International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

http://ijpsat.ijsht-journals.org
Vol. 27 No. 1 June 2021, pp.417-424

Validity of Student Worksheet Inquiry Based Learning Model with Scientific Approach Integrated Creative Thinking Skills for Grade XI Physics Learning on 21st Century

Muhammad Havid[1] and Yulkifli[2]

[1]Mahasiswa Program Pascasarjana Pendidikan Fisika
Universitas Negeri Padang
Padang, Indonesia

[2]Dosen Program Pascasarjana Pendidikan Fisika
Universitas Negeri Padang
Padang, Indonesia

Jalan Prof. Dr. Hamka, Air Tawar Padang, Sumatera Barat. Indonesia

Abstract – One of the success factors of learning is the use of learning resources in the form of worksheets that are able to guide students in investigating and solving problems. Choosing a model and approach that is integrated with the ability to think creatively is also another factor that also supports the success of learning. Based on the analysis of student needs and characteristics, as well as the limitations of previous validation studies, an inquiry-based learning model with scientific approach integrated creative thinking skills can be a problem solution. The purpose of this study was to produce worksheets based on an inquiry-based learning model with scientific approach integrated creative thinking skills in the valid category. The research method used is descriptive statistics. The instrument used was a validation sheet that was filled in by the experts. The validity of the worksheets is obtained from the feasibility of the content, presentation, language and graphics components. The average validation of the LKS for the four components was 0.83 by development experts. Therefore, a worksheet based on an inquiry-based learning model with scientific approach integrated creative thinking skills is produced, the ability to think creatively in the valid category.

Keywords – ***IBL, Worksheet, Scientific, Creative, Physics Learningsheet.***

I. INTRODUCTION

The development of the 21st century has brought many changes to human life, especially in the education's perspective. In the 21st century, all students must have various skills to be able to compete in the face of rapidly changing times [1]. Education is required to be able to produce human resources (HR) who can globally compete each other, especially for those who have high skills, critical thinking, systematic, logical, creative, and willingness to cooperate effectively. The formation of a good quality human resources (HR) can be started from the education system, so the government conducts various efforts to improve the quality of education, including by increasing the availability of educational facilities and infrastructure and developing the curriculum. The education curriculum used today is the 2013 curriculum [2].

In the 2013 curriculum, it has been done some improvements for the student centre learning mindset which was previously a teacher centre learning process. The student centre learning is the learning process that is more interactive and also it follows the

Corresponding Author: Muhammad Havid

real-life situation. This curriculum is designed to form a graduated, skilled, and knowledgeable character competencies that are integrated into learning materials [3]. The fact that happened in schools shows that learning activities are not following the 2013 curriculum. This can be seen from the results of the achievement of students' Physics knowledge competencies on daily tests from several high schools, there are SMAN 4 Padang, SMAN 6 Padang, and SMAN 8 Padang. Based on the results of student learning outcomes with the Minimum Completeness Criteria (KKM), 80 of all interview results were obtained at SMAN 4 Padang, there were 21% completeness with an average value of 60.42. And all the students at SMAN 8 Padang, there were 22% completeness with an average value of 64.44, while at SMAN 6 Padang completeness is only 18% with an average score of 58.95. based on the data, it can be seen that the average Physics score of students is the lowest from the target.

Observations of the physics learning process were also carried out directly at SMA N 4 Padang, SMA N 8 Padang, and SMA N 6 Padang. The initial study carried out was filling out the questionnaire. The analysis of the need for teaching materials was carried out referring to the performance analysis with the teacher identification indicator, the average result was 59.17%. As for the indicator of the completeness of facilities and infrastructure the results are an average of 63.89%, and for the analysis of the Graduation Competency Standards (SKL) related to the achievement of competencies required by the 2013 curriculum, the average result is 61.17%. Furthermore, the analysis of learning difficulties related to LKS applied in learning with an average of 56.48% and analysis based on learning models obtained an average of 56.67%. Meanwhile, the analysis of students covers aspects of knowledge and skills with an average of 54.90%.

Based on the results of the questionnaire filled out by students after being analyzed, it showed that the interest of students in learning Physics was an average of 55.67%. and also, it showed that the analysis of aspects of learning motivation with an average of 60.07%. Meanwhile, the results of the analysis of learning styles showed that it reached with an average of 57.5%. furthermore, an analysis was also carried out to see the students' creative thinking ability, including the aspects of fluency which is obtained with an average of 54.00%, the aspect of flexibility 62.33%, while the aspect of novelty (originality) is 45.33 %, and aspects of elaborative ability is obtained with an average of 53.67%. this analysis was also carried out to assess the practicum activities and the use of worksheets with an average of 50.00%.

From the results of the questionnaire analysis, it can be explained that: first the students are generally interested and have a high curiosity about learning physics, but many of them don't response very well during the problem-solving process. Second, the preferred learning style of students is to interact with the learning environment directly, including interactions between students and teachers. The students find it easier to master learning materials through practicum and discussion because they can be directly involved in the process of inquiry and concept discovery. Third, students' social and spiritual attitudes need to be improved. Fourth, students' knowledge is still lacking. it happened because Physics is not represented in several forms so that students who have different learning styles seem difficult to understand Physics in depth.

The preliminary study illustrates that it is necessary to take appropriate actions to overcome some educational problems in order to face the 21st century industrial revolution. it happened because Physics is one of the subjects that has an important role in rallying human resources (HR). One of the best solutions is to drill physics learning directly in the form of practicum. Physics learning is believed to be more practical and time-saving by using the equipment in their practicum [4]. So it is necessary to involve a student worksheet to be able to enhance students' competence in learning Physics that depend on the characteristics of students and subjects. The use of student worksheets in the learning process is included in the process of core activities. Student worksheets must be attached inside the syntax so that the learning process remains focused on achieving learning objectives. The learning model can be seen as a systematic and complete teaching guide for teachers to be applied in their teaching [5].

A learning model that can help students to be more active in investigative or problem-solving activities based on the demands of the 21st century is the inquiry-based learning (IBL) model. The inquiry-based learning (IBL) model affects the understanding, development of knowledge on some topics, scientific process skills, attitudes towards learning about science, learning motivation, and student communication skills [6]. Inquiry-based learning (IBL) can be applied on some knowledges which have more meaningful and permanent in students. Students are accustomed to acquiring knowledge and solving problems through the process of discovery and investigation. The IBL model has several advantages. First, it can provoke students' interests in learning about science. Second, it can improve students' conceptual understanding. Third, it leads to understand the nature of scientific knowledge. Fourth, it simplifies the collaboration between each student. Fifth, to help students' experimental skills. This shows that the use of the inquiry-based learning (IBL) model is applied based on the 2013 Curriculum, which involves the active participation of students

in learning and it can develop the attitudes, knowledge, and skills of students. The representative abilities are needed in order to apply the inquiry-based learning (IBL) model to abstract data analysis into a concept one [7].

Student worksheets with the proper model and approach are needed to help improving students' abilities [8]. The proper approach used in this case is the scientific approach. The learning process using a scientific approach is directed to them so that they are able to identify some problems and they do not solve problems by just simply answering the problems. The scientific approach is also designed so that students actively create concepts, laws, or principles through observing, formulating problems, formulating hypotheses, collecting data with various techniques, analyzing data, drawing conclusions, and communicating them through the formula. The purpose of using a scientific approach is to drill students' character, improve students' critical thinking skills so that their creativity increases and also it becomes the high learning outcomes [9]. In addition, integrating literacy in student worksheets can help students to face against the challenges of skills in the 21st century. Therefore, the solution for this problem is the development of an inquiry-based learning model student worksheet that integrates creative thinking skills with a scientific approach about physics learning. Based on the results of the interview, it is also known that the student worksheet used as a learning tool is not sufficient to be used during practicum [10].

Student worksheet developed by the teacher who teaches without paying attention to the steps of the learning model will affect the outcomes of the learning process. Student worksheets that are used as learning tools are still inadequate to be used not only in doing a practicum, but also in drilling some questions. The existing student worksheets are arranged in the form of some sheets containing the practical implementation procedures which are presented briefly and it consists of the titles, work steps, data tables, and questions that must be submitted by students. From the results of the questionnaire, it is also showed that the students have not been able to apply creative thinking skills in answering the questions. So it can be concluded that the student worksheet used in learning does not achieve the criteria and students have not used creative and critical thinking skills in solving problems yet. Student worksheets can guide students to understand Physics and it can use the student worksheets on some lessons that are easy to be analysed. This reason will be the basics for researchers who connect student worksheets with creative thinking and also a scientific approach is able to affect the teaching and learning process of students. The development of worksheets is aimed at increasing the creative and learning activities of students throughout the learning process which is guided by the principles of a scientific approach.

II. METHODS

This research method uses descriptive statistics one. Descriptive research is not intended to prove certain hypotheses. Descriptive research is conducted to describe, interpret and explain variables or statuses. This research is aimed at developing student learning media, it was called the student worksheet. The development model chosen for this research is the Plomp development model. The Plomp development model consists of five phases, there are: 1) initial investigation phase, 2) design phase, 3) realization phase, 4) test, evaluation, and revision phase and 5) implementation phase. In this study, development was only conducted until the fourth phase. The fifth phase wasn't conducted because of the limited process and time. The Plomp model is used because it is under the characteristics encountered in the field.

This study will explain the results of the validation of the student worksheet development stage. At the development stage, validation is acquired by filling out product validation instruments by the expert validators. Validation is used to obtain a valid product. The product in this study was assessed based on four aspects, there are the feasibility of the construct, the feasibility of the material or the lesson, the feasibility of the language and the feasibility of the graphic. Validity analysis used in this study is a Likert scale with the following steps:

a) Giving a score of 1 to 4 with the criteria such as very good (4), good (3), enough (2), and bad (1).
b) Summing up the total score of each validator for all indicators in the validation instrument
c) Giving the validity value using the Aiken'V formula

$$V = \frac{\sum S}{[n(c-1)]} \quad \text{..... (1)}$$

Note :

lo = the lowest validity number (value = 1)
c = the highest validity number (value = 4)

r = the number given by the validator

The validity assessment is determined based on the score interpretation criteria. The Classification of validity values used in the range of 0.61-1.00. The validity category based on Aiken's V coefficient can be seen in table 1.

Table 1. Validity Category Product

Value	Criteria
≥ 0,667	Valid
< 0,667	Not Valid

Source [11]

III. RESULTS AND DISCUSSIONS

Results

The Data on instrument and product validation were obtained from three expert lecturers with their initials: FM, RM, and YH. Before validating the product, it is better to validate the instrument first. The Instrument validation has been done by the three expert lecturers and then the following results were obtained which can be seen in table 2.

Tabel 2. Analysis of instrument validation

No	Validator	Value	Note
1	FM	0,91	Valid
2	RM	0,87	Valid
3	YH	0,83	Valid

Based on table 2. It can be seen that the average score of each expert validator is above 0.6. This has been adjusted into the category based on the assessment and category of Aiken's V where a score above 0.6 refers to the valid category, it means that the validation instrument can be used because it has achieved the requirements and also it categorised as valid.

Furthermore, the student worksheet that has been designed will be validated by the three expert validators. The Expert reviews about the inquiry-based learning model student worksheet are able to be integrated with creative thinking skills through a scientific approach to Physics, including the feasibility of content, construction, language and graphics. These are the results of the average validator assessment for each component of the student worksheet validity by the inquiry-based learning model that integrates creative thinking skills through a scientific approach to physics can be seen in table 3.

Tabel 3. An Analysis of Validity Product

No	Validity Components	Validator Experts	
		Aiken's V Value	Criteria
1.	Content	0,74	Valid
2.	Construction	0,90	Valid
3.	Language	0,81	Valid
4.	Graphics	0,91	Valid

Based on table 3. It can be seen that the average value of the inquiry-based learning model validity through student worksheet can be integrated with creative thinking skills by a scientific approach in Physics. All Aiken's V scores were obtained by each validity component which is greater than 0.6, so it can be concluded that all components are in the valid category.

The Next step is the description of the assessment of each aspect. It is explained that the first aspect is content. This aspect consists of nine components, there are 1) The material presented in the student worksheet is under the demands of KI, KD, and all indicators that are formulated there, 2) The learning instructions in the student worksheet include for teachers and students, 3) The learning competencies achieved when they are derived from the standard competencies 4) The equations or formulas in the student worksheets have been achieved based on the writing of physics formulas 5) The facts in presenting the problems given can affect students' understandings 6) The concepts in the student worksheet do not cause many interpretations 7) The case examples presented

in the student worksheet can improve students' understanding 8) Student worksheet assessment is carried out on the process and results of student work and 9) Presentation is based on the standard student worksheet sequence. Each component is assessed by an expert validator, the results of the assessment on each component can be seen in Figure 1.

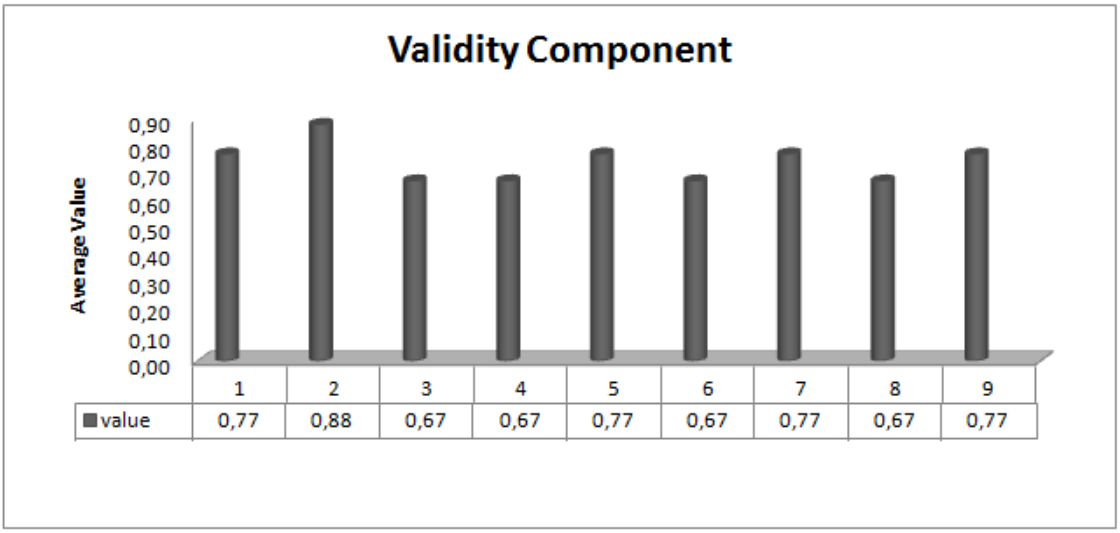

Figure 1. Results of Content Component Assessment

Based on Figure 1, it can be revealed that the range of values for the content components is 0.67 to 0.88 in the valid category. The average value of the content is 0.74, it can be concluded that the inquiry-based learning model student worksheet integrated creative thinking ability with a scientific approach to physics in this aspect is valid.

The second aspect of construction. The construction aspect consists of nine components, there are: 1) The purpose of the indicators to be achieved is clear, 2) The displayed phenomena provokes the curiosity of students to build a knowledge, 3) it Facilitates the students to formulate problems based on the phenomena presented, 4) it Facilitates the students to do investigation, 5) it Facilitates students to process data, 6) it Facilitates students to conclude the results of the investigation, 7) it Facilitates the students to discuss understanding concepts with their colleagues or friends, 8) it Facilitates teachers and students in carrying out learning reflection activities and, 9) it Facilitates students to build hypotheses. Each component is assessed by an expert validator, the results of the assessment on each component can be seen in Figure 2.

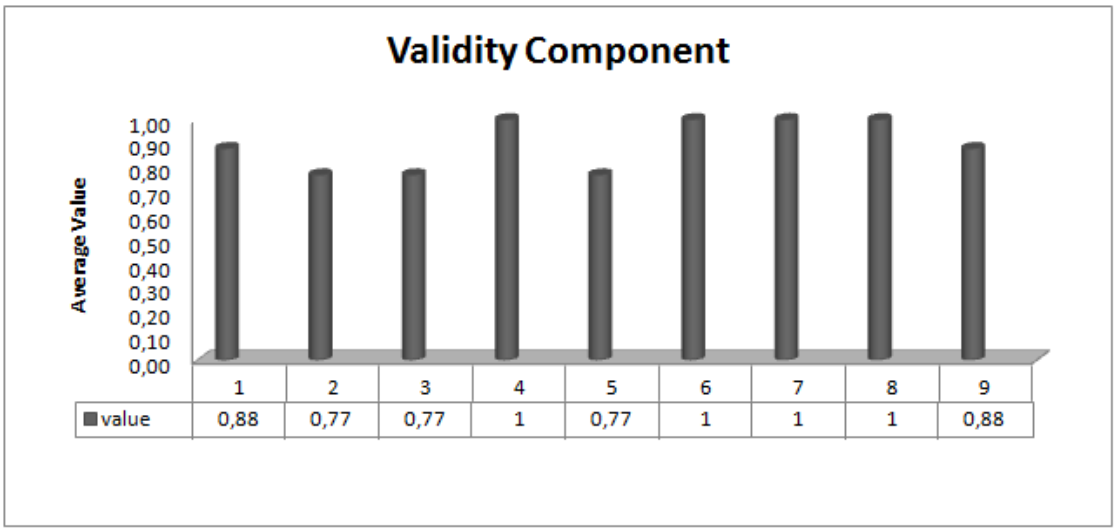

Figure 2. Construction Component Assessment Results

Based on Figure 2, it can be explained that the range of values in the Construction component is 0.77 to 1.00 in the valid category. The average the value of the Construction is 0.90, it can be concluded that the inquiry-based learning model student worksheet through integrated creative thinking skills with a scientific approach to physics learning in this aspect is valid.

The third aspect is language. The language aspect consists of eight components, there are: 1) The language is used based on the level of cognitive development, 2) The language is used based on the emotional maturity level of the students, 3) The message or information is conveyed in a communicative language, 4) The language in the student worksheet encourages students to be involved actively in learning activities, 5) Connecting words used in the student worksheet are based on the author's rules, 6) The sentences presented in the student worksheet are effective, 7) The contents used in the student worksheet are consistent, 8) The spelling used refers to Grammar-Spelling Guidelines (EYD). Each component is assessed by an expert validator, the results of the assessment on each component can be seen in Figure 3.

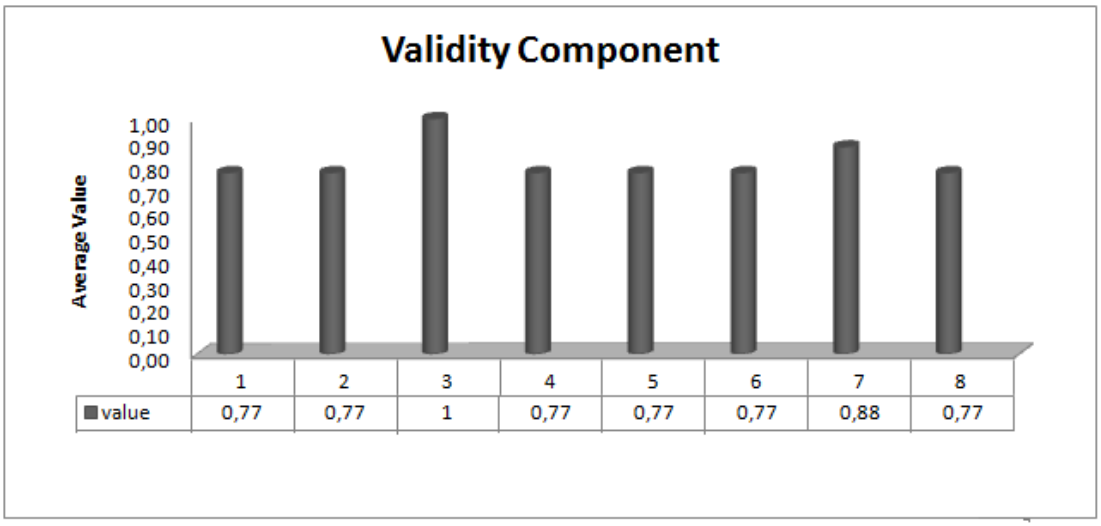

Figure 3. Results of Language Component Assessment

Based on Figure 3, it can be stated that the range of values for the Language component is 0.77 to 1.00 in the valid category. The average value of the language component is 0.81, it can be concluded that the inquiry-based learning model student worksheet through integrated creative thinking skills with a scientific approach to physics in this aspect is valid.

The fourth aspect is graphics. The graphics aspect consists of four components, there are: 1) the student worksheet usage is clear and legible fonts, 2) the student worksheet has an orderly layout, 3) The layout of image captions in the student worksheet is correct, 4) The illustrations presented in the student worksheet cannot build the students' understanding. Each component is assessed by an expert validator, the results of research on each component can be seen in Figure 4.

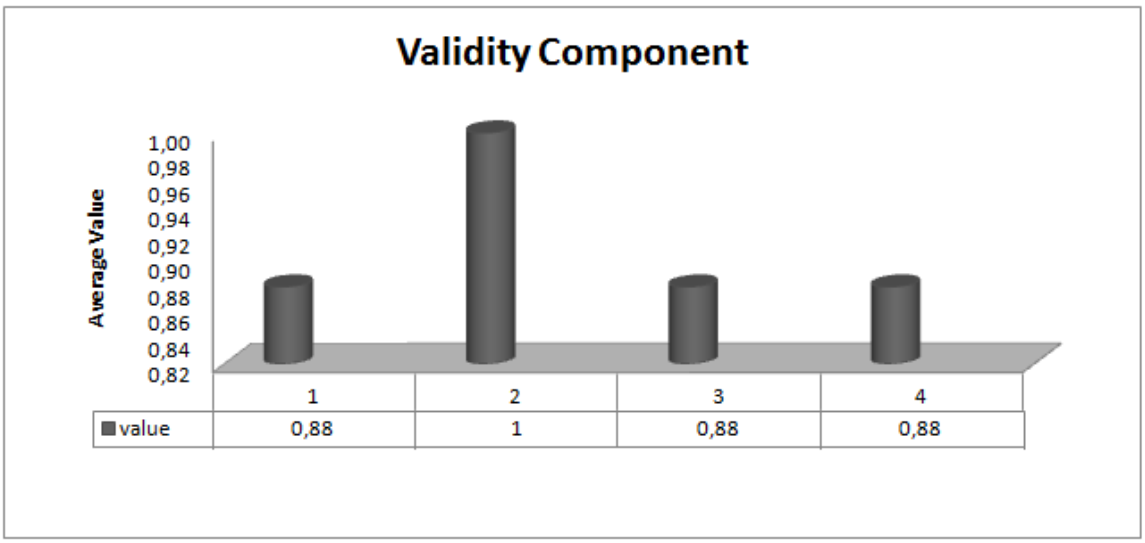

Figure 4. The results of the assessment of the Graphical Component

Based on Figure 4, it can be stated that the value range for the graphic component is 0.88 to 1.00 in the valid category. The average value of this component is 0.91, it can be concluded that the inquiry-based learning model through integrated creative thinking skills with a scientific approach to learning in this aspect is valid.

Discussions

In the preliminary research stage, it was found that the use of teaching materials in the form of worksheets was in the poor category and it had not been combined with a learning model that was followed by the 2013 curriculum. This became the basics for designing student worksheets based on their needs, characteristics of students, and teaching materials so that the expected learning objectives were achieved. Student worksheets are designed in such away. The cover of the student worksheet is made in colourful pictures to make it attractive and also it can display the characteristics of the designed student worksheet. The student worksheet also includes the study instructions for students and teachers to make it easier to use. In the student worksheet, there are also learning competencies in the form of KI, KD, indicators of competency achievement and then it is explained into instructional goals that must be achieved after the learning process takes place. The student worksheets also include with learning materials, assignments and assessments that make it easier for teachers to assess student worksheets.

The process of completing the inquiry-based learning (IBL) model student worksheet which has been integrated with creative thinking skills through a scientific approach to Physics is carried out by self-assessment and revising the parts that need to be revised first. Furthermore, the validity test was carried out by the expert. The Instruments tested the validity of the product were also validated by experts. After the instrument is categorized as valid, it is used to test the validity of the student worksheet. The assessment of the validity of the student worksheet is based on the adjustments with the components of the preparation, the steps in the student worksheet are based on the syntax of the inquiry-based learning (IBL) model that integrates creative thinking skills with a scientific approach. The test of the validity of the student worksheet is based on the adjustments of the content, construction, language, and graphics. After the four aspects are categorized as valid, it means that the student worksheet is suitable for use in physics learning for class XI students. This research has been supported by some previous researches about the student worksheet validity based on the inquiry-science learning model skill process for Physics in Senior High School Students [12].

IV. Conclusion

Based on these results and discussion, it was concluded that the development of students' worksheet using an integrated inquiry-based learning model of creative thinking skills through a scientific approach to physics was in the valid category and it could be used in physics learning in schools.

ACKNOWLEDGMENT

This research could not be done without the help and support of various parties. The author would like to thank the lecturers who have provided some motivations and suggestions for the perfection of this article and also the author would thank the big family of SMAN 4 Padang, SMAN 6 Padang, and SMAN 8 Padang who have supported in giving permission and assistance during the study.

REFERENCES

[1] Nicols, Jennifer, "4 Essential Rules Of 21th Century Learning," Teach thought, 2013.

[2] Hamida, S, and Desnita,"Analisis kebutuhan video pembelajaran Fisika berbasis kontekstual materi Suhu dan Kalor untuk pembelajaran abad 21," Jurnal Pendidikan Fisika. Vol.9, No.1, 2020.

[3] Septiani, T., Yulikifli, & Havid, M.," Analisis pendahuluan pengembangan LKS dengan pendekatan Multirepresentasi pada pembelajaran abad 21," Journal of Physics: Conference Series, *1481*(1), 2020.

[4] Yulkifli," Validitas LKS berdasarkan model pembelajaran inkuiri terbimbing berbantuan praktikum digital," Jurnal Fisika, Vol. 1185 No.1, 2019.

[5] Asrizal," Studi Pendahuluan dalam Pengembangan buku ajar menggunakan model pembelajaran berbasis Inkuiri pada mata pelajaran Fisika," Jurnal internasional penelitian ilmiah dan teknologi , Vol.9 No 4, 2020.

[6] Bayram, Z., Oskay, Ö. Ö., Erdem, E., Özgür, S. D., and Şen, Ş,"Effect of Inquiry based Learning Method on Students' Motivation. *Procedia - Social and Behavioral Sciences*," 12(112) 988–996, 2013.

[7] Ramnarain, Umesh Dewnarain," Teachers perceptions of inquiry-based learning in urban, suburban, township and rural high schools: The context-specificity of science curriculum implementation in South Africa," Teaching and Teacher Education, 2014.

[8] Suhandi, A., & Wibowo, F. C.," Pendekatan Multirepresentasi dalam pembelajaran usaha-energi dan dampak terhadap pemahaman konsep mahasiswa," Jurnal Pendidikan Fisika Indonesia, *8*(1), 2012.

[9] Asrizal," Pengembangan bahan ajar IPA terpadu untuk meningkatkan Lietrasi Digital sisiwa dalam pendekatan Saintifik," Jurnal Pendidikan IPA indonesia, Vol.7 No 4, 2018.

[10] Yulkifli," Pengembangan modul fisika SMA/MA terintegrasi nilai karakter berbasis model Discovery Learning," Jurnal Fisika, Vol. 1185 No., 2019.

[11] Azwar, S," Reliabilitas dan Validitas," Yogyakarta: Pustaka Belajar, 2015.

[12] Yulkifli, Y., Ningrum, M. V., & Indrasari, W.,"Validitas LKS menggunakan model pembelajaran Inkuiri Science Proses Skill untuk pembelajaran Fisika SMA," Jurnal Penelitian & Pengembangan Pendidikan Fisika, *5*(2), 155–162, 2019.