



## LEARNING ENVIRONMENTAL MODEL OF PMRI FOR PREPARING PROFESSIONAL TEACHER TO TEACHING MATHEMATICS AT ELEMENTARY SCHOOL

Eka Zuliana<sup>1</sup>, Henry Suryo Bintoro<sup>2</sup>

<sup>1</sup>Department of Education Muria Kudus University Indonesia

<sup>2</sup>Department of Education Muria Kudus University Indonesia

### ABSTRACT

The aims of this research is to produce a learning environmental model of PMRI by using local context to train or produce professional PMRI teachers, to teaching mathematics at elementary school. This research involved 20 teachers that drawn from MBS partners of PGSD FKIP Muria Kudus University. The research method is development research that consist of three stages: (1) designing, (2) development, and (3) evaluation. The result of this research we can get a learning environmental model of PMRI by using local context to train or produce professional PMRI teacher that called MBS Forum and PMRI classroom.

Keywords: learning environmental, MBS forum, PMRI classroom, professional teacher.

### INTRODUCTION

Teaching mathematics effectively requires understanding what students know in advance and need to learn and then give challenge and supporting them to learn it well NCTM (2000: 20). Piaget in (Ibrahim & Suparni, 2012: 79) mention the primary school students aged 7-13 years are at the concrete operational phase. Under this phase, learning mathematics in elementary school should begin with something concrete and real and close to life, knowledge and experience of students.

Freudenthal (1991) stated that mathematics is a human activity and to be associated with reality. Freudenthal looked at mathematics is not a finished product that we give to the students, but rather a process that is constructed by the students. In mathematics learning model in accordance with the above philosophy is Realistic Mathematics Education model. Realistic Mathematics Education (RME) is a domain-specific instruction theory for the teaching and learning of mathematics (Drijvers et.all, 2013:56). In Indonesia RME called Pendidikan Matematika Realistik Indonesia (PMRI). Treffers (Wijaya, 2012) said that the characteristic of PMRI are: using context, using model, students construction, interactivity and intertwining.

One important characteristic of PMRI is a context. Context as a based of learning. The function of context

are: as a concept forming, model forming, applicability and train to specific abilities (De Lange, 1987). Construction of knowledge and concepts will be easier if it departs from the real experience of being close to the students, related to reality, it is easy to imagine (imaginable), the form of an activity and habits that are often carried out in the neighborhood or the area around the students. Construction of knowledge will be easier when using a context based on students environment.

Zuliana (2014) said that cultural heritage that closed to students have good potential become a source of learning and meaningful context for learning mathematics.

PGSD FKIP Muria Kudus University getting a mandate to develop and establish a forum Management Based School (MBS) SD. (Suhartono et al., 2013) mentions MBS hold on three pillars: (1) School of Management, (2) PAKEM, and (3) community participation.

Elementary school teacher as MBS partners of PGSD FKIP UMK have difficulty in conceptualizing mathematics learning process based PAKEM and create innovative design mathematics learning, fun, departs from realistic problems, make students more active,

constructive and creative. PMRI is one of the model that match with PAKEM concept. However, elementary school teacher MBS PARTNERS still minimal knowledge related to PMRI model according to the characteristics of elementary school students, teachers are also not yet have the ability in designing learning tools such as syllabi, lesson plans and teaching materials: Student Activity Sheet based PMRI model.

Based on the situation and the above conditions, researchers established the learning environmental model for the transfer knowledge so that elementary teachers from MBS partners PGSD getting comprehension about PMRI model and can apply it in order to improve the quality of mathematics learning process in their schools.

This research focus on how learning environmental model of PMRI as a place to train and produce professional PMRI teacher at elementary school.

The purpose of this research is designing learning environmental model of PMRI as a place to train and produce professional PMRI teacher at elementary school. They are: 1) MBS Forum a place for PMRI model training of elementary school teacher as MBS PGSD patners 2) PMRI classroom a place for practice mathematics learning process by using PMRI model.

## METHODS

This research is development research. Van den Akker (1999) said that development research is a systematic study of the designing, development and evaluation program.

The study involved 20 teachers, drawn from primary MBS partners who cooperate with PGSD FKIP UMK. Data taking by observation sheet, interviews and questionnaire.

Observation sheet used to look at the ability of teachers to teach mathematics by using PMRI model during simulation after training in MBS Forum and PMRI classroom. Beside that to see student activity during learning process. Document is used to assess the preparation of teachers to teach PMRI based on principles and characteristics, such as: the use of context, model, interactivity and intertwining obtained through observation sheet.

Interviews and questionnaires are used to determine the response of teachers to PMRI models and learning environtmental model of PMRI formed.

## RESULTS AND DISCUSSION

The development of research carried out in 3 stages that include the following activities:

- a. Phase 1 Preliminary Investigation and Designing
  - 1) Analysis and preliminary investigations
  - 2) Designing a learning environmental model of PMRI for MBS partners (elementary school teachers)
  - 3) Determine the subject of research. From 9 MBS partners, taken 20 teachers
  - 4) Prepare MBS Forum, as a teacher training and simulation PMRI model.
  - 5) Prepare PMRI classroom as a practice place.
- b. Phase 2 Design Development
  - 1) at MBS Forum  
Teachers are trained to prepare the device and the mathematics learning process by using PMRI model with genius local as the context.
  - 2) at PMRI Classroom  
Teacher apply mathematics learning process at PMRI classroom on their schools.
- c. Phase 3 Evaluation Program  
In this phase, data is collected and analyzed to look subjects competency, starting from training activities at MBS Forum, and the activity of PMRI classroom. The Competency included: pedagogical competence, professional competence, personal competence and social competence.

### 1) At MBS Forum

Figure 1 below illustrated the implementation PMRI training on MBS Forum teachers asked to think about PMRI model, PMRI definition, PMRI developmental history, and characteristics of PMRI.



Figure 1. The implementation of PMRI training on MBS Forum

At the next step teachers discussed how to design local genius as a context on PMRI, then designing teaching materials and student activity sheets based PMRI, designing devices the elementary mathematics learning using PMRI models, and the sample of mathematics learning process by using PMRI model.



Figure 2. Designing mathematics learning process by using PMRI model

And the last step teachers is teaching simulation. Figure 3 below illustrated elementary school teacher simulate mathematics learning process by using PMRI model and local genius as a context.



Figure 3. Teaching simulation teacher using PMRI model

## 2) At PMRI classroom

Implementation of mathematics learning process by using PMRI model implemented at PMRI classroom. The purpose of the implementation PMRI is to train and finalize the ability of teachers who have been trained. The subject matter is given to students has been developed using PMRI approach. Then tested in the classroom and observation do during the learning activities. The activities are below:

1. Mathematics learning process on square and rectangle area using 'kotak – kotak' fabric as a context by Mr. Mohamad Muslim, S.Pd in SD 3 Pegunungan.
  - a. Teacher started learning process with the 'kotak – kotak' fabric that are familiar to students. The fabric is distributed to each group.
  - b. Students are asked to think about the shape of the cloth (some are square and the other rectangle).
  - c. Each group of students guided and directed to construct the concept of square area and rectangle area using the fabric. As the precondition material, students already know about the concept of area. With the provision of the precondition material, students were able to mention that the area of the fabric is the number of square units in it.
  - d. Students count the number of squares units in the fabric.
  - e. From the some cases with different squares unit students were able to conclude that the area of a square and a rectangle is the product of each side. Square area = side x side, while the area of a rectangle = length x width.
  - f. Students make a presentation in front of the class.
2. Mathematics learning process on kites area using kites games and the song as a context by Mrs. Budiarti, S.Pd in SD 1 Pegunungan.
  - a. Teachers encourage students to remember a game that often they do on the field in the afternoon. Students said with good the game is kites.
  - b. To giving motivation teachers asked students to sing the kites song.
  - c. Teachers bring learning aid: a kite and asked to the students to consider the area of kite. Students are able to mention well that the area is its surface.
  - d. Students are invited to construct the concept kites area using learning aid. Students construct the concept of kites area with triangular and rectangular approaches.
  - e. Classical presentations and demonstrations.

A traditional game also effective when used as a context of PMRI. Nursyahidah, et.al (2013) said that Dakocan a traditional game in Indonesia can become a context for PMRI approach.
3. Mathematics learning process on the value of integer number by Mrs. Sri Hartani S.Pd.,SD in SD 1 Panjang.
  - a. Teachers began learning process using Parijoto fruit as a context for learning value of place at integer

number: units, tens and hundreds. Parijoto fruit is the local genius that can only live in Colo Kudus.

- b. Each group was given a Parijoto fruit with the rule: one parijoto to represent the value of unit, one stalk parijoto containing ten pieces for the concept of tens and one clump parijoto with the stalk intact comprises a hundred pieces for represent hundreds concept.
  - c. Students are asked to prepare the parijoto according to figures cited by the teacher. Then several groups presentation.
4. Mathematics learning process on cuboid nets using jenang kudus pack/box as a context by Mrs. Fitri Linawati, S.Pd in SD 2 Panjang.
- a. Teacher started learning process by getting students open jenang kudus pack/box.
  - b. Each group was asked to open jenang kudus pack/box.
  - c. Students acquire one of cuboid net. Then some of the group was asked to think of cuboid net to knock down one side of the cuboid and prove that the arrangement of plane is a cuboid net. Then they present the result in front of their friends.
- 3) Evaluation Program

Based on mathematics learning process that has been done by elementary school teacher of PGSD MBS patners found that teachers competency at mathematics learning process by using PMRI model very well and increased. Based on interviews, observations and questionnaires, 95% of teachers mentioned that PMRI is very good, improving their knowledge on innovation mathematics, genius local that used as a context in PMRI also very nice, familiar, easily absorbed by their students, and awake students love to the genius local and nation. Teachers also give positive respons to PMRI model with genius local as the context and they also recommends that we must created guidebooks and more widely disseminated to another elementary school teachers.

The results of this research we can get learning environmental model of PMRI for preparing professional teacher to teaching mathematics at elementary school. The flow of activities are: training, simulating and testing on mathematics learning process at PMRI classroom by elementary school teacher of PGSD MBS patners.

Figure 4 below shows the process of PMRI teacher establishment who is a partner of MBS PGSD UMK. It starts from training and simulating in MBS Forum, teaching practice and mentoring in PMRI class.

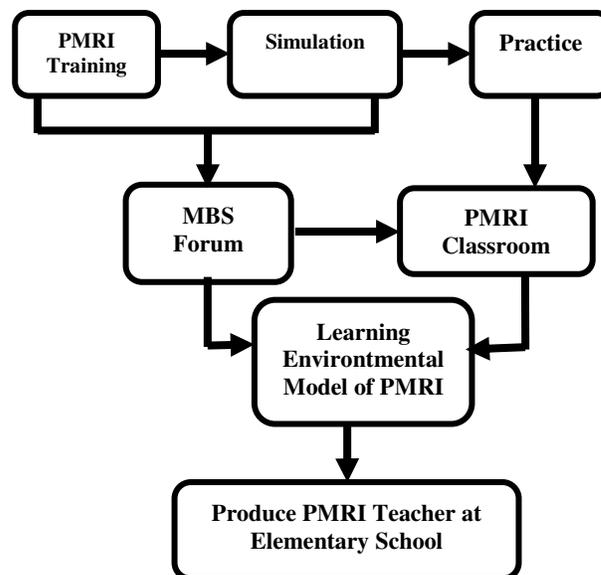


Figure 4. The process of PMRI Teacher Establishment

## CONCLUSION

Based on the result and explanation above, it can be concluded that had been developed learning environmental model of PMRI, consists of: Forum MBS and PMRI classroom.

- 1) In Forum MBS, conducted PMRI training for 20 elementary school teachers where the participants share their experiences and knowledge about PMRI.
- 2) In PMRI classroom, elementary school teachers practice mathematics learning process by using PMRI model for their students.

## ACKNOWLEDGMENT

Kemristek Dikti that give research grant at 2015.

## REFERENCES

- Akker, J., van den. 1999. Principle and Methods of Development Research. In: J. van den Akker, R. Branch, K. Gustafson, N. Nieveen & Tj. Plomp (Eds), *Design methodology and developmental research*. Dordrecht : Kluwer.
- De Lange, J. 1987. *Mathematics, Insight and Meaning*. Utrecht: OW & OC, Rijksuniversiteit Utrecht.
- Drijvers, et al. 2013. *Digital design: RME principles for designing online tasks*. Paper Presented at ICMI 2013: Task Design in Mathematics Education Study 22; 1. UK, Oxford.

- Freudenthal. 1991. *Revisiting Mathematics Education*. Dordrecht: Kluwer Academic Publisher.
- National Council of Teachers of Mathematics (NCTM). 2000. *Principles and Standards for School Mathematics*. Reston, VA: National Council of Teachers of Mathematics.
- Nursyahidah, F., Ilma, R., & Somakim. "Supporting First Grade Student's Understanding of Addition up to 20 Using Traditional Game". *IndoMS-JME*, 4(2): 212 – 223.
- Suhartono, Sukardi, E dan Marsinah N. 2013. Pengarusutamaan Manajemen Berbasis Sekolah pada Program Studi PGSD (MBS-PGSD). *Jurnal Penelitian Pendidikan*. IV(3).
- Wijaya, A. 2012. Pendidikan Matematika Realistik. Yogyakarta: Graha Ilmu
- Zuliana, E. 2014. *Caping Kalo As Kudus Cultural Heritage To Construct Circle Concept Of Primary School Students*. Yogyakarta: Prosiding ISIMMED YSU.