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Analysis Ability Representation Mathematical Student

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ABSTRACT

Study This aim For analyze ability representation mathematical students on the material get up flat rectangular . Subject consists of 30 students class VII at Darul Ma'arif Middle School Indramayu is one of them schools in the district Indramayu . Data collection through 2 questions description . Analysis techniques used For processing and analyzing data , namely results answer student classified based on indicator ability representation mathematically , then researcher count percentage from each indicators and summing up the average percentage from whole indicator For know level ability representation mathematical student . The results of data analysis show that ability representation mathematical student class VIII overall in the category currently . Based on level ability representation mathematical show that student with category low with percentage 20% only fulfil One indicator ie ability representation picture , students with category currently with the percentage of 57% meets two indicators that is representation images and symbols , whereas student with category tall with percentage of 23% capable meet two indicators ie ability representation mathematical images , verbal, and symbols

Keywords: ability representation mathematically , wake up flat rectangular

INTRODUCTION

Mathematics is one of knowledge knowledge that has role important in life human , where concepts is inside mathematics consists from the simplest to the most complex , systematic , logical and hierarchical (Salim Nahdi & Gilar Jatisunda, 2020).

There are many problems in life that can occur resolved with mathematics and being base for other sciences such as physics , chemistry , medicine , economics , accounting , as well as knowledge knowledge others (Tri Wijayanti & Sutiarso, 2019). With Study mathematics , expected student capable think critical and skilled counting as well as own ability in apply draft base mathematics in other subjects as well as in mathematics That alone and deep life daily . Math is mandatory lessons taught to everyone level school . This matter clarified in Republic of Indonesia Law no. 20 of 2003 Concerning National Education System Article 37 confirms that mathematics is one of eye lesson must for students at level education elementary and intermediate .

With So , science mathematics very important For studied To use makes it easier in learn sciences other . In line with matter Accordingly , there are five learning process standards math is a must mastered participant educate namely (1) Learning For solve problem mathematics ; (2) Study

For reasoning and evidence ; (3) Study For communicate ; (4) Study For linking ideas; and (5) Study For present (Nasution, 2018).

Representation Actually No show to results or realized product in configuration or construct new and different , but the thought process that is carried out For can uncover and understand concepts , operations , and relationships math from something configuration . That is , the representation process math taking place in two stages that is internally and externally. Mathematics of course it's not eye lessons that are easy to understand .

For That very important give provision ability mathematics to students in learning mathematics . Mathematics in life real likened like A islands separated by a river , for until to island the needed A bridge, and representation role as bridge the For connect draft mathematics abstract with context life daily (Mulyadi & Fiangga, 2022). The National Council of Teacher Mathematics (NCTM) in the book Principles and Standards for School Mathematics explains that mathematical representation skills are one of the five standard abilities that students must have in learning mathematics (C. W. Midgett & Eddins, 2001). Representation is a crucial skill for students learning mathematics, as it is one of the mathematical processes defined in the primary school mathematics curriculum, along with problem- solving, reasoning and proof, and communication. Therefore, in mathematics lessons, teachers are expected to guide students to integrate meanings across verbal, visual-spatial, embodied, and symbolic representations (Cilingir altiner & Onal, 2023).

Students' mathematical abilities can be formed using relevant learning approaches (Marzuki et al., 2021; Nurjanah et al., 2020). Through strategy and the appropriate guidance, students can get out of the problem in an effort to master mathematical concepts(Pramata Sari & Rosjanuardi, 2018). For makes it easier student in finish question required model or more shape simple For represent problem in question the,model That called representation (Rahmawati et al., 2017). Representation in some models is essential to identify the meaning of symbols and see how students understand them (Novita et al., 2022). Mathematical representation includes the process of transforming problems or ideas into new forms, including changing pictures or physical models into symbols, words, or sentences that can facilitate students in solving mathematical problems(Ridho et al., 2023).

Ability representation Mathematics is very important in finish problem mathematics . (Khairunnisak et al., 2021). The appropriate problem representation is the basic way in order to understand the problem itself and make a plan to solve it (Surya et al., 2013). Representation divided into two , namely internal representation and representation external . Internal representation is originating representation from in mind , it's hard For observed in a way direct Because That is a person's metal activity in his mind , used For define meaning mathematics . Whereas representation

external is results manifestations presented in form symbolic like form pictures , diagrams, tables, graphs , writing, words and symbols mathematics (Goldin, 2020).

Representation external shared become three namely : 1) verbal representation , namely stated representation in writing or verbal , 2) visual representation ie representation form pictures , diagrams or graphs , tables as well as a number of mutual things related , 3) representation symbolic that is consisting representation from numbers , signs operation and connection , symbols algebra and some mutual things relate (C. Midgett & Eddins, 2001). All That need role from all element both teachers , parents , participants education , school , etc government . The math teacher is very giving great contribution in build participant learn at school (Rasilah et al., 2021). Mathematical representation standards set by NCTM consist of, 1) creating and using representations to organize, record, and communicate mathematical ideas; 2) select, apply, and translate mathematical representations to solve problems; and 3) using representations to model and interpret physical, social and mathematical phenomena(Ridho et al., 2023). In line with That results study show that learning based problems developed integrating augmented reality enhances ability representation mathematical student with contribution effective respectively 82.6 % and 84.4%(Rahmasari & Kuswanto, 2023).

Luitel(Luitel, 2002.) differentiate role representation in 7 kinds
as following :

a. Representation as tool communication (source of communication)
   In the mathematics , communication is very vital thing for success learning . By general , mathematics can seen as something Language . In terms of this is a representation of mathematical ideas is tool communicate in mathematics as the words in Work Language .
b. Representation as indicator attitude student to mathematics (indicator of students' attitude)
   Students who feel No understand or No Can slow gradually will have attitude No like mathematics . On the other hand , students can will motivated For Keep going Study mathematics .
c. Representation as proof from understanding mathematics students (evidence of probing understanding of learning)
   Capable students represent something draft Good in form object concrete , image or symbolic show understanding to something draft the .
d. Representation as tool liaison between concepts (means of establishing links between the concept)
   Representation it's not entity single from something , but are a variety of ideas from relations expression mathematics , concepts and principles . More further , representation help visualize relationships between concepts

e. Representation as an existing development process in continuum procedural – conceptual (developmental process that exists in procedural-conceptual continuum)

Information stored implicit in brain shaped internal representation . Information the saved through an iterative process called the redescription process . Redescription process taking place in three phases , namely : procedural , meta procedural and conceptual . In phase procedural , students more Results oriented and demonstrated performance algorithm they . In the procedural meta phase , as example interpretation from algorithms and rationalization from procedure the . In phase conceptual , students show control on continuum external - internal where representation arranged in students' mental networks .

f. Representation as tool overcome obstacle cognitive (means of overcoming cognitive obstacles)

Obstacle cognitive happen when knowledge possessed in system cognitive No capable face problems new , where knowledge student the No Enough

and difficult For adapted . Obstacles the can overcome through increase strength system representational or connect systems representational between

One each other.

g. Representation as part from the process or tool constructing mathematical ideas (part of process or means of constructing mathematical ideas)

System representation can help develop categories and sub-sub categories of the ideas represented student .

Representation mathematical students in Geometry material get up flat rectangle long is a necessary study studied (Hadi, 2018). Analysis representation mathematical student to material get up flat rectangular is aspect important in understand to what extent are the students control draft base geometry Quadrilateral , as one form get up flat , covering various type like square , square long , straight parallelogram , rhombus , trapezoid , and kite . Analysis This covers How student interpret , draw , calculate , and apply traits rectangular in various context . First , deep matter depiction , students often experience difficulty in draw get up rectangular with angle and length right side .

Many students still do need guidance in use tool help like ruler and arc degrees For ensure that picture they accurate (Van de Walle et al., 2019). For example , in draw square , some student Possible make error with No guard similarity long side or straightness corner . This shows that student need introduced more intensive on principles First , still Lots students who do error in counting like perimeter , area , or diagonal of a square.

The first background factor matter This is lack of understanding base . For example , students often confused with formula area (side x side) and perimeter (4 x side) of a square moment must count wide rectangle . Error This show necessity more learning structured and focused on things base before switch to application formula . Apply draft question facet four in life everyday also becomes weakness other . For example , when given question real like determine amount required tiles For cover floor shaped rectangle long , student Possible experience difficulty in change Verbal questions become mathematical models and apply the right formula .

In this case , approach contextual and solving very important issue For increase competence student . Additionally , use technology like device soft geometry dynamic (eg Geogebra) will help student understand draft facet four . Tools This possible student For manipulate pictures and so on direct visualize relationships and traits are revealed . Learning interactive sort of That can become powerful way for student For increase understanding geometry they wake up flat . For face various challenge , teachers can use some strategies. Approach based investigation where students requested For create a faceted model four and perfect its properties can be very effective . Additionally , assessment process based like request student For explain steps they in solve problem can give more insight deep about error in thinking and problem areas .

On analysis overall , representation mathematics student in subject facet four will need approach integrated between theory and practice as well as use technology supporter For create more learning comprehensive . Skills Improved base and usage tool effective help still walk fluent so that student can understand and apply draft facet four with more okay.asar geometry , like How use tool gauge in a way effective. Second , deep interpretation traits quadrilateral , often seen that student understand draft base but experience confusion moment must stated it formally . For example , concept that the diagonal on the square long is The same long , or that the diagonals in a rhombus are mutual intersect upright straight but No The same long . Ability student For state traits This in forms of words or symbol mathematical need more understanding in - depth and repetitive practice .

Learning mathematics No only focus on the answer Correct as product , but rather must focuses on the process (Matematis et al., 2021). By simple , when a process is carried out with good and right , then will obtained results or good and correct product too . Likewise inside learning mathematics . Mathematics it's not just knowledge counting . Especially in learning mathematics , at level school whatever , no Enough only teach student For answer

Correct A question or problem mathematics . According to NCTM (Council of Teachers of Mathematics, 2000), the process in question in learning mathematics differentiated into five process standards , namely ability solution problem , ability reasoning and proof , ability communication , ability connections and capabilities representation . These five processes Actually must can facilitated in every topic learning mathematics Because each other relate between One with other . So that learning mathematics can understood by students in a way more meaningful . This becomes indicator ability student that when student experience difficulty in understand or finish problem math , the odds is there is still a mathematical process Not yet growing deep mind child the . Understanding maximum mathematics can happen if fifth this process standard owned by the child and able For always develop it .

In finishing problem math , important for teachers to own attitude give help to students to order them can carry out mathematical processes with Good . Rivera (2014) suggests that teachers must help child in matter coordinating two actions , viz action on process and action on translation . Processing action involve drawing and diagramming and creating table showing How they looking connection in something problem . Whereas action on translation involve conversion action processing in form correct mathematics .

However based on results observations and interviews (Rasilah, 2020), Mathematics Teacher at NU Darul Ma'arif Middle School is known that No A little easy student give up moment faced with question math is not The same with what the teacher has exemplified , in part big student more choose For wait Friend or the teacher does the work and explains method finish question that , rather than have to try For find and solve it Alone . Then from results observations were also found student seldom very discuss about material or medium lesson or will learned , them tend discuss or chat about something else outside material lesson . Condition This showing that at NU Darul Ma'arif Middle School student own representation low mathematics . Problem the must quick searching for the solution . One of way that can be what the teacher does is with improve the learning process in the classroom and provide approach learning that can be done help student active in Study .

RESEARCH METHODS

Method used in study This is descriptive quantitative . Study with explanation qualitative , use instrument interview For dig understanding , analysis the data use percentage , whereas explanation qualitative explain something to learn What it is , and interesting conclusion from phenomena that can observed in context life real (Mumpuniarti et al., 2023). Data collection was carried out at NU Darul Ma'arif Middle School Kaplongan Regency Indramayu in July 2024. Subject in taking student data class VIII of NU Darul Ma'arif Middle School Kaplongan Regency Indramayu . Instruments used question material get up flat quadrangles , interviews and documentation .

Researcher take three subject covers One student capable high , one student capable medium and one student capable low . Consideration election subject the based on interviews conducted researcher to mathematics teachers class VIII of NU Darul Ma'arif Middle School Kaplongan Regency Indramayu Whereas question in study This that is use material get up flat rectangular .

Steps research used in implementation study This that is make instrument with modify question study in accordance with life real . Then containing instrument indicator ability question , consisting of 2 questions with use material around get up flat quadrilateral , problem Already validated and tested to class already learn material the . Indicator The questions developed have a purpose For analyze representation mathematics used student . Researcher collect data for analyzed , processed based on results processing students on instruments question test ability representation mathematical For get conclusion from results processing instrument . Subject in study This is 30 students School Intermediate First (SMP) type sex women who have ability representation different .

For measure ability representation mathematics possessed by students , researchers analyze each one answers given by students in accordance with indicator ability representation according to Villegas (Castro et al., 2009). Following indicator ability representation according to Villegas.

Table 1. Indicators Study Ability Representation Mathematical

Ability Representation	Indicator
Verbal Representation	1. Serve return information in form of words 2. Answer questions use steps solution use writing or words 3. The student verbalizes the problem, changing some words for others from his usual style of talk.
Image Representation	1.The student draws a pictorial representation with pencil and paper, or modifies such representations made earlier. 2.The student operates with pictorial representations. 3.The student points to or observes a pictorial representation, or verbalizes terms associated with pictorial representations.
Representation Symbol	1.The student solves or tries to solve a symbolic expression with paper and pencil. 2.The student verbalizes how he can solve an equation, or checks how it was solved. 3.The student modifies, re-writes or eliminates a symbolic expressions. 4.The student observes or points to a symbolic expression .

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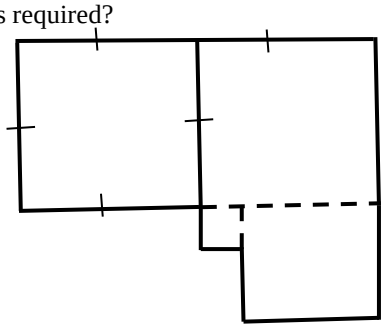
Table 2. Test Questions Ability Representation Mathematical

No	Indicator Ability	Representation Matters Mathematical
1	Verbal Representation	My father has a plot of land consisting of 4 pieces square. Area area of two squares shown in the picture namely 100cm ^{2} and 49 cm ^{2}. The plot of land will have a wire fence around it. The price of one roll of wire with a length of 8 meters is IDR 240,000. Calculate the costs required? 100 cm ^{2} 49 cm ^{2} 
2	Image Representation	Mr Rudi got it project make field football shaped rectangle long with size 60 m wide and 100 m long . For lighting match football all around him will installed light . If every corner field will installed One light with distance 2 meters as point beginning installation lights and every 8 meters are installed One lamp .. Price of one lamp Rp. 1,000,000. How many Amount lights and costs required ?

Guidelines scoring used as reference For give score on each indicator question about ability representation mathematically , then required criteria guidelines scoring For obtain results data instrument tests on students is as following :

Table 3. Guidelines Scoring Test

Indicator	Score	Information
Verbal Representation	3	Write explanation in a way logical , correct , and complete
	2	Write explanation in a way logical , correct , however No complete or write explanation in a way logical , complete , however No Correct
	1	Write explain However No logical
	0	Doesn't give answer or show incomprehension to draft
Image Representation	3	Make picture in a way complete and correct
	2	Make picture in a way complete However Still There is error
	1	Make picture However No complete
	0	Doesn't give answer or show incomprehension to draft

Deep data analysis techniques study this , with method analyze results instrument test on each results answer students , then classified based on indicator ability representation mathematician , researcher calculating the average, calculating percentage from each indicators and conclude Overall , purposeful For know level ability representation mathematics on each student . Researcher calculate and analyze use formula percentage . For find the class average obtained from amount all over score student shared many amount student (Hardianty et al., 2020). Study look for average value using formula percentage as following :

$$R \text{ ata} - \text{average} = \frac{Jumlah\ skor\ seluruh\ siswa}{jumlah\ siswa}$$

Then results score percentage with divide the obtained average with ideal score then multiplied by 100% as following :

$$Persentase = \frac{Rata - rata\ yang\ diperoleh}{Skor\ ideal} \text{x } 100\ \%$$

RESULTS AND DISCUSSION

Results

Study This aim For know ability representation mathematical student class VIII in learning mathematics on the material get up square four . From the data collection that has been done , then results data obtained test representation mathematical student as following :

Table 4. Test Results Ability Representation Mathematical

Amount Student	Minimum Score	Maximum Score	Average	Percentage	Standard Deviation
30	2	6	2.76	46.33	1.48

Based on table 4 is visible that score maximum student of 6 and the student's minimum score of 2 of score overall ideal maximum question namely 6. From the results calculation add up all score Then shared with Lots students who become sample in research , an average of 2.76 was obtained score ideal maximum 6, with percentage 46.33%. From the percentage of the average score student can said that ability representation mathematical student class VIII already Enough high , because has more from half amount student capable do test representation mathematical with good and right . Next , score data student the categorized as become three group that is high , medium and low . For categorize level ability representation mathematical students , researchers use steps according to Arikunto in (Amieny & Firmansyah, 2021) , namely based on average and standard scores deviation .

Table 5. Ability Level categories Representation mathematical Student

Value Criteria	**Category**	**Amount Student**
X < 1.28	Low	6
1.28 ≤ X < 4.24	Currently	17
4.24 ≤	Tall	7

Based on the data shows level ability representation mathematical student categorized currently matter This Can proven from results test representation mathematics carried out by researchers against 30 students as sample . Students who are on category low as many as 6 students (20%), students who are in the category currently as many as 17 students (57%), and students who are in the category tall as many as 7 students (23%). Percentage biggest is in the category currently that is amounting to 57% consisting of 17 students with score between 1.28 and 4.24 of score ideal maximum 6. Many students are in the category currently seen as in the table below this showing student Already understand and that's it have ability representation mathematical For answer questions representation .

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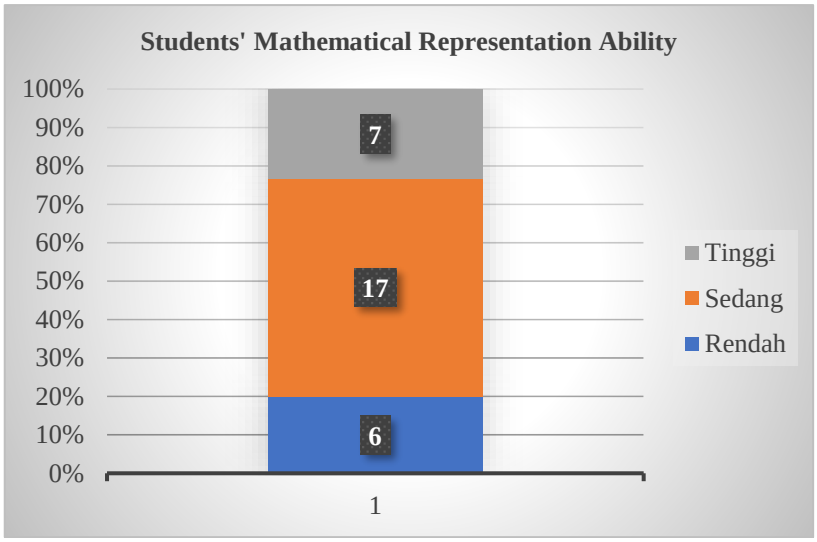


Comparison **Image** Ability Representation Mathematical Student

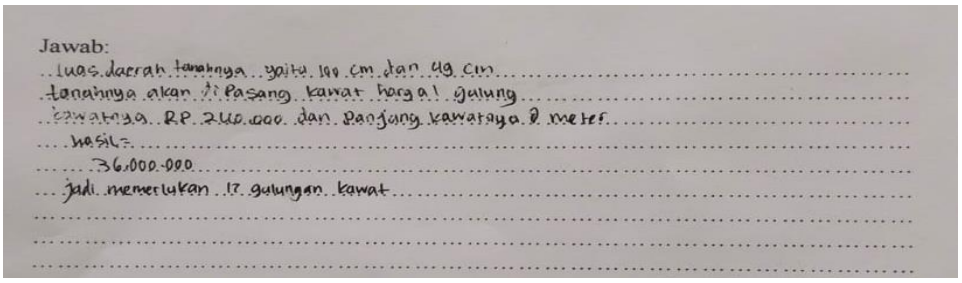
There are three criteria in ability representation , namely (1) creating as well as use For grouping , writing and communicating mathematical ideas . (2) choosing , using and interpreting between representation To use solve problems and criteria . (3) wear representation To use create models and interpret symptom mathematical , physical , and social . Study This aim For know ability representation mathematical student class VIII in junior high school learning mathematics on the material get up flat rectangular . Based on results answer students on the question material get up flat quadrilateral , ability representation student category tall if capable meets 3 types representation on the questions given with Correct if ability representation student category currently if meets 2 types representation , and ability representation student category low If only fulfil One type representation . Type representation the covers ability verbal representation , ability representation symbolic , and ability visual representation .

Discussion

Research process done with give question story mathematics with material get up flat rectangular to subject . After that , researcher do analysis answer student For know representation mathematics used in finish question story the . Following is code subject in study This .

a. Verbal Representation

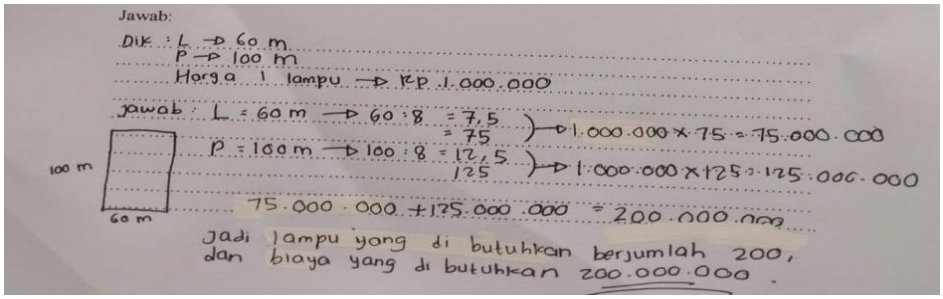
Answer sheet students showing ability representation student in The verbal form is in question number one .



Based on answer AM students get score 1 in answer question . AM students try use verbal representation for understand question , student AM answered No

in accordance that is No write step For count around square 4 pieces rectangle but AM students write return information on the question , command on the question student ordered look for around with method write steps For count around wake up rectangle . Answer sheet ZNA students already capable give form representation use the words to make steps solution question get up flat but No complete , at the end completion , ZNA students create conclusion from the answer given . For answer ZNA students still not enough appropriate in understand and answer That seen from the answer is no structured and wrong inside understanding draft get up flat rectangular . and ZNA students were given value 2. Additionally there are also students No Can answer question The same once , that is showing he experience difficulty in understand information on the question , on the sheet he answered Still clean showing that student That Not yet Can elicits indicators of verbal representation and is given value 0.

b. Visual Representation .



ZAK students use representation visuals for understand question , that is with method make picture rectangle long , make steps solution matter , however from the answer Still seen happen error in understand objective from question with use picture . Based on answer ZAK students get value 1 in answer question rivet get up flat facet four are applied in field football , ZAK students experience difficulty in understand information from question so that ZAK students yet Can bring up indicator fdeep visual representation finish question get up flat , that is seen from answer Already make steps solution question with use picture But Not yet exactly , but use the words as answer . There are not enough ZAK students understand information and lack thorough .

Table 6 Table of Average Capabilities Representation mathematical each question

Indicator Representation	Maximum Score	Average	Amount student	Percentage %	Category
Verbal Representation	3	1.30	4	6.67	Low
			24	76.66	Currently
			2	13.33	Tall
			2	6.67	Low

Visual representation	3	1.46	23	80	Currently
			5	16.67	Tall

On research this will be it two indicators are discussed ability representation mathematical that is indicator visual representation and indicators verbal representation . Based on data from Table 6, it is known that of the 30 students who worked on it question with indicator Verbal representation data obtained from 4 students categorized low (6.67%), students are categorized currently as many as 24 students (80%) while categorized students tall as many as 2 students (13.33%) were categorized low in indicator verbal representation of 4 students of this data obtained from calculation sheet answer students , maximum ideal score of every indicator in study This is 3 and all indicator own item question as much One item .

From the results analysis of the data obtained score highest ability representation mathematical student located on the indicator visual representation with a mean of 1.46 of score maximum 3 (80%) means student Already capable finish problem mathematics use representation picture . This result in line with results findings study previous ability representation , and disposition mathematical contribute in a way significant to performance Study mathematics student class XI Science in the Regency Manggarai , okay in a way direct nor No straight away , big contribution ability connections and capabilities representation to disposition mathematical is 83.7%.(Mandur et al., 2013) Then strengthened with results research that states ability representation you have help student For interpret what 's there in his mind So that what the students said can understood through the interpretation he makes , ability representation student become reject measuring success in Study mathematics , Increasingly Lots representation internally that can represented in a way external , increasingly strong ability representation of that person (Hijriani et al., 2018). Findings That In line with the opinion of Van de Walle, Karp, & Bay-Williams , namely strengthen ability For moving between and between representation This increase comprehension and retention student (Van de Walle et al., 2019)

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CONCLUSIONS

Based on results research and discussion analysis Ability representation mathematical in a way whole classified currently with level ability representation mathematical of 30 students in class VIII of NU Ma'arif Middle School based on score results test representation mathematical showing there are 6 students are in the category ability representation low with percentage of 20%, as many as 17 students are in the category capable representation currently with percentage 57% and 7 students are in the category capable representation tall with percentage 23%.

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