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Research Article

Development of a Spatial Geometry Instrument Based on Minimum Competency Assessment

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Abstract.
This research aims to develop a spatial geometry instrument based on minimum competency assessment. Spatial geometry is a field of mathematics that is important in developing an understanding of shape, size, and spatial relationships between objects in 3-dimensional space. Minimum competency assessment is an approach to measuring the basic understanding that individuals must have in a field of science. The research method used in this research involves the instrument development stage which consists of identifying minimum competencies in spatial geometry, designing the assessment instrument, validation by experts, and testing the instrument on a group of participants. The results of this research are a minimum competency assessment instrument in spatial geometry that can be used to measure basic understanding in this field. It is hoped that this instrument can be a useful tool in curriculum development and assessment in the field of spatial geometry, as well as assist educators in identifying students' level of understanding of basic concepts in spatial geometry. Apart from that this research also contributes to the development of a minimum competency assessment methodology in the context of mathematics and other fields of science.

Keywords: spatial geometry, minimum competency assessment, contextual

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1. Introduction

The Leveling the geometric spatial abilities of junior high school students is a process of identifying, which includes visualization skills, understanding space and form, understanding spatial relationships, and ability to solve geometric problems [1, 2]. Skill leveling is carried out for assist students in acquiring better geometric skills through ethnomathematics-based learning tailored to their ability level. The concept of ethnomathematics makes a major contribution to improving learning mathematics. Students can learn mathematics by visiting the outside world and interact with local culture which becomes the object of ethnomathematics. Object Ethnomathematics is a cultural object

that contains mathematical concepts in something certain communities [3]. Culture-based learning can be divided into three types, namely learning about culture, learning with culture, and learning through culture [4].

Ethnomathematics includes developed mathematical ideas, thinking and practices by all cultures. Ethnomathematics can also be considered as a program aims to study how students understand, articulate, process, and finally using mathematical ideas, concepts, and practices that can solve problems related to students' daily activities. Some researchabout ethnomathematics including [5-7].

Since the 2022/2023 academic year, the Ministry of Education and Culture has issued a policy regarding implementation The Independent Curriculum (IKM) must be welcomed and facilitated to fulfill students' rights in learning independently [8]. Independent curriculum curriculum with learning diverse intracurricular where the content will be more optimal for students to have enough time to deepen concepts and strengthen competencies. Behind the high hopes of independent curriculum, many schools are still worried about the Completeness Assessment Minimum (AKM) [9]. Of course, this must be anticipated so that IKM can run well and schools can prepare their students to face AKM. AKM can viewed from 3 components (aspects), namely: content, cognitive processes, and context [10].

Ethnomathematics-based questions are mathematical questions related to social context and can help students to understand the relationship between mathematics and everyday life

which is packaged in the Minimum Completeness Assessment (AKM). This is in line with

Implementation of the Independent Curriculum (IKM) which is being promoted by the Ministry of Education and Culture. Curriculum independent curriculum with diverse intracurricular learning where the content will be more optimal so that students have enough time to explore concepts and strengthen competence.

Based on the description above, the researcher formulated the problem in this research, namely how to develop an instrument for leveling students' spatial abilities for geometry material based on AKM ethnomathematics at IKM. The urgency of this research is to contribute to the policy of implementing a more inclusive and relevant curriculum for students with diverse backgrounds based on the concept of differentiated learning. The aim of this research is to provide an overview and analysis of students' geometric spatial abilities and a prototype of a more effective teaching approach with a cultural background according to local wisdom.

2. Method

The research method used in this research involves the instrument development stage which consists of identifying minimum competencies in spatial geometry, designing the assessment instrument, validation by experts, and testing the instrument on a group of participants. (In this article session, researchers report only expert validation).

3. Result and Discussion

Results and discussion can be made as a whole that contains research findings and explanations.

3.1. Presenting the Results

3.1.1. Identifying minimum competencies in spatial geometry

The identification was carried out by the team together with the core administrators of the Semarang City Middle School Mathematics MGMP and obtained 5 indicators in spatial geometry, namely: Rotation, visualization, relation, perception, orientation.

3.1.2. Design assessment instrument

Design the assessment instrument based on FGD with Semarang City Middle School Mathematics MGMP teachers and obtain 9 minimum competencies in spatial geometry question indicators, namely **:** (a) elate two-dimensional and three-dimensional geometry using shadows, perspectives, projections, and maps; (b) Understand and apply the concepts of symmetry, similarity, and congruence; (c) Identify, describe, compare, and classify plane and solid geometric figures; (d) Understand the properties of lines and planes, induding parallel and perpendicular lines andplanes, and intersecting lines and planes and their angles of incidence; (e) Explore the relationships among geometric transformations (translations, reflections,rotations, and dilations), tessellations (tilings), and congruence and similarity; (f) Develop, understand, and apply a variety of strategies for determining perimeter, area,surface area, angle measure, and volume ;(g) Understand and apply the Pythagorean Theorem.; (h) Explore patterns produced by processes of geometric change, relating iteration,approximation, and fractals; (i)

Investigate, explore, and describe the geometry in nature and real-world applications, usingmodels, manipulatives, and appropriate technology.

3.1.3. Validation by Experts (Content Validation)

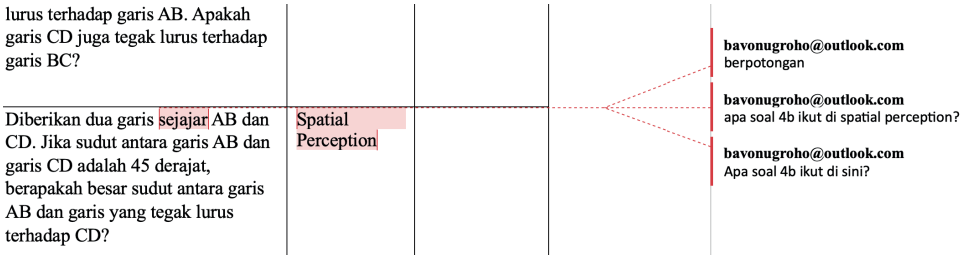

Figure 1: Content Validation at Spatial Perception.

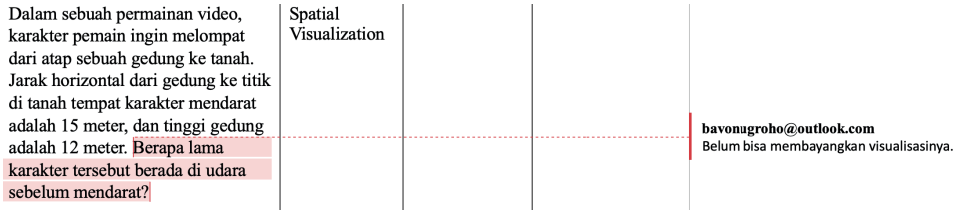

Figure 2: Content Validation Sapatial Visualization.

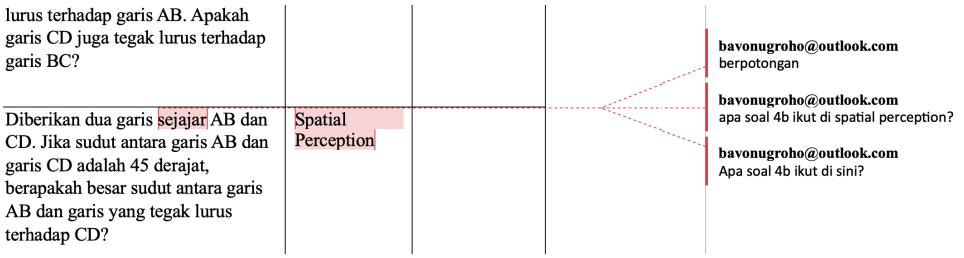

Figure 3: Content Validation about Geometry.

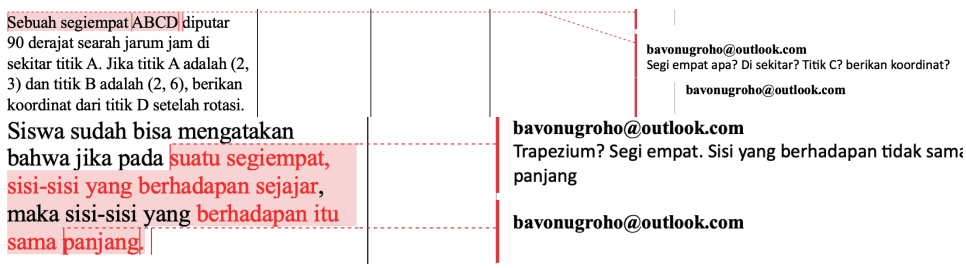

Figure 4: Content Validation about Rectangular.

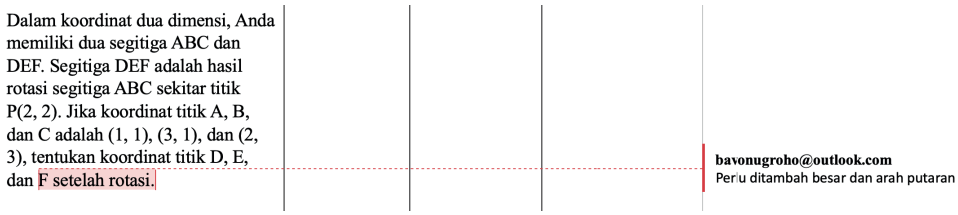

Figure 5: Content Validation about rotation mathematics sentences.

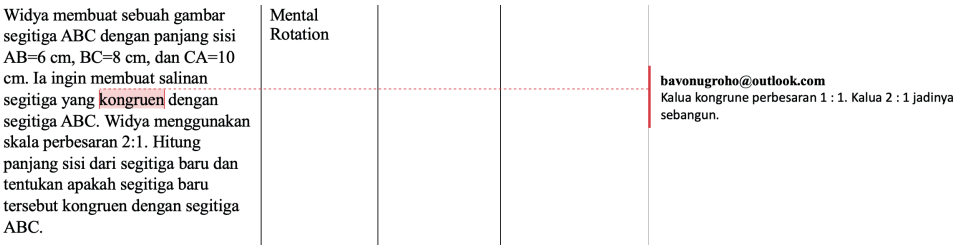

Figure 6: Content Validation About Congruence.

4. Conclusion

The results of this research are a minimum competency assessment instrument in spatial geometry that can be used to measure basic understanding in this field. It is hoped that this instrument can be a useful tool in curriculum development and assessment in the field of spatial geometry, as well as assisting educators in identifying students'

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