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Foreword

Praise be to God Almighty so that the Proceedings of the 2018 International Conference of Mathematics Analysis, It's Application and Learning (ICoMAAL 2018) organized by Sanata Dharma University and Mathematical Analysis Community of Indonesia can be completed. This Conference Proceedings contains the written versions of most of the contributions presented during at the ICoMAAL, which consisted of 25 articles from the speakers who came from various universities. The article has been presented on 15 September 2018 at the ICoMAAL conference and has been reviewed and revised accordingly suggestions from reviewers.

Many thanks go as well to All Keynote Speakers, Steering Committee and Organizing Committee for the success of this conference and to all people who participated for the process of proofread of the contributed papers and in preparing this proceedings.

Yogyakarta, October 2018

Chairman of the committee
Febi Sanjaya, M.Sc.

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Instructional Design of Problem Based Learning (PBL) Model on Relation and Function Material to Improve the Problem Solving Ability of Middle School Students

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Abstract. This study aims to produce learning trajectories to teach relations and function material. The research subjects were students of class VIII C of a State Middle School in Yogyakarta. This research was conducted in October 2017 - November 2017. This researgh is design research. The initial design, trial, and implementation of learning. Uses observation collection data, interviews, documentation, and tests. Data analysis steps used are data reduction, data presentation and conclusions or verification. Data reliability is measured through a description of the learning process carried out by the researcher. In this study the researcher will describe the learning trajectory of students in solving problems in relation and function material. The results of the study show that through learning compiled by researchers design, it can help students solve problems and can improve problem solving skills of eighth grade students of Middle School Students.

1. Introduction

1.1. Research Background

Based on the result of observation in class VIII SMP N 2 Godean obtained a view of learning process situation as follows: learning process still dominated by teacher so that the learning process still passive boring and students unable to discuss with other in the class. Students still unable to solve the contextual problem which given by the teacher. Students prefer memories the formula rather than identify the material concept and lack of ability to solve the problem in the material relation and function. Zulkarnain (2015: 43) states that in fact the ability of solving problem by the students in learning Mathematics haven't trained well. In the mathematics learning process students only memories the knowledge which given by the teacher and unable to implement in the real life. So that whether the students found the question which related with solving problem, they unable to identify and formulate the findings.

The result of the observation shows that teacher rare in arranged the learning plan and learning strategy such as learning trajectory about giving problem and handling and supporting to the students in learning process. This case made less in how to handle and support in a prefer way to the problem which occurred in the class. Thus, in the learning process it is needed in designing to the learning trajectory in a class. Hypothetical Learning Trajectory (HLT) used as part which called cycle in mathematical learning cycle for one or two activity, or more than two activity. HLT can related between instructional theory and trial process. HLT used to guide the trial process so that follows the specification material and learning hypothesis which given in HLT (Bakker, 2004)

Problem Based Learning (PBL) could give a chance to the students to identify the idea explicitly and give a experience which related with the student. PBL model started with giving problem, looking for, and finding the problem. Students would get so many experiences which may change the behavior individually. Changing behavior include knowledge aspect, skill and attitude. The result which expected in implementing PBL model by using questions which arranged and focus in the steps solving problem is in order to give a positive impact in the ability of solving problem. Sahin (Zuliana: 2015) states that PBL give a positive impact to the concept understanding and the students' learning result. Moreover Camp research in (Zuliana: 2015) shows that in PBL learning, students can maintain or memories the knowledge longer than traditional class. Awang & Ramly (2008: 334-335) shows that PBL encourage the students of think creatively in the learning process. Some of the researcher shows that PBL might as alternative solution in developing the ability of solving problem of the mathematics students.

Based on the analysis, the researcher held the research about "Learning trajectory and The Impact in Implementing Problem Based Learning to the Material of Relation and Function to the Ability of Solving Problem.

1.2. Research Question

Based on the described background, the research question as follow:

1.2.1. How learning trajectories to teach material relation and function through PBL model?

1.3. Research Objective

Based on the described research question, the objectives of the research is:

1.3.1. to describe the learning trajectory to teach relation and function material through PBL model.

2. Review of Related Literature

2.1. *Problem Based Learning* (PBL).

Barraw (Anwar, 2017: 357) states that Problem Bases Learning is a learning which produced by investigation process, learning understanding, and giving solution from some problems. Problem Based Learning contains of five (5) phase learning which explain in Table 1 as follows:

Table 1. The Syntax of Problem Based Learning

Phase	Teacher Activity
Phase 1 Give orientation about the problem to the students	Teacher explains the aims of the learning, describe the variety of the important of logistic needs, and motivate the students to involve in problem solving activity.
Phase 2 Organise the students to do research	Teacher helps the students to define and organise the learning tasks which relate with the problems.
Phase 3 Help individual investigation and group	Teacher encourage the students to get the clear information, do the experiment and find the explanation and solution.
Phase 4 Develop and presenting the artefac and exhibit	Help the students in planning and preparing the creations which relate with the report, model, and help them to deliver to others.
Phase 5 Analise and evaluate the process of problem solving	Help the students to do refletion or evaluate their investigation and processes which they used.

Source: Arends (2008: 57)

2.2. Problem Solving

Steps of Problem Solving based on George Polya (Sukirman, 2016: 2), are: (1) understading the problem; (2) arranging the plan; (3) doing the plan; dan (4) re-observing/re-investigating.

2.3. Design Research

Steps of held the design research based on the model of Gravemeijer &Cobb (2006) are: (1) Preparing for the experiment/preparation and design phase; (2) Design experiment; (3) Resrospective Analysis.

2.4. Hypothetical Learning Trajectory (HLT)

Simon (Bakker: 2004) defines the HLT as follows:

The hypothetical learning trajectory is made up of three components: the learning goal that defines the direction, the learning activities and the hypothetical learning process a prediction of how the students'thinking and understanding will evolve in the context of the learning activities.

2.5. Relation and Function.

Relation and function between the member of some association with other member of association. Then function from association A to association B is a relation with linked to each member A to the exact of member of association B.

3. Research Method

3.1. Location and Duration of the Research.

The research was held in SMP Negeri 2 Godean in class VIII C Semester I academic year 2017/2018. The research was held in October – November 2017.

3.2. Research Subject and Object

The research subjects in this study were class VIII C students of SMP Negeri 2 Godean . Based on the research, it is the process of learning *Problem Bas Ed Learning* (PBL) models on students' problem solving abilitiy in relation and function material.

3.3. Type and Design of Research

The research was qualitatif research by using design research.

3.4. Research Instrument

The instrument used in this study is *Hypothetical Learning Trajectory* (HLT) , implementation observation sheets, evaluation questions , unstructured interviews , and documentation.

3.5. Data Collecting Method

In this research, the data collection method used as follows: observation**,** written test (sheet *of pre-test, post test, and* worksheets) **,** unstructured and structured interviews **,** and documentation.

3.6. **Data Data Analysis and Data Reliability Techniques**

3.6.1. Data Analysis Technique

Data analysis techniques in the research were carried out in a qualitative descriptive manner. Data analysis steps used are data reduction, data presentation, and conclusion or verification.

3.6.2. Reliability.

In this research, data reliability is measured through a description of the learning process carried out by researchers.

4. Discussion.

In this section we will discuss how the learning trajectory to teach relation material and function with the PBL approach

4.1. Hypothetical Learning Trajectory (HLT) to teach relationship material and function with the PBL approach .

4.1.1. Learning Objectives.

4.1.1.1. Students can explain the meaning of function .

4.1.1.2. Students can distinguish between functions and not functions.

4.1.1.3. Students can express functions with arrow diagrams.

4.1.1.4. Students can express functions with the Cartesian diagram.

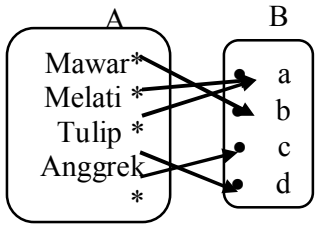
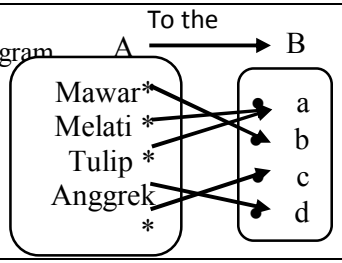
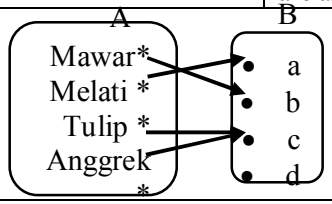
4.1.1.5. Students can express functions with sequential pairs.

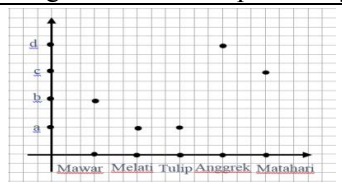
Learning Trajectory

No	Teacher Activity	Possible Teacher Respons	Alternative Activities (Directions that Teachers Do)
1	The teacher begins learning by checking student readiness, class readiness, introduction, and delivery of learning goals	Students do an introduction in an orderly manner and understand the learning objectives to be achieved	The teacher continues the learning process
2	The teacher provides problems related to the function material and how to express functions that	Students actively interact with the teacher to understand problems related	The teacher conditions students to stay active interacting to solve existing

<table>
<tr><td></td><td>can be related to daily life.
The problem is made</td><td>to learning material</td><td>problems.</td></tr>
<tr><td>3</td><td colspan="3">The teacher invites students to complete the case in the second worksheet number 2, namely:
Rini memiliki 5 tangkai bunga, yaitu bunga mawar, melati, tulip, anggrek dan matahari. Jika bunga mawar di masukkan pada vas b, bunga melati dan bunga tulip dimasukkan pada vas a, bunga anggrek dimasukkan pada vas d dan bunga matahari dimasukkan pada vas c. jika 5 tangkai bunga tersebut adalah
himpunan A, dan vas-vas tersebut merupakan himpunan B, maka:
a. Indicate with arrows diagram of relation association A to association B.
b. Indicate the Cartesian diagram of relation association A to association B.
c. State with the set of sequential pairs of relation association A to association B.
d. Is the case a function? Prove it</td></tr>
<tr><td>No</td><td>Teacher Activity</td><td colspan="2">Possible Students' Respons</td><td>Alternative Activities (Directions that Teachers Do)</td></tr>
<tr><td rowspan="3"></td><td rowspan="3"></td><td colspan="2">Step 1. Understanding the Problem</td><td></td></tr>
<tr><td colspan="2">Possibility 1.1
Students can understand the problems of existing problems, because they write down what is known and are asked from the problem correctly as follows.
Is known:
Rini has 5 flower stalks and 4 flower vases
Mawars are added to the vase b
Melati flowers and tulips are included in a vase,
Anggrek flowers are included in the vase d
Sunflower is included in the vase c
Asked:
1. What is the arrow diagram of set A relation to set B?
2. How is the Cartesian diagram of relation set A to set B?
3. What is the set of consecutive pairs of relation sets A to set B?
4. Is this problem a function or not?</td><td>Support 1.1
The teacher gives appreciation to students because they have understood the problem correctly, namely being able to mention what is known and what is asked of the existing problems..</td></tr>
<tr><td>Possibility 1.2
Students find it difficult to write down what is known and asked, even though students understand the purpose of the question given.</td><td colspan="2">Support 1.2
The teacher gives direction to students to write down what students understand on the lines provided. Then, the teacher gives motivation to students to be confident with the students' own answers. The answers expected by the teacher in accordance with the possibility 1.1 students.</td></tr>
</table>

		Possibility 1.3 Students confuse to write down what is known and asked on the line provided because students do not understand the purpose of the question given.	**Support 1.3** First the teacher asks students to read the first sentence, "Rini has 5 flowers, namely Mawar, Melati, Tulip, Anggrek and Sun". Then the teacher asks students " what do you understand from this first sentence? " If the student answers" Rini has 5 stalks of flowers. "Then what are the names of the flowers from the five stems of flowers" Mawars, Melati, Tulips, Anggreks and Sun. " Do you think this is data that needs to be collected as data to solve this problem? If so, then the note in the Sheet is known. " What else do you know? " If the student answers " If the mawar is included in the vase b "emphasize the student in this sentence. Yes, it's enough to get there first, from what sentence can you catch? If the student answers "the mawar is included in the vase b" Good, that is what you already know the flower, in what sentence is this besides flowers? If students answer "vas b". Well, besides what vas you know about the problem, if students write down the next data, "Melati flowers and Tulip flowers are included in the vase, Anggrek flowers are inserted in the vase and matahari flowers are added to the vase c". So how many vases do you know everything? If students answer "4 vases namely vase a, vase b, vas c, and vase d". Well, the teacher appreciates the correct student answers. With support like this helps guided students understand the problem.
		Step 2. Develop a Plan	
		Possibility 2.1 Students can develop a plan for completion according to students' understanding, namely: Arrange a Plan - Describe relations with arrow diagram - Describe the relation with the Cartesian diagram - Describe the relationship with the set of ordered pairs - Proving whether existing problems are a function or not, by reviewing the functional requirements of the problem.	**Support 2.1** Teacher appreciation to the students for having to write aplan penyeles ian problem according to what they understand. Then the teacher gives motivation to students to continue the next steps in accordance with the plans that have been made by students.

<table>
<tr><td></td><td></td><td colspan="2">Possibility 2.2
Students are confused to prepare a settlement plan, even though students can carry out the solution correctly (meaning that if this step is removed, students can still solve the problem)</td><td>Support 2.2
The teacher gives direction and stimulates students to mention what steps they will take if they are given problems such as the existing problems. Then the teacher provides reinforcement to students the importance of preparing plans before solving a problem, namely so that students are accustomed to solving problems in accordance with the analysis of the completion steps that should be. The answers expected by the teacher are in accordance with 2.2 students' possibilities.</td></tr>
<tr><td></td><td></td><td colspan="3">Step 3. Implement the Plan</td></tr>
<tr><td></td><td></td><td colspan="2">Possibility 2.1 (a):
Students can state case with that arrow diagram as follows
 
</td><td>Support 2.1 (a):
The teacher appreciates the arrow diagram that students make and give direction to students to write the relation from set A to set B at the top.
Illustrations expected by the teacher are as follows:
 
</td></tr>
<tr><td></td><td></td><td colspan="2">Possibility 2.2 (a):
Students can describe arrow diagram, however the image is still made yet complete, as the following:
 
</td><td>Support 2.2 (a):
The teacher gives direction to students to be more careful in reading the existing problems, and comparing the images made with the questions asked. The answers expected by the teacher are in accordance with Figure 2.1 (a).</td></tr>
<tr><td></td><td></td><td>Possibility 2.3 (a):
Students cannot state the case with an arrow diagram</td><td colspan="2">Support 2.3 (a):
The teacher guides students by asking students to classify the data they already know. The teacher asks students " what is the first set of you think of the data that you already know above? " If students answer the name set of flowers. " Then what is the other set? " If students answer" flower vases ".Well, from those 2 sets, how do you write down the names of the members of each set in the form of arrow diagrams? The answer expected by the teacher is in accordance with Figure 2.1 (a).</td></tr>
<tr><td></td><td></td><td>Possibility 2.3 (a):
Students cannot state the domain andcase domain with an arrow diagram</td><td colspan="2">Support 2.3 (a):
At first the teacher emphasized the sentence they already knew, namely "the mawar was entered in the vase b" the teacher asked what relationship was right for this sentence? if the student's answer is "included in the vase", then the teacher asks the student to place a domain and codomain to present the direction of the arrow in the sentence that is the mawar is inserted</td></tr>
</table>

			in the vase b.If students draw arrows from members of the set of names of flowers that are mawars towards the members of the set of Vases namely vase b. Ask students if the direction of the arrow you are drawing from the flower goes to the vase, then which area is the origin? The answer expected by the teacher is Himanan Name of Flower is Domain
		Possibility 2.3 (b): Students domain and kodomaininverted states t he case by an arrow diagram	**Support 2.3 (b):** the teacher asks the students who are inverse to write the relation in the two sets that is "entered in" and asks students to write down the domain and codomain members to draw the relation arrows from the two sets. Selanjutnya teacher asks the students to read the diagram arrow made whether it is correct or not. If it is read, the A Vase is inserted into a melati flower, then the teacher emphasizes how to read it if it is like this, "vas a is inserted in the Melati flower vase." After that the teacher asks whether it is correct and the same as the sentence on the question, "Melati flower is inserted in the Vase a?" If the student answers yet, then how should this sentence be? If students answer "reversed". It's good to try to flip it and read it like what? If the student answers "Mawar flowers are included in the vase b.". The teacher appreciates the students' answers and asks to complete the pairs of members for Melati, Tulip, Anggrek and Sun.
		Possibility 2.4 (b): Students cannot express problems using the Cartesian diagram.	**Support 2.4 (b):** The teacher directs students to write the names of flowers at each point in the abscissa, and write down the types of vases at each point in the ordinate.Then ask the student to connect the absence to the ordinate with a point corresponding to the known problem. Because this material was also explained at the previous meeting, the teacher asked the students what the point in the Cartesian diagram was? So that students can present a function with a Cartesian diagram such as the possibility of 2.5 (b).
		Possibility 2.5 (b): Students can state problem with use a diagram Cartesian next to :  	**Support 2.5 (b):** The teacher gives appreciation to students because they have presented the function using the Cartesian diagram correctly.
		Possibility 2.6 (c): Students can express problems using sequential pairs of pairs, namely: {(Mawar, b), (Melati, b), (Tulip, b), (Anggrek, d), (Matahari, c)}	**Support 2.6 (c):** The teacher appreciates the method of writing a set of sequential pairs written by students because it is in accordance with the correct way of writing.
		Possibility of 2.7 (c): Students can state problems with sequential	**Support 2.7 (c):** The teacher directs students to be more careful

		partner leadership but still not true, namely: (Mawar, b), (Melati, b), (Tulip, b), (Anggrek, d), (Matahari, c)	about how to write a set, which is to begin and end with curly braces.
		Possibility of 2.7 (d): Students cannot express problems with sequential pairs.	**Support 2.7 (d):** The teacher reminds students about the correct way of writing sequential pairs. Where students must write the names of the flowers and the type of vase with a comma (,) separator. After that, guide students to add curly braces at the beginning and end of the category. The expected responsecorresponding d en gan Possible 2.6 (c)
		Possible 2.8 (d): Students say the case is a function, because each member A has exactly one partner in B.	**Support 2.8 (d):** The teacher appreciate the students' answers are correct. As reinforcement, the teacher asks about the requirements of a function? And are the problems that meet the requirements of a function or not?
		Possibility 2.9 (d): Students state that the case is not a function, because there are two A members who have the same partner in B.	**Support 2.9 (d):** The teacher confirms to students whether the problems that have been solved meet the requirements of a function or not.If it does not fulfill it is not a function, and if it fulfills it is a function. The answers expected by the teacher are in accordance with the possibility of 2.8 (d)
		Step 4. Conclusion	
		Possibility 4.1 Students can conclude the results of student work correctly as follows:Existing problems are examples of functions, because the function requirements are fulfilled. So that the function can be presented with arrow diagrams, cartesian diagrams and consecutive pairs of pairs as shown above.	**Support 4.1** The teacher gives appreciation to students because they can correctly conclude the work of students. Then the teacher gives motivation to be able to solve other problems in accordance with the steps that have been done by the student.
		Possibility 4.2 Students are confused to conclude the results of their work.	**Support 4.2** The teacher gives direction to students to look back at what was asked of the problem and asked whether each of the questions asked by the students was solved? If you have directed students to write results that are in the line of conclusions. The answers expected by the teacher are in accordance with 4.1 students' possibilities.
4	Teacher concludes the learning process with students	Students conclude learning outcomes by stating their understanding of functions and requirements, and can distinguish a function or not.	Teacher ends the learning activity

4.2 Learning Process

Teacher starts the class by greeting and check students' attendance. Teacher deliver the learning objectives and aprectiate material which will be learn by showing the relation between one students with other

The teachers motivate students to be actively involved in activities addressing issues to improve students' self confidence g uru divide students into 16 groups (2 people at a table). The teacher gives a problem for each group. Points c and d are intended so that students can analyze and understand the problems given in groups. If students find it difficult to solve the problems given, the teacher provides support. This mask is shaped directions and questions which guides the students themselves who can eventually finish. By giving the support form of functioning condition. Students are given time to discuss in groups. When discussing this issue. Students are confused about understanding this problem. When asked by the teacher what did you know about this problem?

Student: (Some can only write "Rini has 5 flower stalks" there is also a brief explanation: "Rini has 5 flower stalk that is the mawar, melati, Tulip, anggrek, and matahari".

Teacher: (The teacher tries to direct students to read one by one and guide students to look at the data in this problem). Try reading the first sentence from Sola.

Student: Rini has 5 flower stems, namely flowers of mawar, melati, Tulip, anggrek, and matahari.

Teacher: What do you understand from this first sentence? do you know from this sentence?

Student: Rini has 5 flower stems.

Teacher: So what do you know of the flower stalks 5

Student: mawar, melati, Tulip, anggrek, and matahari

Teacher: Do you think this is data that needs to be stored to solve this problem? If so, write it in the known sheet. Furthermore, what else do you know? Try to read it carefully and observe sentence after sentence from the problem.

Student: Students only read "If the mawars are inserted in the vase b" "yes, just get there first", the teacher asks "from what sentence can you understand?" "The mawar is not included in the vase b".

Teacher: Okay, what did you know about flowers, in this sentence besides what interest? Try reading carefully.

Student: vas b.

Teacher: Well, besides what vases do you know about the problem?

Student: *Then students write down the next data, namely* "Melati flowers and Tulip flowers are inserted in the vase, Anggrek flowers are inserted in the vase and matahari flowers are inserted in the vase c" .

Teacher: So how many vases do you know everything?

Student: 4 vases namely vase a, vase b, vas c, and vase d.

Teacher: Well, the teacher appreciates the correct student answers. With support like this helps guided students understand the problem .

Furthermore, the first problem is to state with the arrow diagram of the set A relation to set B. In problem one, students still have difficulty presenting from known data into arrow diagrams, this is because students are not accustomed to being faced and practicing with problems like this.

Teacher: (The teacher tries to guide students by asking students to group the data they already know). The teacher asks students "what is the first set of you think of the data you already know above?"

Student: Some answer "The set of names of flowers and sets of flowers".

Teacher: Then what is the other set?

Student: Flower vase .

Teacher: Well, from those 2 sets, how do you write the names of the members of each set in the form of arrow diagrams? At this stage there are also students who are still upside down in determining which domain and which domain is. Then the teacher guides students by asking students to be more careful in understanding this problem . To guide students in

determining which domains and domains are the first, the teacher emphasized the sentence they already knew, namely "the mawars are included in the vase b" first the teacher asks "What relationship is right for this sentence?"

Student: Put in a vase .

Teacher: Next the teacher tries to ask students to place domains and codomains to present the direction of the arrow in the sentence that is first the mawar is inserted in the vase b.

Student: Students draw arrows from members of the set of names of flowers namely mawars towards the members of the set of Vases, namely vases b.

Teacher: For students who answer in reverse the teacher emphasizes how to read the question sentences correctly and presents a diagram of the arrow in accordance with the command questions. To understand students in solving this problem, the teacher then asks students who are upside down to write down members of the domain and codomain to draw the relation arrows from the two sets. " Try to describe the relationship in the form of an arrow from this problem that you already know."

Student: Then the student draws the arrow from vas b towards the mawar, from vas a to melati flower and so on .

Teacher: Next the teacher asks students to read the arrow diagram made "try to read the arrow diagram that you made whether it is correct or not?"

Student: Students don't read .

Teacher: Then the teacher emphasizes how to read to students "how to read it if an arrow diagram like this becomes a vase inserted in a melati flower vase". After that the teacher asked "is it correct with the sentence on the problem that the Melati flower is inserted in the Vase?"

Student: Not yet .

Teacher: Then how should this sentence be?

Student: behind.

Teacher: Good, try to be reversed? After reversing, the teacher asks students "how to read it?".

Student: Mawar flower is included in the vase b .

Teacher: Good, then the *teacher appreciates the correct students' answers and asks students to complete the pairs of members for Melati, Tulip, Anggrek, and Sun.*

Furthermore, for the second problem is to state with the Cartesian diagram the relation of set A to set B. For the second problem students can present the problem in the form of cartesian diagram, because it has got a picture of the pair of members of the Flower set and the set of Vases. For the problem that the three students have also been able to present the problem in the form of cartesian diagrams, only a few need to emphasize the writing rules for sequential pairs, especially those in alphabetical order and number sequence. For the problem the four teachers ask students to state whether the case is a function? Prove it For this fourth problem students are invited to be more daring to argue with what they are doing.

Teacher: Is the case a function? Prove it!

Student: yes, this case is a function.

Teacher: Student is confused when the teacher asks students to prove . Then the teacher reminds students by asking again about the function requirements. The teacher asks " do you know whether this problem is a function? Try to explain with each of your reasons for language. "

Student: Then there are students who answer "because they have fulfilled the function requirements", there are also those who answer "because the function requirements are fulfilled, ie no member of the domain has more than one partner in the Kodomain member".

Teacher: Good The teacher appreciates students who answer correctly. This guidance helps students in solving problems .

The teacher asks the completed group to present the results of their work at front of class. Besides that, I asked other students to give questions and arguments about the presentation of the work presented by other groups. Finished presenting, g uru with students concluded the material concept of the process of finding a solution Permas a land they do. Points 4.2.7. This is intended so that the learning objectives that have been formulated can be achieved. Where students finally understand the application of functions in everyday life. The teacher closes learning with greetings .Guru meminta kelompok yang sudah selesai untuk mempresentasikan hasil pekerjaannya di depan kelas. Selain itu guru meminta siswa lain untuk memberikan pertanyaan dan argumen tentang presentasi hasil pekerjaan yang dipresentasikan kelomppok lain.

5 Conclusion.

Based on the results of design research on relations and functions using the *Problem Based Learning* model approach to the *eighth* grade students of SMP Negeri 2 Godean, the authors can draw conclusions, including: The author is able to produce student learning trajectories for relation and function material. Learning trajectories have been tested in learning 2 times, namely in the trial class and research class. Students are able to construct knowledge and solve problems in daily life related to relationships and functions.

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