DESIGNING OF FUNCTION COMPOSITION LEARNING FUNCTION THROUGH PENDEKATAN MATEMATIKA REALISTIK INDONESIA (PMRI)

Hendra Pratama, Zulkardi, Darmawijoyo
Universitas Sriwijaya, Indonesia

Abstract

The function of composition is one of the important material in Mathematics learning because it makes calculation in daily activities easier, for example, in process of book production, metal recycle, change of golden into jewelery, and also in economics, physics, geography and sociology fields. The purpose of this working paper is to describe about enjoyable mathematics learning in composition function material through Pendekatan Pembelajaran Pendidikan matematika Realistik Indonesia (PMRI). In the fact, the students of learning achievement in composition function in class is less satisfy. Most of students get some difficulties to determine about two functions. Therefore, the learning which is able to assist students more interesting in learning and to increase their concept to develop comprehension is needed. This paper will be explain about PMRI which create the students more effective and enjoyable through water bill in mathematics learning such composition function material.

Keywords: PMRI, Function, Learning, Function Composition, Composition Of Function, Design

INTRODUCTION

The function of composition is very benefit in daily activities, namely, in the process of book production, metal recycle, change of golden into jewelery, in economics field to count and estimate the functon of demand and offer, in chemistry field to decide the time of chemical emetic element, in geography and sociology use in industry and inhabitant population to know the optimum in it, In physics always use the equation of quadrate function to explain about moving phenomenon, the new colour will be got by using the colour composition in printing machine.

Unfortunately, the students still get difficulties to find out the composition of two function because they do not understand yet about the characteristics function of composition as Artiyani, R (2016) state in her research result," the students get difficulties to determine the compositions from two function." Similarly, Mulyani et.al (2015) say the comprehend studens in mathematics conceptual ,mainly, in function composition material is low.

Based on this problem, it needs one of suitable of learning approach. The approach which make students mastery of material that related to composition function and also to force them be active in learning. One of the appropriate characteristics approach is Pendekatan Pembelajaran Pendidikan matematika Realistik Indonesia (PMRI).

PMRI is one of the alternatives that can be used by Mathematics teachers in develop students ability to think, logical reasoning, communicate and overcome problem in daily life. (Zulkardi, 2002). Mathematics in PMRI is human activity so PMRI uses the

real context as starting point in learning (Zulkardi & Putri, 2010). PMRI is the approach that make students understand about the concept of mathematics with connecting the knowledge in daily life (Putri, 2011). According to Bustang, Darmawijoyo & Zulkardi (2013), By using fan context in PMRI approach, students are able to understand similar angles or more than 180°. Furthermore, Fatoni, Putri & Hartono (2015) stated that with the series of student experience as learning activity through PMRI can develop the student comprehension and measuring.

The learning that is connected to the reality can increase students appeal in studying of mathematics. As the previous research, Ariyani (2016) to increase of comprehension composition function material, it can be used electric bill as media. The function that used in Electric bill payment $f(x) = ax + b$. It is the same as liquid bill payment. It called function $f(x)$ if the domain is much water that used and range is the cost of it. Students are able to determine the function of composition $(g \circ f)(x)$ with count the bill that they must to pay if they get 10% merchant online discount. Besides that, By using the problem that face of water company which pay the tax based on the amount of the water processing, students must determine the conditional of composition function.

Based on the background explaination,composition learning function is very important, so the researcher want to reveal it in designing of composition function learning with Pendekatan Pembelajaran Pendidikan matematika Realistik Indonesia (PMRI).

THE METHODOLOGY RESEARCH

In this research, the researcher uses a design research method. The aim is to develop Learning Trajectory or HTL. Another purpose is to develop the theories of learning process and designing procedure, cooperating between researchers and teachers to increase learning quality in order to develop LIT (Gravemeijer & Cobb, 2006).

This research consists of the series of learning activities and another aspects. if the instruction is not appropriate so HTL must be re-designed (though experiment) and re-trialed. The activities of design research is cyclic process. The cyclic proses consists of though experiment and instruction experiment.

As Gravemeijer & Cobb (2006), design research consists of 3 steps, namely, (1) preparing for the experiment, (2) the design experiment, and (3) retrospective analysis. Preparing for the Experiment

Reciting of Literature

In this step, the material of decimal subtraction operate, PMRI, 2013 Curriculum, and design research must be recited as the first step to arrange the strategy in learning process.

Examining of pre-student ability.

Some of students are interviewed by the researcher to get the information how far the students understand about the prerequirement instructional material.

Designing of HTL

The researcher makes HLT design, that is, the description of aim, activity, and equipment learning to assist learning process. In HLT, it will be developed the series of learning activity of decimal substraction operate material with PMRI approach that have assumption to help learning process.

The Design Experiment

The activity in the second step is the implementation of instructional design which is designed in the first step, the purposes are to explorate, find out students strategy in learning decimal substraction operation. There are 2 cycles such as:

Preliminary Teaching Experiment (Pilot Experiment)

Pilot experiment to connect between designing and teaching experiment steps. The aim is to trial of HLT in small group of students to collect the data and by using teaching experiment level. The suggestion gets from discussion and answer question between modelling teacher and students.

Teaching Experiment problem of study.

The process of HLT do in revision of pilot experiment and it has been implemented in teaching experiment level. During teaching experiment, the function of HLT is as the main guidance in instructional, interview and observation.

Retrospective Analysis

HLT would be compared in situation of learning to investigate and explain how the students make the generalisation of the activity that they had done. The result of retrospective analysis is to answer the researcher's question, make the summary and give recommendations to other researchs about HLT that had been devloped. The analysis of data had been done based on collecting data technique that used in pre-test and post-test, observation, interview, documentation and triangulation.

THE METHODOLOGY RESULT

This reserach consists of three steps, namely, preparing for the experiment, the design experiment, and retrospective analysis. In the first step, consists of the interview and observation and also hyphothetical learning trajectory did. After that, HLT will be trialed in the first cycle of design experiment, that is, pilot experiment (first cycle) and retrospective analysis. The result of this analysis to revise of HLT and it will be applied in teaching experiment in the second cycle. Learning activities process in the second cycle will be re-analyzed to revise HLT, in which, it will be come local instructional theory.

Based on pilot experiment in the first cycle, the researcher observe and analysis it to find out which one has to revise, in order to get satisfactory result in the second cycle or teaching experiment. That revision to get the second HLT in second cycle.

The learning in the second cycle did X IPS 2 class. The students as the sample are 32 students and a teacher as a model. Each of groups consists of 4 students. Before teaching experiment, the modelling teacher get the instruction about teaching composition function with PMRI approach. The implementation of learning activities in the second and first cycles almost the same. The researcher give pre-test which is consists of 4 questions first. The purpose of the test to find out pre-knowledge of students about composition function material. The result of experiment from each of LAS in teaching experiment as below:

Activity 1

The teacher divided the students into 8 groups. Each of groups consists of 4 students. Then, the teacher spread of LAS to groups. The teacher gives motivation and introduction about the context of liquid bill with the composition function. The students in groups discuss about the LAS and find out the overcome problem in each of activities.

In the first question, students do not find the difficulties, all of the groups could be answered suitable as their condition.

In the second and third questions, the students still do not find difficulties too, all of the groups could be answered the questions correctly in the activity 1.

Figure 1: Student's answer number 2 and 3

In number 6, all of the groups are able to answer correctly. The students have to determine amount of money that they have to pay if they get 15% discount.
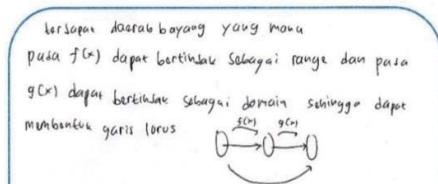

Figure 2: Student's answer number 6 in the activity 1

When the students did in number 9 they become confuse in the beginning, but sooner or later they understand. There is similarity between two functions, namely, Rf = Dg. On the other words, there is 110.000 numeral in that two functions.

The last questions in this activity are In number 10 and 11. The groups that had already answered the questions correctly know the different function, there is a range as a domain.

Activity 2

The aim of learning is students are able to explain in which daily problems as two functions which can be composied. The students must observer liquid bill and explain the information detailly. There are many blocks in it. So, in that block the students must tell the amount of water that had already used and the pattern of cost calculation as function. In order to make students understand about the process as composition function, the researcher analogy of the amount of cost in that block is (fog)(x). The next problem, The researcher asked the students to count the liquid tax a company and analogy the claim of tax the composition function. the aim of the last activity in teaching experiment (1st cycle) is students are able to declare that daily problem as two functions which will be composed. The first function is total of use. From the previous activity, students can determine two functions conditional . It can be seen from the result of students answer analysis toward to arrow diagram..

There are some weaknesses in the second activity, such as the ability of students make a sentence in mathematic less, students cannot answer the questions "why?". Probability, they not accustom yet to analyze the question, they face difficulties to find out the problem in algebra. In the second cycle, some of things that have to upgrade, such as schedule learning arrangement, motivation, apperception, purpose of learning, the questions in first and second activities sheets. After the seconds cycle, the students get the post test to know the comprehension in two function material liquid bill.

REFERENCES

Artiani, R., 2016. Desain Pembelajaran Komposisi Dua Fungsi di Sekolah Menengah Kejuruan. Tesis. Pascasarjana Universitas Sriwijaya.

Bustang, Darmawijoyo, Zulkardi., 2013. Looking At Angles: A Lokal Instruction Theory for Learning the Concept of Angle by Ekploring the Notion of Vision Lines . Tesis PPS Pendidikan Matematika: UNSRI

Fatoni, Putri, Hartono., 2014. Desain Pembelajaran Konsep Pengukuran Panjang Menggunakan Permainan Tradisional Batok Kelapa di Kelas II Sekolah Dasar . Tesis PPS Pendidikan Matematika: UNSRI

Gravemeijer, K. & Cobb, P., 2006. Design Research from a Learning Design Perspective. In J.V.D Akker , K.P.E. Gravemeijer, S. McKenney, N. Nieven (Eds), Educational Design Reseach (pp. 17 – 51). London : Routledge

Mulyani, dkk., 2014. Pengembangan kompetensi Komunikasi dan Pemahaman Konseptual Matematis Siswa melalui Pembelajaran Berbasis Masalah di SMA. FKIP Untan

Putri, R. I., 2011. Professional Development of Mathematics Primary School Theacher in Indonesia Using Lesson Study an Realistic Mathematics Education Approach. Lymasol, Cyprus : Proceeding of International Congress for School Effectiveness and Improvement (ICSEI)

Zulkardi., 2002. Developing A Learning Environment on Realistic Mathematics Education For Indonesian Student Teachers. Doctoral Thesis of Twente University. Enschede: Twente University

Zulkardi & Putri, R. I., 2010. Pengembangan blog Support Untuk Membantu Siswa dan Guru Matematika Indonesia Belajar Pendidikan Matematika Realistik Indonesia (PMRI). Jurnal Inovasi Perekayasa Pendidikan (JIPP), 2(1), 1-24