

Development of Assessment Instruments for Learning Process of Mathematics in Drawing Geometry at the Elementary School Level of Karanganyar Regency

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Article Info

History Articles

Received:
October 2018
Accepted:
November 2018
Published:
December 2019

Keywords:

*drawing geometry,
instrument development,
process assessment*

DOI

<https://doi.org/10.15294/jpe.v8i3.27709>

Abstract

This research is motivated by the need for teachers to conduct assessment or assessment practices that are in line with the demands of the curriculum. The research aims to: (1) develop an assessment of the learning process in mathematics class V SDN; (2) improve the quality of assessment instruments for the mathematics learning process in the fifth grade of Elementary School Karanganyar Regency drawing space based on the 2013 curriculum. This type of research is R & D with the observation method. The results of the preliminary research in the form of observations of instruments that will be developed show that the instrument is in the medium category of 22 items and is in the bad category of 4 items. Subsequently given material enrichment which finally can improve the quality of the instrument into 19 medium categories and 7 good category questions. This R & D research uses instrument trials ranging from observation, instrument development to implementation. The sampling technique used purposive sampling, carried out in Public Elementary School Karangnyar Regency class V with the subject of Drawing Geometry. Results of the research: at the initial stage (observation) there were 4 instruments in the bad category and 22 in the medium category. The revision is done by providing material reinforcement on items 17 and 19, which is about drawing perspective lines on pyramid and prisms. The development phase (test of improvement) experienced the medium category of 19 instruments and good categories into 7 instruments. The implementation phase of the instrument in the medium category 3 instruments is in the category of 23 instruments. So that it can be concluded that "the development of an assessment instrument for the process of learning mathematics drawing up the space in Elementary School Level of Karanganyar Regency is worthy of use because it has increased students can concretize a picture of a rib that does not appear to be a perspective image and from the stages that must be passed in the instrument development procedure.

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INTRODUCTION

One of the Subject that plays an important role in life is mathematics because mathematics is the basis of important components for other fields of science. Mahanta (2012) argued that "learning mathematics is considered very important for every country in the world because learning mathematics is considered as basic education and math calculation skills are very important in every step of life. Muruganantham (2016) said that mathematics is a key subject of several other subjects. Amirali (2010) adding mathematics is the heart of many successful careers and lives to develop society, especially in extraordinary changes and accelerating circumstances.

(Dossey, Halvorsen & Mccrone, 2008) Three points of principle in Mathematics learning, effective learning of the mathematics requires understanding from teachers about (1) what students know, (2) what needs to be learned and challenges, and (3) support for students to learn well.

Suyanto & Hisyam (in Margono, 2016) suggested that so far Indonesian mathematics education was still very focused on the cognitive domain. In line with Margono opinion, Lee's (2014) said that mathematics learning should use good worksheets and so far the reality in the field has not yet been used.

Mathematics learning in Karanganyar District Elementary School is still hard. There were so many students who do not understand mathematical concepts in depth, meanwhile understanding of mathematical concepts is very necessary. Based on the observation result, the phenomena is due to the lack of motivation of students in learning. In learning activities students are less actively involved, even learning activities still use conventional learning models, as well as in terms of assessment. Assessment in Karanganyar District Elementary School is limited to written tests so that if students have not reached the predetermined indicators, it will cause the emergence of the original impression of giving the value or validity of "lever" (*katrol*) system and the main assessment is done that is on summative evaluation through semester tests.

The mathematics learning in grade V on the theme of playing with objects around with competencies to form various forms of space requires student activeness and skills such as drawing, making nets, using props to calculating the volume of building a simple space.

Therefore, in this learning students need to have abilities that are not only cognitive abilities, but also the ability of students' skills with the aim that student learning outcomes increase, in addition to choosing the right strategy in mathematics learning, teachers also need to choose the right form of assessment to measure learning outcomes students holistically or completely. One alternative in overcoming problems in the field of assessment is to develop an assessment carried out in an integrated manner in learning activities. Assessments developed are not solely done to determine student achievement, but the assessment is also needed to foster student activity and skills.

Student performance assessment is one of the alternative assessments that are in accordance with the curriculum, it is supported by Government Regulation No.19 of 2005 which mandates that assessments should be carried out by educators, education units and government. In Wardono's dissertation (2011) mentioned that the academic quality between nations through Programme for International Student Assesment (PISA) shows that of the 41 countries surveyed for mathematics, Indonesia is ranked 38th, while the Mathematics and reading ability ranks 39th. Geometry is abstract material for students, so it is necessary to concretize namely by drawing up space. Teachers need to understand and be able to carry out assessment or assessment practices that are in accordance with the demands of the curriculum. This research is aimed at: (1) developing an assessment of the fifth-grade mathematics learning process in Karanganyar District Elementary School in drawing space based on the 2013 curriculum; (2) improve the quality of assessment instruments for the fifth-grade mathematics learning process in Karanganyar District Elementary School drawing geometry based on the 2013 curriculum.

METHODS

This study is Research and Development research, R & D, which was adopted from the Borg and Gall models.

According to them R & D is a development model where the research is used to design new

products and procedures that are tested in the field, evaluated, and refined to meet certain criteria.

Conceptually, the research and development approach includes 10 general steps, as described by Borg & Gall, in Figure 1.

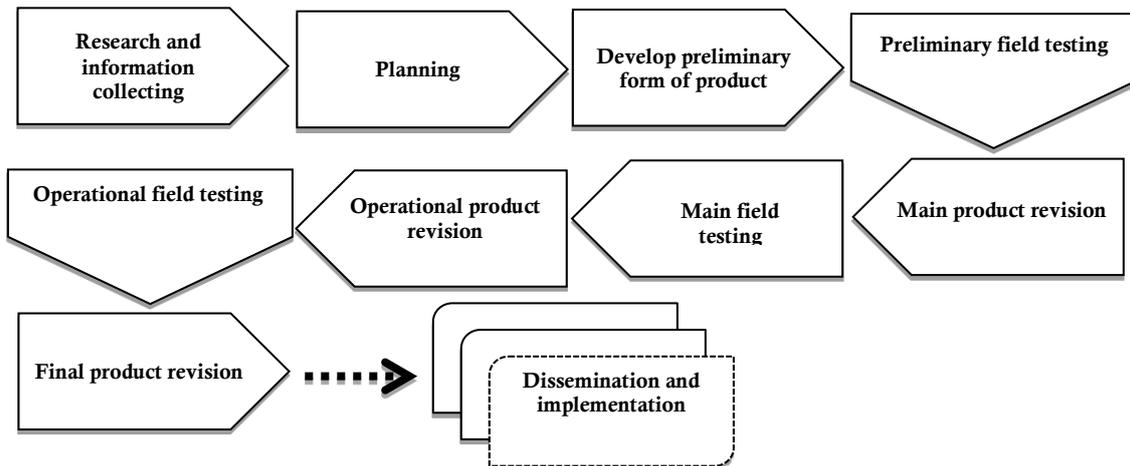


Figure 1. Borg & Gall Model



Figure 2. Instrument Testing Scheme

RESULTS AND DISCUSSION

The presentation of the results of the development of an assessment instrument in the process of learning mathematics drawing geometry at Karanganyar District Elementary School level was carried out by applying the instrument starting from the observation, testing and instrument improvement and instrument implementation on a wider scale. The research results from the stages of this development research are as follows:

Research and information collecting; collecting the material and geometry theory and make observations to SD1 to get preliminary data as a reference for developing instrument development. The recapitulation of observations to elementary school is as follows.

Planning, plan the stages from observation to SD 1, Test the development of Instruments to SD 2 and Implementation of Instruments to SD 3, 4, 5.

Develop a preliminary form of product, which is developing a geometry instrument after SD 1 trial. The instruments developed are 9 aspects of the syllabus. The results are made into an assessment sheet and developed into 26 student assessment indicators. Students worked on 14 items consisting of 7 questions on drawing 7 geometry nets.

Preliminary field testing, which is conducting a trial of geometry instruments on a limited scale in SD 1 involving 20 subjects with a total of 26 items. The results of the instrument testing stage at SD 1 are in accordance with Figure 3.

Table 1. Recapitulation of Initial Observation Results in SD1

Aspect	Results
The number of students	The number of students in SD 1 in 5 th grade is 20 students
Curriculum	The curriculum used is the 2013 Curriculum
Learning infrastructure facilities	Infrastructure facilities in the class that are used for geometry learning are not complete so the geometry instrument needs to be developed
Student's initial ability	The initial ability of students is still relatively low for learning to draw geometry

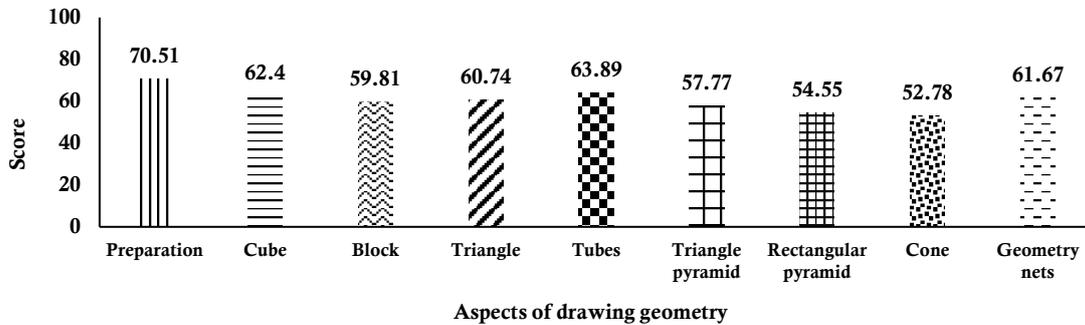


Figure 3. SD Instrument Testing Results 1

Main product revision, this stage is the improvement phase according to the results of the trial on SD 1. In accordance with Figure 3, it can be concluded that there are some aspects need to be improved, among them are the cone aspect at the percentage of 52.78, rectangular pyramid 54.55, triangle pyramid 57.77 and 59.81 on the beam aspect.

Main testing field, trial after improvement involving all elementary school students 2. The next trial is in SD 2. This trial was conducted before testing the validity of the validator. The trial results on SD 2 correspond to Figure 4 below. This trial was carried out based on the improvement of the trial of SD 1.

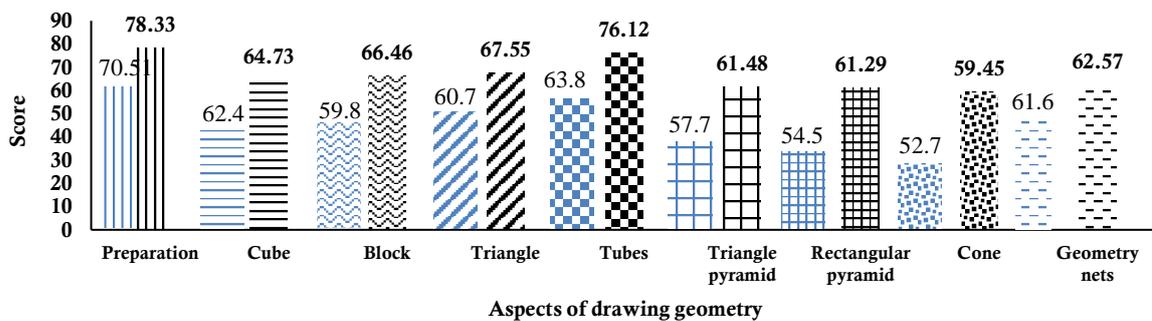


Figure 4. SD Instrument Testing Results 2

Based on Figure 4, it can be concluded that there are several aspects that need to be improved, including the cone aspect at 59.45%. The results of the trials on SD 1 and SD 2 then made improvements before validating the test to the validator.

Operational product revision, namely the step of validation testing of the instrument drawing geometry that has been produced. This research uses 2 validators namely experts and practitioners. The validation test results are as follows in Table 2.

Table 2. Recapitulation of Validation Test Results

Aspect	Validator value 1	Validator value 2
Conformity of instruments with SK & KD	91.7	100
Instrument accuracy	83.3	83.3
Supporting learning instruments	81.25	75
Total	85.42	86.1
Average	85.76	

Based on the validation test, the following is to enter the validator on the instrument that made improvements is to give more examples of images, reduce the drawing commands made by students, students are given enrichment about the perspective ribs image and the results of 2 validators are 85.76 with very good categories.

The Operational field testing, which is conducting the test after it has been validated. After the SD2 trial was repaired and validated, the next step was to make improvements and wider trials. Implementasi SD 3-5. The results of the implementation of SD 3, 4, 5 are accordance in Figure 5 below.

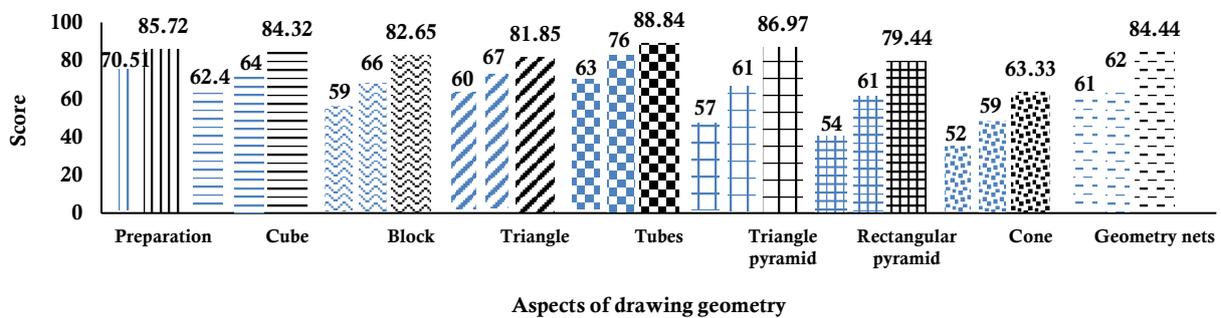


Figure 5. Implementation Results in SD 3, 4 and 5

Final product revision, which is to make final improvements to the instrument drawing geometry to produce instruments drawing final geometry. Based on the results of the trials in SD 3, 4 and 5 it shows good numbers from the 9 aspects assessed.

The results of the validator commentary on the education evaluation lecturer on geometry instruments said that it had fulfilled the aspects of the level of difficulty and the dissemination of the questions adequately. Poor instrument value category observation stage as many as 4 items, medium instrument value category is 22 items, while for good category in stage 1 there is no. Furthermore, for the trial and development of instruments, there were no bad questions, 19 medium categories, and 7 good items for the good category.

Based on the results of observations made by teachers and researchers on the development of drawing geometry instruments, it can be known about the learning process of drawing geometry, so that the parts that are still weak can

be enriched. At the implementation's moment of the drawing instrument, students have no difficulty in understanding and completing drawing geometry.

CONCLUSION

The nine groups of assessment instruments of learning mathematics in drawing geometry at elementary school level of Karanganyar Regency which was distributed into 26 instruments the question can be concluded that there was an increase in quality of students' understanding of geometry drawing material. It showed at the initial stage at SD 1, then further revisions at SD 2 and the last trial at SD 3, 4, 5, there was an increase in the quality of the material on drawing geometry from the 9 aspects tested.

After being given material enrichment in the revision stage, the 3 elementary schools were implemented. In implementing the instrument shows students can draw geometry. This research can be refined by further research because the

drawing phase of the pyramid is still having difficulties.

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