Representation Of Mathematics Expression Of Civil Engineering Students In Solving HOTS Problems

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ABSTRACT

The ability of students to represent mathematical expressions related to HOTS problems is still not good. This study aims to describe the representation of the mathematical expression of students in solving HOTS problems. This type of descriptive research using a qualitative approach in terms of aspects of the representation of mathematical expressions. The subjects of this study were 17 Civil Engineering students who were taking lectures in the academic year 2018/2019. The data collection technique in this research is the test item description. The instrument used was in the form of a test sheet. Data analysis was carried out through three stages: data reduction, data presentation, and conclusion drawing. The results showed that students could involve mathematical symbols correctly and appropriately in each stage of solving HOTS analysis type questions. Students can present other mathematical representations into mathematical expression representations and involve mathematical symbols correctly and appropriately in each stage of HOTS problem solving, both Evaluation type and Creating type. The ability of students to represent mathematical expressions related to HOTS problems is still not good. This study aims to describe the representation of the mathematical expression of students in solving HOTS problems. This type of descriptive research using a qualitative approach in terms of aspects of the representation of mathematical expressions. The subjects of this study were 17 Civil Engineering students who were taking lectures in the academic year 2018/2019. The data collection technique in this research is the test item description. The instrument used was in the form of a test sheet. Data analysis was carried out through three stages: data reduction, data presentation, and conclusion drawing. The results showed that students could involve mathematical symbols correctly and appropriately in each stage of solving HOTS analysis type questions. Students can present other mathematical representations into mathematical expression representations and involve mathematical symbols correctly and appropriately in each stage of HOTS problem solving, both Evaluation type and Creating type.

Keywords: Mathematical Representation, HOTS, Civil Engineering

INTRODUCTION

Mathematics is the subject of all disciplines of science and the key to science. Mathematics has an important role to encompassall fields of science. One of the important roles of mathematics is in the world of education so that mathematics learning is involved in all levels of education in Indonesia ranging from elementary schools to tertiary institutions (Rachmayani, 2014 : 14). Mathematical learning is identical with calculation, measurement, space construction, logic, theorem, lemma and proof.. (Dari, 2016 : 18). Mathematics is formed from solid symbolsmeanings and are international, symbols in mathematics are written briefly but have broad meanings (Sabirin, 2014).

Symbols in mathematics are used in various materials, for example, trigonometry, algebra, sets, calculus, geometry, statistics and logarithms. Symbols in mathematics are classified based on their use, among others: operations symbols, grouping symbols, relation symbols, fractional symbols, symbols in geometry, symbols in probability and statistics theory, symbols in calculus, and symbols in logic and sets (Sumardyono, 2012 : 1). The combination of symbols in mathematics forms a mathematical expression. Mathematical expression is to state a problem or event in daily lifewhich is interpreted in the form of a mathematical model language (Hodiyanto, 2017 : 13). Students must have the ability to represent mathematical expressions well, to know how a mathematical idea is represented and so that the idea is easily understood (Astuti, 2017 : 72). Representation has a very important role in mathematics, among others: facilitate in understanding the material, improve cognitive abilities,connecting mathematical representation and modeling in problem-solving, and anticipating misconceptions in understanding material (Rangkuti, 2014 : 115).

Representation is a form of interpretation of the results of student thinking about symbols and mathematical problems. This representation is used as a tool to find solutions to mathematics learning problems (Sabirin, 2014 : 35). Mathematical representation is grouped into 3 aspects, namely: aspects of visual representation, aspects of mathematical expressions or expressions, and words or written text. Visual aspect indicators can be recognized through diagrams, graphs, or tables, and figures. Aspects of visual representation have operational forms as follows: (1) restate data or information from a representation to representations of diagrams, graphs or tables, (2) use visual representations to solve problems, draw pictures of geometric patterns, (3) make geometrical figure drawings to clarify the problem and facilitate its solution making drawings of geometric patterns, (4) drawing geometrical figure drawings to clarify the problem and facilitate its solution. Indicators of aspects of equations or mathematical expressions can be known through symbols. The representation aspect of mathematical equations or expressions has operational forms including through making mathematical models of other given representations, making conjectures and solving problems by involving mathematical symbols. Indicator Aspects of written words or texts can be identified through written text . (Apriani, 2016 : 17 ; Syafri, 2017 : 49) There is a mathematical representation that is classified into 2 namely: internal representation and external representation. Internal representations relating to mental configurations are related to thinking about mathematical ideas that are applied in the form of external representations. Mental configuration can be seen based on its external representation in various forms, including: written text, concrete objects, through writing symbols, pictures, graphics, tables or props (Dewi, Saragih, & Khairani, 2017).

The ability of representation is needed by students not only in solving low order thinking skill (LOTS) questions but also on high order thinking skill (HOTS) questions (Nuragni, 2018 : 1). HOTS is a measurement instrument used to measure the ability to think at a high level, which is not just to remember, restate or refer without processing (Kemendikbud, 2017 : 4). Indicators about HOTS are mathematical explanations, writing of mathematical symbols,

determining mathematical models, doing calculations and determining solutions (Croslie, 2019 : 16). HOTS problem aspects are grouped into 3, namely: analyzing, evaluating, and creating (Julianingsih, 2017 : 16). The aspects of analysis include: specifying aspects, checking and criticizing. Aspects of evaluating include: making your own decisions, deciding, and choosing. Aspects of creating include: creating their ideas, constructing, and developing (Afriansyah, 2018 : 257) HOTS questions in the context of assessment measure ability among other things: 1) channeling one concept to another, 2) processing and applying information, 3) looking for the relationship of various information, 4) applying the information to solve problems, and 5) examine information critically and deeply. However, HOTS-based questions do not mean more difficult questions than recall (Kemendikbud, 2017).

Based on Agung's research (2018)), it states that students experience difficulties in evaluating and creating aspects. Students have difficulty in evaluating aspects shown by the lack of more open ideas and lack of understanding of the information about the problem. Students experiencing difficulties in creating aspects are shown by their lack of creativity in constructing problems. Andhany (2018) states that the ability of mathematical expression in solving HOTS problems is still lacking. Therefore, efforts to improve the ability of mathematical expression. Amaliyah AR & Mahmud (2018) stated that students are less capable of representing mathematical expressions, the lack is found in solving geometry problems in the form of geometry patterns. Rosita, Laelasari, & Noto (2014). Therefore this study aims to describe the mathematical expressions of students in solving HOTS problems.

RESEARCH METHODS

In this study using descriptive research by using a qualitative approach in terms of aspects of representation of mathematical expressions. The subjects of this study were Civil Engineering students who were taking lectures in the 2018/2019 academic year. The data collection technique in this research is the test item description. The instrument used was in the form of a test sheet. Data analysis was carried out through three stages: data reduction, data presentation, and conclusion drawing. Data reduction was carried out by taking random test results from 17 of 48 students. Presentation of the data is done after the data reduction process is completed, at this stage, the process of clarifying data from HOTS test results is based on aspects of the ability to represent mathematical expressions. The results of the tests of the ability to represent mathematical expressions are expressed in terms of describing mathematical expressions through indicators such as: presenting other mathematical representations into mathematical expression representations and involving correct and correct mathematical symbols in solving problems. Drawing conclusions from the data collected and has been through the process of clarification so that the mathematical expression results obtained by Civil Engineering students in solving HOTS questions.

RESULTS AND DISCUSSION

In the results described about describing the representation of the mathematical expression of students in the HOTS problem. Describe the representation of mathematical expressions from 3 HOTS questions consisting of 1 type analysis problem, 1 type evaluating problem, and 1 type creating question which is viewed from the aspect of representation of an equation or mathematical expression.

Representation of Mathematical Expressions in Solving Analysis Problems

HOTS type analyzing questions are questions that require the ability of students to specify aspects, examine and criticize. Examples of HOTS type analyzing problems are shown in Figure 1.

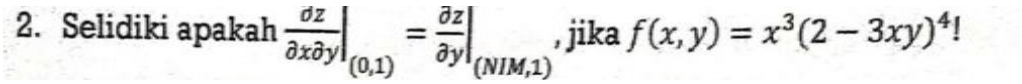

Figure 1. Example of a HOTS analysis type

The problem in Figure 1 is classified as a type of analysis problem because the student criticizes the problem indicated by the word search.The problem in Figure 1 is classified as a type of analysis problem because the student criticizes the problem indicated by the word search $\frac{\partial z}{\partial x \partial y}\Big|_{(0,1)} = \frac{\partial z}{\partial y}\Big|_{(NIM,1)}$. The question will be investigated whether. Completion to get a conclusion students conduct an investigation 2 times. The first investigation $\frac{\partial z}{\partial x \partial y}\Big|_{(0,1)}$ which is done $f(x,y) = x^3(2-3xy)^4$ by reducing to y, hen lowering again to x and substituting the value x. he second investigation is to determine the value ofhe second investigation is to determine the value of $\frac{\partial z}{\partial y}\Big|_{(4,1)}$ subjects with the last NIM of 4) by decreasing $f(x,y) = x^3(2-3xy)^4$ to y and substituting values $x = 4$ and $y = 1$. The final stage is checking whether the value $\frac{\partial z}{\partial x \partial y}\Big|_{(0,1)}$ is the same as the value $\frac{\partial z}{\partial y}\Big|_{(4,1)}$.

The results of students' answers in working on HOTS type analyzing questions are presented in Figure 2. The questions are a matter in the form of mathematical expressions, so students do not need to present other mathematical representations into mathematical expression representations. Students involve mathematical symbols in solving the problem of the first investigation viz $\frac{\partial z}{\partial x \partial y}\Big|_{(0,1)} = f_{yx}(0,1)$ by using a formula$f'(x) = u(x) \cdot v'(x) + u'(x) \cdot v(x)$ (15).Students involve mathematical symbols for example equations $z = f(x,y) = x^3(2-3xy)^4$ becomes $u = x^3$, $u_y = 0$, $v = (2-3xy)^4$, and $v_y = -12x\,(2-3xy)^3$ with

$\frac{\partial z}{\partial x \partial y}\Big|_{(0,1)} = f_{xy}(1,0)$. Students involve mathematical symbols in solving equations $f\ (x,y\ ) = x^3(2-3xy)^4$ passed down to y, derived against, so that by involving mathematical symbols is obtained $f_y(x,y) = u\ \cdot\ v_y + u_y\ \cdot\ v\ = x^3 \cdot\ -12x\ (2-3xy)^3 = -12x^4(2-3xy)^3$ then involves mathematical symbols to get an example $u = -12x^4$, $u_x = -48x^3$,$v = (2-3xy)^3$, and $v_x = -9y(2-3xy)^2$. Students involve mathematical symbols in the derivative of x obtain $f_{yx}(x,y) = u \cdot v_x + u_x \cdot v\ =\ 12x^4 \cdot 9y\ (2-3xy)^2 + (-48x^3(2-3xy)^3)\ =$ $108x^4y\ (2-3xy)^2 - 48x^3(2-3xy)^3$.

Students substitute grades $x = 0$ and $y = 1$ yx into derived results using mathematical_symbols_obtained

$f_{yx}(0,1) = 108\ (0)^4(1)(\ 2-3(0)(1))^2 - 48(0)^3(2-3(0)(1))^3 =\ 0 \cdot 4 - 0 \cdot$ 0

presented in the first black square mark in Figure 2. Students involve mathematical symbols in solving the second inquiry problem, i.e. $\frac{\partial z}{\partial y}\Big|_{(4,1)} = f_y(x,y) = -2x^4(2-3xy)^3$. Students substitute grades $x = 4$ and $y = 1$ into_the_equation

$f_y(4,1) = -2x^4(2-3xy)^3 =$

$-2(4)^4(2-3(4)(1)^2) = -512(2-12)^3 =\ -512-1000 =\ -1512$

presented in the second black box in Figure 2. Students conclude the results of 2 investigations conducted using mathematical symbols $\frac{\partial z}{\partial x \partial y}\Big|_{(0,1)} \neq \frac{\partial z}{\partial y}\Big|_{(4,1)}$ which is presented in the third black box mark in Figure 2. Students involve mathematical symbols correctly and precisely so that indicators involving mathematical symbols that are correct and appropriate in solving problems are met.

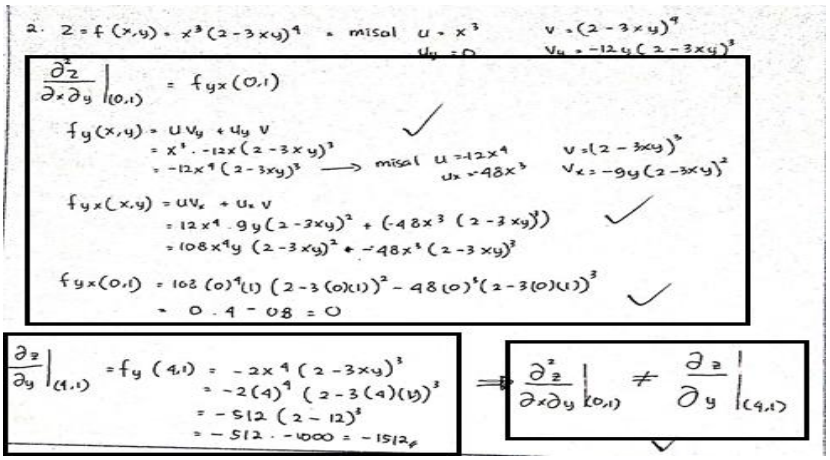

Figure 2. Results of student answers in solving HOTS type of Analysis questions.

Based on the research findings of 3 out of 17 students meeting the indicators involving the correct and appropriate mathematical symbols in solving problems. Five students fulfilled the indicators involving mathematical symbols correctly and precisely but did not conclude the results of the investigation conducted, so the indicators involving mathematical symbols that were correct and appropriate in solving problems were not met. Nine other students wrote the mathematical symbols incorrectly on the first investigation, the second investigation and concluded the results of the investigation. Nine students did not meet the indicators involving the correct and appropriate mathematical symbols in solving problems.

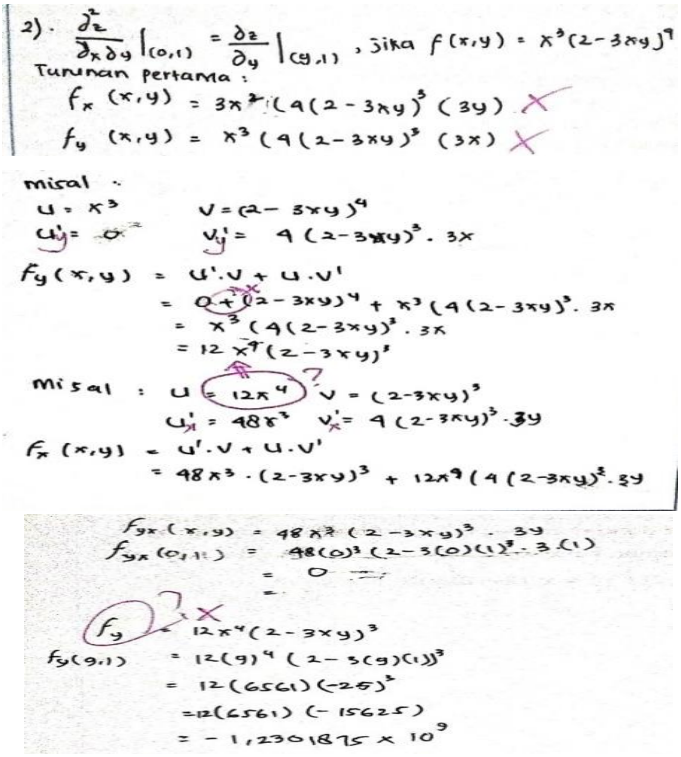

Figure 3. The results of student answers that do not meet the mathematical expression representation of HOTS analysis type.

The results of students' answers in working on HOTS type analyzing questions that do not meet the representation of mathematical expressions are presented in Figure 3. Students write mathematical symbols that are less precise on the first derivative of x and y pada persamaan$f\ (x,y\ ) = x^3(2-3xy)^4$menjadi $f_x(x,y\ ) = 3x^2(\ 4(\ 2-3xy)^3\ (3y)$ dan $f_y\ (x,y) = x^3(4(2-3xy)^3\ (3x)$ even though the process does not need to be done. Students write mathematical symbols incorrectly for example derivatives of equationseven though the process does not need to be done. Students write mathematical symbols incorrectly for example derivatives of equations $f\ (x,y\ ) = x^3(2-3xy)^4$ with $u' = 0$ and $v' = 4(2-3xy)^3 \cdot 3x$. Students write mathematical symbols not quite right in solving equationsStudents write

mathematical symbols not quite right in solving equations $f\ (x,y\ ) = x^3(2-3xy)^4$ passed down to y obtain $f_y(x,y) = u' \cdot v + u\ \cdot v' = 0 + (2-3xy)^4\ + x^3(\ 4(\ 2-2xy)^3\ \cdot (3x) =$ $x^3(4(2-3xy)^3 \cdot\ (3x) =\ 12x^4(2-3xy)^3\ \ .$

Students write mathematical symbols are not appropriate in involving mathematical symbols for example derivatives of equations $f_y(x,y) = 12x^4(2-3xy)^3$ with $u' =\ 48x^3$ and $v' = 4(2-3xy)^3 \cdot 3y.$

Students write mathematical symbols are not right on the derivative of x obtain $f_x(x,y) = u' \cdot v + u\ \cdot v' = 48x^3 \cdot (2-3xy)^3 + 12x^4(4(2-3xy)^3 \cdot 3y\ \ (57)$ a nd the results of the first investigation $f_{yx}(x,y) = 48x^3(2-3xy)^3 \cdot 3y.$ Students substitute grades $x = 0$ and $y = 1$ into the derivative of $f_{yx} = 48(0)^3(2-3(0)(1)^3 \cdot 3(1) = 0$ Students write mathematical symbols are not appropriate in solving the problem of the second investigation by substituting values $x = 9$ (subjects with the last NIM 9) and $y = 1$ into the equation

$f_y(9{,}1) = 12x^4(2-3xy)^3 = 12(9)^4(2-3(9)(1))^3 = 12(6561)(-25)^3 =$ $12(\ 6561)(-15625) = -1{,}2301875\ \times\ 10^9$

Students write mathematical symbols are not right in 2 investigations that have been done and do not conclude the results of the investigation, so the indicators involving mathematical symbols that are correct and correct in solving problems are not met. This research is relevant to the research of Mu'minah (2018) stating that the cause of students' errors in solving the problem type analysis is there, involving the mathematical symbol of the completion process carried out.

Representation of Mathematical Expressions in Completion of Evaluation Questions

HOTS type evaluating questions are questions that require the ability of students to make their own decisions, decide and choose. An example of evaluating HOTS type problems is shown in Figure 4. Representation of Mathematical Expressions in Completion of Evaluation Questions Students write the symbol of the way it works with.

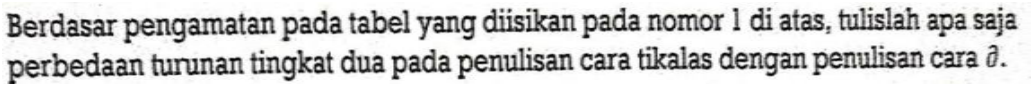

Figure 4. Example of HOTS evaluation type.

The problem in Figure 4 is classified as a type of evaluation because the problem is the student makes his own decision, decides, and chooses how to write with the method of writing ∂. Solution to determine the solution by symbolizing the way of writing symbols based on method and method ∂ as well as writing

differences in the way of tikalas writing and how to ∂ in the form of verbal representations in the form of descriptions/texts.

The results of students' answers in completing HOTS type evaluation questions are presented in Figure 5. Students represent the sentence "write what are the differences in the level two derivatives in writing the way-tikalas by writing the way ∂ " into the form of mathematical symbols and verbal representations in the form of sentences. Students present mathematical expression representations from verbal representations, so indicators present other mathematical representations into mathematical expression representations that are met. Students write the symbol of the way it works with. $F_{xx}(x,y), F_{yy}(x,y)$, $F_{xy}(x,y)$, and $F_{xy}(x,y)$ with $\frac{\partial^2 f}{\partial_x \partial_x}$, $\frac{\partial^2 f}{\partial_y \partial_y}$, $\frac{\partial^2 f}{\partial_y \partial_x}$, and $\frac{\partial^2 f}{\partial_x \partial_y}$ which is presented in the second black square in Figure 4. Students write the characteristics of how to write symbols with the symbol way ∂ with symbol $\frac{\partial f(x,y)}{\partial_y \partial_x}$ ∂ and verbal representation in the form of the sentence "descending order from behind" is presented on the fourth black square mark in Figure 5. Students involve mathematical symbols correctly and correctly and write differences in writing tikalas symbols and writing symbols in the form of verbal representations in the form of written text, so that indicators involving mathematical symbols that are correct and appropriate in solving problems are met.

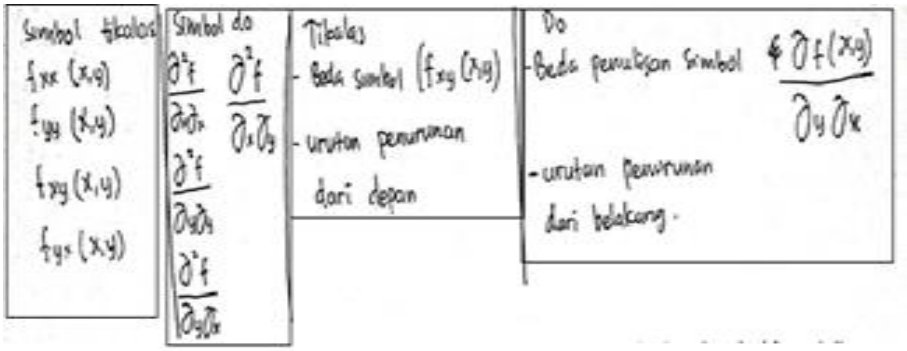

Figure 5. Results of students' answers in completing HOTS type of Evaluation type

Based on the research findings 16 of the 17 students represented the sentence "write what are the differences in the second level derivative in writing tikalas way writing ∂ " became a form of mathematical symbol. Sixteen students represented verbal representations into mathematical expression representations, so the indicators present other mathematical representations into mathematical expression representations that were met. One other student who did not represent the sentence "write what are the differences in the second-level derivative in writing tikalas with writing method ∂" it becomes a verbal representation in the form of the sentence "symbol differences, differences in the order of derivatives/variables", so that indicators presenting other mathematical representations into mathematical expression representations are not fulfilled. There were 8 out of 17 students who met the indicators involving the correct and correct mathematical symbols in solving problems and writing differences in

writing the method of writing and writing the way ∂ in the form of verbal representations in the form of written text. Seven other students fulfilled the indicators involving correct and correct mathematical symbols in solving problems without writing down the differences in writing of the method and the method of writing ∂ in the form of verbal representations in the form of written text. One other student wrote down the mathematical symbols incorrectly on writing the method of tikalas and writing the way ∂ in the form of verbal representations in the form of written text. One other student wrote down the mathematical symbols incorrectly on writing the method of tikalas and writing the way ∂ in the form of verbal representations in the form of written text, so that indicators involving correct and appropriate mathematical symbols in solving problems are not met. One other student does not involve mathematical symbols in solving problems but forms of verbal representation in the form of written text, so the indicators involve correct and correct mathematical symbols in solving problems are not fulfilled.

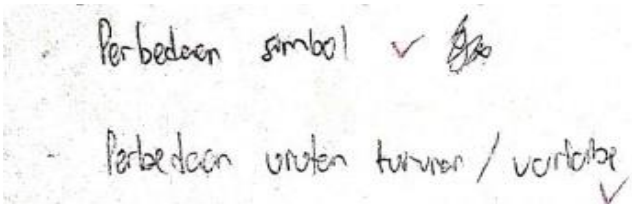

Figure 6. Results of student answers that do not meet the mathematical expression representation of HOTS Evaluation type

Students write mathematical symbols are not right in 2 investigations that have been done and do not conclude the results of the investigation, so the indicators involving mathematical symbols that are correct and correct in solving problems are not met ∂ "to form" symbol differences, differences in the order of derivatives/variables "as in Figure 6.Students write mathematical symbols are not right in 2 investigations that have been done and do not conclude the results of the investigation, so the indicators involving mathematical symbols that are correct and correct in solving problems are not met.This research is relevant to the research of Mu'minah (2018), stating that the cause of students' errors in solving the problem type analysis is there, involving the mathematical symbol of the completion process carried out. students represent verbal representations in the form of written texts into verbal representations in the form of written texts so that indicators presenting other mathematical representations in representations of mathematical expressions are not fulfilled. Students write answers in the form of sentences "differences in symbols, differences in the order of derivatives/variables" as in Figure 6. Students do not involve mathematical symbols in solving problems only in the form of written text so that indicators involving correct and appropriate mathematical symbols in solving problems are

not met. This research is relevant to Astuti 2017) This result is also relevant to Gustina's research (2018) which states that students who are less able to solve problems due to making mistakes in presenting other mathematical representations into mathematical expression representations. Agung's research (2018) states that students have difficulty in evaluating type questions. Students have difficulty in evaluating type questions indicated by the lack of more open ideas and lack of understanding of information about the questions.

Representation of Mathematical Expressions in Solving Problem Creation

The HOTS type of creating is a matter that demands the ability of students to create their ideas, construct, and develop. An example of a HOTS type creator is shown in Figure 7.

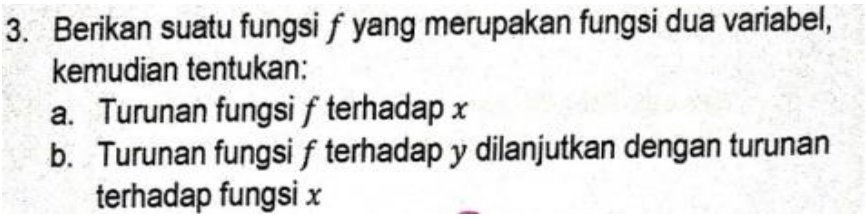
3. Berikan suatu fungsi f yang merupakan fungsi dua variabel, kemudian tentukan:
   a. Turunan fungsi f terhadap x
   b. Turunan fungsi f terhadap y dilanjutkan dengan turunan terhadap fungsi x

Figure 7. Example of a HOTS type Creating question.

The problem in Figure 7 is classified as a matter of creating because the question creates students' own ideas and constructs functions f which are functions of two variables, followed by decreasing to x and decreasing towards y as well as reducing to functions x .Completion of the solution to the problem students give examples of functions f which is a function of two variables, followed by decreasing to x and decrease towards y and reduce the function x.

The results of students' answers in working on HOTS type creating questions are presented in Figure 8. Students write a mathematical model of the sentence "give an example of a function f which is $f(x,y) = 4x^2 + 2xy + y^2$ passed down to x obtain $f_x(x,y) = 8x + 2y$. Students involve mathematical symbols in solving problems b of the equation $f(x,y) = 4x^2 + 2xy + y^2$passed down to x derived from writing down the mathematical symbols of the sentence ". b. function derivatives f to y followed by a derivative of the function x " from the equation $f(x,y) = 4x^2 + 2xy + y^2$ passed down to x obtain $f_x(x,y) = 8x + 2y$. Students write mathematical symbols of the sentence ". b. function derivatives f to y followed by a derivative of the function x " from the equation $f(x,y) = 4x^2 + 2xy + y^2$ paassed down to y and x obtain $f_{yx}(x,y) = 2$. Students represent verbal representations in the form of text into mathematical expression representations, so the indicators present other mathematical representations into mathematical expression representations that are met. Students involve mathematical symbols in problem-solving by writing examples of functions $f(x,y) = 4x^2 + 2xy + y^2$. Students involve mathematical symbols in solving problems from equations

$f(x,y) = 4x^2 + 2xy + y^2$ passed down to x obtain $f_x(x,y) = 8x + 2y$ resented in the first black square in Figure 8. Students involve mathematical symbols in solving problems b of the equation $f(x,y) = 4x^2 + 2xy + y^2$ passed down to yx obtain $f_{yx}(x,y) = 2$ which is presented in the second black square mark in Figure 8. Students involve mathematical symbols correctly and appropriately so that indicators involving mathematical symbols that are correct and appropriate in solving problems are met. Students represent verbal representations in the form of text into mathematical expression representations, so the indicators present other mathematical representations into mathematical expression representations that are met.

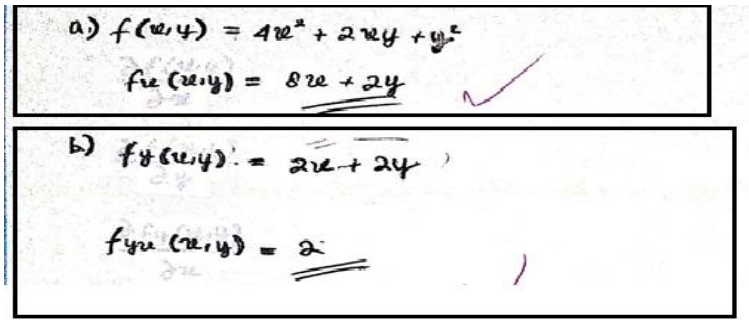

Figure 8. The results of students' answers in completing HOTS questions Creating a type.

Based on the research findings all students represented the sentences "give examples of a function,which is a function of two variables, then specify a. derived function, towards to; b. function derivatives to followed by a derivative of the function. into a symbolic form. Students write mathematical symbols from the sentence "a. function derivatives into a form of mathematical symbol. Students represent verbal representations in the form of descriptions/texts in the form of mathematical expression representations, so the indicators present other mathematical representations into mathematical expression representations are met. There are 8 out of 17 students involving mathematical symbols correctly and precisely so that indicators involving mathematical symbols that are correct and appropriate in solving problems are met. Nine other students wrote the mathematical symbols incorrectly on the solution of a and b problems so that the indicators involving correct and correct mathematical symbols in solving problems were not met.

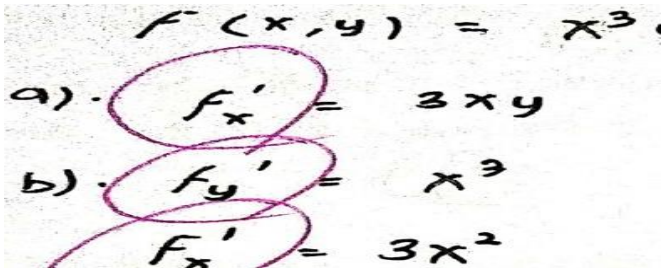

Figure 9. Results of student answers that do not meet the mathematical expression representation of HOTS type Creating.

The results of students' answers in working on HOTS type creating questions that do not meet the representation of mathematical expressions are presented in Figure 9. Students represent verbal representations in the form of written text into mathematical symbols as shown in Figure 9 so that the indicators presenting other mathematical representations into mathematical representations are fulfilled. Students write examples of a function f which is a function of two variables$f(x,y) = x^3y$. Students write mathematical symbols are not quite right at solving problems an of functions$f(x,y) = x^3y$ passed down to x obtained $f_x' = 3xy$ .Students write mathematical symbols that are not right when solving problem b from a function$f(x,y) = x^3y$ passed down to y obtained $f_y' = x^3$. Students write mathematical symbols that are not right when solving problem b from a function $f(x,y) = x^3y$ passed down to yx obtained $fx' = 3x^2$ as shown in Figure 9. Students write mathematical symbols incorrectly on the derivative of y and the derivative of yx, so the indicators involve correct and correct mathematical symbols in solving problems that are not met. This research is relevant to (Astuti's, 2017) research stating that students who can represent other mathematical representations into mathematical expression expressions correctly and correctly can involve mathematical symbols correctly and correctly in solving problems. This result is also relevant to Gustina's research (2018) Gustina's research (2018) which states that students who are less able to solve problems due to making mistakes in presenting other mathematical representations into mathematical expression representations. Research Agung (2018) states that students have difficulty with creating types. Students have difficulty in creating aspects shown by their lack of creativity in constructing problems by involving mathematical symbols.

CONCLUSIONS AND SUGGESTIONS

Conclusions

Based on the results and discussion, it can be concluded that the representation of students' mathematical expressions in solving HOTS problems is as follows: Three students can involve the correct and appropriate mathematical symbols in each stage of solving the HOTS type analysis problem, while the fourteen other students cannot involve the correct mathematical symbols and appropriate in each stage of solving HOTS type of analysis questions. Fifteen students can involve

correct and correct mathematical symbols in each stage of completion and can present other mathematical representations into mathematical expression expressions about HOTS evaluation types, while the other two students cannot involve correct and appropriate mathematical symbols in each stage of completion but can present other mathematical representations into mathematical expressions about HOTS evaluation type questions. Eight students can involve mathematical symbols that are true and right in each stage of completion and can present other mathematical representations into mathematical expressions about HOTS type creation, while nine other students cannot involve mathematical symbols that are right and right in each stage of completion but can present other mathematical representations into mathematical expression expressions about HOTS type creates.

Suggestions

Based on the research conclusions that have been presented, the suggestions that researchers can put forward are as follows: (1) The study in this study is limited to the representation of mathematical expressions of Civil Engineering students in solving HOTS questions only. Therefore, researchers suggest that if they want to carry out similar research, it is better to use mathematical expression representation in solving HOTS problems in other majors; (2) This research only reveals the representation of mathematical expressions in solving HOTS problems, so that for further research it is hoped that it can reveal other mathematical representations in solving HOTS problems; and (3) The study in this study only analyzes students' mistakes by representing mathematical expressions in solving HOTS problems. Suggestions for further research should present efforts in the ability to represent mathematical expressions, one of which is to conduct learning that emphasizes mathematical representation about HOTS.

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