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The Practicality and Effectiveness of the PjBL Model-Based Electronic Student Worksheets Assisted Science Lab Kits to Improve Science Process Skills in Students

Bahagia Maharani[1], _Yohandri[2*],

1 SMA Bukit Barisan, West Sumatera, Indonesia
2 Department of Physics, Universitas Negeri Padang, West Sumatera, Indonesia

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Correspondence
Email : bahagiamaharani.bm@gmail.com
Phone :

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ABSTRACT

This study aimed to determine the practicality and effectiveness of learning based on the student worksheet model based on a kit-assisted science laboratory project to improve science process skills in class. The type of research used in research and development using the Plomp model consists of a preliminary research stage, a development or prototype stage, and an assessment stage. The practical results consist of a teacher response questionnaire and a student response questionnaire with a value of 99.2% and 85.0% with a very practical category. The effectiveness of the knowledge competence of students with posttest results of 77.5%. The effectiveness of the student's science skill competence has increased compared to the previous meeting, with an average of 84.7% in the very good category. The electronic student worksheet based on the Project-Based Learning (PjBL) model assisted by the Science Lab Kits is practical and effective for improving science process skills in class

INTRODUCTION

The importance of science is a systematic collection of theories, and its application is generally limited to natural phenomena, produced and developed through scientific methods such as observation and experimentation, requiring scientific attitudes such as curiosity, openness, and honesty. Science is a collection of systematic theories; its application is generally limited to natural phenomena, born and developed through scientific methods such as observation and experimentation, and requires a scientific attitude such as curiosity, openness, honesty, and others. Science is concerned with systematically finding out about natural phenomena in life. Science is concerned with the systematic discovery of natural phenomena in life.

Because of the importance of science education, the government is trying to improve the quality of education by improving the curriculum, including the 2013 curriculum, which is a refinement of the Education Unit Level Curriculum (KTSP). Based on the 2013 curriculum, the learning objective is to provide direct learning experiences by using and developing scientific process skills and attitudes. Science education allows students to explore their potential through learning experiences and research and build science in the best way (Wisudawati, 2013).

Law on the National Education System (No. 20/2003) states that the learning process is entirely directed at the development of the three domains as a whole/holistic, meaning that the development of one domain cannot be separated from the other. The learning process creates personal qualities, attitudes, knowledge, and skills. Student success in science relates to the teacher's ability to design learning activities. Students who actively participate will get better learning outcomes, so the teacher must be able to design lesson plans and determine the textbooks to use. Teaching materials can help teachers carry out learning activities in class.

Textbooks are all materials (information, tools, or texts) arranged systematically, which contain abilities that will be mastered and used by students in the learning process, with the aim of planning and reviewing the implementation of learning. For example, textbooks, modules, handouts, student worksheets, audio, and interactive textbooks (Pastowo, 2011).

The availability of textbooks is also expected to improve students' reasoning abilities in learning (Astutik, 2017). Textbooks that have been developed so far are less interesting and not optimal. In order to maximize the use of teaching materials developed, they must be able to adapt to the times and habits of students. This activity provides tools and materials that students must assemble or complete.

One factor influencing the success of laboratory activities is the availability of resources, including materials and equipment, rooms and furniture, laboratory staff and technicians. However, limited laboratory equipment and study time at school mean that teachers often only teach theoretical material in class. In response to these problems, researchers are interested in developing electronic student worksheets and textbooks to encourage student learning.

Student worksheets given to students will enable students to be more active in answering questions, conducting experiments, making students more interested in learning, and improving their communication skills when communicating the results of experimental activities (Yohandri, 2018). Ramli (2020) students use the student worksheets prepared by the teacher as a textbook, which can be used alone or in groups. In the experimental activities, the student worksheets contain concept material, assignments and experimental procedures to guide students in conducting experiments.

Textbooks are subjects teachers use to support the learning process in schools (Asrizal, 2017). So that the impact is maximized, the textbooks developed must be able to adapt to the times and habits of students. This activity provides tools and materials that students must assemble or complete. This set of tools and materials is often called a laboratory kit.

A *laboratory kit* is a teaching aid with tools and materials that can be assembled into an experimental tool. Usually, every school laboratory provides this laboratory tool. However, due to various limitations, the kit can only operate sometimes. For this reason, teachers must be able to innovate and make simple teaching aids or laboratory equipment to assist the learning process. Several applications, such as spring practice kits (Nugroho, 2018).

To carry out practices such as assembling kits, of course, instructions are needed. So, to implement it, a learning model is needed, one of which is project-based learning (PjBL). The Buck Education Institute points out that the project-based learning model is a systematic learning method that enables students to learn knowledge and skills through structured, authentic experiences and thorough processes that aim to produce products (Buck Education Institute, 2003).

Physics learning is expected to be carried out under the 2013 curriculum requirements, but the actual situation in the physics learning field is different than expected. On this basis,

researchers used interview forms, teacher questionnaires and student questionnaires to obtain initial data. Preliminary data collection was carried out at SMAN 16 Padang. The analysis of teacher interviews consists of three components: learning Physics, using teaching materials and learning models.

Regarding the results of the first interview to study physics, the teacher said that physics consists of interrelated facts, principles and procedures. The implementation of physics learning in schools uses the 2013 curriculum, and schools provide printed books supplemented by publisher worksheets. The obstacle to learning physics is the low ability of students to distinguish facts, principles and procedures. The low ability of students is due to the limitations of existing teaching materials; students need to make maximum use of existing printed teaching materials, and laboratory utilization is not optimal.

The results of the second interview were about the use of teaching materials. The teaching materials used are printed books and publisher worksheets. There must be experiments to improve students' scientific process skills. However, some books and worksheets do not have experiments because not all basic competencies have been carried out in the trial procedure. While studying, some students need to remember to bring printed books and student worksheets. Books and worksheets used by teachers and students still need to include information and communication technology.

The results of the third interview about the learning model. Teachers use learning models that meet the requirements of the 2013 Curriculum. However, teachers still rarely use project-based learning models because they adapt to the material and apply a project-based learning model, dividing students into several groups and doing overall projects based on KD. During the implementation process, problems were found, such as intensive material, short time, inefficient use of laboratories, and inefficient use of teaching materials.

In addition to interviews, researchers observed the physics learning process of teachers and students of SMAN 16 Padang through an observation questionnaire. Preliminary research on students analyses interest, motivation to learn, learning styles, attitudes, knowledge and skills. The results of the analysis are expressed as an average percentage. The students' analysis results include interest, motivation to learn, learning styles, attitudes, knowledge and skills, respectively 51.5%, 52.9%, 65.5%, 91.5%, 49.3% and 54.1%.

The solution to overcome this is that teaching materials are needed in electronic student worksheets because they can be brought and saved on cellphones and computers. Electronic student worksheets have four functions: first, as a teaching material that can minimize the role of educators but activate students more. Second, as teaching materials that make it easier for students to understand the material provided. They are third, facilitating the implementation of teaching to students. Then, electronic student worksheets have many benefits for learning; through electronic student worksheets, we have the opportunity to lure students into being actively involved with the material being discussed (Prastowo, 2014). Based on this, students need these electronic student worksheets. Therefore, the teacher is responsible for adequately preparing electronic student worksheets. The preparation and development of electronic student worksheets must meet at least the criteria related to whether or not the essential competencies mastered by students are achieved. Students can acquire these skills through the science learning process, namely science process skills. *Process skills* lead to the growth and development of several skills. In learning science at school, students will find many new and valuable things, namely in the form of concepts, facts and the development of attitudes, so that learning becomes more meaningful and students' thinking skills develop.

Research by Janbuala et al. (2013) found that scientific learning can improve students' students' science process skills. Learning science does not only develop students' science process skills, but students also gain learning experiences that they experience themselves. The process skills approach can intellectually, manually, and socially develop students' abilities to make their learning experiences more meaningful. These process skills include observing, submitting hypotheses, using tools and materials properly and correctly by always considering work safety and security, asking questions, classifying and interpreting data, communicating findings orally or in writing, and digging and sorting out relevant factual information. To test ideas or solve everyday problems (Depdiknas, 2006).

According to Tawil (2014), students' science process skills are the development of existing skills in students and are used as insight for various skills, including intellectual, social, and physical skills. Science process skills must be grown in students according to their level of thinking development. Lessons at school are developed based on the demands of process skills, including science subjects. Indicators of process skills are observing, classifying, inferencing, predicting, looking for relationships, communicating, formulating hypotheses, performing experiments, controlling variables, and interpreting data (Azizah, 2018).

Based on the results of the student questionnaire, the learning process uses a science laboratory kit with a value of 60.1. Implement the Project Based Learning (PjBL) model with a value of 70.1. Science process skills indicators include observation, classification, interpretation, prediction, communication, asking questions, submitting hypotheses, experimenting with plans, using tools, applying concepts, and conducting investigations (Tawil, 2014). Students still need to meet the indicators of science skills, as seen from the questionnaire, with a score of 66.5. Science learning needs to be addressed so that students do not become passive. Students' science process skills in learning will involve students actively. Students' science process skills can be applied in secondary schools both in theory and practice by training students' involvement in science (Akinbobola& Afolabi, 2010). Students' science process skills will only develop when the learning process accommodates scientific activities that can trigger the growth of scientific attitudes and hone process skills in students (Karamustafaoglu, 2011). Based on the description above, the authors have conducted research entitled "Development of Electronic Student Worksheets Model Based Project Based Learning Assisted by Science Laboratory Kits to Improve Science Process Skills in Class X SMA".

METHODS

The type of research that will be used in research and development. Research and development is a method used to produce specific products and test the effectiveness of these products (Sugiyono, 2011). Development research aims to produce specific products and test the effectiveness of the resulting products.

Research conducted using the Plomp model consists of three stages, namely: preliminary research (initial investigation stage), Development or prototyping phase (design and prototyping stages), and assessment phase (Plomp, 2013). Preliminary research includes field observations, literature reviews, and student and teacher analyses. Analysis of material and learning objectives at SMAN 16 Padang. The development or prototyping phase at this stage includes the design stage and formative evaluation of the Project-Based Learning Model-Based electronic student worksheets assisted by the Science Laboratory Kit to improve science process skills. The assessment phase in this phase is to test the effectiveness of the project-based learning model electronic student worksheets assisted by the Science Laboratory Kit to

improve the science process skills being developed. Evaluation is carried out on students' knowledge competence and science process skills.

Formative evaluation methods include self-evaluation, expert review, one-to-one evaluation, and small group and field tests. The practicality instrument consists of teacher and student response questionnaires. The teacher response questionnaire was used to obtain teacher responses to the electronic student worksheets based on the Project Based Learning (PjBL) model assisted by the Science Laboratory Kit that was developed. The effectiveness instrument was used to develop data on the effectiveness of the electronic student worksheets based on the Project Based Learning (PjBL) model assisted by the Science Laboratory Kit for students, which can be seen in the knowledge and science process skill aspects.

Data analysis of the product practicality questionnaire uses a Likert scale. The practicality analysis steps carried out are as follows: 1) Giving a score for each item answers strongly agree (4), agree (3), disagree (2), and strongly disagree (1). 2) Add up the total score of each practitioner for all indicators. 3) Giving practical value by using the formula:

$$P = \frac{f}{N} x\ 100\% \quad (1)$$

In this equation, P is the final grade, f is the score obtained, and N is the maximum score.

Table 1. Practicality Category

Achievement Level (%)	Category
81-100	Very Practical
61-80	Practical
41-60	Quite Practical
21-40	Less Practical
0-20	Impractical

Source: (Riduwan, 2008)

To analyze the competency data of students descriptive analysis. Competence mastery of students, according to Arikunto (2008), both individually and classically for knowledge competence uses the following equation:

$$KI = \frac{SB}{SM} x\ 100\% \quad (2)$$

$$KK = \frac{JT}{JS} x\ 100\% \quad (3)$$

In this equation, KI is individual completeness, KK is classical completeness, SB is the correct score obtained, SM is the maximum score, JT is the number of students who complete, and JS is the total number of students.

RESULTS AND DISCUSSION

Results

The practicality instrument consists of teacher and student response questionnaires. The practicality of the student electronic worksheets from one-to-one evaluation uses a student response questionnaire. The student response questionnaire to see the practicality of the student electronic worksheets has three indicators, namely 1) easy to understand, 2) attractive, and 3) efficient. The practical results of the one-to-one evaluation phase of the student electronic worksheets can be seen in Figure 1.

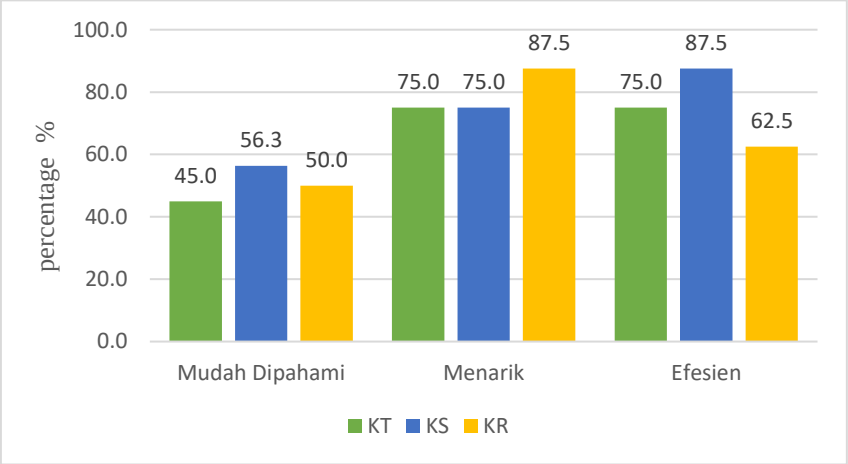

Figure 1. The Practicality of E-LKPD Phase One-to-One Evaluation

Based on Figure 1, students with moderate abilities easily understand electronic student worksheets. Students with low abilities judge the appearance of electronic student worksheets as more attractive. Meanwhile, electronic student worksheets are more effective for students with moderate abilities. The practicality value of the three students shows that the electronic student worksheets are based on the Project Based Learning Model to improve practical science process skills.

The small group assessment involved nine class X MIPA 1 students at SMAN 16 Padang with high, medium, and low abilities. Students do learn using electronic student worksheets. The researcher gave a questionnaire after carrying out the learning process to students. The practical results of the electronic student worksheets in the small group evaluation phase can be seen in Figure 2.

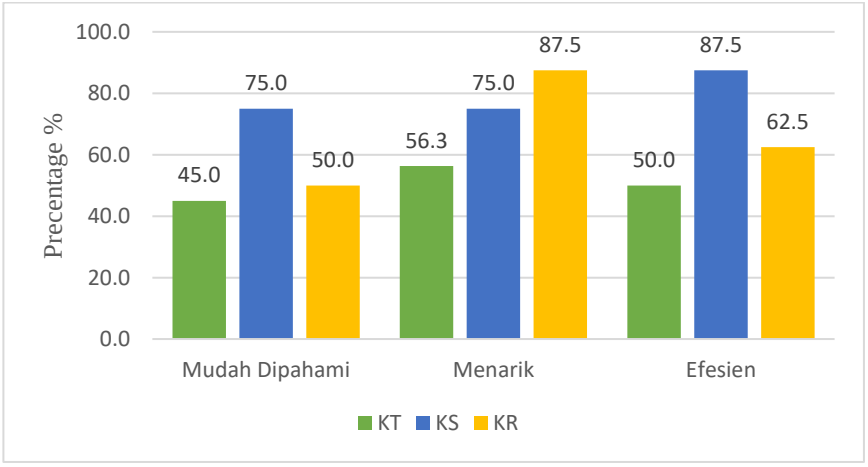

Figure 2. The Practicality Of Electronic Student Worksheets Small Group Evaluation Phase

Based on Figure 2, students with moderate abilities more easily understand electronic student worksheets. Students with low abilities judge the appearance of electronic student worksheets as more attractive. Meanwhile, electronic student worksheets are more effective for students with moderate abilities. The practicality value of the nine students shows that the electronic student worksheets Based on the Project-Based Learning Model are used to improve practical science process skills.

The practicality of the electronic student worksheets from the field test assessment uses the teacher's response questionnaire. The teacher's response questionnaire to see the practicality of the electronic student worksheets has three indicators, namely a) easy to understand, b) interesting, and c) efficient. The practical results of the electronic student worksheet field test of the teacher's response can be seen in Table 2.

Table 2. Field Test Phase Electronik Student Worksheets Practicality Results (Teacher Response)

Indicator	Value	Category
Easy to Understand	97,5	Very Practical
Interesting	100	Very Practical
Efficient	100	Very Practical
Average	99,2	Very Practical

Based on Table 2, the average value of the practicality of the teacher's response to electronic student worksheets is 99.2% in the very practical category. Project-Based Learning Model Electronic Student Worksheets to improve science process skills can be easy to understand, interesting and efficient. The results of the practicality of the electronic student worksheet field test of student responses can be seen in Table 3.

Table 3. The Practicality Of The Electronic Student Worksheets Field Test Of Student Responses

Indicator	Value	Category
Easy to Understand	80,8	Very Practical
Interesting	90,3	Very Practical
Efficient	84,1	Very Practical
Average	85,0	Very Practical

Based on Table 2, the average value of the practicality of the Electronic Student Worksheets in the student's responses was 85.0% in the very practical category. Project-Based Learning Model-Based Electronic Student Worksheets to improve science process skills can be easy to understand, interesting and efficient.

The activities carried out in the assessment phase are to test the effectiveness of the Electronic Student Worksheets Based on the Project-Based Learning Model assisted by the Science Laboratory Kit to improve the science process skills developed. Evaluation is carried out on students' knowledge competence and science process skills. Assessment of knowledge is based

on students' understanding of the material that has been studied. *Knowledge assessment* is an assessment carried out to determine student mastery, including factual and conceptual knowledge. The knowledge assessment results carried out during and after the Learning processes are expressed in numbers ranging from 0-100.

The effectiveness of students' knowledge competence can be seen from the increase in learning outcomes during the learning process using the Project-Based Learning Model-Based Electronic Student Worksheets assisted by the Science Laboratory Kit. Improved learning outcomes obtained from pretest and posttest scores. The results of the analysis of the effectiveness of students' knowledge competencies can be seen in Table 4.

Table 4. Knowledge Effectiveness Results

	Pretest	*Posttest*	*Gain Score*
Average	43,75	80,0	
Classical Mastery	12,5%	77,5%	0,44

Table 4 shows that the average pretest score of the students was 43.75%, with classical completeness of 12.5%. At the same time, the average posttest score of students is 80.0, with classical completeness of 77.5%. Improved student learning outcomes can be seen using the gain score. The analysis was carried out by reviewing the pretest and posttest values. The gain score obtained was 0.44 in the moderate category. Electronic Student Worksheets based on the Project-Based Learning Model assisted by the Science Lab. The kit can improve student learning outcomes.

The effectiveness of students' science process skill competencies can be seen from the results of observations while doing the project. Assessment of science process skills with indicators, namely a) assembling experimental tools/materials, b) accuracy in using tools, c) accuracy of experimental steps, d) processing data, and e) presenting. The results of the analysis of the effectiveness of science process skills can be seen in Table 5.

Table 5. Effectiveness Results of Science Process Skills

Observed aspect	Mark Meeting I	Mark Meeting II	Total	Average
Assembling Experimental Tools/Materials	75,0	100,0	175,0	87,5
Accuracy Using Tools	75,0	81,9	156,9	78,4
Trial Accuracy	75,0	82,5	157,5	78,8
Processing data	75,0	82,5	157,5	78,8
Presenting	100,0	100,0	200,0	100,0
Average	80,0	89,4	169,4	84,7

Based on Table 5, the average value of the effectiveness of the student's science skills competence has increased compared to the previous meeting, with an average of 84.7% in the very good category. Electronic Student Worksheets based on the Project Based Learning Model assisted by the Science Laboratory Kit can improve students' science process skills. The results showed that the practicality, according to teachers and students, was 99.2% and

85% in the very good category. In contrast, the effectiveness is 84.7%, with a very good category.

Discussion

The effectiveness of students' knowledge competencies can be seen from the increase in learning outcomes during the learning process using Electronic Student Worksheets. Improved learning outcomes obtained from pretest and posttest scores. The average value of students' knowledge competence is above the classical KKM of 75%. The average shows that the Project-Based Learning Model-Based Electronic Student Worksheets assisted by the Science Laboratory Kit to improve science process skills are effectively used in learning because students can achieve predetermined knowledge competencies. The results of Mimi's research (2015) state that Physics teaching materials using the Project Based Learning model can address students' needs in the learning process, increase learning activities, and produce teaching materials that are valid, practical, and effective.

Meanwhile, the effectiveness of students' science process skill competencies can be seen from the results of observations during the project. Assessment of science process skills with indicators, namely a) assembling experimental tools/materials, b) accuracy in using tools, c) accuracy of experimental steps, d) processing data, and e) presenting. The average value of the competency effectiveness of students' science skills has increased compared to the previous meeting. The research results of Syam et al. (2015) state that the use of the Science Kit can improve students' skills on average because students can determine and recognize tools and materials describe observations, interpret events that will occur, carry out practicum according to procedures, write data experiments neatly and systematically, and make temporary conclusions, and present the results of experiments.

According to Dahar (1996), scientific process skills are individual abilities to apply scientific methods in understanding, developing, and discovering science. Leeper (Nugraha, 2008) also said that developing students' science learning enables students to solve the problems they face. Students are assisted and skilled in solving various problems using the scientific method. Scientific attitude towards acquiring scientific knowledge or information, including having students' science process skills. Science process skills are students' abilities to understand, develop, and seek knowledge. The knowledge possessed (Afrizon, Ratnawulan, &Fauzi, 2012). Process skills are also a process approach in teaching natural science based on observing what a scientist does (Rusman, 2013).

CONCLUTION

Based on the research results, the Practical Science Laboratory Kit assists the PjBL model-based Electronic Student Worksheets to improve the science process skills of science students in the very practical category. According to teachers and students, the practicality value is 99.2% and 85.0% in the very good category. Electronic Student Worksheets are also practical, scoring 84.7% in the very good category. Electronic Student Worksheets can be used as a learning resource to improve students' science process skills as required by the 2013 curriculum.

REFERENCES

Afrizon, R., Ratnawulan, &Fauzi, A. (2012). *PeningkatanPerilakuBerkarakter Dan KeterampilanBerpikirKritisSiswaKelas IX MTsN Model Padang Pada Mata Pelajaran IPA-FisikaMenggunakanModel Problem Based Instruction.*JurnalPenelitianPembelajaranFisika, 1, 1–16.

Candra Sayekti, I., Sarwanto, &Suparmi.

Akinbobola, A. O., & Afolabi, F. (2010). *Analysis of science process skills in West African senior secondary school certificate physics practical examinations in Nigeria. American-Eurasian Journal of Scientific Research.*

Astutik, J. (2017). *Developing Save Your Food Kit (Sayofu Kit) to Support Inquiry, Improve Student Learning Outcomes at SMP Plus HidayatulMubtadiin and Public Awareness on Food Additives*. IOP Conf. Series: Journal of Physics: Conf. Series 812 (2017) 012080.

Azizah, K N, M Ibrahim dan W Widodo. *Process Skill Assessment Instrument: Inovation to Measure Student's Learning Result Holistically. Journal of Physics: Conference Series*, 947 (2018) 012026.

Buck Institut for Education. (2003). *Project-Based Learning.*Tersedia pada: http//:www.bgsu.edu/organization/etl/proj.html.

Dahar, R.W. (1996). *Teori-TeoriBelajar*. Jakarta: Erlangga

Depdiknas. (2006). *PedomanMemilih dan Menyusun Bahan Ajar*. Jakarta: Depdiknas.

Janbuala, S., Dhirapongse, S., Issaramanorose, N., &Iembua, M. (2013). *A Study of Using Instructional Media to Enhance Scientific Process Skill for Young Children in Child Development Centers in Northeastern Area. Dr. Kathleen P. King, University of South Florida, USA, 40. Jurnal International Forum of Teaching and Studies.* Universitas Thailand.

Karamustafaoğlu, S. 2. *Improving the Science Process Skills Ability of Prospective Science Teachers Using I Diagrams. Eurasian Journal of Physics and Chemistry Education*. 3(1), 26-38.

Mukhtar, Mimi Khaira. (2015). *PengembanganBahan Ajar FisikaMenggunakan Model Project Based Learning (PjBL) denganPendekatan Scientific Pada Pembelajaran E-Learning Kelas X MIA.* Tesis. Padang: Universitas Negeri Padang.

Nafsih, Nurul Zakiatin., Festiyed, FatniMufit,.(2020). *Meta AnalisisPengembanganInstrumenTesKeterampilan Proses Sains dalamPembelajaranFisika dan IPA.* JurnalPenelitianPembelajaranFisika. Vol 6 N0 .1 (2020) 89-96.

Nugraha, Ali. (2008). *PengembanganPembelajaran Sains Pada Anak Usia Dini*. Bandung: JILSI Foundation.

Nugroho, Adiyatno dan Suliyanah. (2018). *Pengembangan Kit PraktikumPegasBerbasisPembelajaran Guided Inquiry Pada MateriElastisitasSebagai Media PembelajaranSiswa SMA*. Inovasi Pendidikan Fisika. Vol.07 No.02. ISSN: 2302-4496.

Ploom, Tjeerd dan Nienke Nieveen. 2013. *Educational Design Research.* Enschede: Netherlands.

Prastowo, Andi. (2011). *Panduan KreatifMembuatBahan Ajar Inovatif.* Yogyakarta: DIVA Press.

Rahma, ElfianaLathifa., Hufri., Yohandri. *LKPD SaintifikMenggunakan Model Discovery Learning Terhadap Hasil BelajarFisikaSiswaKelas XI MAN 2 Padang. Pillar of Physics Education.* Vol 11. No 3, 2018, 113-120.

Ramli., Yohandri, YulisSeprtianas Sari., MitriSelisne. *Pengembangan Lember Kerja Peserta Didik Fisika Berbasis Pendekatan Science, Technology, Engineering, and Mathematics untukMeningkatkan BerpikirKriis Peserta Didik.* JEP (JurnalEksakta Pendidikan). Volume 4 Nomor 1 Mei 2020.

Rusman. (2013). *Model-Model PembelajaranMengembangkanProfesionalisme Guru*. Jakarta: PT. Raja GrafindoPersada

Sugiyono. (2011). *MetodePenelitianKuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.

Syam, Marlina, dkk. (2015). *PerananPenggunaan KIT IPA Sebagai Alat Pembelajaran dalam Upaya MeningkatkanKeterampilanPesertaDidikKelas VIII4 SMP Negeri 1 Belawa KabupatenWajo*. JPF Volume 3 Nomor 3 ISSN: 2302-8939.

Tawil, M dan Liliasari. (2014). *Keterampilan-Keterampilan Sains dan ImplementasinyadalamPembelajaran IPA*. Makasar: Badan Penerbit Universitas Negeri Makasar.

Wisudawati, AsihWidi dan Eka Sulistyowati. (2013). *MetodologiPembelajaran IPA*. Jakarta: BumiAksara.