes the cause of an event; choosing factors that support a decision.

Student activity in the learning process is very supportive of student learning outcomes this is related to cognitive learning outcomes. This is in line with Slavin's opinion that students should build knowledge in their own minds, teachers can facilitate this process by teaching ways in which information is meaningful and relevant to students by allowing students to discover or apply their own ideas. Ideas, knowing and consciously using their own strategies. In order to gain an understanding or knowledge, students "construct or build on their understanding of the phenomenon encountered using their experiences, cognitive structures and beliefs". This is in line with the opinion of Santrock which states that individuals will learn well if they are actively involved in constructing their knowledge and understanding, through student activity in learning.

Learning activity with Inquiry learning model involves the active role of students and teachers in learning. Teachers have acted as mentors and facilitators well enough in applying the model phases of Inquiry Learning. This is in line with the opinion of Arends[4] which states that innovative learning is divided into two, namely teacher-centered learning (presentations and explanations, direct learning and inquiry learning) and student-centered learning (cooperative, problem-based learning and classroom discussion). The inquiry learning model is a student-centered learning model that adopts from the principle of constructivism. Inquiry learning is a series of stages of activity (phase) organized in such a way that students can master the competencies to be achieved in learning by playing an active role.

Student response after following learning by using Inquiry learning model also become supporting data in this research. Student response is obtained by using student response questionnaire. Questionnaire response students are given after the whole learning activities implemented. Students are asked to fill out a questionnaire containing opinions on the developed device, learning process and other supporting components. The result of student's response analysis on student learning component development showed positive response. Student responses show that students receive well all the learning components that include student books, LKS, assessment sheet, teacher teaching methods, methods and learning models. Student interest in the learning process, means students interested in learning by using the model of Inquiry Learning applied during the Trial. This interest reinforces the data why students are motivated to use the skills of the science process and the increasing skills of the science process during learning. Based on the student's cognitive results indicating that students who have high scientific process skills then the skills of the science process are also high. Based on these findings can be said that if someone who has a high cognitive process then the skills of the science process can be developed properly.

The cognitive learning result of the research shows that the inquiry model influences the student's cognitive especially the science process skill. This is in line with the opinion of Sornsakda, etc., namely the use of learning models Inquiry learning can be a significant improvement in the skills of the science process. This suggests that the model used by researchers to develop learning tools positively contributes to the skill of the process of science. The above description also shows that learning tools that have been developed meet the needs. Curriculum 2013 because basically Curriculum 2013 demands student activeness in the classroom.

Based on the description of effectiveness also shows that learning tools developed and validated by validators have proven practical by referring learning data to be used in learning and also proven effective by referring data to the science process skills. This is in accordance with the opinion of Plomp and Nieveen[8] that prototype learning device (intervention) has met the criteria of high quality

that is to meet the feasibility of the validity, practicality and effectiveness, so, it can say that the device The learning that has been developed is feasible for use in the learning process.

CONCLUSION

Based on the results of instructional device development using inquiry learning model, the products produced in this study are: Learning devices developed by researchers have been validated and declared valid with material of electrical energy and alternative energy. The resulting product as follows: RPP Kit Meeting 1 Introduction of Process Skills of Science including: LKS 1 and LKS Key 1. (Appendix 4 is bounded separately). RPP Devices Meeting 2 Electrical Energy including: Syllabus, RPP Scenario, Student Handbook, LKS 2 and LKS Key 2, Assessment Specification Table, LP 2.1 Product Cognitive and Key LP 2.1, LP 2.2 Cognitive Process Skills of science process and LP Key 2.2 and short version of RPP. (Appendix IV is bounded separately). RPP Device Meeting 3 Alternative energy of sunlight includes: Syllabus, RPP Scenario, Student Handbook, LKS 3 and LKS Key 3, Specification Table, LP 2.1 Product Cognitive and Key of LP 2.1, LP 2.2 Cognitive Process Skills of science process and LP Key 2.2 and short version of RPP. (Appendix IV is bounded separately). RPP Devices Meeting 4 Alternative Water Energy including: Syllabus, RPP Scenario, Student Handbook, LKS 4 and LKS Key 4, Assessment Specification Table, LP 2.1 Product Cognitive and Key of LP 2.1, LP 2.2 Cognitive Process of science process skills and Key LP 2.2 and short version of RPP. (Appendix IV is bounded separately). The validation instrument and assessment instrument developed by the researcher and declared valid to trace the skill of the science process. The resulting product is as follows: RPP Device Validation Instrument Meeting 2 including: Instrument Validity of RPP Devices (RPP Devices, LKS 2, Student Handbook of meeting 2, LP 2.1 Product Cognitive, LP 2.2 Cognitive Process Skills in the process of science), Practical Instruments RPP Tools (Lesson Learned, Readability of LKS and Student Books) and Instrument Effectiveness Instruments RPP (LP 2.1 Product Cognitive, LP 2.2 Cognitive Process of Science Process Skills, Observation of Student Activity, Student Response, Constraints During Learning) . 2) RPP Device Validation Instrument Meeting 3 including: Instrument Validity of RPP Devices (RPP Devices, Worksheets 3, Student Teachings meeting 3, LP 2.1 Product Cognitive, LP 2.2 Cognitive Process of Science Process Skills) instrument Practical Devices RPP (Lesson Learned, Readability of LKS and Student Books) and Instrument Effectiveness Instrument RPP (LP 2.1 Product Cognitive, LP 2.2 Cognitive Process of Science Process Skills, Observation of Student Activity, Student Response, Constraints During Learning). RPP Device Validation Instrument Meeting 4 including: Instrument Validity of RPP Devices (RPP Devices, Worksheets 4, Student Textbook 4, LP 2.1 Product Cognitive, LP 2.2 Cognitive Process of Science Process Skills) instrument Practical Instrument RPP (Lesson Learned, Readability of LKS and Student Books) and Instrument Effectiveness Instrument RPP (LP 2.1 Product Cognitive, LP 2.2 Cognitive Process of Science Process Skills, Observation of Student Activity, Student Response, Constraints During Learning).

REFERENCES

01. Julianto, S., 2011. [Theory and Implementation of Innovative Learning Models]. Unesa University Press, Surabaya, Indonesia, (In Indonesian).
02. Suastra, I.W., 2009. [Latest Science Learning]. Universitas Pendidikan Ganesha, Singaraja, Indonesia, (In Indonesian).
03. Warsono, 2013. [Active Learning Theory and Assessment]. PT Remaja Rosda Karya, Bandung, Indonesia, (In Indonesian).
04. Arends, R., 2012. Learning to Teach. McGraw Suastra-Hill, New York, USA.,.
05. Arifin, S., 2011. [Learning Evaluation: Principles, Techniques, Procedures]. PT Remaja, Bandung, Indonesia, (In Indonesian).
06. Mahtari, S., 2015. [Development of prototype of teacher's books and science student books with guided discovery for practicing the scientific creativity of junior high school students]. Master Thesis, Universitas Negeri Surabaya, Surabaya, Indonesia. (In Indonesian)
07. Nur, M., 2013. [Science Process Skills and Critical Thinking Skills]. Penelitian Unggulan Perguruan Tinggi, Surabaya, Indonesia, (In Indonesian).
08. Plomp and Nieveen, 2007. An Introduction to Educational Design Research. NetzoDruk Digitaal Drukwerk, Enschede, Netherlands,.
09. Thiagarajan, S., D.S. Semmel and M.I. Semmel, 1974. [Instructional Development for Training Teacher of Exceptional]. Indiana University, Minnesota, (In Indonesian).
10. Fraenkel, J.R. and N.E. Wallen, 2003. How to Design and Evaluate Research in Education? 5th Edn., McGraw-Hill, New York, USA., ISBN-13: 9780072485608.
11. Ratumanan and Laurents, 2006. [Evaluation of Learning Outcomes Relevant to the Competency Based Curriculum]. Unesa University Press, Surabaya, Indonesia, (In Indonesian).
12. Glynn, S.M., G. Taasoobshirazi and P. Brickman, 2007. Nonscience majors learning science: A theoretical model of motivation. J. Res. Sci. Teach., 44: 1088-1107.