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Analysis of Written Mathematics Communication Skills in Solving Solo Taxonomy Assisted Problems

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Abstrak:
Tujuan penelitian ini adalah untuk mengetahui kompetensi komunikatif tertulis siswa dalam memecahkan masalah kunci SPLDV dalam kehidupan sehari-hari. Penelitian ini menggunakan penelitian kualitatif deskriptif. Data ini ditentukan dengan pengujian. Subjek dalam penelitian ini terdiri dari tiga orang mahasiswa S1 hasil UTS. Ketiga siswa tersebut terdiri dari perwakilan siswa berkemampuan tinggi, sedang dan rendah. Selain itu, siswa diberikan soal-soal tes yang didukung oleh taksonomi SOLO materi SPLDV yang dianalisis menurut indikator kompetensi komunikatif matematis. Intinya adalah siswa dengan kemampuan matematika yang baik mampu memberikan jawaban yang benar dan benar, tetapi belum mencapai tingkat abstraksi yang diperluas. Siswa dengan kemampuan menulis sedang dapat mendemonstrasikan prosedur yang benar, namun masih mengalami kesulitan dalam menggunakan dan mengolah informasi, sehingga jawaban salah dan hanya mencapai tingkat polistruktural. Siswa dengan kemampuan matematika rendah tidak menyelesaikan masalah, hanya sebagian dari masalah yang disajikan, sehingga mereka hanya mencapai tingkat monostruktur dan sebagian besar jawaban salah.

Kata Kunci : Kemampuan komunikasi tulis, SPLDV, Taksonomi SOLO

Abstract:
The purpose of this study was to determine students' written communicative competence in solving key problems of SPLDV in everyday life. This study uses descriptive qualitative research. These data are determined by testing. Subjects in this study consisted of her three undergraduates from UTS results. The three students were made up of representatives of high, middle and low ability students. In addition, students are given test questions supported by the SOLO taxonomy of SPLDV materials, which are analyzed according to indicators of mathematical communicative competence. The bottom line is that students with good math skills are able to give correct and correct answers, but have not yet reached the level of extended abstraction. A student with moderate writing ability can demonstrate the correct procedure, but still has problems using and processing the information, so the answers are wrong and only reach the polystructural level. Students with low mathematics ability do not solve problems, only part of the problem is presented, so they only reach the monostructural level and most of the answers are wrong.

Keywords : Write communication skills, SPLDV, SOLO Taxonomy

Introduction

Communication is a way to share ideas and clarify understanding in writing and orally(Makarova & Maksimov, 2020; Palinussa et al., 2021). Communication is an important thing in learning mathematics, with communication students can exchange ideas and ideas and knowledge during the process of (Arinindya Putri et al., 2020) learning mathematics (Syafina & Pujiastuti, 2020). Mathematical communication skills are the ability to transfer information about mathematical ideas using language, symbols, words, numbers and graphics

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so that they are able to express numbers, quantities, sizes, shapes and other mathematical concepts orally and in writing (Darmayanti, Baiduri, et al., 2022; Tong et al., 2021).

Written mathematical communication is the process of conveying ideas in written form, while oral mathematical communication is the delivery of ideas in spoken form (Mutamima & Manoy, 2019). Based on the results of interviews conducted (Rakhmahwati et al., 2019) written mathematical communication skills are still lacking because students are not accustomed to being faced with questions in the form of writing that are known and which are asked in questions, students do not understand the concept of mentioning mathematical symbols, which results in student errors in state the meaning of the question and do not write a conclusion at the end of the answer (Setiyani et al., 2020; Yaniawati et al., 2019). The teacher can give a test whose work in addition to answering in writing is also done by explaining what was written and thought (Hasan, 2017).

Based on research (Sriwahyuni et al., 2019) it was found that the lack of students' ability to complete mathematical communication skills, can be seen from the results of the overall recapitulation of students' answers who answered correctly as much as 21%, answered incorrectly as much as 76%, and did not answer as much as 3%. Research (Radiusman et al., 2019), in improving written mathematical communication using the think talk write (TTW) strategy, the results obtained that students re-examined their work whether there were errors in solving problems students could write their answers using their own expressions so that they would understand more about solution based on observations (Yeh et al., 2019). Research conducted (Arifin et al., 2016) states that teachers who are the main actors are more active than students, as a result mathematics learning is still lacking in developing mathematical communication in written form which causes students to feel doubtful and afraid to propose opinions with other students or teachers (Darmayanti, Sugianto, et al., 2022).

Students have different levels and abilities when solving problems, the way to recognize students' abilities when solving problems is the SOLO taxonomy (Setyowati et al., 2020). (Biggs & Collis, 1978) said that the SOLO Taxonomy (Structure of Observed Learning Outcomes) is grouped based on five different levels, namely level 0: prestructural, level 1: unistructural, level 2: multistructural, level 3: relational, and level 4: extended abstract. . The preparation of questions based on the SOLO taxonomy, otherwise known as superitem has four levels (without a prestructural level) including, unistructural questions using clear and direct information from the questions. Multistructural questions are questions that use two or more different pieces of information in the problem. Relational questions are questions that use the understanding of two or more information contained in the problem. Meanwhile, extended abstract questions are questions that use general principles that are abstract or conjecture derived from the information in the problem (Agustina & , Mulyono, 2016)

The following are some of the studies related to the SOLO Taxonomy including, research (Mulbar et al., 2017), which found that students who showed a field independent cognitive style (FI) had a higher level of ability in terms of the SOLO taxonomy level for solving mathematical problems than students who have a field dependent cognitive style (FD). Research (Yarman et al., 2020), the results obtained are errors made at the five levels, namely due to lack of skill in using formulas, not being thorough, and the habit of not repeating lessons. Research (Rosadi et al., 2018), subjects with geometric visualization thinking levels tend to use unistructural level taxonomy aspects to solve problems. The subject of the geometric analysis thinking level mostly uses the multistructural level. Subjects with an informal deductive geometric thinking level used the relational level. The difference in the results of the research that has been done, namely the provision of

questions based on the SOLO taxonomy which is interestingly applied to see students' written communication skills in achieving the indicators of the SPLDV material which is the importance of this research.

This study aims to see students' mathematical communication skills in solving problems with SPLDV material based on the SOLO taxonomy which contains real-life problems. The communication skills in this study are only on written communication skills with aspects of mathematical ability to write information on problems, write mathematical arithmetic operations, use examples or add other information in conveying mathematical ideas and solutions, and explain conclusions from the answers obtained. The analysis of the results of this study is expected to be useful in learning mathematics and be able to become a benchmark in improving and maintaining students' mathematical written communication.

METHOD

This type of research is a qualitative descriptive study that aims to describe students' mathematical communication skills in solving SPLDV problems based on the SOLO Taxonomy through tests or asking questions. The participants of this research were eighth grade students of SMP Negeri 12 Batanghari. Subject determination was obtained by looking at the UTS results with high (≥76), medium (61-75), and low (<60) criteria. Then, the SPLDV material test was given based on the SOLO taxonomy to 3 students with high, medium and low categories to analyze their written mathematical abilities.

The instruments in this study were written tests and interviews. The test sheet is prepared based on the SOLO Superitem Taxonomy. Superitem contains problems with four different levels. Items representing the four levels of SOLO's taxonomy include Unistructural, Multistructural, Relational, and Extended Abstract. So, with this Superitem, correct answers indicate students' mathematical written communication skills at each level based on the SOLO taxonomy. Written test questions must have been validated by validators, namely lecturers and mathematics teachers. While the interview guidelines are adjusted to the indicators that have been made, namely: 1) students can mention the information obtained from questions, 2) students know the methods used to solve problems, 3) students can explain the methods used to solve problems and, 4) students can conclude from the answers they get.

This research was conducted in several stages, including: 1) Preparation includes licensing and preparation of instruments to conduct research. 2) Implementation, including data collection. 3) Completion, including processing data, compiling reports, and drawing conclusions. The data in this study were analyzed by: (1) Determining the subject to be given a test question, (2) Analysis of test results to measure students' written mathematical communication skills, (3) Interview analysis was used to ensure data from written test results. Furthermore, data analysis techniques from Miles & Huberman, (1994), are: 1) data reduction, carried out by correcting student test results and analyzed based on indicators of students' written mathematical communication skills, 2) data presentation, obtained from the results of written test answers and interviews conducted carried out by students will then be explained in the form of sentences or descriptions, 3) drawing conclusions, namely providing conclusions or brief meanings from the results of the analysis of written mathematical communication skills based on SOLO Taxonomy.

RESULTS AND DISCUSSION

The instruments to determine the 3 subjects are in the high, medium, and low students' mathematical communication skills can be seen in Table 1. The three subjects, namely, AK, OP, and DF with the acquisition of scores:

Table 1. Research Subject Code

Initials	Category	UTS Value
AK	Tall	95
OP	Currently	80
DF	Low	57

Subject Analysis of High Writing Mathematical Communication Ability

In Figure 1. subjects with high mathematical abilities, namely subjects with the initials AK.

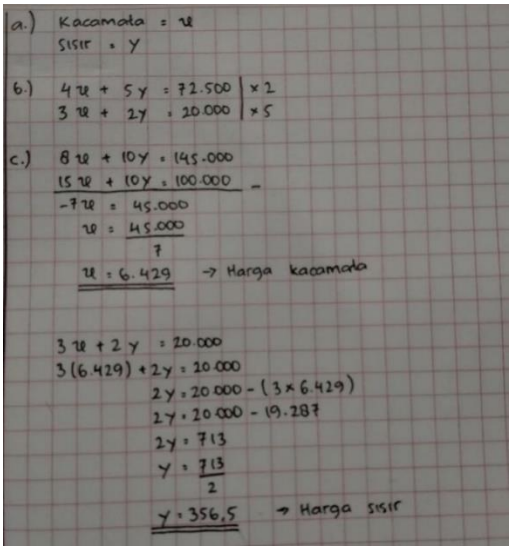

Figure 1. Job Results of Subjects with High Writing Communication Ability

AK's work on the written test shows that AK can correctly answer level 1 to level 3 questions in the SOLO Taxonomy called relational. In the indicators of written communication skills, AK is able to write down information that is known and asked in the problem, can determine variables in the problem and is able to show it, followed by coefficients and constants in equations, make mathematical arithmetic operations and use examples to get solutions. The steps used to solve the problem are correct, but the answers are still less relevant and have not reached a conclusion. This is in line with (Setyowati, dkk 2020) which explains that students with high mathematical skills, their mathematical communication skills are very well written. Therefore, high-ability students have excellent mathematical communication skills and are able to solve high-level problems in the SOLO tak taxonomy.

This finding is supported by excerpts of interviews conducted by researchers with the following AK subjects:

Researcher: *"What problems are contained in the problem, what do you know?"*

AK: *"It is known that the price of 4 glasses and 5 combs is 72,500. the price of 3 glasses and 2 combs is 20,000".*

Researcher: *"Then what is being asked about that question?"*

AK: *"which a represents glasses and combs to a variable form. The b make the equation, the c price for 1 glasses and 1 comb, how much money do you have to pay Dinda and the rest of the money"*

Researcher:	*"then, how do you determine the variable"*
AK:	*"I assume glasses with the letter x and comb the letter y"*
Researcher:	*"So what method do you use to find out the unit price of glasses and combs?"*
AK:	*"I made the equation first, then I eliminated y first, so my equation 1 times 2 and my equation 2 times 5"*
Researcher	*"How to find the y? Should we take the second equation? can't equation 1?"*
AK:	*"can. It's up to you which equation to use."*
Researcher:	*"Why don't you do D? what difficulties did you encounter?"*
AK:	*"I don't know, Sis, the question is difficult and I don't understand the words. I don't know how to make the mathematical model"*
Researcher:	*"Did you double check before submitting the assignment?*

Subject Analysis Mathematics Communication Ability Write Medium

In Figure 2. subjects with moderate mathematical abilities, namely, subjects with the initials OP.

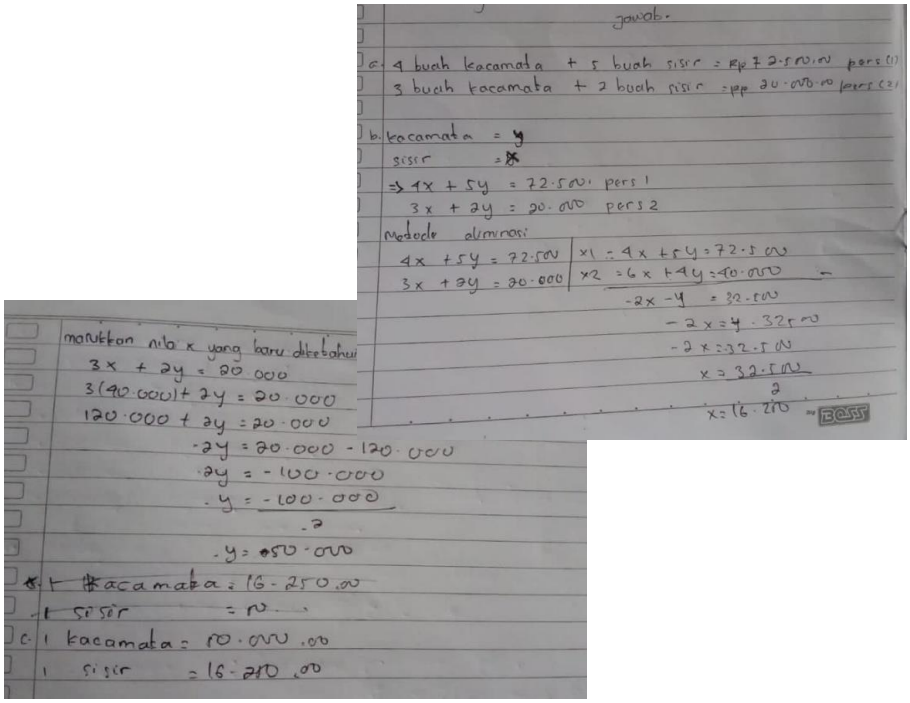

Figure 2. The Subject's Work Results of Medium Writing Communication Ability

Subjects can answer level 1 and 2 questions which are called multistructural levels. In the indicator of written communication ability, the subject can write down the information contained in the problem by using an example of the variables before writing the equation. However, the steps used in solving the problem are different and only guesswork. The subject still looks difficult in processing and using some information when faced with different questions so that the answers given are still wrong. This is in line with (Lim, dkk 2010) which explains that students only focus on certain information that is relevant to the given problem to provide answers to the problem, but this information is still treated freely.

This finding is supported by excerpts of interviews conducted by researchers with the following subject OP.

Researcher:	*"What problems are contained in the problem, what do you know?"*
OP:	*"The price of 4 glasses and 5 combs is 72,500. Then the price of 3 glasses and 2 combs is 20,000".*
Researcher:	*"Then what is being asked about that question?"*
OP:	*"turned into a variable, made the SPLDV equation, continued to determine the price of glasses and combs"*
Researcher:	*"Which d was asked?"*
OP:	*"I don't know if it's d"*
Researcher:	*"In that case, how do you determine the variable"*
OP:	*"I use for example glasses x and comb y"*
Researcher:	*"So what method do you use to find out the unit price of glasses and combs?"*
OP:	*"I searched for the formula on google to solve the SPLDV problem, Ms., I followed the method"*
Researcher	*"Then why are you next to the equation 1 and 2 where do you come from?"*
OP:	*"I saw on google like that, so I don't know"*
Researcher:	*"How to find the y? Should we take the second equation? can't equation 1?"*
OP:	*"can ma'am"*
Researcher:	*"What did you find?"*
OP:	*"It's hard to count, sis. I don't understand the language either"*
Researcher:	*"Did you double check before submitting the assignment?*
OP:	*"no ma'am. I'll gather right away."*

Subject Analysis of Low Writing Mathematical Communication Skills

In Figure 3. subjects with low mathematical abilities, namely subjects with the initials DF.

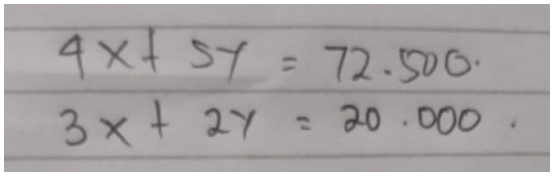

Figure 3. Job Results of Subjects with Low Writing Communication Skills

DF subjects are only able to solve level 1 questions, namely unistructural. Judging from the indicators of written communication skills, the subject is able to write down information on the problem, namely writing the equation and when the interview is conducted the subject knows what are called variables, coefficients, and constants. The subject is unable to answer the questions. The subject does not understand the meaning of the question and tends not to give an answer. This is in line with the opinion (Tarrua, dkk 2019) which explains that students at the unistructural level answer questions in a limited way, namely by choosing one information contained in the questions asked, student responses only focused on one relevant aspect.

This finding is supported by excerpts of interviews conducted by researchers with the following DF subjects.

Researcher:	*"What problems are contained in the problem, what do you know?"*

DF:	*"The price of 4 glasses and 5 combs is 72,500. then the price of 3 glasses and 2 combs is 20,000".*
Researcher:	*"Then what is being asked about that question?"*
DF:	*"Declare glasses and combs in variable form, make SPLDV model equations, determine the price of glasses and combs"*
Researcher:	*"Which d was asked?"*
DF:	*"it's okay ma'am"*
Researcher:	*"Then the answer you wrote was for which question?"*
DF:	*"I don't know, because I searched on Google I made the equation"*
Researcher	*"You know what that variable is?"*
DF:	*"don't know"*
Researcher:	*"Then what difficulties did you encounter in this matter?"*
DF:	*"everything"*
Researcher:	*"Did you double check before submitting the assignment?*
DF:	*"no"*

CONCLUSION

Through the results and discussion, the results obtained are students who have high written mathematical abilities, are able to solve relational level problems. The subject can solve the problem correctly according to the steps and the right formula. Students with moderate written mathematical ability are able to solve problems up to a multistructural level. Students work on the right questions and steps, but there are difficulties when using the information provided so that the final answer obtained is wrong. Students with low written mathematical abilities can work on problems and only up to the unistructural level which causes most of the answers to be wrong.

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