LEARNING FUNCTION WITH ONLINE TRANSPORT APPLICATION

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Abstract

Function is one of subject of math in the high school student. Transportation online is one of the most popular application in Indonesia. We present activities using calculate the cost in online transportation. This study aims to produce a learning trajectory of using online transportation. Therefore, the design research was chosen to meet the research aims and to give in formulating and developing local instructional theory in learning function. Learning trajectory designed in the early phases and tested on 6 eight-grade students in the public islamic junior high school number 2 Palembang (MTsN 2 Model Palembang). The results showed that the activity of using online transportation can stimulate informal knowledge of students in the selection of objects where order does not matter. Furthermore, activities of using online transportation can be used by students gradually developed into more formal mathematics.

INTRODUCTION

Function is one of the material of mathematics which is learned in high school student. Function as a unique rule associate the elements in a set by set [15]. Fuctions are often used to transform an element in a set to element in a other set [10].

Based on research [11], some student difficulties in material of function are difficulty to accomplish operation calculating with less accurate answers and lack of understanding of concept. While the result of the research [2], understanding and the use of formal and informal concepts of functions depend on the experience of students at school as well as outside the school.

Based on previous research [9], students' ability to think and understand the concept of function consept to be developed after a series of activities designed with PMRI approach. [4] emphasizes that mathematics should be linked with something tangible to students through problems from situations close to the student. [8] PMRI refers to the concept of Freudenthal in realistic mathematics Education (RME). There are two important sight of freudenthal. The first is mathematics must be connected to reality. Mathematics must be closed to student and connected to daily student life. The second is mathematics is a human activity. The student is gave a chance to do learning activity with material of mathematics [13].

Although PMRI learning is adapted from RME learning but PMRI is developed adjust with local culture context and condition in Indonesia [14]. Therefore, the context used in PMRI learning is attempted to be a context that has ever experienced students in Indonesia. One of the principles of PMRI is the intertwine where the mathematical concepts odf one and others can be interconnected [3]. The context to used on thi research

is online transportation. Online transportation is available in some major cities in Indoneisa, one of them is Palembang.

One of the features in aplication of online transportation is delivery food. The concept of the payment is the price of the menu multiplied by the portion and summed up with shipping fee. This is line with [15] the best way to learning function is contextual situation where the movement in an object (independent variable) causing change to other object (dependen variable). The independent variable is th price of the menu and the dependent variable is the total price to pay.

From the above discussion, researcher carry out research with the aim of developing a theory of learning to assist students to understand the concept of the function with online transportation.

LITERATURE REVIEW

In this study, the literature corresponding to the title above is as follows :

PMRI

Realistic Mathematics Education (RME) is a theory about mathematics learning that was first introduced and developed in the early 1970s in the Netherlands [17], RME is based on Freudenthal's opinion that mathematics is a human activity and students can not be regarded as a passive recipient of existing mathematics [8]. In Indonesia, RME in adaptation and known as Realistic Mathematics Education Indonesia (PMRI). PMRI itself can be regarded as RME version Indonesia because the concept is adapted to Indonesia culture and based on the theory of RME [14]. PMRI began applied in Indonesia since 2001 developed by The Institute of Developers PMRI (IP-PMRI) and chaired by Prof. Dr. R. K. Sembiring [16].

Based on [14], learning with PMRI approach has some charachter : First, students are more active to thinking. Second, context and material are related to environment of school and student. The last, the teacher's role is more active to design teaching materials and class' activities.

RME has three principle and five characters [5]. The three pinciples such as : guided reinvention and progressive mathematizing, didactical phenomenology, and self developed models. Then, the five characters are : Using context, using model, using student contributions, interactivity and intertwine.

Function

According to [12] linear function is a statement that explains the relationship of variables and the end of learning the students are required to be able to interpret that the value of y or f(x) depends on the value of x, where the value of x is may be fickle. The main form of linear function is f(x) = ax+b. Based on the curriculum 2013 with revision 2016, for the eight grade in junior high school, the material function is studied by student is function.

Online Transportation

Online transportation is tranport based online application. Currently, it started to develop in Indonesia. There are several brands of online transportation develop in big city in Indonesia, included Palembang. In this study, the feature what is uses is food delivery.

In food delivery, there are some aspect that influence it. There are the price of menu, number of menu ordered (portion), and shipping fee. So, the total price that we must pay can be the price of menu multiplied with number of menu ordered and summed with shipping fee. If x is number of menu ordered, a is the price of menu, b is shipping fee and f(x) is total price, we can form $f(x) = ax+b$.

Objective

This study aims to produce a learning trajectory of using online transportation.

METHODOLOGY

This study uses design research. According to [7] state that the design research aims to develop Local Instructional Theory (LIT) with co-operation between researcher and teacher to improve the quality of the learning. In general, there are characteristics of Design Research [1] such as : 1) Interventionist nature : design research is flexible because of design of learning activities can be changed during research for measure the situation of learning; 2) Process oriented research design based on lesson plans and tools or device used to understanding the learning; 3) Reflective component after implementation of design of activity of learning, conjecture from each analysis of learning process is compared with real learning; 4) Cylic character, There is process of evaluation and revision which the process actually use as the basis for next activity; 5)Teory oriented has to related with the real teaching experiment. to produce HLT and LIT.

This research was did in odd semester. The subject of this research is eight grade student in public islamic junior high school number 2 Palembang. The data is took such such as interview, photo, video and the result of student's work.

In this study, several learning activity on material function an other aspects are designed in order so that formed a cyclic process that can change and developing during the teaching experiment process. In design research, there is cyclic process (recurring) to do activity of the design and pilot learning activity and the other aspects. A cyclic process consisting of thought experiment and instruction experiment occurs repeatedly until the discovery of local instructional theory which is the result of a revision of that learning tested before.

According to [6], there are three phases in design research. First, preliminary design is introduction to start the research. There are 2 phases in preliminary design. Suc as : 1) Literatur review. 2) Designing prejudice of HLT. Second, teaching experiment have two phases. 1) Pilot experiment 2) Teaching experiment.

RESULT

This study aims to produce a learning trajectory in the learning material function with online transportation. This research through two phases of the three phases of design research, namely: preliminary design and the design experiment were conducted in the pilot experiment.

Preliminary design

At the phase of preliminary design, researcher examined the literature on material function, PMRI, and design research that was used as research methods.

Once the researcher have designed the initial learning, later obtained a learning device that will be used in the experiment phase. Before researcher conducted experimental phase, researcher discuss in advance with the mathematics teacher who became a model teacher. This is done because the teacher is more familiar with the characteristics of students who will be the subject of study. At this phase of these discussions, researcher and the teacher together to discuss learning device, if it is not in accordance with the research subjects, it will be revised. Among them is a learning device Hypothetical Learning Trajectory (HLT), student activity sheet, lesson plans, teacher guide, pre-test and post-test questions.

Pilot experiment

Student activity sheet 1 – The concept of linear function

In activity 1 of student activity sheet 1, the students are introduced to the context. The context is online transportation. Activity 1 asks about student's experiences. The experiences are about online transportation.

In figure 1, the student answer that they ever use online transportation and order food delivery by online transportation. This shows that the student already know about the context to be used in learning.

In activity 2, the student will use handphone to order menu in application of online transportation and after that, they fill the blank in student activity sheet 1. From this activity, researcher want to lead the student to understand the formula of linear function in each their reservation.

In figure 2, the student already know how to form of formula of linear function for x order.

After they form of formula of linear function for x order, next activity is determine of total price we must paid if we want to 10 order.

According to figure 3, the student makes a form of formula of linear function from the previous activity. And then, they substitution x to 10. At least, they got the result is 130.000.
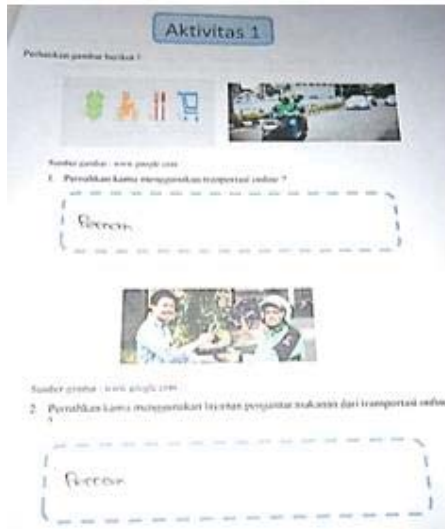
Figure 1. The Student's Answer In Activity 1

Figure 2. The Student's Answer In Activity 2

Figure 3. Student's Answer In Activity 2

In activity 3, the student required to make a table from the previous activity. On the previous activity, they are invited to classify domain and range.

Figure 4. The Student's Answer In Activity 3

From the figure 4, the student can classify x and y and make it to a table. x is the number of menu that want to order (portion) and y is total price that must pay depend on portion.

Student activity sheet 2 – Student solve the problem related to function

In activity 4 of student activity sheet 2, They will solve several problem that have connected with linear function. This is one of problem in student activity sheet 4.

Question : Candra orders 2 plates of mie celor (traditional noodles from Palembang, Indonesia) in a cafetaria with application of online transportation. The price of mie celor is Rp 15.000/plate. He paid Rp 42.000 to driver. How much shipping fee for Chandra's order ?

Rp. 15.000 ×2 : Rp 30.000

Total : Rp .42.000

Ditanya : biaya ongkir ?

Jawab: Rp 42.000 – Rp 30.000

: Rp 12.000

Biaya Ongkir : Rp.12.000

Pembuktion

harga 2 porsi : Rp 30.000

harga ongkir :Rp 12.000 +

total :   Rp42 000

Figure 5. The Student's Answer 1 In Activity 4

From the figure 5, the student solves the problem with ordinary calculation. For find the shipping fee, they count the price of the menu and then multiplied it with number of orders. It is 15.000 x 2 = 30.000. And after that, they decrease the total price with the result of previous calculation. It is 42.000 – 30.000 = 12.000. The last, they prove their previous calculating with total price and the result is uncontradiction with problem.

Here is the other answer for same question.

$$f(x) = ax + b$$
$$f(2) = 15.000 (2) + b = Rp. 42.000$$
$$f(2) = 30.000 + b = 42.000$$
$$b = 42.000 - 30.000$$
$$b = 12.000$$

Figure 6. The student's answer 2 in activity 4

From the figure 6, the student solve the problem with concept of function. First they make the main formula of linear function $f(x) = ax + b$. After that, they subtitution the value of $f(2)$, a, x. x is the number of mie celor that he wanted to order (portion), $f(2)$ is total price that he must pay to driver, a is the price of mie celor for 1 plate and b is the

shipping fee. At least, they got the answer is 12.000. It shows that they use concept of function to solve this problem.

Here is example of student's answer to solve the problem.

Figure 7. The student's answer in activity 4

Based on figure 7, the student can make the formula of Yudha's order and Fathan's order. They substrack two of those form and get the value of a. a is the price of Seblak and b is the shipping fee. At least, they get the price of seblak is Rp 15.000.

DISCUSSION

This study aims to give contribution for develop the local Instructional Theory (LIT) by designed several activities for help the student understood the concept of linear function.

The learning was designed based on principles and character of PMRI [5]. Such as (1) using context, the context was used in this research is online transportation (2) using model, the model was used in this research is the details of total price that we must pay (3) using student contributions, the student did the reservation online transportation's application and count the (4) detail of interactivity, the main activities are form the formula linear function and solve the problem with the concept of linear function (5) intertwine, function connected with other concept in mathematics.

CONCLUSION

Based on the results of the discussions that have been described, it can be concluded that the activities in the student activity sheet that has been designed actually can help students understand and resolve problems in addition of linear function from informally intuitive to the formal problem-solving. In this study of learning linear function include 2 main activities. There are form the formula of linear function and solv the problem has related with linear function. Through learning with PMRI approach with online transportation, the student get conception about linear function. The student can

make the form of formula from reservation which they order from previous activity. At least, the student can solve the problem using the concept of linear function.

Acknowledgment

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