International Journal of Science and Applied Science: Conference Series P-ISSN: 2549-4635
Int. J. Sci. Appl. Sci.: Conf. Ser., Vol. 2 No. 1 (2017) E-ISSN: 2549-4627
International Conference on Science and Applied Science 2017 doi: 10.20961/ijsascs.v2i1.16748

Student Worksheet Static Fluid Material Based on Scientific Approach Using Giuded Inquiry Model

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Abstract: This Research and development goal is to produce Student Worksheet (SWS) static fluid material based on the scientific approach using guided inquiry learning model, which is easy, interesting, useful and effective. This research was conducted through seven stages, namely: pra-research and data collection stage, planning stage, pra-developing product stage, pra-test stage, revising design stage, product test stage, and revising product stage. The pra-study stage consists of a literature study and teacher and student assessment analysis in Al Kautsar Bandar Lampung high school. The developing stage is produces (SWS) static fluid material with scientific approaches based using guided inquiry learning model with well validated of design expert and well enough of the material expert. The product test stage had been held on the sample with random cluster sampling technique which XI.IPA-5 class as the experimental class and XI.IPA-4 class as the control class. The results of this study indicate that the developing result SWS s has the easy category, interesting, useful, and good enough effective with the N-gain 0.599.

Keyword : guided inquiry, scientific approach

1. Introduction

Learning activities are educational processes that provide opportunities for learners to develop their potential into increasingly increasing abilities in attitudes, knowledge, and skills. Learning activities are directed to empower all of them to be expected competencies. The difficulties often faced by them in the learning process is a lot of information that must be accepted and used by learners. In addition, the curriculum demands which must complete the subject matter which has been established and also the objective value and national/examination value of learning are the report which sometimes obligate the teacher to complete the material on time and train students to be skilled in solving the problem question. So again the teacher delivered the lesson by using the lecture model which is considered the easiest to complete the material on time. The learning process in the classroom is still dominated by teachers (teacher center). Classroom learning also tends to be oriented toward the students' final score of daily exams that include several chapters already taught, with no attitudinal and skill values [1].

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Characteristics of learning activities in the knowledge domain aimed at strengthening the scientific approach, integrated thematic and thematic are highly recommended for applying discovery/inquiry learning is highly recommended for applying discovery/inquiry learning based[2]. Characteristics of physics subjects namely: The process of obtaining information through empirical methods, information obtained through logical and systematic inquiry, through a combination of critical thinking processes to produce reliable and valid information [3]. Inquiry learning is an active mental learning process that demands the active participation of learners [4].

The role of media or teaching materials in the learning process is a changin step in the information transfer process, diverting the position of a teacher as the source of information into the students facilitator, making learning more effective in the delivery of information through demonstrations or experiments and students are also active in Developing their intellectual potential directly. The simplicity of the media or teaching materials such as the Student Worksheet (SWS) used is not an obstacle to improving the quality of learning. The worksheet is one of the most ingredients for achieving the purpose of educational activities in Turkey [5]. SWS developed based on a constructivist approach allows students to participate actively in the learning process, helping them learn a better subject, and feels improving student success [6]. SWS Know-Want-Learn (KWL) combined with project-based learning is effective for advancing the creative thinking process of students and contributing as well as alternative solutions [7]. Teaching with the use of SWS developed in by with constructivist theory, students can play an active role and more effective than using other traditional teaching methods [8].

To optimize the media or teaching materials required a model of learning so that learning can be directed by with the objectives to be achieved. One of the learning models that can be applied by the teacher is the guided inquiry learning model. Guided inquiry is a learning model in which there are several scientific activities, learners convey ideas before the topic is learned, learners investigate a phenomenon, learners explain facts, Facts and compare them scientifically [9]. Implemented guided inquiry model in physics learning at SMAN 8 Bengkulu concluded that students' logical thinking ability using guided inquiry model is higher than using conventional method [10]. The Exploration of Student Learning Difficulties on the subject of Light and Efforts to Improve Learning Outcomes through Guided Inquiry Learning resulted in guided inquiry learning to overcome the students 'learning difficulties that have an impact on improving student learning outcomes as demonstrated by students' From the experimental group from 28.57% to 85.71%[11].

In addition to the learning, model is also required learning approach for the learning process will be more effective. One approach to learning is the scientific approach. Physics learning with scientific approach improves students' critical thinking skills in moderate criterion experimental class, meaning that students can provide simple explanations (Elementary clarification), build basic skills (basic support), give conclusions (Inference), provide the further explanation (advanced classification), and

set strategies and tactics [12]. The Application of Scientific Approach to the Co-operative Learning Model of think pair share (TPS) can improve students' understanding, communicate the findings, and apply the concepts they get in solving the problems in SWS [13].

Based on the observation in Al Kautsar Bandar Lampung Senior High School student are known that, (1) inquiry learning according to learners is 66.67%, (2) most learners have used SWS (77.73%) but almost a Half of them feel it is still difficult to understand SWS as completing of the tasks and exercises. (3) SWS used do not have characteristics of the scientific approach, so almost half of the students are less able to perform scientific activities (observing, asking, gathering information, associating and communicating). (4) Most students need and agree to develop SWS based on scientific approach with inquiry learning model (78.33%). Similarly, Al Kautsar High School physics teachers strongly agreed to develop the SWS-based scientific approach with inquiry learning model (100%).

Based on the above problem description, it is done the development of student worksheet (SWS) of static fluid material based on scientific approach with guided inquiry learning model. The purpose of this research is the goal to produce an SWS static fluid material based on a scientific approach with guided inquiry learning model. Describe the attractiveness, convenience, and usefulness and effectiveness of the use of static fluid material SWS based on a scientific approach by guided inquiry model learning in the classroom. The benefits of assisting learners in developing direct learning knowledge and experience can be used to achieve the mastery of the concept of static fluid, as a resource in learning when discussing static fluid materials, helping teachers to improve effectiveness in physics learning on static fluid materials, as sources and materials Teaching for teachers in the process of physics learning, providing motivation for teachers to be more creative in developing learning media and as a reference in libraries that can be read and used as a source of learning by all citizens of the school.

2. Research methods

2.1. Type of research

This research method uses research and development aimed at producing Student Worksheet (SWS) of static fluid material based on scientific approach with guided inquiry learning model. The product of SWS of static fluid material based on scientific approach with guided inquiry learning model consists of several stages shown in Figure 1.

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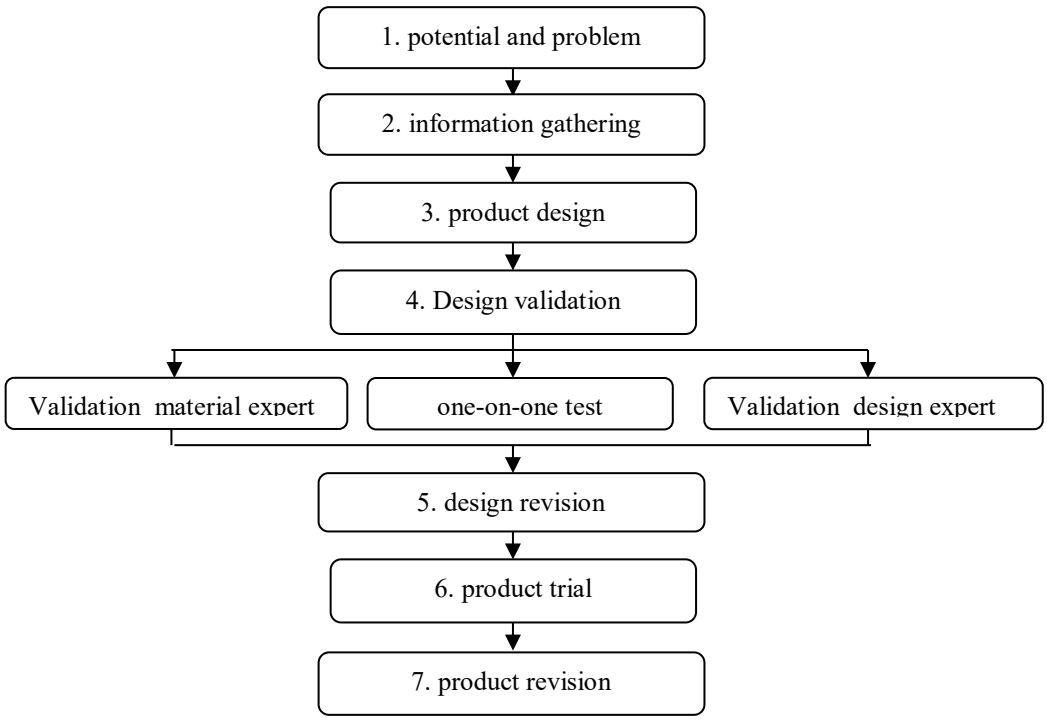

Figure 1. Design development product adapted [14].

2.2. Time and place of research

Research development begins from the stage of potential, and the problem is through observation to reveal the needs of teachers and learners. The observations were held on April 7, 2015, at Al-Kautsar Bandar Lampung High School. Validation stage by design expert and material expert and one-on-one test from 28 June to 19 October 2016. While the product trial phase from 28 October s.d 14 November 2016 at Al Kautsar Bandar Lampung High School .

2.3. Research subject/population and sample

Subject of this research consists of: (1) experts and product testers who test the validity SWS. The SWS validity examiner consist of material experts from physics educational FKIP lecturers and design experts from of educational technology lecturer ; (2) the sample is students of class XI of Al Kautsar high school using random cluster sampling technique and simultaneously SWS user who assess the level of attractiveness, usefulness, convenience and effectiveness of SWS.

2.4. Data, instruments, and data collection techniques

This research uses quantitative data obtained from the closed questionnaire in the form of data of SWS product feasibility of development result based on the test result of design expert and material expert; Data on the attractiveness, convenience, and

usefulness of SWS; As well as data obtained from test results on the effectiveness of SWS.

The data collection of this research is obtained from the filling of expert test questionnaire, one-on-one test, attractiveness test, convenience test and benefits test. At the expert validation stage, the data was obtained from the test questionnaires by the lecturer of FKIP Unila physics education master and design test by the lecturer of Unila Education Technology. At the product trial stage, filling a one-on-one test questionnaire containing indicators of attractiveness, convenience, and usefulness of SWS by three Al Kautsar class XI.IPA students from three different classes. In the limited test phase, the test of ease, the attractiveness test, and the benefit test were performed, the questionnaire was completed by the experimental class XI.IPA-5. While the data of SWS effectiveness is obtained from the question of pretest and postest given in the experimental class and control class (XI.IPA-4).

2.5. Data Analysis Technique

The technique of questionnaire data analysis is done by: Data classification, perform tabulation of data based on the classification made, score the respondent's answer, cultivate the total score of respondents' answers, calculate the questionnaire responses on each item, calculate the average questionnaire percentage to determine the effectiveness, attractiveness, convenience, and usefulness of the instrument and interpret the score as a whole. Processing the score of respondents' answers on expert test materials and design experts using equation (1).

$$P = \frac{\sum X}{\sum X_i} x100\% \quad \text{.....(1)}$$

Where:
P = Percentage searched
$\sum X$= score of respondents' answers
$\sum X_i$ = score of ideal values

Decision making/interpreting scores used the criteria of validity and product revision levels shown in Table 1.

Table 1. Criteria level of validity and revision products.

Percentage (%)	Validation Criteria
76 – 100	Valid
56 – 75	Simply Valid
40 – 55	Less Valid
0 -39	Not Valid

The respondent answers scoring to test test one-on-one test the attractiveness test, facilities test and usefulness test based on Linkert scale: a score of 4 (very interesting, very easy, very useful), a score of 3 (interesting, easy, useful), a score of 2 (interestingly enough, Easy enough, useful enough), score 1 (less interesting, less easy, less useful).

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The quality of attractiveness, convenience, and usefulness of the product can be determined by converting the score [14]. Becomes the percentage range by using equation (2):

$$\% = \frac{Scores\ obtained}{Ideal\ score\ count} x100\% \quad \text{.....(2)}$$

Meaning of percentage range on one-to-one test, attractiveness test, convenience test and usefulness test are as follows: 90% -100% (very interesting, very easy, and very useful), 70% -89% (interesting, easy and useful) , 50% -69% (interesting enough, easy enough, and useful enough), 0% -49% (less interesting, less easy, and less useful).

The effectiveness test of SWS at Product Test (Pretest-postest Control group Design) was analyzed by using independent sample T-test. Using SPSS Statistic 21 software. The product effectiveness level based on average normalized gain values[16] is calculated using the equation (3).

$$\langle g \rangle = \frac{\langle S_f \rangle - \langle S_i \rangle}{100 - S_i} \quad \text{.....(3)}$$

With <g> = normalized gain, $<S_f>$ = the mean value of the posttest class, $<S_i>$ = the average value of the pretest class. Normalized gain values are then classified as in Table 2.

Table 2. Average value of gain normalized and classified.

Average gains normalized	Classification	Effectiveness level
$\langle g \rangle \geq 0{,}7$	High	Efektif
$0{,}3 \leq \langle g \rangle < 0{,}7$	Medium	Effective enough
$\langle g \rangle < 0{,}3$	Low	Less effective

3. Results and discussion

3.1. Results

The main result of the research from the development study is the Student Worksheet (SWS) of static fluid material based on the scientific approach with guided inquiry learning model. Details of the results of the stages of the development procedure are as follows:

3.1.1. Initial research and data collection

Based on the results of the questionnaire analysis in the initial study/student needs analysis, found that the learning in the new class of 67% of inquiry learning modeling, 73% of the students used the existing SWS in the learning, 69% of the scientific approach to the SWS because the SWS is a summary of the learning materials and the collection of question, and 78% approve the development of SWS that have characteristics and can develop the ability of students inquiry.

3.1.2. Initial Product Development

Initial product development, is the embodiment of the planned development scenario with the following stages: (1) cover making; (2) the preface; (3) table of contents; (4) Standards of Competence, basic competence, and the formulation of indicators adjusted to the inquiry model of learning indicators; (5) SWS 1 Main Law Hydrostatika, SWS 2 Pascal's Law, SWS 3 Law Archimedes; And (6) References. Each SWS components: (1) title; (2) time allocation; (3) Indicators of Competency Achievement; (4) instructions of using of SWS; (5) the scientific approach stage let's watch, let's ask, let's try, let's process the information, and let's communicate.

3.1.3. Initial Test

The initial test is done in the form of expert validation that is the validation of SWS design experts by the lecturer design experts of the Master of Education Technology course and the validation of the material experts by the lecturer of the Master of Physics Education course. The process of SWS validation by design experts is done twice, this is due to the first validation need an improvement on the terms of construction. After the SWS design was improved the results of the re-validation questionnaire by design experts are shown in Table 3.

Table 3. Test Results from Design Experts.

	Assessment Elements	Value in (%)	Validation Criteria
1	Dedactic Conditions	87,50	Valid
2	Terms of Construction	92,67	Valid
3	Technical Requirements	92,86	Valid
4	Terms Characteristics	90,00	Valid
Average overall		90,76	Valid

SWS material validation process done by material experts is done three times to get SWS with the minimum criterion is valid enough. After the LKS is improved and a third validation test is obtained, the result of SWS validation by the material expert is shown in Table 4.

Table 4. Test Results Analysis Expert Content.

	Assessment Elements	Value in (%)	Validation Criteria
1	Adjustment of indicators with inquiry learning	75.00	Valid enough
2	Conformity Questions with Learning Inquiry Model	75.00	Valid enough
3	Material Accuracy	75.00	Valid enough
4	Material preservation	75.00	Valid enough
5	Language and Indicator-based	75.00	Valid enough

scientific approach		
Average overall	75.00	Valid enough

After the product is diverted by the design experts and the material experts are then tested one on one to find out the readability, the attractiveness of the product, the ease of use, of the product as well as to know the weakness of the product before being revised and tested. The one-on-one test was conducted on 3 high school students of Al Kautsar Bandar Lampung class XI from different classes. The results of a one-on-one test analysis are shown in Table 5.

Table 5. One-on-one Test Results

	Assessment Elements	Value in (%)	Meaning
1	Readability	100.00	Very easy
2	Convenience	83.33	Easy
3	the attractiveness	87.50	Interesting
4	the usefulness	80.95	Helpful

3.1.4. Product Test Stage

Stages of product testing by distributing questionnaires to obtain data on the convenience, the attractiveness and usefulness of LKS result of improvements to the experimental class. Recapitulation of convenience test, attractiveness and usefulness can be seen in Table 6.

Table 6. Summary of convenience test, attractiveness, and usefulness.

	Assessment Elements	Value in (%)	Meaning
1	Convenience	85.86	Easy
2	The attractiveness	86.23	Interesting
3	The usefulness	89.84	Helpful

To test the effectiveness of SWS of this development result with pretest-postest control group design method and analyzed by Independent t-test, while product effectiveness level is based on the average of normalized gain (N-gain). The t-test results show that the Sig. (2-tailed) the value of 0,000 means the value of Sig. (2-tailed) <0.05. It is concluded that H_0 is rejected, or it can be said that there is significant (significant) difference between mean score before learning (pretest) and after learning to use SWS development with inquiry model learning (postest) on the static fluid material. The average postest score is greater than the average pretest score with an increase in learning achievement with an average value of 33.56 increase. While the calculation of the average value of N-gain of experimental class and control class can be

seen in Table 7. which shows the average of N-gain of learning achievement of experiment class student has medium category and control class is in the low category.

Table 7. an N-gain average grade of Experiment Class and Control Class.

Component	*Class*	
	Eksperiment	*Control*
Average N-gain	0.599	0.266
Classification	medium	low

3.1.5. Product Revision After Trial

After conducting the research there are some revisions to the SWS of the development results, namely (1) on the cover page is added posts that characterize SWS development result is SWS-based scientific approach with guided inquiry learning model; (2) the previous page numbering in the lower left to the bottom right. (3) Adding photos of students who are the practicum on the cover, and (4) Replacement of the image on SWS 1 of the branded bottle image with the unbranded bottle. The final product in the research is SWS of static fluid material based on the saintific approach with guided inquiry learning model.

3.2. Discussion

Discussion of revised product development, including product suitability for development purposes; the attractiveness, convenience, usefulness; and the effectiveness of the product developed as one of teaching materials or learning media.\

3.2.1. Product Compliance Generated

The objective of this research is to produce a static fluid material SWS based on a scientific approach with guided inquiry learning model that is attractive, useful and as a learning material that qualifies deductions, constructs, techniques and characteristics with validation from design experts 90, 76%. This by the opinion that a good SWS should meet didactic requirements, construction terms, technical terms, and characteristics [16]. While the material validation of the material experts is 75.00% which means that the SWS has valid enough criteria, which means that the SWS has the conformity of the indicator with the guided inquiry learning model, has the suitability of the questions with guided inquiry learning, has material accuracy, has material progression, and the use of language A good and scientific approach.

The advantages of SWS result of this development include: presents the phenomenon of everyday life so that learners can observe and find facts in accordance with the subject or the material to be studied; helping learners to dare to ask questions; guide learners independently to formulate problems, hypothesize, design experiments, be able to analyze experimental data, summarize and communicate it; helping learners to find concepts, principles, and laws on a mandated basis; can be used as an evaluation tool to know the level of mastery of the concept of matter on the cognitive aspect. This is

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consistent with[8] 's research, on the student worksheet developed questions to attract students' interest and attention. Students create questions that enable them to make transitions between subtitles and to make correlations between the material. That student worksheets developed using a constructivist approach allow the students to participate actively in the learning process, help them learn better subjects, and enhance them to success [6].

3.2.2. The convenience, attractiveness, and usefulness of SWS

The result of SWS static fluid material based on scientific approach with guided inquiry learning model convenience test has the easy category (85.68%) which means SWS is easy to use (operational), easy to read, easy to understand, and easy to embed the concept of static fluid. SWS of development result has the category (86,23%), meaning SWS of static fluid material based on scientific approach with guided inquiry model study in regarding of design, illustration, writing, color usage, and drawing can attract and stimulate the attention of learners. Is in by with the opinion of [17] that the use of illustrations in teaching materials has a variety of benefits that make teaching materials more interesting through the variation of appearance. While the format of the flow or description of its contents, problems and format evaluation is not confusing and can arouse the interest of learners using SWS. The attractiveness of instructional media means that learning media should be able to attract and stimulate the attention of students, whether the display, color choices, and contents, description of the content is not confusing and can arouse students' interest to use the media[18].

SWS of the development have a useful category (89.86%), which means SWS has the useful of facilitating the process of interaction between teachers with learners, in this case helps learners to learn optimally, generate the curiosity of learners, help learners make it concrete something abstract so that Helps to strengthen learners' understanding and so on. The quality of student learning can be improved. This result is supported by[18] that the ease of learning by using media such as SWS means that all the content of learning through media should be easy to understand, studied or understood by the students, and very operational in its use, The attractiveness of instructional media means learning media should be able to attract or stimulate the attention of students, either the appearance, the choice of colors, and the contents. The description of the content is not confusing and can arouse the interest of students to use the media and the usefulness of the learning media is the content must be valuable or useful, contains benefits for the understanding of learning materials and not redundant or futile or damaging the students. The media provides useful: Clarify the presentation of messages and information so that the learning process more smoothly and improve learning outcomes; Improving student motivation, by directing students' attention so as to enable students to study independently according to their abilities and interests; Overcoming the limitations of the senses, space, and time; Students will have the same experience of an event, and enable direct interaction with the surrounding environment [19].

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3.2.3. Effectiveness of SWS Use

Paired sample t-test is different from the average of pretest and postest data of the experimental class that on the significance of α = 0,05 we get the Sig (2-tailed) value = 0,000, which means that the Sig (2-tailed) <0.05 then reject H0 and receive H1, so it is concluded there is a significant difference between the average postest value of the experimental class students with the average postest value of control class students. While from the average of N-gain result of pretest and postest of experiment class 0,599 and control class 0,22 it shows the learning achievement in the experimental class is in the medium category with effective effectiveness level while the learning achievement in the control class is in low category with Effectiveness is less effective. Learning in the experimental class by using SWS of static fluid material based on scientific approach with guided inquiry learning model is quite effective, because: From pretest and postest result in experimental class there is an increase of learning achievement with the average increase of 33,56 that from mean value 40.03 to 77.58. This is in accordance with the opinion of [20] that the effectiveness of product development can be seen from the average score of post test experimental class and control class; SWS results of development have a format or flow systematic in building understanding of learners that is in accordance with the learning phase of scientific approach, so that learners can construct their understanding systematically or participate more actively through guided inquiry learning model step This result is supported by the results of research Done by [8], SWS developed in accordance with constructivism theory where students play an active role more effectively than using other traditional teaching methods . SWS physics character of the nation in the form of dialogue with inquiry approach for students Madrasah Aliyah feasible, effective, and practical use in learning activities[21], Learning Outcomes through Inquiry Learning Guided that inquiry learning guided On the subject of light, especially light reflection can overcome the students 'learning difficulties that have an impact on improving student learning outcomes, which is shown by the improvement of students' classic learning completeness from the experimental group from 28.57% to 85.71%[11].

4. Conclusions and recommendations

4.1. Conclusion

The conclusions of this research are: SWS-produced static fluid materials based on scientific approach with validated inquiry learning; SWS Static Fluid Material Based on Scientific Approach with Guided Inquiry Learning has 85.86% ease, 86.23% attractiveness, and usefulness value 89.84% (useful); (3) Implementation of SWS Static Fluid Material Based on Scientific Approach with Guided Inquiry Learning is proven Effective enough to be used in learning with N-gain value 0,599 and has a significant influence on students achievement with average learning achievement of 33.56.

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4.2. Recommendations

The recommendations relate to the using of SWS Static Fluid Material Based on Scientific Approach with Guided Inquiry Learning in the following learning: This developed SWS can be used in the learning process and can be further developed on different materials or levels; Teachers can make SWS based on a scientific approach with guided inquiry learning model as an alternative to designing more active, creative, innovative, and fun learning; The problems presented in the learning activities should be tangible or factual and relevant as the application of the concept in everyday life and interesting for learners happy to solve the problem; Time management when the application of guided inquiry learning is very necessary for the learning activities are really timely.

References

[1] Aprilia L, & Mulyaningsih S 2015 Penerapan Perangkat Pembelajaran Materi Kalor melalui Pendekatan Saintifik dengan Model Pembelajaran Guided Discovery Kelas X SMA *Jurnal Inovasi Pendidikan Fisika* **3** 1-5.

[2] Kemendikbud. 2013. *Lampiran Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 65 Tahun 2013 Tentang Standar Proses Pendidikan Dasar dan Menengah.* Jakarta: Mendikbud Republik Indonesia.

[3] Siswanto, Darjatiningsih I, & Mulyana B 2016 *Materi Pokok Pelatihan Implementasi Kurikulum SMA Mata Pelajaran Fisika* Jakarta: Direktorat PSMA.

[4] Anderson R D 2002 Reforming Science Teaching: What Research says about Inquiry *Journal of Science Teacher Education,* **13** 1-12.

[5] Kaymakci S 2012 A Review of Studies on Worksheets in Turkey *US-China Education Review, ISSN 1548-6613* 57-64.

[6] Töman U, Akdeniz A R, Gurbuz F, & Cimer S O 2013 Extanded Worksheet Developed According to 5E Model Based on Contructivist Learning Approach *International Journal on New Trends in Education and Their Implication* **4** 173–183.

[7] Mihardi S, Harahap M B, & Sani R A 2013 The Effect of Project Based Learning Model with KWL Worksheet on Student Creative Thinking Process in Physics Problems *Journal of Education and Practice* **4** 188-200.

[8] Çelikler D. (2010). The Effect of Worksheets Developed for the Subject of Chemical Compounds on Student Achievement and Permanent Learning. *The International Journal of Research in Teacher Education* **1** 42-51.

[9] Chodijah S, Fauzi A, & Wulan R 2012 Pengembangan Perangkat Pembelajaran Fisika Menggunakan Model *Guided Inquiry* yang Dilengkapi Penilaian Portofolio pada Materi Gerak Melingkar *Jurnal Penelitian Pembelajaran Fisika* **1** 1-19.

[10] Purwanto A 2012 Kemampuan Berpikir Logis Siswa SMA Negeri 8 Kota Bengkulu dengan Menerapkan Model Inkuiri Terbimbing dalam Pembelajaran

Fisika *Jurnal Exacta* **10** 133-135.

[11] Wijayanti P I, Mosik, & Hindarto N 2010 Eksplorasi Kesulitan Belajar Siswa pada Pokok Bahasan Cahaya dan Upaya Peningkatan Hasil Belajar melalui Pembelajaran Inkuiri Terbimbing *Jurnal Pendidikan Fisika Indonesia* **6** 1-5.

[12] Wuri O R, & Mulyaningsih S 2014 Penerapan Pendekatan Saintifik pada Pembelajaran Fisika Materi Kalor terhadap Keterampilan Berpikir Kritis Siswa Kelas X SMA *Jurnal Inovasi Pendidikan Fisika* **3** 91-95.

[13] Tawil A H, M Ismaimuza D, & Rochaminah S 2014 Penerapan Pendekatan Scientific pada Model Pembelajaran Kooperatif Tipe Think Pair Share untuk Meningkatkan Pemahaman Siswa Di Kelas VII SMPN 6 Palu *Jurnal Elektronik Pendidikan Matematika Tadulako* **2** 87-97.

[14] Sugiyono 2015 *Metode Penelitian Pendidikan (Pendekatan Kuantitatif Kualitatif dan R&D)*. Bandung: Alfabeta *p* 137

[15] Hake R R 1998 Interactive Engagement vs Traditional Methods: A Six Thousand Student Survey of Mechanics Test Data for Introductory Physics Courses *American Journal of Physics* **66** 64-74.

[16] Nurulita F, Kuswanti N, & Indah N K 2015 Validitas Lks Praktikum Berbasis *Scientific Approach* Pada Materi Sistem Ekskresi. *Bioedu* **4** 717-722.

[17] Untari S, Hakim S A, Astawa K D, & Rochmadi N W 2008 Pengembangan Bahan Ajar dan LKS Mata Pelajaran PKn dengan Pendekatan Deep Dialoque untuk Meningkatkan Kemampuan Berdialog Kritis Siswa SMA di Jawa Timur *Jurnal Penelitian Kependidikan* **18** 154-177.

[18] Mulyanta St, & Leoang, M 2009 *Tutorial membangun multimedia interaktif : Media pembelajaran*. Jakarta: Universitas Atma Jaya pp 3-4

[19] Arsyad A 2004 *Media Pembelajaran* Jakarta: PT Raja Grafindo Persada pp 25-27

[20] Sugiyanto, Sunarno W, & Prayitno B A 2012 Pengembangan Modul Berbasis Inkuiri Terbimbing disertai Multimedia pada Materi Keanekaragaman Makhluk Hidup di SMPN 1 Kendal Kabupaten Ngawi *Bioedukasi* **6** 22-33.

[21] Muna F, & Sugianto 2014 Pengembangan Lembar Kerja Siswa (LKS) Fisika Berkarakter Bangsa Berbentuk Dialog dengan Pendekatan Inkuiri pada Siswa Madrasah Aliyah *Unnes Physics Education Journal* **3** 7-14.