The development of performance assessment on science learning use integrated model in elementary school

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Abstract. One of the curriculum demands for teachers is being able to develop the performance assessments. The reality shows that there is not available performance assessment use integrated model on science learning. The purpose of this research is developed a valid and practical performance assessment. This type of research is research and development of 4-D model that consist of definition, design, development, and disseminate stage. The subject of research is fifth grade students in Elementary School. Data were collected using observation sheets, validation sheets, questionnaire of student and teacher responses to the implementation of performance assessment. The research was produced the performance assessment use integrated model on static electricity material. The results of the data analysis showed that the performance assessment included valid category. The teacher and student response so that the performance assessment included practically.

1. Introduction

An assessment is an important stage in assessing the learning process in schools. It is one of the important factors that determine the success of learning processes and outcomes [1]. The assessment results received by the students can be used as a benchmark for their success in understanding the concept or material given by the teacher. It is a process to find out whether the process and results of an activity program are in accordance with the objectives and criteria that have been set or not.

These days, the government is trying to implement assessments not only in the form of written tests, but also in the form of authentic assessment that measures attitudes, skills, and knowledge competencies based on learning processes and achievements. This kind of assessments is implemented by some schools in West Sumatera through the education unit level curriculum (KTSP). It is used because the concept is followed by examples to be easily understood by the students, the delivery of material is more in-depth, and make clear the scope of the boundaries between each field of study.

However, the assessment of learning outcomes has been refined, that means the assessment carried out refers to the assessment standard, whereby the teachers assess skills competency through performance assessment that requires the students to demonstrate a particular competency by using practice tests, projects, and portfolio assessments (Minister of Education and Culture Regulation No. 66 the year 2013).

The basic understanding of assessment requires the students to demonstrate performance by not only answering or choosing answers from a range of possible answers that are available but also explaining the answers in their own words and ways. In this way, they are expected to show their mastering related to the subject requested or solve a problem in the right way. Additionally, they can
also explain the events in their own words and ways or formulate hypotheses. These kinds of activities can be referred to performance assessment from the teachers to the students.

The performance assessment can be used to assess the students' abilities in the discussion, problem-solving, participation, using laboratory equipment, operating a device, and other activities that can be observed [1]. It affects the understanding of the science concept for the students and helps to assess process skills in learning [2]. For those reasons, it needs to be carried out on the students. Moreover, natural science has a lot of materials that develop science process skills of the students. However, many educators whose assessment focuses on the students’ cognitive abilities have difficulties in carrying out this assessment. This matter results in improper performance assessment application.

Therefore, based on an interview with the elementary school teachers in Padang Utara, Padang Selatan, and Nanggalo (sub-districts in Padang), it was found that there were still some problems on implementing class based assessment, especially performance assessments. First, the assessment process that carried out so far only emphasizes the mastery of the concept [3] and covers the low-cognitive cognitive domain only. It had not been able to reveal the skills in carrying out activities when conducting experiments or creating the work. The students are required to memorize all concepts without involving activities. Meanwhile, the science learning requires active involvement in learning [4]. The teachers have sought performance assessment, but it is not always there in learning. Second, some teachers expressed difficulties in conducting performance assessments. This difficulty arises due to the enormous number of the students in the classroom [5]. In various activities so far, the groups of the students prepare power points to present their analysis of a situation or experiment. They explained the importance of learning emphasizing conceptual understanding and science process skills such as how to ask questions, make predictions, collect evidence, and make conclusions. Meanwhile, the teacher has not conducted an authentic assessment [6]. The description of the difficulties encountered by the teacher at the school provides a foundation for developing the performance assessment to measure the competence of the students.

Then, the difficulties faced by the teachers in the school motivate the development of performance assessment that can be used to measure the students’ competency [7]. Based on the second observations that conducted to assess the textbooks used today, it turns out that the textbooks have not been able to involve the students to be active in learning that is why many of them have difficulty in answering questions and completing assignments at home. Besides, the reality of life shows that each student has different life experience from different places or region. Thus, the connotation of assessment used by the teachers to measure the students' abilities must be adjusted to the conditions of each region where they live.

Considering that the science learning requires the students to be active in learning in order to achieve maximum learning process or outcomes, a conducive and comprehensive model as the integrated model is needed. The model that can be used to help the students to master concepts or practice in learning. Those points make the researchers try to use the integrated learning model in the performance assessments development. Moreover, the previous studies show that The integrated learning models provide high learning outcomes for science learning [8]. It improves the students' critical thinking skills so that the students’ learning outcomes are high.

Previously, there were several instruments developed by several researchers. For instance, the results of performance assessments development for Newton's legal material could be said as a valid category [9]. Yet, the assessment to process the science learning using a scientific approach has not been well developed. For this reason, an assessment technique that is able to express aspects of products and processes is needed to be developed such as integrated performance assessment. This type of assessment should be tailored to the character of elementary school age children whose development stage are still in a holistic stage [10]. The elementary school-age children whose level of holistic thinking is very suitable to use integrated learning models [11]. In general, to answer these problems, the research problem was formulated as follows: How was the development of performance assessment of science learning using the integrated model in elementary school?
2. Method
This study used Research and Development of 4D research design [12], whose steps consist of : (1) define stage that included curriculum analysis, concept analysis, and student analysis, (2) design stage included the preparation of instruments and prototypes of assessment tools, (3) develop stage which consisted the validation and practicality stage, and (4) disseminate stage that included the distribution of the development tool.

The focused development of performance assessment based on the integrated models for natural science learning in motion and magnetic materials. [13] stated that integrated learning aims to integrate some subjects into the same theme. There are 10 models of integrated learning: fragmented, connected, squinted, nested, immersed, shared, webbed, integrated, networked; and the integrated model chosen for use in this study.

Moreover, the subjects in this development consisted of the product trial subjects or one on one test and product use test subjects. The test subjects were the fifth grade elementary school students in Padang. At the data collection stage, the data were obtained by filling out the questionnaires by the teachers and students. At the expert validation stage, the data was obtained by filling out the questionnaire of the media, content, and language by the expert judgment from the Faculty of Education, Universitas Negeri Padang. At the product testing and trial phase, the data were obtained by filling out questionnaires by the teacher as well as interviews regarding the validity, practicality, and effectiveness of the development performance assessment instruments.

| No | Quality      | Criteria                                                                 |
|----|--------------|--------------------------------------------------------------------------|
| 1. | Validity     | The performance assessment is developed in accordance with the principles of scientific knowledge |
|    | a. Relevance | Performance assessments are developed logically                           |
|    | (Content validity) | Performance assessments are developed logically                           |
|    | b. Consistency | Performance assessments are developed logically                           |
|    | (Construc validity) | Performance assessments are developed logically                           |
| 2. | Practicality | Performance assessments are used in accordance with the settings that have been designed and developed |
| 3. | Effectivity  | Developed performance assessments can achieve the desired results        |

The data analysis techniques of the questionnaire were done by (a) giving a score for each in the category very good (4), good (3), bad (2), and very poor (1); (b) summing up the total score of each expert judgment for all indicators; (c) finding the value of validity by using the formula \( p = (f) / N \times 100 \) with \( P \) was the value of validity. \( F \) was the score, \( N \) was the maximum score. Furthermore, (d) processing the number of scores of respondents' answers; (e) calculating the percentage of the questionnaire answers on each item; (f) calculating the average percentage of the questionnaires to determine the appropriateness, suitability, ease and usefulness of the instrument; (g) visualize data; and (h) interpreting the overall score using the validity category of performance assessment. If the value score \( \geq 61 \), it means that the materials were valid.

This development research had resulted from a performance assessment for learning science using the integrated model. If the performance assessment is used by the teacher in the learning process, it will have an impact on understanding the learning material that is more perfect and focused on the prospective teacher's students [14].

3. Result and Discussion
The main results of this development research were performance assessment instruments based on the integrated model that can be used to assess the performance of the students on natural science learning for motion and magnet materials based on the integrated model. The integrated model used for
instrument development included the process of (1) the planning stage including in which the teacher designed a learning plan program by conducting a theme exploration by brainstorming, (2) the implementation stage included: the process of gathering information, managing information by means of analysis comparative with synthesis, the preparation of reports can be done by verbal, gravitational, pictorial, audio, motion, and model, (3) the culmination stage included: report presentation (written, oral, performance, product) and the assessment including processes and products using formal and informal procedures with pressure on product evaluation. The results of each stage of the development procedure were as follows:

3.1. Define Stage
This stage consisted of curriculum analysis, concept analysis, and student analysis. At the stage of curriculum analysis, an analysis of basic competencies was translated into indicators for motion and magnet material. These stages were done to compile the lesson plan, lesson instructions, performance assessment sheet, student worksheet that were relevant to the basic competencies and indicators were used to formulate learning objectives at each meeting. Nevertheless, the reality showed that both output assessment and learning process did not measure one or some of the students’ skill only, but also it should measure all aspects of learning.

Example, the city of education in the medium rank in the world (Hong Kong) conducts experiments in various ways (for example project-based assessment) to measure student skills in the 21st century [15]. Another view of the city of Shanghai is that it does not have a comprehensive framework for measuring 21st century skills but using PISA-type tests for problem solving as a way to shift their school paradigm towards modern assessing. So it is possible that the assessment is only conducted through standard tests, but the assessment process (especially performance assessment) is the main focus of assessment [16].

Then the results of the concept analysis stage obtained a general description of the approach used in the development of performance assessments used for force and magnetic materials. After that, an analysis phase was conducted for students who were students of prospective elementary school teachers majoring in elementary school teacher education at the Faculty of Education, Padang State University.

3.2. Design Phase
This stage included the preparation of assessment instruments and prototypes. The purpose of this stage is to design performance models based on the integrated model that was in line with the indicators and learning objectives. The results of the design stage were developing a performance assessment sheet and a performance sheet based on the integrated model about motion and magnetic material. In short, this stage results: (1) preparing the learning process like syllabus and lesson plans, (2) learning preparation that includes task, rubric, and scoring performance. (3) The Student Worksheet which consists of student worksheets that use integrated performance assessments on motion and magnetic material along with key answers for the student worksheet.

Assessment instruments can be web-based designed to measure student knowledge and use of assessment criteria for cognitive interviews and skills tests [16]. Therefore the design process involves aligning basic curriculum standards, the mind of the expert team (expert), and the views of the practice teacher.

3.3. Develop Phase
This stage included the validity and practicality stage that aimed to produce a valid and practical performance assessment sheet to be used in the learning process and assessment process, especially in motion and magnetic material. The results obtained at this stage are as table 2.
Table 2. The Validation Result

| Aspect                     | Expert Judgment 1 | Expert Judgment 2 | Expert Judgment 3 | Average Value |
|----------------------------|------------------|------------------|------------------|---------------|
| Performance assessment sheet | 85.5             | 86.5             | 89.0             | 87.0          |
| Student Worksheet          | 85.0             | 87.5             | 89.5             | 87.3          |

Based on these data, it can be seen that the score given by the expert judgment was in the very good category. This result indicated that the validation sheet for performance assessment and student worksheet using the integrated model were valid. Whereas, the practicality score was obtained from the questionnaires distributed to the students and teachers, which were subjectively assessed (through observation). The measurement of the teachers' and the students' response gave good results so that it can be used for the research. Further, science learning, mathematics, Indonesian language, and civics that used in an integrated manner according to students could be easily followed with a score of 80.56%.

It was also revealed that the performance assessment was applicable based on 4 main assumptions; (1) student active participation, (2) the tasks assigned or done by the students are an integral part of the entire learning process, (3) assessment is used not only to know the students’ ranking in learning but also to improve the learning process, (4) by knowing the criteria used to measure and assess the success of the learning process, means the students actively strive to achieve good learning goals. These results were in line with the statement [17] states that the performance assessment consists of two parts; (1) clearly defined tasks, and (2) a list of explicit criteria for assessing student performance or product.

3.4. Disseminate Phase

The stage of the disseminate of products conducted during the research. After dissemination, the following results were obtained table 3.

Table 3. The Students Learning Outcome

| Competence Domain | Average |
|-------------------|---------|
| Cognitive         | 86.5    |
| Psychomotor       | 86.7    |
| Affective         | 82.5    |

It can be seen from the table 3 that the score of the students’ performance assessment increased by using the integrated model. This can be seen from the number of points that the students had given as follows [7]:
1. Learning using the integrated model was different from the conventional one. Thus, it was fun for the students (99%).
2. Integrated learning of science, mathematics, Indonesian language, and civics according to the students can be easily followed (80.56%).
3. Through integrated learning model, the students feel free to think, express opinions, ask questions, are free to do, as long as it is in accordance with the learning objectives to be achieved under the guidance of the teachers (86.11%).
4. Integrated learning model does not stress the students about any task given by the teacher (88.89%).
5. The students find no difficulty in group work using the integrated learning model instead, they feel happy (72%).
6. More than 60% of the students who participated in the lesson said that they did not experience any difficulties when expressing their opinions or suggesting ideas. They were just feeling a little stiff and unfamiliar (66.67% and 83.33%).
The students revealed that learning using the integrated model was not difficult otherwise, it was really fun. There were only small part difficulties like feeling unfamiliar with the model [18]. Meanwhile, the teachers’ said that integrated learning model needs to be applied in schools because the students can capture several learning concepts from several fields of study when learning is taught simultaneously.

4. Conclusion
This research has developed a performance assessment using an integrated model on the motion and magnetic material for fifth grade students in elementary school. The results of performance assessment sheets validation and the student worksheet were categorized as valid so that they can be used in learning and assessing the students’ natural science learning. The practicality of this model is very practical. Thus, the teachers’ and students' responses showed that the performance assessment sheets were practical.

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