

ANALYSIS OF STUDENTS' ABILITY WITH CONCEPTUAL TEMPO LEARNING STYLE IN SOLVING SPATIAL PROBLEMS

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Abstract:

This study aimed to describe students' spatial abilities in terms of cognitive conceptual tempo style. This type of descriptive qualitative research was conducted at SMP Negeri 26 Makassar with class VIII-2 research subjects. The instruments used in this study were: the MFFT (Matching Familiar Figures Test), spatial ability tests, and interview guidelines. The MFFT test (Matching Familiar Figures Test) was carried out to determine the type of student's cognitive style. Then found 1 subject of impulsive cognitive style and 1 subject of reflective cognitive style. Then the subject was given a spatial ability test to determine the students' spatial abilities after which an interview was conducted. Indicators of spatial ability are: (1) stating the position of the elements of a spatial figure. (2) Constructing and presenting geometric models drawn on a flat plane in a spatial context. (3) imagining the shape or position of a geometric object being viewed from a certain point of view. (4) Investigating the actual size of the visual stimulus of a geometric object. The results showed that students with an impulsive cognitive style had low spatial abilities because they were only able to fulfill 1 spatial ability indicator, namely constructing and presenting geometric models drawn on a flat plane in a spatial context. Meanwhile, students with a cognitive reflective style have high spatial abilities because they are able to fulfill all indicators of spatial abilities.

Keywords: Solving Spatial Problem, Conceptual Tempo Cognitive Style, Impulsive Cognitive Style, Reflective Cognitive Style

ANALISIS KEMAMPUAN SISWA DENGAN GAYA BELAJAR TEMPO KONSEPTUAL DALAM MEMECAHKAN MASALAH SPASIAL

Abstrak:

Tujuan penelitian ini adalah untuk mendeskripsikan kemampuan spasial siswa ditinjau dari gaya tempo konseptual kognitif. Penelitian ini merupakan jenis penelitian kualitatif deskriptif yang dilakukan di SMP Negeri 26 Makassar dengan subjek penelitian kelas VIII-2. Instrumen yang digunakan dalam penelitian ini adalah: MFFT (Matching Familiar Figures Test), tes kemampuan spasial, dan pedoman

wawancara. Untuk mengetahui jenis gaya kognitif siswa, dilakukan tes MFFT (Matching Familiar Figures Test). Kemudian ditemukan 1 subjek gaya kognitif impulsif dan 1 subjek gaya kognitif reflektif. Kemudian subjek diberikan tes kemampuan spasial untuk mengetahui kemampuan spasial siswa setelah itu dilakukan wawancara. Indikator kemampuan spasial adalah: (1) menyatakan posisi unsur-unsur suatu figur spasial. (2) Membangun dan menyajikan model geometris yang digambar pada bidang datar dalam konteks spasial. (3) membayangkan bentuk atau posisi objek geometris dilihat dari sudut pandang tertentu. (4) Menyelidiki ukuran sebenarnya dari stimulus visual dari objek geometris. Hasil penelitian menunjukkan bahwa siswa dengan gaya kognitif impulsif memiliki kemampuan spasial yang rendah karena hanya mampu memenuhi 1 indikator kemampuan spasial, yaitu membangun dan menyajikan model geometris yang digambar pada bidang datar dalam konteks spasial. Sedangkan siswa dengan gaya reflektif kognitif memiliki kemampuan spasial yang tinggi karena mampu memenuhi semua indikator kemampuan spasial.

Kata Kunci: Pemecahan Masalah Spasial, Gaya Kognitif Tempo Konseptual, Gaya Kognitif Impulsif, Gaya Kognitif Reflektif

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INTRODUCTION

Education is one of the important roles in terms of producing quality human resources. With a good education system, quality human resources will also be produced (Ardian & Munadi, 2015). There is one subject that is a universal science that can be applied in everyday life, namely mathematics (Kusumawardani & Budiarto, 2021); (Satriani, Uddin, Halim, & Syamsuadi, 2020). Mathematics plays an important role in other subjects, namely as the basis for other sciences (Bety & Rachmaniah, 2020). Mathematics has many branches of knowledge that have different roles in everyday life, one of the branches of mathematics is geometry (Purborini & Hastari, 2019). The purpose of learning geometry is to develop logical thinking skills and spatial abilities as well as geometric modeling to solve problems (Fajri, Johar, & Ikhsan, 2017).

Related to spatial ability, Gardner (in Harmony & Theis, 2012) suggests that spatial ability is the ability to accurately capture space or the other words the ability to visualize images including the ability to recognize shapes and

objects accurately, make changes to an object in one's mind and recognized these changes, describing a thing or objects in mind and changing it in the real form, expressing data in a graph as well as sensitivity to balance, relations, color, line, shape, and space. In addition, Piaget & Inhelder (Alimuddin & Trisnowali, 2018) revealed that spatial ability is an abstract concept that includes the ability to observe the relationship of object positions in space, signs used as benchmarks to determine the position of objects in spaces, the ability to see objects from various angles. Point of view is the ability to estimate the distance between two points, the ability to represent spatial relationships by cognitively manipulating, and the ability to imagine the rotation of objects in space.

The ability of students to solve spatial problems is still low. That was stated in Sefina's research (Wulansari & Adirakasiwi, 2019) which concluded that students' spatial abilities were still lower, that was evidenced by student worksheets showing each item of question no student was able to answer correctly, and most of the students were only able to answer parts only certain parts, the rest blank the answer sheet. Likewise, Kariadinata's research (Hanafiah, 2019) states that students still find it difficult in geometry material, especially in the section on constructing geometric shapes. Even though visualization is needed for the geometry problem.

Someone's ability to solve problems is different. Therefore, they often have to take different ways to solve the same problem. That indicates that students have different ways because their characteristics are also different (Appalumbang & Tamba, 2018). That is following Ellis' opinion (Hanafiah, 2019) that 5 factors distinguish a person's characteristics, There are namely: age, behavior, cognitive style, motivation, and personality.

The characteristics of the students used in this study are cognitive styles. Cognitive style is a typical student way of learning, both related to how to receive and manage information, attitudes towards information, and habits related to the learning environment (Wijaya, 2016). Basse and Omoren (Geni & Hidayah, 2017) cognitive style is a process of self-control style which is determined by students' conscious activities in organizing and managing, receiving and disseminating information which ultimately determines students' main behavior. Rahman (in Aini, Murtianto, & Prasetyowati, 2019) classify cognitive styles as follows: (1) differences in psychological cognitive styles, namely field-dependent and field-independent cognitive styles, (2) differences in cognitive styles conceptual tempo, namely: impulsive and

reflexive cognitive styles, (3) differences in cognitive styles based on ways of thinking, namely intuitive-inductive and logical-deductive cognitive styles

Based on the explanation above regarding how to process the information in cognitive styles, both impulsive and reflective, have different characteristics between two. That relates to students' spatial abilities because of an impulsive cognitive style that tends to be fast in solving problems but the error rate of answers is very high and reflective which is slow in solving problems, careful, thorough and careful so that the error rate of answers is lower will affect students in visualizing or describes an object when it experiences a rotation or change.

Several studies that have discussed students' spatial abilities include Aini, Murtianto, and Prasetyowati (2019); Alimuddin and Trisnowati (2018). However, there is still a lack of research discussing students' spatial abilities in terms of the tempo of conceptual cognitive style. Therefore, this research discusses the spatial abilities of students with impulsive and reflective learning styles.

METHODS

The type of research used in this research is descriptive research using a qualitative approach. This research was conducted at SMP Negeri 26 Makassar. In selecting research subjects, that is based on the results of the MFFT cognitive style test (Matching Familiar Figures Test) by taking one student who is dominant in the impulsive cognitive style and one student who is dominant in the reflective cognitive style. The main instruments in this study were the researchers themselves and supporting instruments in the form of: 1) The MFFT test consisting of 13 questions; 2) The Spatial Ability Test. This test sheet is in the form of a description problem that aims to determine students' spatial abilities. This question has been valid by the validator; 3) Interview Guidelines. In this interview, the researcher used semi-structured interviews, namely interviews that took place in a series of open questions. In this interview, further questions can be developed according to the subject's answers provided that the questions are adapted to the conditions in the field. Data analysis techniques consist of: 1) data condensation, 2) data presentation, and 3) data verification.

RESULT AND DISCUSSION

1. Test Results in Subjects with Impulsive Cognitive Style

The following are the results of the subject's spatial ability test in the test for the indicator stating the position between the spatial elements.

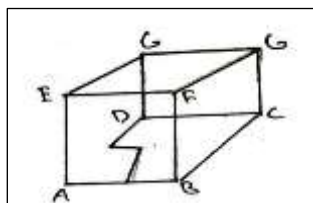


Figure 1. Impulsive Subject Test Results on Indicator 1

According to the results of spatial ability tests and interviews, subjects with an impulsive cognitive style were only able to fulfill one indicator of spatial ability. According to the interview results, information was obtained that the first step taken by the impulsive subject in solving the problem was to draw the ABCD.EFGH cube. The subject said that a cube is a geometric shape, did not know the meaning of the ribs, and also did not know what the sides meant, but the subject could show what was meant by the vertices. The subject only read the problem three times and immediately worked on the problem. Then only guess in drawing the illustration referred to in the problem.

From the results of tests and interviews, it can be concluded that the subject did not meet the indicators stating the position between the geometric elements, because the subject did not know some of the geometric elements depicted so he only guessed in describing the illustration asked in the question.

The following are the results of tests on the spatial abilities of the subjects in the test for indicators of constructing and presenting geometric models drawn on a flat plane in a spatial context.

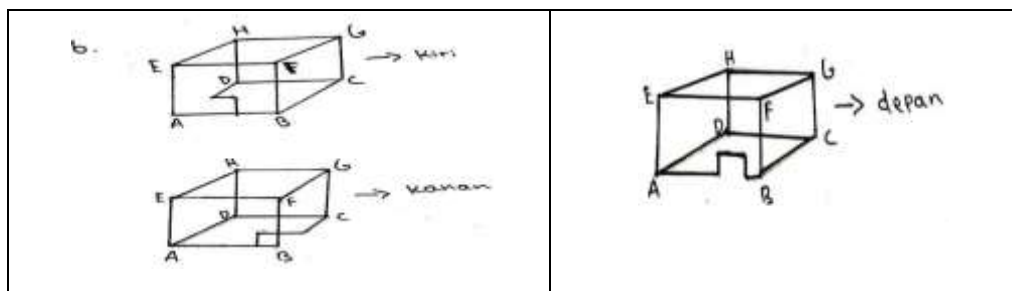


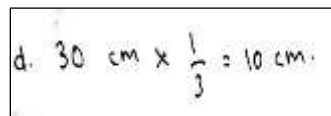
Figure 2. Impulsive Subject Test Results on Indicator 2

From figure 2 it can be seen that the Impulsive Subject can draw an aquarium illustration with various models both viewed from the left, right, and front. Following the results of the interview, information was obtained that the subject had difficulty drawing the aquarium. The subject draws a cube ABCD.EFGH then cuts the base. However, the subject does not know how many parts are cut, and the shape of the part that is cut. Then the subject draws three pictures from his point of view.

From the results of the tests and interviews, it can be concluded that the subjects in this test fulfilled the indicators of constructing and presenting models drawn on a flat surface in a spatial context. Because the subject can draw several models from various points of view.

Following are the results of the subject's spatial ability test on the test for indicators of imagining the shape or position of a geometric object viewed from a certain point of view (indicator 3). From the results of the tests and interviews, it can be concluded that the subjects in this test did not meet the indicators of imagining the shape or position of a geometric object viewed from a certain point of view.

The following are the results of the subject's spatial ability test on test for indicators of investigating the actual size of the visual stimulus of a geometric object.



A handwritten calculation inside a rectangular box. The text reads: "d. 30 cm x 1/3 = 10 cm." The fraction 1/3 is written with a horizontal line over the 1 and a vertical line under the 3.

Figure 3. Impulsive Subject Test Results on Indicator 4

From the results of tests and interviews, it can be concluded that the subject did not meet the indicators of investigating the actual size of the visual stimulus of a geometric object because the subject was unable to answer the required cloth size precisely.

2. Test Results in Subjects with Reflective Cognitive Style

The following are the results of the subject's spatial ability test in the test for the indicator stating the position between the spatial elements.

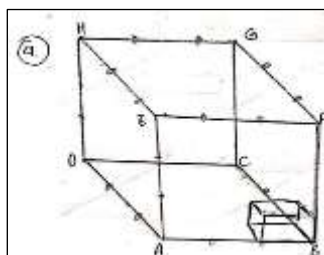


Figure 4. Reflective Subject Test Results on Indicator 1

From figure 4, it can be seen that the Reflective Subject can describe the shape of the cube, give a name to each corner point on the cube and cut the other side of the cube-shaped base. According to the interview results, information was obtained that the initial step taken by the subject in solving this problem was to draw the ABCD.EFGH cube and determine the part to be cut. The subject says that a cube is a three-dimensional figure bounded by 6 sides that have the same shape and size, the subject can also express the meaning of the ribs and at the same time indicate what is meant by sides, can show what is meant by the corner points and the number of corner points in the image, and the subject reads the problem many times until he understands the purpose of the question and describes the illustration requested.

From the results of the tests and interviews, it can be concluded that the Reflective Subject in this test fulfills the indicators stating the position between the elements of the spatial structure.

The following are the results of tests on the spatial abilities of the subjects in the test for indicators of constructing and presenting geometric models drawn on a flat plane in a spatial context.

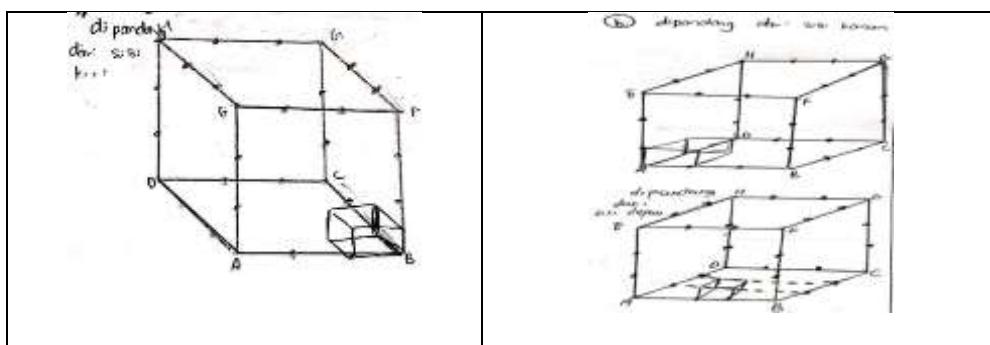


Figure 5. Reflective Subject Test Results on Indicator 2

From figure 5, it can be seen that the Subject drew an illustration of an aquarium with various models. In the first picture, the subject draws an

illustration of an aquarium which is seen from the left side according to his view. Subject cuts the side of the plinth on the left in another cuboid. also on the right side. then in the third picture, the subject draws an illustration of the aquarium which is seen from the front but is not quite right.

Following the results of the interview, information was obtained that the subject experienced a little difficulty in drawing the aquarium, but managed to draw the illustration. even though I had a mistake in the picture and asked for about 20 minutes to re-read the questions and re-draw the aquarium illustration. The subject also knows how many parts are cut, the shape of the cut parts, and the missing points when the cube is modified. The subject succeeded in drawing 3 model images on a flat plane in a spatial context even though it was not quite right. From the results of the tests and interviews, it can be concluded that the subjects in the test fulfill the indicators of constructing and presenting models drawn on a flat surface in a spatial context.

For indicators 3 of imagining the shape or position of a geometric object viewed from a certain point of view from the results of the tests and interviews, it can be concluded that the subjects in this test fulfill the indicators of imagining the shape or position of a geometric object viewed from a certain point of view. This was proven when the subject was able to reveal that the shape of the image at points A and B is the same but looks different when viewed from a certain point of view.

The following are the results of the subject's spatial ability test on test for indicators of investigating the actual size of the visual stimulus of a geometric object.

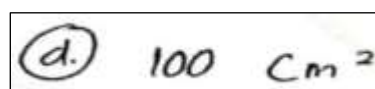
A rectangular box containing handwritten text. On the left, there is a circled letter 'd.'. To its right, the number '100' is written, followed by 'cm²'.

Figure 6. Reflective Subject Test Results on Indicator 4

From figure 6, it can be seen that the reflective subject states the required cloth size is 100 cm^2 . According to the results of the interview, information was obtained that the subject knew the shape of the part to be covered with cloth, so he answered the required cloth size correctly. From the results of tests and interviews, it can be concluded that the reflective subject meets the indicators of investigating the actual size of the visual stimulus of a geometric object.

According to the results of spatial ability tests and interviews, subjects with an impulsive cognitive style were only able to fulfill one indicator of spatial ability. For the first indicator, namely stating the position between the elements of a geometric shape, the initial step taken by the subject was to draw the ABCD.EFGH cube, but the subject was unable to state the position of the geometric elements in the image he made. This inability is due to the subject's lack of interest in this subject so that when explained the subject is not very interested in paying attention, this is in line with the opinion (Arifin, Yusmin, & Hamdani, 2017) which states that the inability of students to express geometric elements is caused by student factors. not interested in geometric material and students did not pay close attention when the geometric learning was explained. The subject is also in a hurry to solve the problem so the resulting answer is not correct. This is in line with the theory (Bety & Rachmaniah, 2020) which explains that children with impulsive cognitive abilities tend to answer questions faster, but are not careful enough so that the answers tend to be wrong. Likewise, with Nasution's theory (Setiawan, 2016) students with an impulsive cognitive style tend to use the fast time to make decisions without thinking long. Furthermore, in the indicator of imagining the shape or position of a geometric object viewed from a certain perspective, the subject is unable to imagine the shape of an object because the subject has difficulty imagining the shape of the image so that the subject does not know the difference in the image that is made when viewed from a certain perspective. This is in line with the results of research (Putra, Maya, Purwasih, Fitriani, & Nurfauziah, 2022) which state that the factor is the lack of students' spatial abilities in imagining an object from a certain point of view, that is, students find it difficult to connect various visual forms of a three-dimensional geometric shape and are unable to imagine a geometric shape. when viewed from a certain point of view. Then in investigating the actual size of an object's visual stimulus, the subject is unable to determine the shape of the cut part, so the subject is unable to determine the required cloth size correctly. This is in line with research conducted (Istiani & Hidayatulloh, 2017) which says that the cause of students' inability to answer questions is students who cannot understand the meaning of the questions and are not careful in working on the questions.

According to the results of spatial ability tests and interviews, subjects with a cognitive-reflective style were able to meet all indicators of spatial ability. For the first indicator, namely stating the position between the

elements of a geometric shape, the initial step taken by the subject was to draw the ABCD.EFGH cube and then determine the part to be cut. The subject can state the position of the geometric elements in the image made. This is because students understand the concept of a cube and the elements in a cubic shape. The subject was also careful in working on the problem, this was proven during the interview the subject realized there was a mistake in answering the question so the subject asked for 20 minutes to re-read the question and correct the subject's answer. This is in line with Santrock's theory (Diana & Nurmawanti, 2020) which states that students with a cognitive-reflective style are very thorough in solving problems so that when they find mistakes, they quickly fix them. Likewise, with Nasution's theory (Setiawan, 2016) students with a reflective cognitive style require a long time to obtain decisions or solutions to the problems they face because reflective students are still considering alternatives that influence the decisions they make. In the indicator of constructing and presenting geometric models drawn on a flat surface in a spatial context, the subject can correctly describe the aquarium and chair illustrations, even though this takes a long time and sometimes there is an error in the position of the image so the subject has to repeat the drawing.

Furthermore, in the indicator of imagining the shape or position of a geometric object viewed from a certain point of view, the subject can imagine the shape of an object, even though the subject has difficulty imagining the shape of the image. However, the subject can tell the difference in the images made when viewed from a certain point of view. Then for the indicator to investigate the actual size of an object's visual stimulus, the subject can correctly determine the size of the cloth needed because the subject knows the size of the cut side. These results are in line with the results of research by Aini, Murtianto, and Prasetyowati (2019) who revealed that reflective students tend to have high abilities so that reflective subjects think long and deeply to consider decisions for answers.

CONCLUSION

Students with an impulsive cognitive style can solve spatial ability questions but only meet the indicators of constructing and presenting geometric models drawn on a flat plane in a spatial context. Students with an impulsive cognitive style do not meet the indicators stating the position between the elements of a geometric shape, imagining the shape or position of a geometric object viewed from a certain perspective, and investigating the

actual size of the visual stimulus of a geometric object. Impulsive students tend to have low spatial abilities because impulsive students rush in solving questions and are not careful in answering questions, so they only fulfill 1 spatial ability indicator. Students with a reflective cognitive style can solve spatial ability questions and fulfill all indicators of spatial ability, namely: stating the position between the elements of a geometric shape, constructing and presenting geometric models drawn on a flat plane in a spatial context, imagining shapes or positions a geometric object that is viewed from a certain perspective and investigates the actual size of the visual stimulus of a geometric object. Reflective students tend to have high spatial ability because reflective students think long and deeply to consider the decision of the answer, if there is an answer that is considered wrong then the reflective student immediately corrects the answer, so that the reflective student fulfills all indicators of spatial ability.

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