THE EFFECT OF HOTS ORIENTED WORKSHEETS WITH BARCODE ASSISTANCE IN ONLINE LEARNING TO THE STUDENTS' CRITICAL AND CREATIVE THINKING ON HEAT AND THE KINETIC THEORY OF GASES LEARNING TOPIC IN GRADE XI OF 1st HARAU DISTRICT SENIOR HIGH SCHOOL

UNDERGRADUATE THESIS

Submitted As One Of The Requirements To Get A Degree Bachelor of Education

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UNDERGRADUATE THESIS APPROVAL

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STATEMENT

I hereby declare that:

1. My scientific work, the final project is in the form of a undergraduate thesis with the title: "The Effect Of Hots Oriented Worksheets With Barcode Assistance in Online Learning to the Students' Critical and Creative Thinking on Heat and The Kinetic Theory of Gases Learning Topic in Grade XI Of 1st Harau District Senior High School", Is my original work.
2. This paper is purely my own ideas, formulations and research, without the help of other parties, except the supervisor.
3. In this paper, there is no work or opinion that has been written or published by other people, unless in writing it is clearly stated as a reference in the manuscript by mentioning the author and being included in the literature.
4. I have made this statement in truth and if there are deviations in this statement, I am willing to accept academic sanctions in the form of revocation of the titles that have been obtained because of this paper, as well as other sanctions in accordance with the norms and provisions of the applicable law.

Padang, 22 February 2021
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ABSTRACT

Trio Junira Fernando. 2021. "The Effect Of HOTS Oriented Worksheets With Barcode Assistance In Online Learning To The Students' Critical and Creative Thinking On Heat and The Kinetic Theory Of Gases Learning Topic In Grade XI Of 1st Harau District Senior High School" *Undergraduate Thesis.* Padang: Physics Education of Study Program, Department of Physics, Faculty of Math and Natural Science, Universitas Negeri Padang.

Education is one of the most important components in face the times. It is characterized by the use of science and technology in all facets of life. The demands that a person must have in living in the 21st century is mastering various skills, one of which is HOTS. To realize HOTS, the government is currently implementing the 2013 curriculum. HOTS (Higher Order Thingking Skill) is the ability to use information to solve problems, analyze arguments, and make predictions. Based on Bloom's taxonomy revision 2017. HOTS indicator is that students are able to think critically, make decisions and think creatively, the ability to solve problems. Critical and creative thinking indicators here become the main focal point, because by mastering critical thinking skills and creative mindset students will be trained to face complex problems. However, real conditions in schools show that students' critical and creative thinking skills in school are still relatively low, this is because the learning process in schools has not implemented the 2013 curriculum optimally and in the midst of the covid'19 pandemic which demands that learning must be maintained online. One solution to this problem is to apply a barcode-assisted HOTS-oriented worksheet to the online learning process. This study aims to find out the improvement of students' critical and creative thinking skills by applying HOTS-oriented worksheet assisted by barcodes with an inkuiri model guided on heat material and gas kinetic theory grade XI Of State High School 1 Harau Subdistrict.

This type of research is pseudo experimental research. The research design is Randomized Control-Group Only Design. The population of this study is students of grade XI science 1 and XI science 4. Sampling is done by purposive sampling technique and cluster random sampling. The samples in this study were grade XI science 1 as a class that implemented a barcode-assisted HOTS-oriented student worksheet and a science 4 grade XI as a control class. This research only observes aspects of knowledge. The research data were analyzed using descriptive analysis, normality and homogeneity tests, and hypothesis tests at a real level of 0.05.

Based on the results of data analysis, it can be stated that students' critical and creative thinking skills of each class indicator using a barcode-assisted HOTS-oriented student worksheet have increased significantly. So that it can be concluded that there is an improvement in students' critical and creative thinking skills by applying HOTS-oriented student worksheet with barcode-assisted heat material and gas kinetic theory grade XI High School 1 Harau Subdistrict with a level of 95% trust.

Key Words : Critical and Creative, Thinking Skills, barcodes, Guided Inkuiry

PREFACE

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

Praise and gratitude to Allah SWT, for His mercy and grace so that the author can complete this undergraduate thesis. The title of this undergraduate thesis is "The Effect Of Hots Oriented Worksheets With Barcode Assistance In Online Learning To The Students' Critical and Creative Thinking On Heat and Kinetic Theory Of Gases Learning Topic In Grade XI Of 1st Harau District Senior High School".This Undergraduate Thesis is prepared to fulfill one of the requirements in obtaining a bachelor's degree in the Physics Education study program of FMIPA UNP.

During the implementation of the preparation of this thesis, there have been many suggestions that the author has received, both guidance, motivation, criticism and useful suggestions for the author. For this reason, Authorsay thanks and appreciation to the honorable :

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5. Mrs. Dr. Hj. Fatni Mufit, S.Pd., M.Si as Secretary of the Department of Physics, FMIPA UNP.

6. Mrs. Syafriani, M.Si, Ph.D as the Head of the Physics Study Program of FMIPA UNP.
7. Mr. and Mrs. Teaching staff and employees of the Department of Physics.
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10. Parents who have provided support morally and materially to the author.
11. Seall parties who have assisted in the planning, implementation, preparation, and completion of this undergraduate thesis.

Hopefully the help and guidance that has been given will become good deeds for Mr and Mrs and receive multiple rewards from Allah Subhanahu Wata'ala. The author realizes that this thesis still has shortcomings and weaknesses, for that the authors expect suggestions in improving this undergraduate thesis. Hopefully this thesis is useful for all readers.

Padang, February 2020

Author

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CHAPTER I
INTRODUCTION

A. Background of The Research Problem

Education is one of the most important components in dealing with the times. Education will continue to evolve in line with the demands of the 21st century. It is characterized by the use of science and technology in all facets of life. The demand that a person must have in life in the 21st century is to master a variety of skills. Therefore, education is expected to prepare human resources who master various skills in order to become a successful and qualified person. In Law No. 20 of 2003 on the National Education System states that education is a conscious and planned effort to realize the learning process of students who are actively able to develop their potential. As a forum to develop the ability and formation of dignified national character and civilization is also a function of national education.

To realize national education, the government is currently implementing the revised 2013 curriculum 2017 as an education curriculum in Indonesia. Curriculum learning 2013 revision 2017 is a learning that uses a student-centered approach. Curriculum 2013 revision 2017 aims to give students 4C skills (communication, collaboration, critical thinking, creativity), Strengthening Character Education (PKK), Science Literacy, HOTS (Higher Order Thingking Skill).

Based on the objectives, curriculum 2013 revision 2017 suitable applied in physics learning. Physics learning in high school aims to develop the ability to reason and think analysis using concepts and principles of physics and then solve various problems qualitatively and quantitatively.

Advances in technology that enable the development of education at this time, one of which is online learning. Online-based learning system is the implementation of distance education in higher education aimed at improving equal access to quality learning. Online learning is expected to increase learning independence. Given the changing technological conditions, high adaptation capabilities are needed so as not to be outdated. Thus, through online learning is expected to achieve the skills of 4C, PKK, science literacy and HOTS students.

HOTS (Higher Order Thingking Skill) is the ability to use information to solve problems, analyze arguments, and make predictions. Based on Bloom's taxonomy revision 2017, which belongs to the HOTS category are the ability to analyze (C4), evaluate (C5), and create (C6). Students' HOTS can be measured through hots exposure indicators. HOTS indicator is that students are able to think critically, make decisions and think creatively, the ability to solve problems.

HOTS students can be achieved through a physics learning process that is in accordance with the demands of the curriculum 2013 revision 2017. In curriculum learning 2013 revision 2017 we can apply several learning models including discovery learning model, inkuiri model, problem based learning model, project based learning model 1 and problem solving model. In addition, teaching materials are also one of the supporting for curriculum learning 2013 revision 2017. Teaching materials serve to facilitate teachers in conveying and directing physics learning. Teaching materials are needed by students as a guideline for students to the competencies that must be mastered and as an evaluation tool to see the extent of the understanding that has been mastered by students in the learning process. For

teachers, teaching materials serve to save time, help the role of teachers as facilitators, create effective and interactive learning, guidelines in the learning process. In learning activities, teaching materials need a high level of thinking skills to achieve learning.

Teaching materials that can be used include handouts, modules, Student Worksheets (LKS), brochures, leaflets and so on. Presentation of teaching materials can be developed through a variety of innovations, one of which is combining teaching materials with learning models.

Despite the various efforts that have been made by the government, the reality on the ground has not described the ideal conditions. This fact is found from the initial studies that have been conducted. There are four initial studies, namely the learning process, the use of student worksheets, the learning model of curriculum 2013 and the students' HOTS ability and student learning outcomes there are problems that occur.

Based on observations made in high school 1 District Harau Padang through the permission of the Education Office (Appendices 1 and 2), problems were obtained as a real condition in the field. Observations are carried out in three ways, namely: first through literature studies in scientific articles on the hots level of students in West Sumatra and availability of HOTS indicators on the worksheets of high school physics students in grade XI semester 1 in West Sumatra. Second, through the analysis of the answer documents about the Daily Examination of Static Fluid material with regard to the value of students' critical and creative thinking skills (Appendices 3 and 4). Third, through interviews with teachers of physics

subjects regarding the learning system and the application of student worksheets and learning models in schools (Appendix 5).

The first reality, looking at the current situation and conditions, the earth is facing an extraordinary crisis in the field of health that propagates to the world of education, namely the coronavirus disease 2019 (Covid-19) attacks. During this pandemic, all schools were closed and the learning system was also changed from face-to-face to online learning. From the results of an interview conducted to one of the physics teachers of 1st Harau District Senior High School obtained information. First, students have difficulty following online learning. Second, students have difficulty accessing teaching materials online.

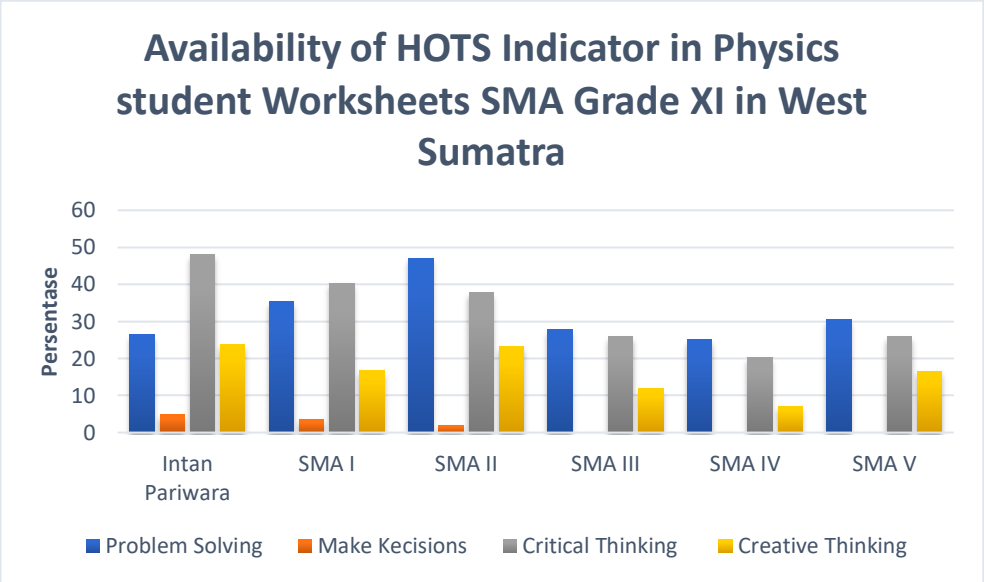
The second reality concerns the use of student worksheets and curriculum learning models 2013. The technique used is interview technique. The interview was conducted with a physics teacher from 1st Harau District Senior High School. From the results of the interview, the first use of physics student worksheets is only for practicum activities only and has not been able to train hots students and only focused on paper form and the lack of variation in learning media in it. Second, the learning model implemented in the learning process is not carried out properly, because teachers tend to use lecture methods. The cause of this problem is the teacher's difficulty in conveying physics material, because the sub-material to be taught is very much and lack of time in teaching activities.

Table 1. Students' Ability to Solve Problems Based on Cognitive Levels of HOTS, MOTS, and LOTS.

Problem Level	Number of Questions	Percentage of Questions	Percentage			
			SMAN A	SMAN B	SMAN C	SMAN D
HOTS	3 Questions	7,5 %	20%	19%	43%	18%
MOTS	29 Questions	72,5 %	31%	40%	51%	32%
LOTS	8 Questions	20%	30%	44%	51%	40%

(Source : Syafrinaldi,2020)

The third reality is the students' HOTS ability. The techniques used are data analysis techniques. Judging from the data analysis based on Table 1, it can be described the number of final exam questions based on cognitive levels such as HOTS as many as 3 questions or 7.5%, MOTS as many as 29 questions or 72.5%, and LOTS as many as 8 questions or 20%. The final exam problem of this semester can be concluded that the dominant problem at mots level and very few problems with HOTS level. Then the results of the analysis of the final exam results of the School Physics semester boasted over Grade XI Semester 1 that the percentage of correct answering hots in high school A is 20% with a very low category, then high school B and high school D answered hots questions also with very low categories with percentages of 19% and 18% respectively. Lastly, high school C answered hots correctly and the highest percentage was 43%. However, this value is still in the moderate category according to the classification of Dr. Purwanto, M.Pd. So, the Ability of Higher Order Thinking Skills (HOTS) of state high school students in West Sumatra is still low. So, it can be concluded that there are still many students who have not been able to answer hots-based questions.



(Source : Syafrinaldi,2020)

Figure 1. Availability of HOTS Indicators on The Worksheets of High School Physics students in Grade XI in West Sumatra

The last reality is the availability of HOTS Indicators on the worksheets of high school physics students in grade XI in West Sumatra. Based on the graph in figure 1, it can be described the availability of HOTS indicators on the Student Worksheet Intan Pariwara has a score of 25.77% , High School I 28.80% , Senior High School II 27.52% , Senior High School III 24.60% , Senior High School IV 19.69% and Senior High School V 24.75%. from the data obtained, it can be concluded that the availability of HOTS Indicators Worksheets of high school physics students in grade XI in West Sumatra is classified as less available.

The reality on the field has not been in accordance with the expected conditions. The problems that occur are the learning process, the use of student worksheets, learning models and learning media, hots ability of students who have not achieved HOTS indicators, and student learning outcomes. The solution to this

problem is the use of student worksheets, models and media that are suitable in the learning process.

This problem must be solved, because in accordance with the demands of the curriculum, students must have critical and creative thinking skills. To improve critical and creative thinking skills, several efforts need to be made including: first, using the Student Worksheet which is a learning resource for students. Student worksheets serve to make it easier for teachers to deliver and direct physics learning. Student worksheets are needed as a guideline for students on competencies that must be mastered and as an evaluation tool to see the extent of the understanding that students have mastered in the learning process.

For teachers, LKS serves to save time, help the role of teachers as facilitators, create effective and interactive learning, guidelines in the learning process. Second, teachers need to use student worksheets that can support students' level of understanding in learning and adapt the difficulty of obtaining teaching materials during a pandemic, one example is the student worksheet assisted by "barcode", where the barcode serves to bring up learning videos, animations and virtual labs relevant to the sub-material being studied, so that it is expected that the student's knowledge is broader and can help improve students' critical and creative thinking skills. All three teachers implemented learning models that could train students' critical and creative thinking skills.

Barcode is a digital technology that has a function to make it easier for Smartphone users to access information with two easy steps, namely: first, scan QR code. Second, take action. the action here can be opening a browser, saving contact

information, or disalling the number in the QR code. Barcode technology is very helpful, especially in the world of education, especially in the current situation, the world of education must do learning that is relatively new or unusual by some students, namely online method learning.

Online or remote learning must be done with the help of an internet connection, here barcode technology has an important role. The role form is the use of barcodes to access digital learning media that is usually listed in textbooks, student worksheets, and others. The barcode display will be included in the student worksheet to be used, where the barcode here will bring up learning videos and virtual labs. The learning video is divided into inkuiri model learning videos guided to the orientation stage designed by the researchers and then validated with the physics teacher of High School 1 Harau Subdistrict and sample video of the problem taken from the Youtube channel.

The video of the inkuiri model learning material contains an introductory video on a sub-material where the defense video follows the steps in the guided inkuiri defense model contained in the student worksheet to be used (accessible at the following link: http://bit.ly/videopembelajaraninkuiriterbimbing). Then virtual lab used here is a virtual laboratory or digital laboratory sourced from the publisher of educational applications, especially virtual laboratories that have been well known and proven accuracy of labornya experiments, namely PHET Simulation from the University of Colorado, USA (can be accessed at the following link: http://bit.ly/2XzvZv3).

Student worksheets and learning models we can combine with each other. As previously done by the researcher, Elsa Imelda who combined student worksheets with guided inquisity models with a validity average score of 87.26, the average practicality score according to teachers was 90.85 and the average student rating was 83.68. Guided inkuiri-based student worksheets lead students more actively. In inquiry-based learning there are phases of scientific research activities using a number of experiments that can improve students' thinking processes (Abdurrahman, 2016).

Based on the background above, researchers wanted to find out how the effect of increasing student HOTS after applying student worksheets based on inkuiri guided by learning media with research title : **The Effect Of HOTS Oriented Worksheets With Barcode Assistance In Online Learning To The Students' Critical and Creative Thinking On Heat and The Kinetic Theory Of Gases Learning Topic In Grade XI Of 1st Harau District Senior High School**.

B. Identification of the Research Problem

Based on the background of the problem above, the researchers identified the problem as follows:

1. The achievement of HOTS students, especially in critical and creative thinking indicators of students is still relatively low.
2. In general, teachers still rarely use learning models that can encourage students to get used to finding concepts independently.
3. Students still have difficulty accessing teaching materials in online learning.

C. Limitation and Scope of the Problem

To get maximum results, the researchers limit the problem of research on:

1. Indicators of critical thinking skills observed are, analysis, evaluation and inference. While the observed indicator of creative thinking is elaboration.
2. The learning model used in this research is a guided inkuiri learning model.
3. The use of HOTS-oriented worksheets on Heat and the Kinetic Theoryof gases in online learning assisted by Barcode.

D. Formulation of Research

Based on the background and limitations of the above problems, the problem formulation is how the influence of HOTS-oriented Student Worksheets assisted by the barcode of the inkuiry model is guided in online learning towards students' critical and creative thinking on Heat and The Kinetic Theory Of Gases Learning Topic In Grade XI Of 1st Harau District Senior High School?

E. Purposes of the Research

Based on the problems presented, this study aims to find out how the influence of HOTS-oriented Student Worksheets assisted by barcodes of inkuiri models is guided in online learning on students' critical and creative thinking abilities on Heat and The Kinetic Theory Of Gases Learning Topic In Grade XI Of 1st Harau District Senior High School.

F. Significance of the Research

The author hopes that this writing will be useful for:

1. Researchers, as a science in self-development in the field of research and add insight and experience as a prospective educator in high school physics learning
2. Teachers, as an alternative learning that can be used in the learning process of Physics.
3. Students, to train and develop and measure their high level of thinking ability.
4. Other researchers, as a source of ideas and references in further educational research.