

# The Development of Authentic Assessment Tools in Physics Science Learning

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**ABSTRACT:** The study was a skim research postgraduate team by the state budget year 2016. In particular, this study aims to develop authentic assessment in science physics learning class first senior high school. In addition this study aims to improve graduate (teacher): (1) Designing assesment to support the quality assurance and quality control of graduates, (2) To produce effective authentic assessment tools, practical and proper to use in High School Physics Science learning, (3) To increase the ability for student graduate to compose a scientific works (thesis) in good quality, (4) Publish scientific work in international and national accredited journal. Method used in this research development, is develop tools authentic assessment in High school physics science learning. Besides, this method selected for achieve the goals and objectives of research, that is facilitating and guiding student graduate candidates Master of Physical Education in finishing their thesis related to Authentic assessment development tools in the areas of Cognitive, Affective, and Psychomotor learning science in physics to be used as guidelines for assessment of thorough, objective, and fair issues. The procedure of this study refers to the development model by Thiagarajan, Semmel, and Semmel (1974) known as four-D model that is define, design, develop and disseminate. The results of this study is to obtain documents authentic assessment tools first class senior high school semester in the cognitive, affective and psychomotor that have been validated by experts in the field of physics learning evaluation and the users (teachers of Physics) and through empirical validity (try out), the result is stated that the Authentic Assessment Tools that have been developed are effective, practical and feasible to use to measure learning outcomes Physical Science first class senior high school.

**KEYWORD:** development, authentic assessment tools, Senior High School physics science learning.

## 1. INTRODUCTION

Ministry of Education and Culture of the Year 2015 in its discretion has determined that any educational institution can reapply curriculum unit level of education and also for units of primary and secondary education that has two (2) years of implementing the curriculum of 2013 to continue its application in order to be used as a trial for the sake of perfecting.

In connection with the policy that a school imposes a two (2) types of curriculum, i.e. there are classes that implementing KTSP and there are classes that implementing Curriculum of 2013. This makes the teachers have difficulty in making judgments based on their respective Assessment Standards of applied curriculum, particularly in application of 2013 curriculum standard assessment. Many teachers that are implementing the curriculum in 2013 experiences confusion in the assessment of student learning outcomes, as required for the use of authentic assessment, but assessment guidelines have not been socialized/ controlled by the teachers as a whole and even are unequally distributed in schools. Based on these problems, developing authentic assessment tools in learning is necessary. Because authentic assessment is a comprehensive assessment conducted to assess such as the input, the process, and the output of learning (Permen Dikbud No. 66 Year 2013: 2 of the Education Assessment Standards).

In addition, the background of Graduate Department of Educational Physics students in the Graduate program of Universitas Negeri Gorontalo are scholars of Undergraduate Educational Physics who is currently teaching at the Junior Senior High School and Senior Senior High School that coming from various provinces. Based on the results of interviews conducted at the time of selection into the graduate program, that one of the goals of students enter the program Physics Education Study S2 is in addition to improving the ability of knowledge in the field of physical sciences, as well as to develop skills in evaluating student learning outcomes, including the adoption of authentic assessment in learning physics, because one of the urgent task of teachers is to make an assessment that is thorough, objective and fair (Permen Dikbud No. 104.2014).

Another problem faced by students of Educational Physics in the completion of Theses are limitations in terms of understanding the Research Methodology. The results of the study of Enos Taruhin 2012 about Mapping the Quality of Scientific Work (Thesis) of students in Faculty of Mathematics and Natural Sciences Universitas Negeri Gorontalo shows that there are three (3) main difficulties students preparing thesis was on: (1) The preparation of background problem,

(2) Preparation of Literature and frame of mind, and (3) the discussion of the results. On the other hand, the school Headmaster where the student on duty wants them to complete their studies as soon as possible, because of their presence is needed in schools, for teachers of physics are included in the number of relatively less in each school.

Substantively the students in addition of faced with the urge to finish his studies, they also can realize the goals of entering the Graduate Program, which is in addition can develop learning in the form of innovations in learning, can also develop authentic assessments in Physics learning. To achieve these objectives, it is necessary to process programmatically to facilitate students in completing their studies through the joint research of Graduate team with the title: "Development of Authentic assessment tools in learning Physics Class X Senior High School". In order for the student involvement together in a research faculty will be able to add insight and experience in completing the writing of his thesis.

Based on the background of the problems described above, then the problem is examined in this study are as follows:

- 1.1. How to develop curriculum of 2013-based Authentic Assessment tool in physics learning in First Grade of Senior High School using Four-D models?
- 1.2. What is the effectiveness, practicality, and the feasibility of authentic assessment tools were developed so can be used as a guide for teachers in 2013 curriculum-based assessment?

In particular, this study aims to: (1) developing Authentic Assessment tools in learning physics in First Grade of Senior High School with four-D model (Define, Design, Develop, and Disseminate); (2) to generate authentic assessment tools that are effective and fit for use in learning of Physics in Senior High School. In addition, this study aims to improve the ability of students (teachers) in: (1) designing the assessment of quality in order to support assurance and quality control of graduates, (2) developing an authentic assessment instrument in learning physics in the cognitive, affective, and psychomotor (3) preparing quality scientific papers (thesis), (4) published a scientific paper in the national journal and internationally accredited.

## **2. LITERATURE**

### **A. Nature of Assessment**

Assessment is a series of activities to acquire, analyze, and interpret data about the process and the learning outcomes of students who performed in a systematic and continuous, so that into meaningful information in decision-making (Djaali and Pudji Muljono, 2008)

In Curriculum of 2013 require the use of authentic assessment. In paradigmatic, authentic assessment requires embodiment of authentic learning (authentic instruction) and authentic learn (authentic learning). It is believed that authentic assessments is more capable to provide information about the ability of learners holistically and valid (Permen Dikbud No. 104, 2014).

Assessment is an important part of learning. By doing the assessment, teachers as managers of learning activities can find out the capabilities of the learners. Based on the results of the assessment, educators can make appropriate decisions to define the steps that must be done next. Results of the assessment can also provide motivation for learners to perform better. Assessment conducted must have the principle of justice, that learners are treated equally so not to harm any one or group of learners that are assessed. In addition, the assessment should not distinguish between socio-economic background, culture, gender language, and religion. Assessment also part of the educational process that can stimulate and motivate learners to perform better in achieve the highest level according to his ability (Direktorat Pembinaan SMA 2010).

Seen from the point of the professionalism of the task of education, the assessment is one of the characteristics inherent in the professional educators. A professional educator always wanted feedback on the learning process does. This is done because one of the indicators of a successful learning is determined by the level of success achieved learners. Thus, the assessment results can be used as a measure of success in learning and feedback for educators to improve the quality of their lessons.

### **B. Principle of Authentic Assessment**

Authentic assessment is the process of gathering information by teachers about the progress and achievement of learning undertaken by learners through a variety of techniques that are able to express, to prove or to show exactly that learning objectives and abilities competencies has really mastered and achieved (Materi Lokakarya Kurikulum 2013. educational Reform, Reform School, Classroom Reform, Community Reform, CHANGE, 2013). In (Permen Dikbud No. 104 Tahun 2014 tentang Penilaian Hasil Belajar oleh pendidik pada pendidikan Dasar dan Menengah) stated that several principles that need to be considered in the assessment of authentic learning outcomes of students, among others:

1. The assessment process should be an integral part of the learning process
2. The assessment should reflect the real-world problems

3. The assessment must use a variety of sizes, methods and criteria in accordance with the characteristics and essence of the learning experience.
4. Assessment must be holistic covering all aspects of the learning objectives.

Furthermore, assessment of learning outcomes by students should pay attention to the following principles:

(A) Sahih (valid), the assessment is based on data that reflect the ability of the measured; (B) Objectively, the assessment is based on procedures and clear criteria, not influenced by the subjectivity of the assessor; (C) Fair, that assessment does not favor or disfavor learners, and does not distinguish between socio-economic background, culture, religion, language, ethnicity, and gender; (D) Integrated, that assessment is an integral component of the learning activities; (E) Open, the assessment procedures, assessment criteria, basis for decision making can be known by an interested party; (F) Comprehensive and continuous, which covers all aspects of competency assessment using a variety of appropriate techniques for monitoring the development of the ability of learners; (G) Systematically, the assessment carried out by following the plan and gradually standardized measures; and (h) using the reference criterion, namely the assessment is based on the size of the attainment of the set. Thus authentic assessment is a form of assessment that requires students to show attitude, using the knowledge and skills gained from learning in the conduct of the actual situation. Or in other words that the Assessment is authentic is the approach, procedures, and instruments of assessment processes and outcomes of learning of students in the application of the attitude (spiritual and social), the knowledge and skills gained in the form of assignment actual behavior or behavior to the level of similarity with the real world, or independent learning (Supardi, 2015).

### **C. Characteristics of Affective Domain**

Krathwohl (in Supardi, 2015), explains that the affective is the behavior that emphasizes the feelings, emotions, or the degree of rejection or acceptance of an object.

Anastasi (in Nadhifah, 2012), which defines attitude as a tendency to act, like it or not against an object. Meanwhile, Chaiken and Stangor (in Supardi, 2015), explains that the affective consists of three components: affective component, cognitive and conative component. Affective component is the feeling of a person to the object. The cognitive component is the belief or conviction that guide a person. And the conative component is the tendency to behave or act by using certain methods shown to an object.

Kinn (2009: 2-10), stating that the scientific attitude contains two meanings, namely, attitude to science and the attitude of science. The first attitude refers to the attitudes toward science, while the second refers to the inherent attitude after learning science. The indicator of attitude domain towards science is represented by the attention, the fun in science, a positive response, honesty, openness, and curiosity

As the preliminary study earlier conducted by researchers (EnosTaruh, 2012) on the Development Model and Assessment of Learning for Children SD/ MI in Remote Areas In 2012, it is found that the development model of learning in remote areas should be tailored to the geographical aspect and local culture, as well as the characteristics of the study participants. In addition, the assessment of learning outcomes is more emphasis on authentic assessment, ie knowledge, attitudes and skills obtained in the form of assignment actual behavior or behavior to the level of similarity with the real world, or independent learning (autonomous learning).

## **3. RESEARCH METHODS**

This research was conducted at the Graduate Program, Universitas Negeri Gorontalo for Authentic Assessment Tool Development and in SMAN 1 Kwandang the tests of Development Kit Authentic Assessment Product is conducted.

The method used in this research is the development of research (Research Development), which is developing the Authentic assessment tools of Learning Physics in Senior High School. In addition, these methods have to be able to achieve the goals and objectives of the research, namely to facilitate and guide students S2 of prospective Master of Physical Education in completing his thesis which is related to the problem of Development Authentic assessment tools in the areas of Cognitive, Affective, and Psychomotor in physics learning to be used as a guideline assessment thorough, objective, and fair.

The procedure of this study refers to the development model by Thiagarajan, Semmel, and Semmel (1974) known as 4-D (four-D models) that are define (definition / determination), design (design), develop (development), and disseminate (dissemination). Activities in this study is shown through the following flow chart diagram

## **4. RESULTS AND DISCUSSION**

### **A. The definition phase**

Generally, in this definition phase, analysis of development needs activities is performed, requirements development of products that fit the needs of users, as well as models of research and development that is suitable

to develop products. This stage has five steps, namely the analysis of the front end (front end analysis), analysis of learners (learner analysis), analysis of the task (task analysis), analyzes of the concept (concept analysis), and the formulation of special purpose assessment (Specifying instructional assessment). Steps in the process of defining this activity as follows.

- a. *Front End Analysis*  
At this stage, researchers examined the curriculum of 2013. In the curriculum there are Core Competencies (KI) and the Basic Competency (KD) to be achieved. Curriculum analysis is useful to define the competencies where such assessments are developed. Based on the analysis of this curriculum, Authentic assessment tools for Odd Semester of 1<sup>st</sup> grade in Senior High School is developed.
  - b. *Analysis of Characteristics of Students*  
Analysis of the characteristics of learners includes individual academic ability, physical characteristics, the ability of group work, learning motivation, economic and social background, and previous learning experience.
  - c. *Task Analysis*,  
The task analysis in the development of assessment tools includes analysis of tasks (basic competencies that must be mastered by learners in learning physics, so that learners can achieve minimal competence.
  - d. *Concept analysis*  
Analysis of concepts/materials is done by identifying the concepts/main materials that need assessment, collect and select relevant material, and reconstruct systematically in the form of concept maps that incorporate the concept/content and assessment of physics learning in odd semester of 1<sup>st</sup> grade at Senior Senior High School.
  - e. *Analysis of the Objective of Assessment*  
In this analysis, the assessment objectives and competencies to be achieved need to be formulated in advance. It is useful to restrict researchers in order not to deviate from the purpose of the assessment that has been set. Formulation purpose of assessment is based on analysis of the concept and analysis of tasks, thus becoming more operational and expressed with behavior that can be observed.
- B. *Stage of Design*

The purpose of design is to prepare the prototype of authentic assessment tools in physics learning. This stage includes: (a) determine the Core Competencies (KI) and the Basic Competency (KD), as the first act to be a reference for teachers in developing techniques and instruments in the authentic assessment of learning physics; (B) arrange lattice that contains indicators and assessment strategies; (C) selecting methods and assessment techniques, as well as the selection of the assessment instruments used; and (d) develop guidelines for scoring. In addition at this stage focused on writing and adoption of assessment tools, consultation with experts, and discussions with colleagues.

Analysis of the design objectives undertaken to formulate the goals to be achieved. In this study, the analysis of the design objectives is based on results of field surveys and school physics learning objectives related to the subject matter of physics that are considered in accordance with the characteristics of the affective domain that are developed. Analysis of interest also adapted to SK Dirjen Mandiksdasmen No.12/C/Kep/TU/2008 on the form and procedure for preparation of the learning outcomes of students unit of elementary and secondary education, which states that the affective aspects are dominant in the subjects of Mathematics, Physics, Chemistry and Biology includes thoroughness, perseverance, and ability to solve problems logically and systematically. Analysis of core competencies, basic competencies and learning objectives on Physic for 1<sup>st</sup> grade of Senior High School in the affective domain can be seen in the following table:

**Table.1 Core Competence and Basic Competence physics in Senior High School K12 Basic competencies**

<p>Developing honest behavior, discipline, responsibility, caring, polite, friendly, caring environment, mutual aid, cooperation, peace-loving, responsive and proactive, and demonstrate behaviors as part of a solution to the various problems of the nation in interacting effectively with the social environment and nature and put themselves as a reflection of the nation in the association world</p>	<ol style="list-style-type: none"> <li>1. Shows a behavioral science (curious, objective, fair, thorough, meticulous, diligent, careful - careful, responsible, open, critical, creative, innovative, and caring environment) in the daily activities - day as a form of implementation of the attitude of doing trial and discussion</li> <li>2. Appreciates the work of individuals and groups in the daily activities - day as a form of implementation</li> </ol>
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**Table. 2 Identification the attitudes that developed  
Basic CompetenceAttitude developed**

<p>1. Shows behavioral science (curious, objective, fair, thorough, meticulous, diligent, careful - careful, responsible, open, critical, creative, innovative, and caring environment) in the daily activities - day as a form of implementation of the attitude of doing trial and discussion</p> <p>2. Appreciating the work of individuals and groups in the daily activities - day as a form of implementation conducting experiments and report the results of the experiment</p>	<p>a. Attitudes toward physics:</p> <ul style="list-style-type: none"> <li>- Curiosity in physics</li> <li>- Pleasure in physics</li> <li>- Attention to physics</li> <li>- A positive response in physics</li> <li>- The choice of a career in physics</li> <li>- Awareness in physics</li> </ul> <p>b. The character of students to physics:</p> <ul style="list-style-type: none"> <li>- environmental care</li> <li>- hard work</li> <li>- discipline</li> <li>- honest</li> <li>- openness</li> <li>- critical</li> <li>- conscientious</li> </ul>
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**C. Stage of Development**

At this stage, the two activities are performed, namely: expert appraisal and developmental testing. Expert appraisal is a technique to validate or assess the feasibility of product design. While developmental testing an experimental activities in the product design targets the actual subject. The measures undertaken at this stage as follows: (1). Validation of the assessment by expert/specialist; (2) Revised assessment tools based on input from experts at the time of validation; (3) The test is limited in the classroom; (4) Revised assessment tools based on trial results; and (5). Implementation of votes in the wider region.

Before authentic assessment tools in the affective domain tested in the wider region, it first has to do research on the instrument. The study carried out by two teams of experts that is a lecturer of Physics, UniversitasNegeri Gorontalo.

Data from the study demonstrate that their point declaration has not been studied in accordance with either aspect of the statement and the language.

**Table 3 Results of the study team of experts to the affective assessment instruments**

Criteria for study Indicator	Assessment	
General Criteria Construction	TA-1	TA-2
sentence in the instrument.	Not good	Not good
Habit sentence in the instrument.	Good	Good
The grammar used in the instrument.	Good	Good
Specific criteria Construction	Appropriate	Appropriate
Compliance with the theoretical operational	Appropriate	Appropriate
Level respondents	Appropriate	Appropriate
Conformance with indicators point statement	Appropriate	Appropriate
Suitability of grains	Appropriate	Appropriate
The assessment instrument affective domain	Appropriate	Appropriate

**Table 4 Results of Revision Team of Experts**

Question (1)	Before Revised (2)	After Revised (3)
1	I am curious about the natural phenomena that I have come across in daily life	I am interested in the phenomena of nature that I have encountered in daily life
2	I do not like Physics lesson	I do not like the physics lesson much
3	Schools should add hours of physics lesson	I wish the school to add hours of Physics
4	Physics lesson has no conjunction with the ideals I want to achieve	Physics lesson not to do with the ideals that I want to achieve
5	I'm not interested in being Physicists	I am less interested in being a physicist
6	I feel nothing I need to ask for learning takes place	I feel no need to ask something during the learning takes place
7	I do not write channels for resolving problems in a coherent physic	I was lazy to explain the flow of problem solving physics with a coherent
8	I did not examine the answers that I do	I rarely re-examine the answers that I do
9	In my opinion there is no relationship between physics I learned with environmental conservation efforts	In my opinion there is no relationship between physics I learned with environmental conservation efforts
10	I pretended not to understand when a friend asked about a physics concept	I pretended not to understand when a friend asked about a physics concept

*a. Limited Test*

Limited testing done to see how effective the first draft of authentic assessment tools in the affective domain. This limited test conducted on 27 students in School SMA Negeri 1 Kwandang Gorontalo Utara as respondents.

**Table 5 Analysis of the validity of the instrument trial**

Statement number	$r_{arithmetic}$	$r_{critical}$	Criteria
15,21, 34, 40, 39, 44, 45,46, 48, 49	0.15	0.38,66	Not valid
12,24, 41, 35,52	0.29	0.38	Not valid
1,2, 20, 33, 19, 22,	0.31	0.38	Valid
3,9,13,16,32,42,43, 51	0.42	0.38	Valid
10.18. 28. 30. 36. 38	0.57	0.38	Valid
4,5, 6, 8, 11, 14, 17, 25,26, 29, 37, 47, 50	0.68	0.38	Valid
27,31,	0,73	0,38	Valid
7	0,81	0,38	Valid

*b. Revised of Limited Draft Test*

The next trial draft instrument revisited in point of not good statement. The draft further improved based on the factors that lead to the invalidity of the item statement. After a further revised draft instrument trials conducted in the wider region

c. *Field Test*

Field testing is done to see how effective the draft affective assessment instruments. The trial was conducted on 39 students of SMA Negeri 1 Kwandang as respondents. Analysis of the validity and reliability of affective assessment instruments that have been tested to show that the instrument developed an effective and feasible for use. Here are the results of analysis of the validity of the draft field test instrument.

**Table 6 Analysis of the validity of the instrument field trials**

Statement number	$r_{\text{arithmetic}}$	$r_{\text{critical}}$	Criteria
1, 2, 3, 4, 5, 6, 10, 11, 13, 15, 19, 21, 22, 23, 24, 28, 31, 34, 35, 36, 38, 39, 41, 44, 45, 46, 49, 50, 51, 52	0.36	0.31	Valid
8, 9, 12, 16, 20, 27, 29, 43, 48.	0.4	0.3	Valid
7, 14, 17, 18, 30, 33, 37, 40, 42, 47	0.53	0.31	Valid
25, 26, 32	0.61	0.31	Valid

d. *Product Enhancements*

At this stage the instrument was completed by adding a section in the form of theoretical basis, instructions for use, and usage guidelines. The products have been completed subsequently assessed by the subject teachers of physics in school. Teacher assessment results of the obtained results that the instrument developed is good and feasible for use in schools.

#### D. Discussion

The trial of Draft 1 affective assessment tools tested on a small group consist of 27 respondents who were students of the School SMA Negeri 1 Kwandang. The results of early trials were then analyzed its validity. Results of the analysis showed that 8,41.8% grain instruments are stated to have good validity for  $r_{\text{arithmetic}} > 12:38$ , 15:20% while the grains have poor validity for  $r_{\text{arithmetic}} < 0:38$ . Therefore the results of early trials showed overall pretty good point statement, then performed a field test..

Field test conducted on 39 students of SMA Negeri 1 Kwandang. The results of field tests with 39 students obtained the result that the whole grain instrument has good validity with a percentage of 10.60% 89.41% and both very good. Benchmark used to determine the quality of the instruments are guidelines for the tool by the Directorate of SMA. Based on the analysis on limited testing and extensive trials, the overall grain affective assessment instruments developed effective to use.

#### E. Dissemination Stage

Dissemination phase is implemented in the form of workshops / workshops by involving teachers field of study Physics incorporated in Subject Teacher Council and related institutions, as well as product development of the authentic assessment is published in scientific journals nationally and internationally accredited.

### 5. CONCLUSIONS AND ECOMMENDATIONS

Authentic assessment tools in the affective domain Senior High School which has been developed and validated by experts (expert validity) and through the validity of the empirical (tray out)), the result is stated that the tools Ratings Authentic that have been developed are effective, practical and feasible used to measure Physics learning results of class X Senior High School. Effective criteria indicated by the results of the analysis of the validity of  $r_{\text{arithmetic}} > 0:31$  and reliability instrument amounted to 0.82 with high reliability category. practical criteria, based on the assessment of teachers as practitioners and users of the products stating that the assessment tools developed simple and easy to use, and the criteria are eligible, based on the assessment and analysis of the team of experts (expert validity).

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