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Epistemic Action of Junior High School Students With Low Spatial Ability in Constructing Cube Nets

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Abstract: This study aims to describe the abstraction of epistemic action, which includes recognition, building-with and construction in junior high school students with low spatial ability in constructing cube nets. The research method used in this study is an exploratory qualitative method with the primary data in the form of interviews with two junior high school students with low spatial abilities who were selected using an inclusive purposive sampling technique. Based on data analysis on the two subjects, it was found that the two subjects constructed a cube net of 14 plain cube nets, 14 colour cube nets and 14 cube nets with variations of domino motifs. In the activity of constructing the cube nets, the two subjects used different epistemic actions; subject SR1 constructed the cube nets as a whole using only two epistemic actions, referred to as recognition and building-with. The activity of subject SR2 in constructing cube nets as a whole uses more epistemic actions that are tiered and interrelated with each other, where the first action that occurs is recognition, the second is building-with, and the third is construction.

Keywords: *Abstraction, building-with, construction, epistemic action, recognition.*

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Introduction

Several experts who have defined abstraction (Backhouse & Skemp, 1986; Dubinksy, 2000; Hershkowitz, 2001) provide a definition that indirectly describes the difference between abstracting and abstraction. Abstracting is an activity in which a person is aware of the similarities between the experiences he has obtained by classifying or collecting experiences based on their similarities. At the same time, abstraction is the final change resulting from the abstraction that allows us to recognize new experiences that have similarities with existing classes previously formed. Gray (2007) also state that "abstraction" has two meanings, namely, first as a process of "describing" a situation and the second, namely as a "concept", which is the result of a process. Based on this, it can be concluded that abstraction is a person's thinking process in solving problems which is done by imagining the problem in mind. For example, when someone draws a geometric shape, then in the drawing activity, someone will imagine the elements contained in shapes such as points, straight lines and curved lines where knowledge about these elements has been known beforehand and stored in memory, then called to be used in drawing activities at this time, then armed with previous knowledge, both formal and informal knowledge, a person is able to draw several shapes. Abstraction is a fundamental process in mathematics, so that its existence has an important role in forming new concepts. This is in line with previous research (Ferrari, 2003; Hassan & Mitchelmore, 2006; Hershkowitz et al., 2007; Hong & Kim, 2016; Mitchelmore & White, 2007) which states that abstraction in mathematics is very important because it is a mental process in describing mathematical concepts in a mathematical problem.

Hershkowitz (2001) in his research on abstraction, states that abstraction passes through three epistemic actions, namely recognition, building-with and construction, which are related to each other. The research was then developed by previous studies (Dreyfus, 2015; Ferrari, 2003; Hassan & Mitchelmore, 2006; Hershkowitz et al., 2007; Hong & Kim, 2016; Mitchelmore & White, 2007; Nurhasanah et al., 2017; Ozmantar & Monaghan, 2007; Sinaceur, 2014) which revealed the basic elements of three epistemic actions. Hershkowitz et al. (2007) state that epistemic action is a mental

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action that can be observed through verbalization or students' physical actions. Mental action will appear when students are faced with needs that encourage them to be involved in finding new constructs. The need for this new construction allows the connection between past knowledge and knowledge that is built on the present. When students carry out the new construct, students rethink their old knowledge in memory where in that memory is stored vague knowledge that is needed for use in the present. Based on this, the researcher views that the abstraction of epistemic action is a process. The process referred to here is the depiction of a certain situation in a concept that can be thought of through a construction where abstraction occurs when several objects are dropped based on the characteristics or properties of objects that are considered unimportant and finally only noticed or taken important properties contained in the object itself (Dreyfus et al., 2007; Hassan & Mitchelmore, 2006; Ozmantar & Monaghan, 2007; Sümen, 2019).

The epistemic action includes three actions that are interrelated with one another (Dreyfus, 2015; Ferrari, 2003; Hassan & Mitchelmore, 2006; Hong & Kim, 2016; Mitchelmore & White, 2007; Ozmantar & Monaghan, 2007; Sinaceur, 2014; Sümen, 2019). Theoretical research on the abstraction of epistemic action has actually been explained at length in several studies such as (Dreyfus et al., 2007; Gray, 2007; Hershkowitz, 2001; Hershkowitz et al., 2007) but in the case of mathematics learning whether these epistemic actions are related to each other needs further research, especially in the activity of constructing cube nets.

Jeon (2009) states that students' activities in constructing cube nets can make students think more abstractly. Shiakalli et al. (2015) states the same thing that the activity of constructing cube nets can require students to do abstractions. Furthermore, Thissen et al. (2018) explain that he has found students' mistakes in compiling the desired pattern of cube nets in his research. These studies explain students' mistakes in constructing cube nets caused by weak spatial abilities or spatial abilities that occur in students, which are then concluded that this is a student's inability to abstract in their thinking processes. Sahrudin et al. (2021) explain in their research that junior high school students, in studying cubes and constructing patterns of cube nets, perform abstracted tiered and related epistemic actions where the epistemic actions carried out include recognition, building-with and construction. However, these studies do not explain students' spatial ability in constructing cube nets.

Several experts who have defined ability (Bodner & Guay, 1997; Battista, 1999; Fiantika et al., 2017; Güven & Kosa, 2008; Islam et al., 2013; Katsioloudis et al., 2014; Nagy-Kondor, 2016; Pitta-Pantazi & Christou, 2010; Saeed et al., 2017; Segil et al., 2015; Yurt & Tünkler, 2016) state that spatial ability is the ability to change, rotate, fold, and flip visual images in mind. This is in line with Linn and Petersen (1985) which state that spatial ability is a mental process in perceiving, storing, remembering, creating, changing, and communicating spatial structures. Based on this, the spatial ability is needed to get a picture of students' abstractions in constructing cube nets because spatial abilities are spatial thinking abilities that apply exploratory and understanding aspects that can describe students' abstractions in constructing cube nets accurately and provide opportunities to students can imagine the position, size, color and shape of spatial objects

The results of the studies above are the basis for researchers to conduct further research on the abstraction of epistemic actions that occur in junior high school students, especially junior high school students with low spatial abilities in Serang City in constructing cube nets. Therefore, this research is important to reveal that the abstraction of epistemic action is related to each other, especially in the case of learning mathematics, which in this study focuses on the epistemic action of junior high school students with low spatial ability in constructing cube nets.

The research results are expected to fully describe the epistemic actions of students in constructing cube nets by considering students' spatial abilities and adding references to complete student abstractions.

Based on the explanation above, the research questions must be answered is how the epistemic action description of junior high school students with low spatial ability in constructing cube nets?

Methodology

Research Design

This research was carried out with a descriptive qualitative approach that describes the abstraction of junior high school students with low spatial ability in constructing cube nets.

Subjects and Data Collection

The subjects in this study were two junior high students with low spatial ability who are selected by using the technique of purposive sampling inclusive through the provision of test administration Purdue Spatial Visual Type Rotation (Bodner & Guay, 1997; Branoff, 2000; Güven & Kosa, 2008; Maeda et al., 2013; Zurn-Birkhimer et al., 2018) and the subject criteria is a subject that has been studying geometry.

Analyzing of Data

Abstraction data of junior high school students was obtained through clinical interviews conducted to find out the epistemic actions that occurred through verbalization or dialectical students after the activity of constructing cube nets which included 14 models of plain cubes, 14 models of cubes with color variations, and cubes with a variety of domino motifs as many as 14 models. From the clinical interview activities, an analysis was then carried out by sorting out the verbalization and actions of the subjects that appeared in constructing the cube nets. Data analysis begins with a transcript of the data from the recorded clinical interviews. Transcripts in the form of interviews based on CNCT as data revealers of epistemic actions which were then classified and categorized. The second step is data reduction with the initial step of comparing the data obtained with audio-visual recordings and field notes by making a summary of the core, processes and questions that need to be carefully guarded in order to produce data reduction. The third step is to categorize the data by grouping data that has a clear relationship with the epistemic action indicators used in constructing cube nets which include recognition, building-with and construction. The fourth step is that the researcher triangulates time by collecting additional data to support and strengthen the data that has been owned and the last step is to conclude the data where at this step, the researcher concludes and interprets the data that has been collected.

Findings / Results

To get an abstraction of the epistemic action on the subject. Subjects were asked to construct a cube through the provision of a CNCT instrument in which there were three problems. In the first problem, the subject is presented with 14 plain cube models; in the second problem, the subject is presented with 14 cube models with colour variations; and in the third problem, the subject is given 14 cube models using variations of dominoes on the sides of the cube. The three cube models are presented in Figure 1 below:

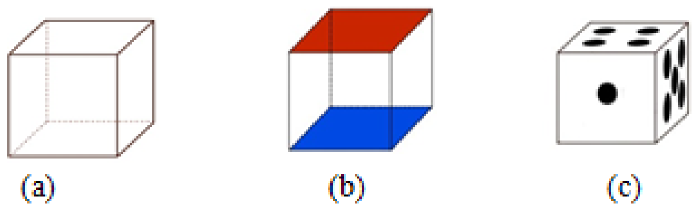

Figure 1. (a) Plain Cube Model (b) Cube Model with Color Variations (c) Cube Model With Domino Pattern Variations

Based on the observations made to the two subjects, SR1 and SR2 sliced all the cube nets that had been provided. The cube nets with different patterns generated by SR1 and SR2 are presented in Table 1 below:

Table 1. Number of Cube Nets Successfully Created by Subjects

No	Subject	Plain Cube	Cubes With Color Variations	Cubes With Domino Pattern Variations
1	SR1	4	5	7
2	SR2	3	10	11

Based on the table above, it can be explained that the success of SR1 and SR2 in constructing cube nets is different. Therefore, based on this, the researchers conducted clinical interviews with each subject separately to obtain information about how SR1 and SR2 found and constructed the cube nets and what epistemic actions were used to obtain the cube nets.

Based on the data analysis that has been carried out, it shows that SR1 knows the cube but vaguely, meaning that the subject is only able to name some of the elements contained in the cube. SR1 also made a mistake in distinguishing between cubes, planes and blocks. This shows that SR1 has difficulties in recalling previous knowledge so that it does not provide the right answer to the questions given. Although SR1 is not precise in naming the elements contained in the cube, SR1 is considered to have used previous knowledge to be used at the present time. So that this activity is part of the first epistemic action, namely recognition, even though there has been an error made by SR1 in explaining the concept of the cube.

After slicing the ribs on the SR1 cube model, lay the cube model that has been sliced to form cube nets and refold the cube nets to form a cube model. In the activity of constructing the nets of the first plain cubes, SR1 stated, "I first paid attention to the shape of the cube, then sliced the edges to form cube nets". The statement explained that SR1 had observed a plain cube and directly sliced the cube model that had been provided. From the researchers' observations in observing the cube, SR1 only observed for a short time, which was only 1 minute, SR1 also flipped a plain cube but did not show any accuracy in examining the cube model he observed, then SR1 immediately sliced the first plain cube model without considering the direction of the slice. What was done in the interview, SR1 also explained that he did not consider the direction of the slice because he sliced the cube arbitrarily.

The slicing and refolding activity in the abstraction of the epistemic action is a building-with action, so it can be concluded that the second epistemic action that occurs in constructing the first plain cube nets is the building-with action. In the activity of constructing the first plain cube nets based on interviews with SR1, the analysis showed that he did not use the construction action because SR1 explained that he was unable to remember the shape or pattern of the cube nets that had been studied previously and this reason also caused that SR1 constructed cube nets randomly.

In the activity of constructing the nets of the second plain cube, SR1 observes the plain cube model in the same way as in the first plain cube model. SR1 slices each edge on the plain cube model very quickly and does not consider the direction of the slice and the pattern of the first cube nets it has made, then SR1 stretches and refolds the cube nets that have been sliced to form a cube model and put them in a stack with the nets of the first cube. In the activity of constructing the nets of the second plain cube, SR1 stated "That, will it be the same as the first one. It turns out that the shape is the same, sir." SRI's answer indirectly confirms that in making the nets of the plain cubes they did not think about and consider the shape of the desired cube nets and the direction of the slices of the previous cube model, but only sliced the plain cube model in arbitrary directions and ways to form cube nets. The statement shows that in constructing the nets of the second plain cube that SR1 did, namely realizing the need for the concept of a cube to solve the given new problem situation, SR1 expressed it by slicing some of the edges on the cube so that when opened and laid down on a flat plane it would form a shape. Flat forming webs cubes and folded back in the nets of the cube to form a cube- SR1 is not trying to solve the problem by generalizing the concept of a cube and is not trying to establish and develop new knowledge in making patterns of nets cube based on the concept of cube and prior knowledge so that it can it can be concluded that in constructing the second, fourth, fifth, sixth, eighth to fourteenth plain cube nets, the activities are the same as in the activity of constructing the first plain cube nets, which only uses recognition and building-with actions .

Activities when constructing nets of the third to twelfth plain cubes SR1 performed in a relatively similar way, meaning that in constructing the nets of plain cubes, it can be concluded that SR1 only uses epistemic action recognition and building-with. However, in constructing the nets of the thirteenth plain cube, SR1 began to think about how to get different cube nets.

SR1 explained that he had difficulty finding the pattern of the nets of the cubes. Therefore, slicing the first to twelfth plain cube model was done arbitrarily. When the subject sliced the thirteenth and fourteenth cube models, SR1 began to consider the shape of the cube nets to be made, so that in the observations of the researchers, SR1 observed the thirteenth and fourteenth cube models with a slightly longer time than before, namely for 7 minutes. Based on clinical interviews conducted by SR1 stated, "I was curious whether the cube nets that I made were different or not, so I thought I wanted a different shape, sir." In the activity of constructing the thirteenth and fourteenth plain cube nets, SR1 realized the need understand the plain cube model in order to find patterns of different cube nets. Although SR1 slices arbitrarily, SR1 realizes the need to know the cube well to be able to solve new problems, which in this case construct nets of plain cubes. From the researcher's observations, SR1 takes longer than when constructing the first to twelfth plain cube nets, the thirteenth plain cube model, and the fourteenth plain cube model SR1 has attempted to solve the problem by generalizing the concept of a cube, forming and developing new knowledge in making net cube patterns based on the concept of a cube and previous knowledge. So that in constructing the thirteenth and fourteenth plain cube nets, SR1 has performed tiered epistemic actions, which include recognition, building-with and construction.

In the activity of constructing cube nets with the first colour variation, SR1 realized that he needed prior knowledge to solve a new problem, but both in the observations and answers given by SR1 in the interview, SR1 did not try to find cube nets with different patterns but instead found nets, any cube net. The subject also stated that they ignored the colour of the cube model. Therefore, the subject did not determine the base and roof on the cube model with colour variations based on its colour. Based on this information, it can be concluded that the SRI subject has done recognition but cannot remember clearly previous knowledge or previous activities, namely activities in constructing plain cube nets. In constructing the first colour cube nets, the subject feels confident that the cube nets the colour variations he made were correct because the subject expressed them by folding them back to form cube nets but in the activities carried out, SR1 did not actively apply previous knowledge in constructing cube nets with colour variations. This shows that in constructing the first cube nets, SR1 only performs abstraction of epistemic actions in the form of recognition and building-with.

In constructing cube nets with the second to fourteenth colour variations based on information on clinical interviews and the observed subject activity, SR1 was able to recall previous activities and think about getting different cube nets. However, SR1 had problems where the subject had difficulty thinking about different cube net patterns. Where SR1 does not think about finding different patterns and SR1 only has a desire to get different patterns but does not think about how to solve problems or generalize previous knowledge and develop previous knowledge to be applied to the activity of constructing nets with other colour variations so that in the activity constructing cube nets with colour variations of the two subjects did not perform the epistemic action in the form of construction. These difficulties caused SR1 to construct cube nets with the second to fourteenth colour variations almost the same way as when constructing cube nets with the first variation.

In the activity of constructing cube nets with variations of the first domino motif, SR1 which states "The first thing I noticed first, the second I determined the base and the roof and then sliced it to form a net." the need to know the cube well based on previous knowledge, SR1 has known the cube model very well so that before making slices on the cube model with variations of the first domino motif, SR1 first pays attention to the cube model carefully and determines the base and roof first based on the domino motif owned. This was also confirmed in the interview where SR1 stated that determining the base by determining the roof with the number of domino motifs of four and the base with the number of domino motifs of three, which means that SR1 understands that in determining the base and roof on the domino motif, each side facing must be seven. SR1 believes that the cube nets he made are correct because he pays attention to the previous cube nets and refolds the cube nets he has laid down. SR1 through his efforts to dismantle the pile of cube nets that have been stacked before. However, SR1 experienced distrust and gave up easily when he encountered obstacles, so the effort was only SR1's desire which was not accompanied by the realization of problem-solving. Therefore, the researcher assumes that the construction action taken by SR1 in constructing cube nets with variations of the first domino motif does not occur. So, it can be concluded that in constructing cube nets with variations of the first domino motif, SR1 performs epistemic action recognition and building-with.

In constructing cube nets with variations of the second to eleventh domino motifs. Based on the interview transcript above, the subject stated, "I first noticed the shape, then I sliced the ribs. I wanted to have a different shape, but I was confused hehe. So, I just slice it randomly." This shows that the subject does not try to solve the problem by generalizing the cube concept and does not form and develop new knowledge in making a pattern of cube nets based on the concept of a cube and previous knowledge. Therefore, in constructing the nets of the second, third and eleventh cubes, SR1 only uses epistemic action recognition and building-with as in constructing cube nets with variations of the first domino motif.

In constructing the nets of the twelfth to fourteenth cubes, SR1 was observed to construct the nets of the cubes with a longer time than the previous one where for each cube nets it took about 6 minutes to 7 minutes. Based on the results of the interview, SR1 stated, "I am curious sometimes to get a different form. So, I thought, sir, how do you get something different?" SR1's curiosity to get a cube net pattern coupled with a serious effort by looking for different cube net patterns by doing different slices than before shows that SR1 has tried to solve the problem. By generalizing the concept of a cube as well as forming and developing new knowledge in making a pattern of cube nets based on the concept of a cube and previous knowledge to find different patterns of cube nets by considering the variation of domino motifs on each side. Based on this, the researcher feels confident that in constructing the twelfth to fourteenth cube nets, SR1 performs three complete and tiered epistemic actions: recognition, building-with, and construction.

The epistemic action carried out by SR1 in constructing plain cube nets has similarities with the activity of constructing cube nets with variations of domino motifs. The epistemic action that occurs in constructing the first to twelfth cube nets on plain cube nets uses two epistemic actions, referred to as recognition and building-with, and what happens in constructing cube nets with variations of the first to eleventh domino motifs. Using two epistemic actions, namely recognition and building-with. Meanwhile, plain cube nets from thirteenth to the fourteenth and cube nets with variations of the twelfth to fourteenth domino motif use complete and tiered epistemic actions, namely recognition, building - with and construction.

In the activity of constructing cube nets with colour variations, there are different plots where the epistemic action that occurs in the activity of constructing cube nets with colour variations from the first to the fourteenth SR1 only uses epistemic action recognition and building-with

The results of the S2 data analysis show that SR2 knows the cube and the elements contained in the cube well. This is reflected in SR2's answer, which states clearly that a cube is an object that exists in everyday life such as cardboard, mochi boxes, and so on that have the shape of a box, the sides are the same size, have ribs of the same length and angle. In constructing the nets of the first cube, SR2 made observations in a short time where SR2 observed a plain cube model with only 10 seconds, then SR2 expressed it by slicing a few edges on the cube so that when opened and laid down on a flat plane it would form a flat shape which forms a net of cubes of things. This can be shown from SR2's answer, which stated that he first paid attention to the shape of the cube, which then sliced the edges to form cube nets and folded them back into their original shape. Based on this, it can be concluded that SR2 performs epistemic actions recognition and building-with in constructing the first cube nets.

In the activity of constructing the nets of the second cube, SR2 realized that he needed the concept of a cube to solve the given new problem situation, namely constructing cube nets; this was reflected in SR2's answer, which stated, "I had difficulty using a knife, so I thought using scissors could be easier, then I thought it would be the same as the first one. It turns out that the shape is the same, sir, then I cut each rib, sir, to form a grid of cubes, not thinking about the shape of the pattern of the cube nets. The important thing is to make cube nets," SR2's statement stated that the subject had performed a recognition action and a building-with action where in addition to the subject realizing that he needed the concept of a cube to solve a new problem situation, the subject also expressed it by slicing some ribs on the cube. So that when it is opened and laid down on a flat plane, it will form a flat shape that forms cube nets. In the activity of constructing the nets of the second plain cube, the same as in the activity of constructing the nets of the first plain, because in constructing the nets of plain cubes, the two subjects did not try to find and think about how to find the nets of the cube as desired, but only sliced in a different way arbitrarily and without taking into account the direction of the slices so that it can be concluded that in constructing the nets of plain cubes, both SR2 only perform recognition and building-with actions because SR2 does not solve the problem by generalizing the concept of a cube and also does not form and develop new knowledge in making net patterns of cube net based on the concept of the cube and previous knowledge.

Furthermore, in the second, fourth, fifth, sixth, eighth to fourteenth cubes, SR2 did not think about the shape or pattern of the desired cube nets because they had realized that the cube nets that could be produced were different, but because they felt that the cubes provided in the basket were very large. SR1 made most of the cube models with various colour motifs as his test material to find various patterns of cube nets, as previously believed. So that the activity of constructing the second, fourth, fifth, sixth, eighth to fourteenth plain cube nets after triangulation, it can be concluded that there is no epistemic action construction because SR2 does not solve the problem by generalizing the concept of a cube and does not form and develop new knowledge in making patterns cube nets are based on the concept of cubes and previous knowledge but construct the cube nets arbitrarily as a test in order to be able to think about and find as many patterns of cube nets as possible

In constructing nets of plain cubes, SR2 grumbled while constructing nets of the third and seventh plain cubes. Based on the interview, SR2 explained that he felt anxious that the cube nets he made were not what he wanted, but the cube nets' pattern was the same as before, even though SR2 had already thought about the desired direction and pattern. Based on this, the researcher feels confident that in constructing the nets of the third and seventh plain cubes, SR2 performs a complete and tiered epistemic action, including recognition, building-with, and construction.

In constructing cube nets with the first colour variation, SR2 explained that he thought about the similarities between the plain cube model and the cube model with colour variations. Armed with previous knowledge and the colours of the colour cube model, SR2 determines the base and roof where red is the roof and blue is the base, then proceeds to cut the cube model to form nets. SR2's answer shows that in constructing the nets of the first colour cube, SR2 has realized the need for the concept of a cube to solve the given new problem situation; SR2 simplifies the problems encountered into a more concise form by determining the base and roof of the cube based on the colour of the cube model; and SR2 also expresses by slicing the ribs on the cube so that when it is opened and laid down on a flat plane, it will form a flat shape that forms cube nets. Therefore, from SR2's answer, it is quite clear that in constructing cube nets with colour variations, the first and second epistemic actions are performed, namely recognition actions and building-with actions. To be sure, the researcher asked about the confidence of SR2 in constructing the nets of the first colour cube. SR2 stated that he felt confident and confident with the cube nets he made because he checked again by folding back and confirming the position of the predetermined colour. SR2 also explained that he knows the number of cube nets with eleven different patterns; therefore, SR2 slices very carefully and considers the direction of the slices. This strengthens the researcher that in constructing the nets of the first colour cube, recognition and building-with actions and construction actions.

In constructing cube nets with the second colour variation, SR2 constructs cube nets with a time of 1 minute 50 seconds where the time is not much different from the time used by the previous SR2. This shows that SR2 understands the problem better than before. In the interview activity, SR2 also stated that in constructing cube nets with a second colour variation, he followed the steps in the previous activity, which means that SR2 realized the need for the concept of a cube to solve the given new problem situation, SR2 simplified the problem into a concise form by determining the base. In addition, the roof of the cube based on the color it has, SR2 expresses by slicing some of the ribs on the cube so that when it is opened and laid down on a flat plane it will form a flat shape that forms cube nets, SR2 folds back the cube nets with various colors to form a cube, SR2 actively utilizes and applies the concept of a cube, the elements contained in the cube and other knowledge about the cube to obtain other cube net patterns on a cube with a variety of color motifs, SR2 solves problems by generalizing the concept of a cube, SR2 forms and expands Find new knowledge in making cube net patterns with color variations based on previous knowledge where these things in epistemic action are complete and tiered epistemic actions which include recognition, building-with and construction.

To increase confidence, the SR2 researcher also stated that he observed continuously by comparing the cube nets that had been made with cube nets that were in the process of slicing in order to get different patterns so that the researchers felt confident that in constructing cube nets with variations first colour SR2 complete and tiered epistemic action that includes recognition, building-with and construction.

In the activity of constructing cube nets with the third to fourteenth color variations, SR2 confidently constructs cube nets and constructs cube nets with relatively the same time, which is between 1 minute to 2 minutes for each cube net. SR2 also states that the method used to construct the cube nets with the third to the fourteenth colour variations is the same as when constructing the cube nets with the second colour variation. SR2 stated that the process is observing first, remembering and paying attention to the shape of the previous cube nets and then making different patterns so that it can be concluded that constructing cube nets with the third to fourteenth colour variations is the same as in the activity of constructing nets. The first and second colour variation cubes perform complete and tiered epistemic actions, namely recognition, building-with and construction.

From high self-confidence and SR2's confidence in constructing cube nets, SR2 can make different patterns on cube nets with more colour variations, which is ten pieces compared to when constructing plain cube nets that only get three different patterns of cube nets.

Interpretation of SR2's interview data in the third session shows that SR2 constructs cube nets with variations of the first to fourteenth domino motifs with a time of 21 minutes where the time required to make each cube net with variations of domino motifs is 1 minute to 2 minutes. SR2 stated that he constructed cube nets with variations of the domino motif as a whole, constructing it almost the same way as the activity in constructing cube nets with colour variations where SR2 observed first, then in slicing the cube model, remember and pay attention. The direction of the slices and the shape of the nets of the previous cubes. A cube with a variation of the SR2 domino motif also determines the base and roof on the cube model by considering the domino motif on its side, where each side facing must be seven. Based on SR2's answer, it can be interpreted that in constructing cube nets with variations of domino motifs, SR2 realizes the need for the concept of a cube to solve the given new problem situation, namely constructing cube nets with variations of domino motifs, SR2 expresses by slicing several ribs on the cube so that when it is opened and laid down on a flat plane, it will form a flat shape that forms cube nets and refold the cube nets with variations of domino motifs to form a cube, SR2 actively utilizes and applies the cube concept, the elements contained in the cube. Cubes and other knowledge about cubes to get other cube net patterns on cubes with variations of domino motifs, SR2 solves problems by generalizing the concept of cubes and SR2 forms knowledge and develops new knowledge in making net cube patterns with variations i domino motif based on previous knowledge. Based on the interpretation of the data, it can be concluded that in constructing cube nets with variations of the first to the fourteenth domino motif, SR2 performs a complete and tiered epistemic action where the epistemic action performed by SR2 includes recognition, building-with and construction.

In the activity of constructing plain cube nets, SR2 found three cube nets with different patterns. In the cube nets with colour variations, ten cube nets with different patterns were found in the activity of constructing cube nets with variations. The SR2 domino motif found as many as 11 cube nets with different patterns. This means that SR2 continues to form and develop new knowledge in making net cube patterns in each activity until SR2 finds more cube net patterns than before.

Discussion

The epistemic action carried out by SR1 in constructing plain cube nets has similarities with the activity of constructing cube nets with variations of domino motifs. Where the epistemic action that occurs in the activity of constructing the first to twelfth cube nets on plain cube nets uses two epistemic actions, namely recognition and building-with, as well as what occurs in the activity of constructing the first to eleventh cube nets. cubes with variations of domino motifs only use two epistemic actions, namely recognition and building-with. This is because SR1 cannot remember clearly previous knowledge about learning about cubes and also cannot remember previous activities. SR1 also experienced errors in compiling the pattern of cube nets desired by Thissen et al. (2018). Meanwhile, the thirteenth to fourteenth plain cube nets and cube nets with variations of the twelfth to fourteenth domino motif use complete, tiered epistemic actions that are interrelated with each other, namely recognition, building-with and construction (Dreyfus, 2015; Dreyfus et al., 2007; Gray, 2007; Hassan & Mitchelmore, 2006; Hershkowitz, 2001; Hershkowitz et al., 2007; Mitchelmore & White, 2007; Nurhasanah et al., 2017; Sümen, 2019).

In the activity of constructing cube nets with colour variations, there are different plots where the epistemic action that occurs in the activity of constructing cube nets with colour variations from the first to the fourteenth SR1 only uses epistemic action recognition and building-with

In the activity of constructing plain cube nets, SR2 found three cube nets with different patterns; in the cube nets with colour variations found ten cube nets with different patterns and in the activity of constructing cube nets with variations The SR2 domino motif found as many as 11 cube nets with different patterns. This means that SR2 continues to form and develop new knowledge in making net cube patterns in each activity until SR2 finds more cube net patterns than before. However, based on the interview above, the subject also experienced difficulties were to producing different patterns of SR2; one had to be careful in slicing, remembering well and always paying attention to the previous slices (Battista, 1999; Pitta-Pantazi & Christou, 2010; Shiakalli et al., 2015; Thissen et al., 2018; Yurt & Tünkler, 2016); Sahrudin et al., 2021. While in the activity of constructing nets with variations in colour and motifs of domino SR2, it produces cube nets with more different patterns, namely ten patterns each and 11 patterns of cube nets and based on the interpretation of the data above; it shows that in constructing the nets, cube nets with colour variations and domino motifs from the first to the fourteenth, SR2 performs complete, tiered and interrelated epistemic actions where the epistemic actions carried out by SR2 include recognition, building-with and construction (Dreyfus, 2015; Dreyfus et al., 2007; Gray, 2007; Hassan & Mitchelmore, 2006; Hershkowitz, 2001; Hershkowitz et al., 2007; Mitchelmore & White, 2007; Nurhasanah et al., 2017; Sümen, 2019).

Conclusion

Based on the results of the research above, the epistemic actions carried out by SR1 in constructing cube nets can be concluded as follows:

1. In the activity of constructing the first to twelfth plain cube nets, the epistemic actions performed by SR1 were recognition and building-with;
2. In the activity of constructing the thirteenth and fourteenth plain cube nets, the epistemic action carried out by SR1 was a complete epistemic action in stages and related to each other, which included recognition action, building-with action and construction action;
3. In the activity of constructing cube nets with the first to fourteen colour variations, SR1 performed epistemic actions, referred to as recognition and building-with;
4. In the activity of constructing cube nets with variations of the first domino motif to the eleven epistemic actions that occurred, referred to as recognition and building-with; and
5. In constructing cube nets with variations of the twelfth to fourteenth domino motif, SR1's epistemic action is a complete and tiered epistemic action that includes recognition, building-with, and construction action.

Meanwhile, the epistemic actions taken by SR2 in constructing cube nets can be concluded as follows:

1. In the activities of constructing the first, second, fourth, fifth, sixth, eighth to fourteenth plain cube nets, the epistemic actions carried out by SR2 were recognition actions and building-with actions;
2. In the activity of constructing the third and seventh plain cube nets, the epistemic action carried out by SR2 is a complete and tiered epistemic action which includes recognition action, building-with action and construction action;
3. In the activity of constructing cube nets with the first to fourteen colour variations, SR2's epistemic action is a complete and tiered epistemic action which includes recognition action, building-with action and construction action;
4. In the activity of constructing cube nets with variations of the first domino motif to the fourteenth epistemic actions carried out by SR2 are complete and tiered epistemic actions which include recognition actions, building-with actions and construction actions;

Overall, the subjects' epistemic actions were different, where SR1 constructed cube nets using two epistemic actions, referred to as recognition and building-with. Meanwhile, SR2 constructs cube nets using tiered and interrelated epistemic actions, including recognition, building-with, and construction. This study is limited to subjects with low spatial ability, so further research is needed on epistemic actions in subjects with moderate spatial abilities and high spatial abilities.

Recommendations

This epistemic action research was conducted on junior high school students with low spatial ability. So, it is necessary to do further research on abstraction epistemic action in junior high school students with middle spatial ability and junior high school students with high spatial ability. The epistemic action research in constructing cube nets also needs to be reviewed based on the gender of the students so that the description of the abstraction in context epistemic action is more complete.

Limitations

This study is limited to subjects with low spatial ability so that further research is needed on epistemic actions that occur in subjects with moderate spatial abilities and subjects with high spatial abilities.

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