

# DEVELOPMENT OF OUTDOOR LEARNING TO IMPROVING LEARNING OUTCOMES REVIEWED FROM ABSTRACT THINKING ABILITY, RESPONSE TO GUIDELINES AND SCIENCE PROCESS SKILLS FOR STUDENT OF VOCATIONAL HIGH SCHOOLS

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## ABSTRAK

**Abstract:** This study aims to (1) describe the feasibility of outdoor learning models, (2) describe the developed outdoor learning models that can improve student learning outcomes, (3) describe whether abstract thinking abilities, responses to guidance and science process skills can contribute to understanding resistivity topic in vocational schools. This research was conducted using the Research and Development method with 4D, namely define, design, develop, and disseminate. The subjects of this study were of 49 students of class X TKPI. The research sample consisted of one experimental class and one control class. Learning outcomes data obtained from the posttest, abstract thinking ability data obtained from abstract thinking test questions, science process skills data obtained from science process skills test questions, response data to learning were collected by questionnaire—data analysis using ANCOVA analysis. The results showed that (1) the development of learning devices with the topic of types of obstacles meet the feasible criteria, (2) there is a positive influence of outdoor learning in improving student learning outcomes indicated by the value of  $F_{count} = 32.41$  while  $F_{table 5\%} = 2.81$ . The difference in learning outcomes shown by the gain index of the experimental class 0.78 and the control class 0.67, (3) there is a relationship between the ability to think abstractly, responses to learning and science process skills with student learning outcomes in the topic of resistivity that can be seen from the regression coefficient  $R = 0.8268$  and the coefficient of determination  $R^2 = 0.6836$ . So that it can be interpreted that the three covariates are good predictors of learning outcomes, (4) the effective contribution of abstract thinking ability 1.908%, (5) the relative effective contribution of science process skills 51.269%, (6) effective contribution of responses to effective learning 1,076%.

**Abstrak:** Penelitian ini bertujuan untuk (1) mendeskripsikan kelayakan model pembelajaran *outdoor learning*, (2) mendeskripsikan model pembelajaran *outdoor learning* yang dikembangkan dapat meningkatkan hasil belajar siswa, (3) mendeskripsikan apakah kemampuan berfikir abstrak, tanggapan terhadap bimbingan dan keterampilan proses sains dapat memberikan kontribusi terhadap pemahaman hambatan jenis di tingkat SMK. Penelitian ini dilakukan dengan metode *Research and Development* dengan 4D yaitu *define, design, develop dan disseminate*. Subjek penelitian ini adalah 49 siswa kelas X TKPI SMK. Sampel penelitian terdiri dari satu kelas eksperimen dan satu kelas kontrol. Data hasil belajar diperoleh dari *posttest*, data kemampuan berfikir abstrak didapatkan dari soal test berfikir abstrak, data keterampilan proses sains didapatkan dari soal test keterampilan proses sains, data tanggapan terhadap pembelajaran dikumpulkan dengan angket. Analisis data menggunakan analisis anakova. Hasil penelitian menunjukkan bahwa (1) pengembangan perangkat pembelajaran dengan topik hambatan jenis memenuhi kriteria layak, (2) terdapat pengaruh positif pembelajaran *outdoor learning* dalam meningkatkan hasil belajar siswa ditunjukkan oleh nilai  $F_{hitung} = 32,41$  sedangkan  $F_{tabel 5\%} = 2,81$ . Perbedaan hasil belajar ditunjukkan oleh indeks *gain* kelas eksperimen 0,78 dan kelas kontrol 0,67, (3) terdapat hubungan antara kemampuan berfikir abstrak, tanggapan terhadap pembelajaran dan keterampilan proses sains dengan hasil belajar siswa topik hambatan jenis yang dapat dilihat dari koefisien regresi  $R = 0,8268$  dan koefisien determinasi  $R^2 = 0,6836$  sehingga dapat diartikan ketiga kovariat merupakan prediktor yang baik untuk hasil belajar, (4) sumbangan efektif kemampuan berfikir abstrak 1,908 %, (5) sumbangan efektif relatif keterampilan proses sains 51,269%, (6) sumbangan efektif tanggapan terhadap pembelajaran efektifnya 1,076 %.



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## A. INTRODUCTION

Understanding of physical concepts, in addition to rational thinking, also needs to be done by research through experimental activities and direct observation activities (Malik et al., 2018). Sound equipment that is not available in schools and the many competencies in vocational high schools that must be mastered by students are suspected to be an obstacle in the experimental activities so that it did because it requires equipment, preparation, and lengthy implementation (Sukoco, 2015), (Siswandi & Sukoco, 2016). This situation is also supported by students who are less accustomed to doing scientific activities and are slow in responding to scientific activities. To explore these problems, an effort to uncover this activity requires perception or response to obtain information about an object (Tauhidah & Suciati, 2015), (Laelasari & Sari, 2017). Physics practicum activities carried out in the laboratory or outside the school through observation with the senses, and students can give meaning and interpret the objects observed and can make it easier for students to understand the concepts of physics (Hamidah, 2014), (Dewi, Sunariyati, & Neneng, 2016).

Physics subjects at SMK Negeri 1 Tanjungsari are only delivered in class X with an allocation of 2 hours of study time each week by the 2013 curriculum. Referring to the standard content of the subject matter, applying the circuit and the principle of working direct current electricity in which there is material about the resistance of a conductor. The topic studied in class X semester 2 (Permendikbud Number 24 of 2016). The equipment consists of concepts and symbols about the charge ( $q$ ) that move in a conductor, electric current ( $I$ ), current density ( $\vec{J}$ ), electric field ( $\vec{E}$ ), Ohm's law, electrical conductivity or conductivity ( $\sigma$ ), electrons ( $e$ ), resistivity ( $\rho$ ), potential difference ( $V$ ), resistance ( $R$ ). These concepts and symbols are concepts and symbols that students must master so students can analyze and associate ideas and symbols in daily life.

Based on the experience of researchers for 12 years teaching at SMK Negeri 1 Tanjungsari, the implementation of physics learning in class X takes place in the classroom, due to the lack of sound equipment and a lot of essential competencies

delivered so that learning tends to target teachers as the learning center (*teacher-centered education*). In the learning process so far, the teacher explains the material with whiteboard media assisted with physics textbooks for problem exercises, student representatives asked to do the question exercises on the blackboard. However, it is tough for students to dare to advance to do the question exercises. Students find it challenging to solve physics problems that involve concepts and quantities in physics (Rubiah, 2016), (Kawuri, Ishafit, & Fayanto, 2019). In this connection during learning, the teacher must point and approach several students to be guided working on the questions on the board alternately.

Based on the description that has been described so that it needs to be developed and implemented, a learning model designed to enable students so that learning-centered on students (student center learning). Besides, activities in learning physics need to be made more appealing to foster enthusiasm, creativity, curiosity, social relations with friends, develop student skills, especially in scientific activities such as observing, measuring, interpreting data, concluding and communicating the results of operations carried out by students directly on concrete objects. Therefore, this research develops an outdoor learning model to develop cognitive processes at the level of High Order Thinking Skills.

The outdoor learning model is expected to improve social skills, collaboration, and better communication (Harun & Salamuddin, 2014). Also, students' academic abilities and environmental awareness will likely need to be better. In this connection, outdoor learning thought to be able to support students' health and growth because students are physically actively involved and free to move, increasing student confidence, giving more extensive opportunities for students to communicate with others, increase the activeness and high order thinking (High Order Thinking Skills) of students in learning. Outdoor learning can also develop students to learn in new situations and higher risks, build creativity, and ability to solve problems, improve the imagination, discoveries, and reasoning abilities of students (Amaluddin et al., 2019). Outdoor learning will allow students to have direct contact with the real world and provide an additional form of

unexplored unique experience not found in the classroom or textbook (Forsey, 2014).

To explore the potential of students during learning through outdoor learning will be explored the role of abstract thinking abilities, science process skills, and students' initial abilities. It aims to link the potential of the students with the achievements of their learning outcomes. There is an allegation that through outdoor learning, the initial ability will contribute to learning outcomes because learning outside the classroom needs a broad thinking response. Besides that, by explaining knowledge systematically, it is suspected that scientific process skills and initial abilities contribute to the improvement of student learning outcomes.

Based on the description above, the outdoor learning model and its learning tools that support the implementation of the model are expected to be an alternative model that can be applied to support learning at school. The model developed is associated with abstract thinking skills, responses to students' guidance, and science process skills. The main objectives in this study are (1) describing the outdoor learning model developed in this study can improve student learning outcomes; (2) to describe the relationship of abstract thinking ability, responses to the guidance and skills of the science process on material types of obstacles with student learning outcomes of SMK Negeri 1 Tanjungsari together and individually; (3) To describe whether the ability to think abstractly, he ladder of guidance on science process guidance and skills can contribute to understanding the types of obstacles at the vocational study level.

## B. RESEARCH METHODS

This research is included in the Research and Development study by adopting a 4D design consisting of 1) Define; (2) Design; (3) Develop; (4) Disseminate.

The Define phase consists of preliminary analysis, student analysis, task analysis, concept analysis, specification of learning objectives, and preparation of test research tools. The design phase consists of media selection (OHM topic, type resistance experiment, topic of conductivity experiment), format selection, and initial design of

the student worksheet outdoor learning model. The Development Phase consists of the validation of expert lecturers and peers, revision I, limited field test, revision II, operational field test. The purpose of this stage is to produce a syllabus, lesson plans, student handbooks and teacher manuals that are suitable for outdoor learning models in physics learning that have been revised based on comments, suggestions, and assessments from expert lecturers, peers in physics teachers, limited field tests, and operational field test. The Disseminate Phase consists of Dissemination in MGMP (Indonesia name) Physics at Gunung Kidul Regency Vocational School.

Trials will be conducted on a small number of students with learning tools that have been produced. The test was conducted with an experimental model with a pretest-posttest with nonequivalent groups design. This design involves two groups of participants, namely the experimental group and the control group. The research design is presented as follows:

E	O <sub>1</sub>	X <sub>a</sub>	O <sub>2</sub>
K	O <sub>3</sub>	X <sub>b</sub>	O <sub>4</sub>

Where, E is Experimental class, K is Control class, O<sub>1</sub> is pretest in the experimental class, O<sub>2</sub> is posttest in the innovative class, O<sub>3</sub> is pretest in the control class, O<sub>4</sub> is posttest in the control class, X<sub>a</sub> is Treatment of outdoor learning model learning, X<sub>b</sub> is Treatment of conventional learning models that.

The subject of this research is class X Vocational school of 1 Tanjungsari Gunung Kidul 2018/2019 school year, even semester, which amounted to 2 classes with a total of 49 students. One class chose as a limited trial class, and one level as a field trial class. The selection of research subject classes made using subjects with three levels, namely the upper group, middle group, and lower group. Learning instrument assessment instrument, questions of abstract thinking skills, instruments for gathering student responses/responses to guidance, questions about science process skills, and questions about student learning outcomes.

Data analysis techniques consisted of the analysis of validating instruments using Aiken's V guidelines, abstract thinking ability tests, science process skills, and student test competency tests using multiple-choice test forms with test assessment indicators guided by Miller, Linn, &

Gronlund (Bott, 2014). Analysis of student responses, abstract thinking skills, and science process skills using Cronbach alpha analysis. Learning outcomes were analyzed with the gain index obtained from the average value of the posttest minus the mean cost of the student's pretest. Product testing using effectiveness donations. To analyze the effectiveness of the outdoor learning model, the data of the pretest results, the ability to think abstractly, and the science process skills of responses to guidance on the learning outcomes of studentsto test the hypothesis of differences in learning in the experimental class with the control class in this study were analyzed using analysis of covariance (ANCOVA) with four inclusion variables (covariates), namely pretest, abstract thinking ability, science process skills and responses to guidance.

### C. RESULTS AND DISCUSSION

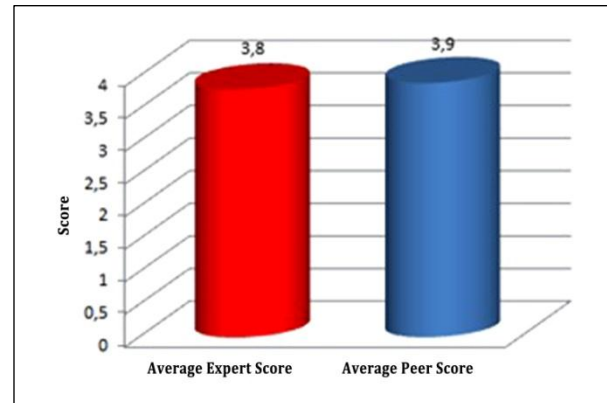
Based on the initial analysis, the underlying problem is the lack of efficient equipment, lack of skill in the scientific process, and the difficulty of students in understanding physical concepts. The learning methods used by teachers have not yet trained in science process skills and understanding of physical theories.

Based on the analysis of students obtained data that class X students of Vocational school of 1 Tanjungsari have mixed abilities with low learning motivation and low learning outcomes. Nevertheless, students have a soul of mutual awareness among good friends, and students like learning methods outside the classroom that require skills. In this study, learning uses outdoor learning methods.

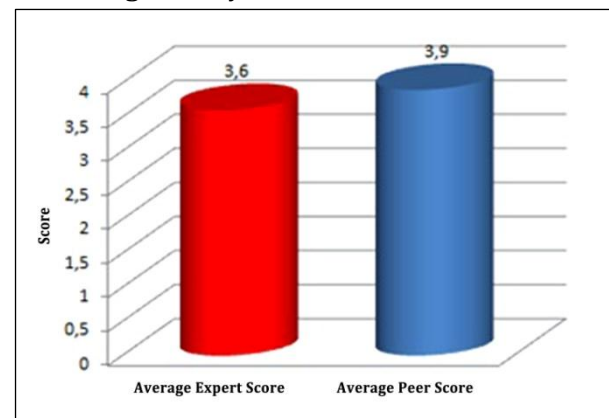
Competency The basic knowledge used in the development of this learning tool is "Applying the circuit and the principle of direct current electrical work" and Skills basic competency, "Conducting a direct current circuit experiment." The subject chosen is a type of obstacle. Essential concepts in this subject are Ohm's law, resistivity, and conductivity summarized in the title "Topic Resistivity."

To support how valid a device made: all instruments must go through a validation process. Validation instruments consist of syllabus validation, lesson plans, teacher handbooks, teacher handbook

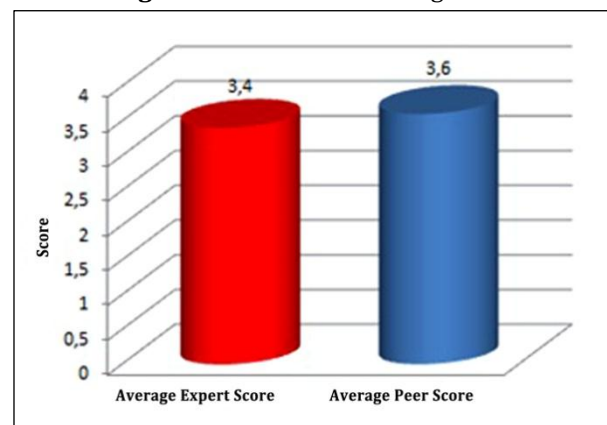
scores, and test assessments for learning outcomes. Two lecturers validated the learning device as expert validators, two physics teachers as peers. The validation results are displayed in the form of Figure 1,2,3,4,5.



**Figure 1.** Syllabus Assessment Chart



**Figure 2.** Lesson Plan Rating Chart



**Figure 3.** Assessment of Student Handbooks

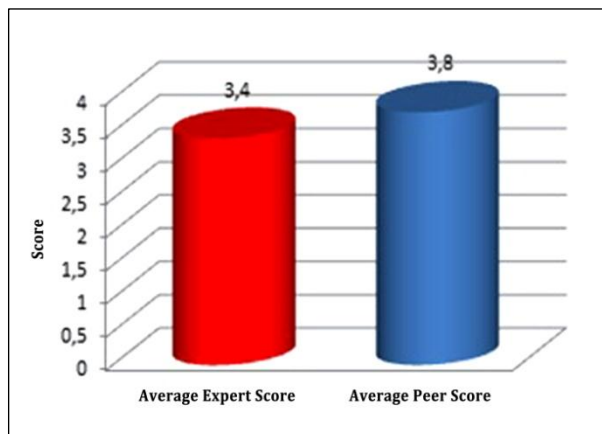


Figure 4. Graph of Syllabus Assessment

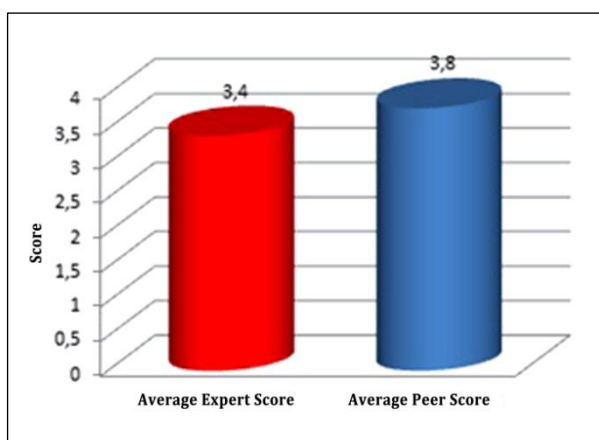


Figure 5. Assessment Charts on Learning Outcomes

From all learning tools that have been validated by the validator then analyzed to determine the category. Validation results can be seen in Table 1.

Table 1. Value of Validation Results

	Device Type	Expert Score	Peer Score	Category
1.	Syllabus	3,8	3,9	Excellent
2.	RPP	3,6	3,9	Excellent
3.	Student book	3,4	3,6	Excellent
4.	Teacher's book	3,4	3,8	Excellent
5.	Problem learning outcomes	3,4	3,8	Excellent

From Table 1, it can be seen that the number of learning tools can be categorized very well. Furthermore, the results of content validation were analyzed using Aiken's V. The results of the analysis are presented in Table 2.

Table 2. Results of Content Validation Analysis Using Aiken's V

Type	Statement / Aspect assessed	Aiken's V	Quality category
Syllabus	Completeness of syllabus components	1	Very good
	Selection of teaching materials	0,92	Very good
	Learning Activities	1	Very good
	Indicator	1	Very good
	Assessment	0,75	Good
	Time Allocation	1	Very good
	Learning resources / materials / tools	1	Very good
	Use of language	1	Very good
RPP	Complete RPP components	0,75	Well
	Indicators of Competency Achievement	0,92	Very good
	Learning objectives	1	Very good
	Learning materials	0,92	Very good
	Time Allocation	0,92	Very good
	Learning methods	0,92	Very good
	Learning Activities	0,92	Very good
	Assessment of learning outcomes	0,83	Very good
	Learning resources / materials / tools	0,92	Very good
Use of language	0,83	Very good	
Student handbook	Accuracy of content	0,92	Very good
	Accuracy of coverage	0,92	Very good
	The digestibility of teaching materials	0,92	Very good
	Use of language	0,83	Very good
	Change packaging	0,67	Well
	Illustration	0,75	Well
Teacher's manual	Completeness	0,83	Very good
	Content eligibility	0,92	Very good
	Accuracy of coverage	0,92	Very good

Type	Statement / Aspect assessed	Aiken's V	Quality category
	Presentation	0,83	Very good
	Use of language	0,75	Well
	Change / packaging	0,75	Well
	Completeness	0,92	Very good
	Substance	1	Very good
	Construction problems	0,75	Well
Problem learning outcomes	Construction of answer choices	0,75	Well
	The truth about the contents of the questions and the answer key	1	Very good
	Use of language	0,75	Well
	Readability of the shape and size of the writing used.	0,83	Very good
	Use of pictures, tables, and diagrams	0,92	Very good

A limited trial was conducted on a group of class X students of Vocational school of 1 Tanjungsari who were allowed to read and provide input to the student handbook while filling out the checklist and after an average score of 88 was obtained which meant the book was acceptable to students. Furthermore, to see the effect of each indicator, normality, homogeneity,

and ANCOVA tests were performed. A normality test is conducted to determine whether each sample is from an average distribution population or not. The normality test in this study uses the Kolmogorov-Smirnow-Test One-Sample test in the SPSS 23 program with a significance level of 0,05. The results of the analysis are presented in Table 3.

**Table 3.** Results of Normality Test

Variable name	Experiments	Control	Conclusion
Pretest	0,200	0,131	Data is normally distributed
Science process skills	0,200	0,183	Data is normally distributed
Ability to think abstractly	0,131	0,200	Data is normally distributed
Posttest	0,078	0,151	Data is normally distributed
Response to guidance	0,200	0,101	Data is normally distributed

From Table 3, it can be observed that both the experimental class and the control class get the significance value of all variables  $> 0,05$ . It means that the data values of all the variables studied for the experimental and control class come from normally distributed populations. After finding out that the sample comes from a normally

distributed population, a homogeneity test is performed. Uji homogeneity did find out whether the variations of the two populations are homogeneous or not. The homogeneity test in this study uses SPSS 20 variant. The analysis results are presented in Table 4.

**Table 4.** Results of Homogeneity Test

	Levene Statistic	df1	df2	Sig.	Conclusion
Pretest	2,074	1	47	,156	Homogeneous variant
Response to guidance	1,218	1	47	,275	Homogeneous variant
science process skills	,941	1	47	,337	Homogeneous variant
Ability to think abstractly	,313	1	47	,579	Homogeneous variant
post-test	,150	1	47	,700	Homogeneous variant

From Table 4, it found that the significance value of the variance homogeneity test for the experimental class and the control class for all four variables is higher than the significance value  $\alpha$  of 0,05. It indicates that there is no difference in variance between the experimental class and the control class; in other words, the two data groups

are homogeneous. Furthermore, to see the interrelationships of each covariate, an ANOVA test is carried out by looking at the relative and practical contributions. ANOVA analysis results are presented in Table 5, whereas the results of the analysis of relative contributions and useful contributions shown in Table 6.

**Table 5.** Results of Analysis ANCOVA

Source of Variation	Db	JK	MK	F <sub>o</sub>	Ft/P	Conclusion
Intergroup (A)	1	52,751	52,751	10,352	1,6023	Significant
In Groups (d)	44	224,216	5,096			
Total (T)	45	276,967	-	-	-	

**Table 6.** Relative and practical contributions of each covariate

Covariate	Relative contributions	Effective donations
Pretest	20,642 %	14,111 %
Science process skills	74,994 %	51,269 %
Ability to think abstractly	2,791 %	1,908 %
Response to guidance amount	1,573 %	1,076 %
	100 %	68,364 %

From Table 6, the most considerable contribution to learning outcomes is obtained from science process skills. The four covariates contributed 68,384% to learning outcomes.

Based on the results of data collection, description of data and calculation of findings to answer the problem formulation in this study, it can be revealed that the learning tools through outdoor learning developed through the discovery learning model on the topic of type obstacles have met the feasible criteria (Table 2). It shows that products designed through the revision stage can be implemented in learning. Learning has begun with the provision of a pretest, and the same problem will be given to students at the end of learning the topic of type obstacles as a posttest. From the data obtained, an overall average score of learning devices is 3,7 for a maximum score of 4, so that it falls into the first category.

The implementation of learning is done by involving variables including pretest, science process skills, abstract thinking skills, and student responses to guidance appear to be a mean score of science process skills 18, abstract thinking skills 19, and student responses to guidance 149. To describe the implementation of a learning device development product with the variables, including science process skills, the ability to think abstractly, and responses to guidance on student learning outcomes on obstacle type topics have been carried out data collection and analysis through ANOVA. Calculation results are obtained  $F_{reg} = 32,41$  and  $F_{5\%(3,45)} = 2,81$ . So it can be concluded that there is a difference between the

learning outcomes of the topic of type barriers between the experimental and control groups. It suggests that there is a significant influence between the application of the topic of type barriers to learning outcomes. These results are in line (Djajadi, 2019), which suggests that outdoor learning can improve student learning outcomes. The same thing strengthened from the results of the study (Lubis & Azizan, 2018) that by using the model of outdoor learning, learning can improve mathematics learning outcomes.

The four inclusion variables associated, it found that the regression coefficient is  $R = 0,8268$ , and the ratio of determination  $R^2 = 0,6836$ , which means that the four covariates can explain learning outcomes. Related to the four inclusion variables is obtained that the regression coefficient obtained  $R = 0,8268$  and the ratio of determination  $R^2 = 0,6836$ , which means that the four covariates can explain learning outcomes. It can be interpreted that the development of learning tools with pre-included variables, science process skills, abstract thinking abilities, and responses to guidance have a significant influence on student learning outcomes on the topic of type obstacles.

Based on Table 6, the magnitude of the pretest contribution to learning outcomes is 20,642%, while useful participation is 14,111%. From these results, it means that the pretest influences 14,111% of the learning outcomes of type obstacles. The contribution of science process skills to learning outcomes is 74,994%, while useful participation is 51,269%. From this result, it means that science process skills can explain the learning outcomes of the topic of obstacle type 51,269%. The contribution of abstract thinking ability to learning outcomes is 2,791%, while useful participation is 1,908%. From these results, it can be interpreted that the learning outcomes of the 1,908% obstacle type can be explained by the ability to think abstractly. Contributions to the contribution to the learning outcomes 1,573% while the useful participation of

1,076%. From these results, it can be interpreted that responses to guidance can explain the learning outcomes of a 1,076% type of obstacle.

The implications of a covariate review of science process skills make an enormous contribution compared to other covariates. Outdoor learning that involves science process skills is a process of inquiry by utilizing the natural surroundings aimed at building scientific attitudes and applying for experimental work in discovering scientific concepts (products). Hasanah & Utami (2017) argues that outdoor learning models can influence science process skills. This result is supported by Ting & Siew (2014) says that outdoor learning can improve students' science process skills.

Therefore, science concepts that involve thinking, reasoning, and acting logically skills to research and build scientific ideas that are useful in problem-solving processes. Science process skills require cognitive abilities, psychomotor skills, and social skills. If taught to students, it will make science learning meaningful. Knowledge, science process skills, and scientific attitudes are essential to instill in students because they are in line with the objectives of the Curriculum 2013, It is namely providing meaningful learning experiences by developing various attitudes, knowledge, and skills.

#### D. CONCLUSION AND SUGGESTIONS

From the resulting product development, it has found that there is a positive influence on outdoor learning in improving student learning outcomes in terms of science process skills, abstract thinking skills, responses to guidance. There is a relationship science process skills, the ability to think abstractly. In terms of effectiveness, outdoor learning model provides significantly contribute effectively to each covariate variables.

This study was provided suggestions for the next research development, namely: physics teacher suggested using alternative activity outdoor learning as learning, especially for topics that require understanding and discovery of the concept.

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