Students’ Intuition Characteristics in Solve Mathematical Problem In Stage Planning

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Abstract. This research is descriptive explorative with a qualitative approach, aims to know the characteristics of student intuition in making the mathematical problem-solving plan. Data collection methods triangulate data through tests, and documentation. The subject of the research is a mathematics education student of the Muhammadiyah University of Cirebon. The population of the subjects was fifty students and then selected who had the initial ability of mathematics was twenty five students, after that selected one female student whose TPMM and IPK is medium and has good mathematical delivery. The results of this study indicate that the intuition of students in solving mathematical problems at the stage of understanding Polya problem: First, Subject using intuition is self-evident intuition, that is, statement, representation, or interpretation is considered the subject right by itself, the subject feels no need to show/prove formally the truth of such statements, representations, or interpretations. Second, Subjects use certainty's intrinsic intuition, ie the subject assumes a statement, its representation, or its interpretation, a certainty, no external support (formal or empirical to obtain it). Third, the subject uses intuition perseverance, ie the interpretation and the resulting representation of the subject tend to be difficult to change. It is proved by the tendency to not use something new beyond its mathematical comprehension. Fourth, Subject use extrapolative ness intuition, ie, subject to certain interpretations, decisions or conclusions based on insufficient information or data. It is proved that the subject is not intact in making problem-solving plans based on the Polya stage.

Keywords: Intuitive Characteristics, Mathematical Problem Solving

1. Introduction
The truth obtained through intuition is not absolute. Because every result of mathematical thinking that contains intuitiveness is true and will always be true, intuition only guides mathematics activities, but mathematical activities based on intuition do not always produce truth.[2] But the existence of intuition is always based on a particular schema structure.[6] Besides that it was found that intuition was a spontaneous guess that was a fact behind the screen of the scheme. [3] Intuition also shows that it can occur due to a certain schema structure. Therefore, if students are solving mathematical problems, intuition arises, which is a spontaneous guess due to the facts behind the screen. [4] The study of the results of the study shows the role of intuition in geometry in solving geometry problems and mechanisms that might produce intuition of geometry. The results of the study show that students use intuition when solving geometry problems. [14] Shows that out of the 105 top managers
studied, strategic thinking used will be more developed if it is based on intuition compared to analysis. Strategic thinking illustrates a form of focus on foresight, new ideas and synthesis. [5] Intuition that underlies strategic thinking in solving geometric problems can be influenced by gender differences in problem solving. The influence is in the form of a strategy used in the form of completion patterns related to cognitive abilities, psychological characteristics and influenced by experience and education. [12] The characteristics of intuition in solving problems in terms of ability and gender produce intrinsic certainty intuition. [11] Likewise the differences in student intuition in divergent mathematical solutions based on the independent cognitive style field and field dependent in terms of cognitive style, produce differences in the Visualization and Analysis stages in solving geometric problems. [1] So that suggestions from a study include the following: (1) the teacher should provide a problem or question that can stimulate students to think intuitively, (2) involve students using intuitive thinking by giving freedom to students to do problem solving. By giving freedom of thought, students will involve their intuition and make decisions based on ideas that arise in their minds to solve the problem. Thus, the teacher will get a variety of ways given by students in solving problems to get the right answers, (3) the results of this study need to be explored more deeply. Therefore, it is recommended for advanced researchers to sharpen the focus of research, (4) in this study, only taking 4 subjects with high levels of mathematical ability, it is recommended to involve differences in the level of mathematical abilities of students as research subjects. [10]

While problem-solving is the process of applying various skills and cognitive actions to a problem, which is intended to get the right solution from solving the problem. And also said that problem solving is a set of actions taken to find a way out of a problem. This was expressed [7] who defines the -solving as "the set of actions taken to perform the task (i.e., Solve the problem)." Cognitive psychologists [8] define the problem-solving as directed thinking in solving a particular problem that involves both the formation of responses and the choice between possible responses.

Based on the theory and problems described above, it is very important to know how the intuition characteristics of students of mathematics students in using their intuition at the stage of making a plan for solving mathematical problems, when they try to solve mathematical problems with basic mathematical discussion through the problem-solving steps. [9] Developed a problem-solving procedure in four steps, namely: First, analyzing and understanding problem, Second, designing and planning a solution, Third, exporting solutions to difficult problems, Fourth, verifying a solution. Therefore it is important to do a very interesting study with the title "student intuition in solving mathematical problems at the stage of understanding the Polya problem."[13]

2. Research Method
This research method is explorative descriptive with a qualitative approach, aims to determine the characteristics of student intuition in making the mathematical problem-solving plans. Data collection methods are data triangulation through tests, interviews, and documentation. The research subject was a student of mathematics education at the Muhammadiyah University of Cirebon. Subject population amounted to fifty students and then were selected who had an initial mathematical ability amounting to twenty five students. After that one student was chosen whose TPMM and IPK were moderate and had a very good mathematical delivery.

3. Result and discussion
A hexos candy company has three sales stores in the city of Cirebon. Each shop provides 100 boxes of candy. One box consists of 15 large packs. One large pack contains 12 small packs. The price of one small pack of candy is Rp. 7,500, -. The hexos candy company, costs from each store for the following purposes:

a. 25% to pay employee salaries
b. 20% for capital and raw materials
c. 10% for store operating costs

Asked:
1) If all hexos are sold out, how much is the sale of one store?
2) What is the net profit of the hexos candy company from the 3 stores?

Subject answer results according to the data exposure of the characteristics of students' intuition of mathematics education in solving mathematical problems of female subjects at the stage of making a mathematical problem-solving plan are:

1 city = 3 shops, 1 shop = 100 boxes of candy
1 box of candy = 15 large packs of candy
Price of 1 small package = Rp. 7,500
The price of 1 large pack (12 small bugs) Rp. 7,500, × 12 = Rp. 90,000
Price of 1 carton (15 large packs) = Rp. 90,000, × 15 = Rp. 1,350,000.
Sales of 1 store = Rp. 1,350,000, × 100 = Rp. 135,000,000.
So from 1 store is Rp. 135,000,000.

The question is if all the HEXOS candy is sold out, what is the sale of one store, and what is the net profit of the hexos candy company from the 3 stores.

Here it is clear that the price of 1 large pack of candy with a capacity (12 small bugs) namely, Rp. 7,500, × 12 = Rp. 90,000. Price of 1 box of candy with capacity (15 large packs) Rp. 90,000, × 15 = Rp. 1,350,000. - and sales proceeds for 1 shop Rp. 1,350,000, × 100 Rp = 135,000,000, - So the result of 1 store is Rp. 135,000,000. As for sales results from 3 stores are Rp. 135,000,000, - × 3 = Rp. 405,000,000.

The dialogue results from interviews with the subject

Researcher: After understanding the problem, try to make a settlement plan and write down the completion plan?

Subject: Yes sir? The first plan is to write what is already known, that is,

![Figure 1. Subject Answer 1](image)

Then the second one saw what was asked
1. The sale of 1 shop if all the candy is sold out
2. Net profit for companies from 3 stores

Before working on understanding the problem number.2, namely the net profit and in each case the company must pay
a. 25% of employee salary
b. 20% capital/raw material
c. 10% of store operations

From this description, I can plan for solving the answers to the questions asked for number 1, namely by multiplying the elements already known, while number 2 is from answer no.1 I subtract the total expenditure for each store after that multiplied by 3 because the ask the net profit of 3 stores. I wrote the completion plan for one shop first.
Figure 2, Subject Answers

Researcher: is this an FX plan that I mean?
Subject: Yes sir, the next problem is to use the operation, because every element in the problem uses a multiplication, addition, division and evaluation system. I write like this, sir

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Harga 1 bungkus besar (12 bungkus kecil)
= Rp. 7500,- x 12.
= Rp. 90.000,-

Harga 1 dus (15 bungkus besar)
= Rp. 90.000,- x 15
= Rp. 1.350.000,-

Hasil penjualan 1 hrs.
= Rp. 1.350.000,- x 100
= Rp. 135.000.000,-
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Figure 3, Subject Answers

Researcher: Why think of using number operations?
Subject: I immediately thought that you are using a number operation, because if you look at what you know and ask about the problem itself, sir, you really have to use a number operation, which in addition, subtraction, multiplication, and division.

Researcher: Does this problem have characteristics using number operations?
Subject: Yes sir there, from the beginning, it was seen from the problem explaining about a hexos company that has three shops, one shop = 100 boxes of candy, one box of candy 15 big packs of sweets, one big pack = 12 small packs and the price of one small pack = Rp. 7500,-, this analysis really requires a number operating formula.

Researcher: What are the characteristics?
Subject: When viewed from the questions given by the father, there is an operation of addition, subtraction, multiplication, and division in solving the problem, sir. Because the analysis of this problem must indeed use this number operation, sir.

Researcher: So looking at the problem of directly thinking using number operations?

Subject: Yes sir, when I saw the question, I immediately thought of using a number operation, because it was seen from the problem it was like that, explaining hexos candy companies had three stores, one shop = 100 boxes of candy, one box of candy 15 big packs of candy, one pack big = 12 small packs and the price of 1 small pack = Rp. 7500, - ., this analysis really requires a number operating formula. Then spend 25% on employee salaries, 20% for capital and raw materials, 10% for operational costs. Then those who were asked how much profit from one shop, and also how much net profit from the 3 stores.

Researcher: After thinking of using number operations, it seems to think of making illustrations first?

Subject: Yes sir, before thinking of using a number of operation I made an illustration first with a picture of the problem. By writing how many stores, how many boxes, how many packs and how small packs, including the price tag, sir. That's all I try to describe first, so that it makes it easier to make a solution settlement plan.

Researcher: What is the intended picture?

Subject: Like this picture, sir, to make it easier for the complete plan for the answer

![Figure 4, Subject Answers](image)

Researcher: So will the number operation be obtained in this way?

Subject: Yes sir, the picture is like the table I made this one, which was written, because with this picture, I easily developed a plan to solve the answer, according to what I wanted, what was known and what was asked in the question.

Researcher: So what will the settlement plan be written like?

Subject: I will write the settlement plan like this sir, the first thing I wrote is what was explained from this story about the hexos candy company. Then I wrote back for the answer settlement plan, namely, how much each shop costs for its needs. And what are the advantages of the 3 stores.
The discussion of the results of this research interview shows that the characteristics of student intuition in solving mathematical problems at the stage of making a mathematical problem-solving plan according to Polya's problem-solving theory: show that: First. In making a mathematical problem-solving plan. Subjects use the characteristics of self-evident intuition, that is, statements, representations, or interpretations are considered to be true subjects by themselves, the subject feels no need to show / formally prove the truth of the statement, representation, or interpretation. Second Subjects use the characteristics of intrinsic certainty intuition, namely the subject in making a mathematical problem-solving plan considers the statement, representation, or interpretation, and determination (certainty), no need for external support (formal or empirical to obtain it), proven by describing that subject cognition is accepted as an individual feeling without requiring further checking and verification. And this is cognition whose truth statement is received directly. Third. In making a mathematical problem-solving plan the subject uses the characteristics of perseverance intuitions, namely the interpretation and representation produced by the subject tend to be difficult to change. Evidenced by the tendency not to use something new beyond mathematical understanding. The subject proved by describing that the subject in making a plan for solving mathematical problems did not want to use alternatives other than what he believed to be the characteristics of his cognition which he understood about the problem, he refused other understandings to support his cognition. Fourth. Subjects use extrapolative ness intuition characteristics, namely subjects in making plans to solve mathematical problems by looking at certain interpretations, decisions or conclusions based on insufficient information or data. This is proven that the subject is not intact in making a problem-solving plan based on the Polya stage.

4. Conclusions
The conclusion of this study shows that the characteristics of students' intuition in solving mathematical problems at the stage of making a plan for solving mathematical problems according to Polya's steps are: In making a mathematical -solving plan. Intuition characteristics used by the subject are the characteristics of self-evident intuition, ie a statement, representation, or interpretation is considered to be a true subject by itself, the subject feels it is not necessary to show / formally prove the truth of the statement, representation, or interpretation. then the subject is also at the stage of making a mathematical problem-solving plan using the characteristics of perseverance intuitions, namely the subject considers the statement, representation, or interpretation, a determination (certainty), there is no need for external support (formal or empirical to obtain it). Then in making a mathematical -solving plan the subject also uses the characteristics of perseverance intuitions, namely the interpretation and representation produced by the subject tends to be difficult to change. Evidenced by the tendency not to use something new beyond mathematical understanding. The subject proved by describing that the subject in making a plan for solving mathematical problems did not want to use alternatives other than what he believed to be the characteristics of his cognition which he understood about the problem, he refused other understandings to support his cognition. Then the subject uses
extrapolative ness intuition characteristics, namely the subject in making a plan to solve a mathematical problem by looking at certain interpretations, decisions or conclusions based on insufficient information or data. This is proven that the subject is not intact in making a problem-solving plan based on the Polya stage. From the conclusion of this study the characteristics used by the subject at the stage of making a mathematical problem-solving plan use four characteristics of mathematical intuition.

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