Preliminary study on development of assessment performance instruments on physics learning to improve students' critical thinking ability

D E Harahap, Festiyed* and D Djamas
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Jl. Prof Hamka, Padang 25131, Indonesia

*festiyed@gmail.com

Abstract. The problem that is still in the educator process today is that the implementation of the process is not yet very effective, namely the semester and final semester exams. Process aspects such as neglected skills and attitudes. The purpose of this study was to study the process provided by educational in high school. Data analysis techniques are tabulation and percentage. From the analysis, most educators around 80% are based on and around 20% of the process based (viewer, assessment essay, portfolio). For skills indicators obtained: practicum (K1) 40%, summing up the results of practicum (K2) 40%, presentation (K3) 10%, applying new knowledge (K4) 10%, solving problems and problems (K5) 40%, as well as aspects of attitude: Curiosity (A1) 77.46%, Confidence (A2) 45%, Responsibility (A3) 48%, Discipline (A4) 40%, Thorough (A5) 30%, Cooperation (A6) 30 %, Listening to explanations (A7) 60%, Asking (A8) 45%, Answering (A9) 25%, Responding (A10) 25% . The research design was developmental research. The model of development was 4-D that consists of defining, designing, developing and disseminating phase. Curriculum analysis, students analysis and material analysis were conducted in defining phase. It can be concluded using a special process and needs special attention. For this reason, research is needed for the manufacturing process.

1. Introduction
The 21st century is a challenging century of globalization. Countries in the world are increasingly racing to win a global era marked by technological and technological progress. The era of globalization is marked by rapid change, so the world of education must also change, the world of education is relevant to the challenges and opportunities that occur in real life. In the world of work today the capabilities used are the ability to work together in teams, problem-solving skills, the ability to direct, think critically, master technology and be able to communicate effectively. Given the importance of the physical body, the government has made many efforts to improve the quality of education. Hidayat (2012) Learning is a process that is known to achieve clear goals by doing the right activities and followed by measurement, monitoring and control activities in the form of magazines. The government effort is to carry out various measures starting from the improvement of the education curriculum, upgrading for educators, facilities and infrastructure, educator certification programs, and the application of innovative models to the provision of learning media.

Physics is one of the important subjects in school, has a role in supporting the development of science and technology. A good learning system will produce good quality learning. The quality of
this learning can be seen from the results of the assessment. Likewise in the learning process, there needs to be an assessment process. According to Minister of Education and Culture Regulation No.59 of 2014 "Physics is (1) the process of obtaining information through the empirical method; (2) information obtained through investigations that have been arranged logically and systematically; and (3) a combination of critical thinking processes that produce reliable and valid information ". Educators have not fully carried out process-based assessments. The assessment that has been carried out is only writing so that students only cover the cognitive domain. So that the learning outcomes of students are very low, there is no balance between affective, cognitive and psychomotor.

Assessment (assessment) is the process of gathering and processing information to determine the achievement of student learning outcomes. Educational assessment must refer to assessment standards. Assessment of learning outcomes by educators is carried out in an integrated manner in the learning and continuous process. Assessment aims to monitor the learning process and progress of students and to improve the effectiveness of learning activities. Various types of assessment techniques can be done complementary in accordance with the competencies assessed. Law Number 20 of 2003 concerning the National Education System states that national education functions to develop the ability and form dignified character and civilization in order to educate the life of the nation. Festiyed (2015) [1] explains that assessment is the right term for the assessment of students' learning processes. In addition assessment is also an activity of collecting evidence that is carried out intentionally, systematically, and continuously and is used to assess students' competencies. This is expected to be a meaningful information in making a decision.

The problem that is still experienced by educators today is the difficulty in carrying out process-based assessments so that most educators carry out results-based assessment of written tests and oral tests, in the form of mid-semester tests and end of semester in the form of assignments, also process-based assessments have not been implemented as expected. So that aspects of skill and attitude are ignored. In the midterm and final semester exams, students are required to have aspects of knowledge in answering questions. This learning process affects the mindset of students.

The 2013 curriculum education assessment standard refers to Permendikbud No. 23 of 2016. Previously, the assessment standard in the 2013 curriculum referred to Permendikbud No. 66 of 2013, namely criteria regarding mechanisms, procedures, and instruments for assessing student learning outcomes. The assessment standard in the 2013 curriculum emphasizes more on the principles of honesty, which emphasizes aspects of knowledge, skill and attitude. One form of assessment is authentic assessment. Authentic assessment mentioned in the 2013 curriculum is an assessment model conducted when the learning process takes place based on the three components above. Among the techniques and assessment instruments in the 2013 curriculum are as follows:

1.1 Assessment of attitude competency
Educators conduct attitude competency assessments through observation, self-assessment, peer evaluation by students and journals. The instruments used for observation, self-assessment, and inter-participant assessment are check lists or rating scales accompanied by rubrics, while in journals are educator notes.

1.2 Assessment of Knowledge Competence
Assessing knowledge competencies through written tests, oral tests, and assignments.

Based on Permendikbud No. 104 of 2014, explained that the form of questions for written tests is as follows:

a) Choosing answers, can be:
   • multiple choice
   • two choices (right-wrong, yes-no)
   • matching
   • cause and effect
b) Supply answers, can be:
- fill in or complete
- short or short answers
- description

1.3 Assessment of Skills Competencies
Educators assess skills competency through performance appraisal, which is an assessment that requires students to demonstrate a particular competency by using practice tests, projects, and portfolio assessments. The instrument used in the form of a checklist or rating scale equipped with a rubric. Applying the development of Assessment Performance Instrument on Physics Learning to Improve Critical Thinking Skills of Students. Problem Based Learning is learning that provides stimulation to students to think critically in addressing each problem because this learning model is oriented to the problem.

Problem based learning adheres to constructivism in learning and gives students the opportunity to develop critical thinking skills and evaluative through the analysis of real problems in everyday life [6]. Critical thinking skills are organized processes that allow a person to evaluate evidence, assumptions, logic, and language that underlies the statements of others. Critical thinking is defined as two meanings, the first is critical thinking skills. Critical thinking skills involve a person's ability to use their reasoning power to analyze and solve a problem. The second meaning is critical thinking character. Character is a person's mental attitude or character. Activities that are carried out repeatedly and continuously will become a habit. Jawad, D Djamas (2017)[12] Character comes from habits that have long been attached to a person, so that someone does activities based on habits and does not think long to do so. The habits inherent in the individual will become the individual character. critical thinking skills is a person's ability to think ability to analyze and solve an existing problem. Indicators in critical thinking skills are:

1.3.1 Analysis
In the initial stage, the analysis phase, where a person can understand and express the intent or meaning of a variety of data, experience, and consideration. It includes classifying skills, determining meaning, and explaining meaning. To examine ideas, identify assumptions, reasons and to gather detailed information from a graph, diagram, paragraph and others.

1.3.2 Evaluation
The evaluation phase is the ability of a person to assess information and real strength or relationship with conclusions, the ability to express the results of one's thoughts. To assess the credibility of the claim and the strength or weakness of the argument.

1.3.3 Inference
Inference stage, wherein the ability of a person to identify and secure information needed to describe conclusions. A person forms an assumption and hypothesis, considers relevant information and reaches important consequences / conclusions. Conclusions can be drawn skillfully from various information, data, beliefs, opinions, facts, definitions, principles, pictures, and documents.

1.3.4 Deductive
The deductive stage, where a person's ability starts from a general or premise that is considered right, comes to a specific conclusion.

1.3.5 Inductive
The inductive stage where a person's ability starts from the premise and application related to knowledge and experience, reaches a general conclusion.
The Development of Assessment Performance Instrument is one of the alternative solutions to improve students' physical knowledge competencies in the learning process. The competence seen in this study is knowledge competence. [9] Another factor that influences learning outcomes is student academic achievement. Academic ability is divided into three categories, namely high, medium, and low academic ability. Lack of students' critical thinking skills can also be seen in students' arguments where their reasons are not appropriate, provide more logical assumptions, and evaluation without inventory based on facts. this shows that the learning method or learning model used is less able to develop critical thinking skills.

2. Research methods
This research is the initial stage of development research, which aims to analyze the assessment given by educators in secondary schools. The analysis was carried out by distributing instruments in the form of questionnaires and interviews to students and physics teachers about assessments made by educators for skills indicators including: Conducting practicums, summarizing practical results, making presentations, applying new knowledge, solving problems and problems. Likewise, aspects of attitude: Curiosity, Beliefs, Responsibilities, Discipline, Research, Collaboration, Listening to explanations, Asking, Answering, Responding.

This research was conducted in one of the secondary schools in Padang City, namely SMAN 15 Padang. The collected data is processed and displayed in the form of graphs or tables which are then analyzed

3. Results and Discussion
Based on the results of a preliminary study conducted at SMA 15 Padang, analysis of inquiry based learning based assessment can be described as follows:

![Figure 1. Skill indicator](image-url)

From the graph of the results of the field study on the characteristics of students can be concluded: For skills indicators, namely students: Conducting a practicum (K1) 40%. Summing up the results of practicum (K2) 40%. Make a presentation (K3) 10%. Applying new knowledge (K4) 10%. Resolve 40% problems and problems (K5).
Figure 2. Aspect of Attitude

The results of subsequent analysis are aspects of attitudes: Curiosity (A1) 77.46%, students have high interest and curiosity towards learning physics. Confidence (A2) 45%. 48% responsibility (A3). Discipline (A4) 40%. Thorough (A5) 30%. Cooperation (A6) 30%. Listen to explanations (A7) 60%. Ask (A8) 45%. Answer (A9) 25%. Respond (A10) 25%.

The results of subsequent analyzes of process-based assessments. Only 20% of educators implement it and 80% of educators still use results-based assessments. From the results of the analysis, the process-based assessment is still ineffective so that most educators carry out results-based assessment of written tests and oral tests in the form of mid-semester tests and end of semester in the form of assignments. So that aspects of the process such as skills and attitudes are ignored. It can be concluded that the assessment process based on the assessment process of skills and attitudes has not been implemented well. For this reason, further research is needed to develop process research. The purpose of the assessment of the teaching and learning process is essentially to know teaching and learning activities, especially efficiency, effectiveness, and productivity in achieving teaching objectives. The dimensions of the assessment of the teaching and learning process relate to the learning process components such as the purpose of teaching, methods, teaching materials, teacher learning and teaching activities, and assessment.

This is in line with the research conducted by Anggraheni [4] Authentic assessment instruments developed are assessment sheets presented using project appraisal and scientific approaches. Based on the results of the study obtained an expert validation score of 3.399 with a good category. While the results of the item validity obtained a mean score of 0.601 in the high category and the results of the reliability calculation is 0.959 with the perfect reliability category. The mean of learning achievement by using authentic assessment is 3.39 with good categories. As well as the students' response to the learning process by using authentic assessments, the score was 85.8%. Thus the Authentic Assessment Sheet for Measuring Social Attitudes of High School Students in class X in Physics Subjects is appropriate to be used as an assessment instrument in physics learning. Festiyed [2] Learning through self-assessment is developed based on critical thinking skills. Aspects of ability, namely: the ability to think critically in terms of problem solving and self-management ability. Self management indicators consist of: a sense of responsibility for actions taken, making a work plan systematically, implementing work plans consistently, staying calm in stressful situations, conducting self-evaluation
and seeking improvements to improve performance, having confidence in the ability to complete work, and manage various resources owned to produce the best work.

Aulia [3] The results showed that the working hypothesis which states that "there is a significant influence of physics modules assisted by interactive multimedia games in problem-based learning models of critical thinking skills in class X SMA 4 Padang” can be accepted at a significant level of 0.05 with the contribution of the multimedia assisted game interactive module of 32.51%. Then, the interactive multimedia game physics assisted by the module can be applied by the teacher during the physics learning process. Thus it is expected that the achievement of student competencies is better and the learning objectives are achieved.

Various attempts have been made by the government, but in reality there have been no optimal results. In fact the ability to think critically in physics is still not optimal. Dewi, Festiyed (2018) [10] The results of this study were conducted in Padang Pariaman District consisting of 17 kecamatan and 84 junior high schools managed by the government and the private sector. The sample of this study was Padang Pariaman Natural Science teacher with the sampling technique was stratified random sampling. The instrument used in this study was a questionnaire for respondents. The research questionnaire data was processed with a percentage (quantitative) technique. The results of this study explain that the understanding of science teachers in Padang Pariaman Regency towards the implementation of 2013 Curriculum is still lacking. The science teacher in Padang Pariaman District does not understand the scientific approach and effectiveness of the 2013 curriculum in shaping the character of students. To improve understanding of the implementation of the 2013 curriculum, it is necessary to strengthen literacy for science teachers at junior high school level in Kabupaten Padang Pariaman.

4. Conclusions and Recommendations

Based on the results of a process-based assessment analysis conducted by educators at SMAN 15 Padang who became the sample school in this study, the following findings were obtained: a) The effectiveness of educators in conducting process-based assessments, b) Students’ lack of critical thinking skills, c) Need assessment instruments performance developed in physics learning.

References

[1] Festiyed.2015. Asesmen Autentik, Alternatif, Tradisional, dan Informal. Palembang, Indonesia.
[2] Festiyed, D Djamas and D Pilendia. 2018. Implementation Authentic Task to Enhance Problem Solving and Self-Management for Physics College Students. IOP Conf. Ser.: Mater. Sci. Eng. 335 012068 https://doi.org/10.1088/1757-899X/335/1/012068
[3] Aulia, Djamas, Ramli. 2017. Pengaruh Modul Fisika Multimedia Interaktif Berbantuan Game Dalam Model Problem Based Learning Terhadap Critical Thinking Skill Siswa Kelas X Sman 4 Padang. Padang : UNP
[4] Anggraheni, Sriyono, Ngazizah. 2015. Pengembangan Instrumen Penilaian Autentik Untuk Mengukur Sikap Sosial Peserta Didik SMA Kelas X Pada Pembelajaran Fisika. Po
[5] Ariani D, E Saptaningrum, J Siswanto.2016. Instrumen Penilaian Keterampilan Kerja Ilmiah pada Pembelajaran Fisika Berbasis Inquiry. Po
[6] Widowati, Asri. 2010. Pengembangan Critical Thinking melalui Penerapan Model PBL (Problem Based Learning) dalam Pembelajaran Sains. Jurnal FIP
[7] Permendikbud. 2014 : Lampiran Menteri Pendidikan Kebudayaan Republik Indonesia Nomor 59 tahun 2014 tentang Kurikulum 2013 Sekolah Menengah Atas/Madrasah Aliyah. Jakarta
[8] UU RI.2003: SalinanUndang-undang Republik Indonesia No. 20 Tahun 2003tentang Sistem Pendidikan Nasional. Jakarta
[9] Muhlisin, A et al. (2016). Improving Critical Thinking Skills of College Student Through RMS Model for Learning Basic Concept in Science. Asia-Pasific Forum on Science Learning and Teaching. 17 (1) art.12
[10] Dewi, Festiyed. 2018. The Study of Literacy Reinforcement of Science Teachers in Implementing 2013 Curriculum. Padang :UNP

[11] Hidayat, Festiyed, Fauzi. 2012. *Pengaruh Pemberian Assessment Essay Terhadap Pencapaian Kompetensi Siswa Dalam Pembelajaran Fisika Menggunakan Pendekatan Ekspositori Dan Inkuiri Di Kelas Xi Ia Sma N 1 Kecamatan Suliki Kabupaten Lima Puluh Kota*. Padang :UNP

[12] Jawad, Djamal, Gusnedi. 2017. *Pengaruh Handout Fisika Multimedia Interaktif Berbasis Discovery Learning Berbantuan Games Terhadap Critical Thinking Skills Peserta Didik Kelas X Sman 3 Padang*. Padang :UNP