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Effect of Realistic Mathematics Education Approach Among Pubic Secondary School Students In Riau, Indonesia

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ABSTRACT

Background: Indonesia students' mathematics achievement ranked low internationally. The teaching and learning of Mathematics in secondary schools in Indonesia is very much teacher-centred and lacks activities that could enhance students reasoning skills when learning mathematics. **Objective**: this study was to identify the effect of Realistic Mathematics Education (RME) approach on mathematical analogy reasoning and generalization among students at public secondary school (SMU), Riau, Indonesia. The topic of focus was Linear and Simultaneous Equations. This study had used a quasi-experiment research design involving the use of mathematics structure question and observations to collect data. The research subjects comprised of 69 students whereby 35 were in the experiment group and another 34 in the control group. **Results**: Most of the students exposed to RME approach had achieved better in mathematical analogy reasoning and generalization than students who went through the conventional approach. RME approach had also affected students' perception towards learning of Mathematics. **Conclusion**: This study contributes to research findings within mathematics education as well as construction of policies related to curriculum development in mathematics education for secondary school students in Riau, Indonesia.

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INTRODUCTION

Reasoning skills is important in learning of mathematics and could excite students' thinking when solving mathematics problem. Reasoning skills, in fact, constitutes the base for learning mathematics (Diezman, Watters, & English, 2002). Reasoning is very important in solving everyday lives problems. Since reasoning is important in Mathematics learning, hence changes in the approach to learning and teaching Mathematics is necessary (Zulkardi, Nieveen, van de Akker, & de lange, 2002).

Indonesia's position at the international level also indicates that the nation's Mathematics achievement is declining. The Trends in International Mathematics and Science Study (TIMSS) report shows that the level of Indonesia's students Mathematics achievement is low (Kamaliyah, Zulkardi, & Darmawijoyo, 2013). TIMSS report shows Indonesia is at the 34th place out of 50 countries with average score 411; in 2007 it was at the 36th position out of 49 countries with the average score 397, and in 2011 it was at the 38th position out of 42 countries with the average score of 386. It can be concluded that Indonesia's students Mathematics ability is below the international score, which is 500. This situation shows that Indonesia students were only capable to answer questions that were at the low level which did not need reasoning thinking. In fact, many Indonesia's students had failed to answer high level questions that need reasoning ability. Mathematics teaching approaches in schools need to be changed because the approaches can affect students' achievement in Mathematics tests at the national level. According to Muhammad Nuh (2013), the passing percentage in the 2013 national test had declined compared to the previous year achievement, and a total of 5301 students (69.94%) was below the determined national standard, which was 5.5.

Students were weak in Mathematics because of lack of interactions among them and also lack of reasoning activities during Mathematics teaching and learning processes in classrooms and this had resulted in the unsatisfactory achievement in Mathematics (Yanto Permana & Utari Sumarmo, 2007). Mathematics learning that provides opportunity for students to use reasoning when solving Mathematics problems can increase students' performance (Saragih, 2007).

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The use of Mathematics analogy reasoning is still lacking in mathematics classrooms in Indonesia (Ondi Saondi & Siti Khudriyah, 2009). This situation can be seen among students who are not capable to change contextual problems into relevant or appropriate Mathematics learnings models that can be used in mathematics classrooms. Students face difficulties to construct models that relate the real problem with mathematical models and vice versa (Crouch & Haines, 2004).

Today, teaching and learning of Mathematics in Indonesia place greater emphasis on the acquisition of basic skills, compared to the inculcation of Mathematical reasoning skills (Fadjar Shadiq, 2007). Other than that, a large portion of the teaching approaches used by the teachers are still teacher-centred (Isjoni, 2007). Students should not be passive but instead should explore ideas by themselves and seek for opportunities to learn and be responsible for their learning (Arsaythamby & Rosna, 2009).

Mathematics teachers should use teaching approaches that are able to enhance learning of Mathematics among students (Edy, 2008). One approach to teach Mathematics whereby reasoning skills can be used is the Realistic Mathematics Education (RME) approach (Freudenthal, 1991). This approach relates the learning of Mathematics with everyday lives (Ifada Novikasari, 2007).

Mathematics learning within RME involves cooperation and discussions among group members to discover and construct mathematical concepts by themselves and subsequently use the discussions' outcomes to solve problems individually or in groups (Zulkardi, 2003). Gravemeijer (1994) suggests three main principles that need to be taken into account when planning learning using the RME approach, namely guided discovery and progressive mathematizing didactic phenomena, and expansion of oneself models. According to Kwon (n.d.):

"The RME theory focuses on guided reinvention through mathematizing and takes into account students' informal solution strategies and interpretations through experientially real context problems. The heart of this reinvention process involves mathematizing activities in problem situations that are experientially real to students. It is important to note that reinvention is a collective, as well as individual activity, in which whole-class discussions centering on conjecture, explanation, and justification play a crucial role".

RME has five characteristics, namely (i) use real life context, (ii) use mathematizing models, (iii) use production and construction, (iv) use interactions, and (v) use intertwinement (Gravemeijer, 1994).

Methodology:

This study had used quantitative and qualitative approaches, in which data was collected from pretest, posttest and observations. The experimental research design involved two groups of students from a randomly chosen class. One group was made the experimental group and the other the control group. The research subjects were comprised of 69 students whereby 35 of them were in the experimental group whereas the remaining 34 students were in the control group. The experimental group was taught Mathematics using the RME approach whereas the control group was taught using the conventional approach. Both the groups were given the pretest and the posttest. The duration for experiment in this study was eight (8) weeks. The purpose of the tests was to identify the students' level of Mathematical analogy reasoning and generalization.

Observations were carried out to explore the students' activities during their process of learning. Data from the tests was analysed using t-test. The data obtained during observations were analysed descriptively. The Randomized Pretest-Posttest Control Group design, introduced by Jack and Norman (1993) was used in this study (Figure 1).

Experimental Group	R	O	X_1
		O	
Control Group	R	O	X_2
		O	

Keys:
O : Pretest and Posttest
X_1 : Learning through RME approach
X_2 : Learning through conventional approach

Fig. 1: The Randomized Pretest-Posttest Control Group design

The Posttests was used to determine the students' level of reasoning. The outcomes of the Pretests were used to determine whether or not the homogeneity of variance for both groups were similar. The Posttests was administered after the learning of Mathematics using the RME approach ended.

Findings:

Based on seven times observations, it can be said that the students knew how to identify key information and how to solve the problem. Additionally, the students can informally classified information to build Mathematical model based on their understanding. From their mathematics informal model, students then construct Mathematical formal model. Figure 1 shows how a student was able to turn his informal model into a much more formal model to solve the following contextual problem:

Zahra wanted to buy some flowers. She saw some lilies and roses neatly arranged in a flower pot. With Rp 12,400.00, she was able to buy 2 lilies and 6 roses. However, if she had Rp 17,600.00, she would be able to buy 6 lilies and 4 roses. Determine how much she had to pay for one lily and one rose.

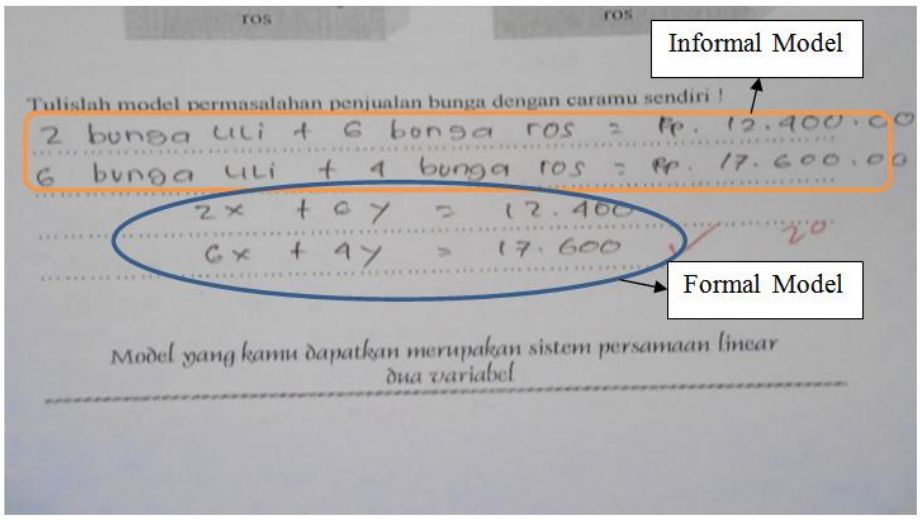

Fig. 2: Solution model constructed by the students from the informal form to a formal form in simultaneous equations

Formal mathematical problem-solving models aid students in applying their experience of solving previous simultaneous equations problem to solve new simultaneous equations given to them. Another example is as follows:

Machine A is able to produce 100 units of items per hour and machine B can produce 150 units of items per hour. In a day, both machines A and B are able to produce 2600 units of items. In total, both the machines operate 20 hours daily. How many hours does machine A and machine B have to operate in a day?

Figure 4

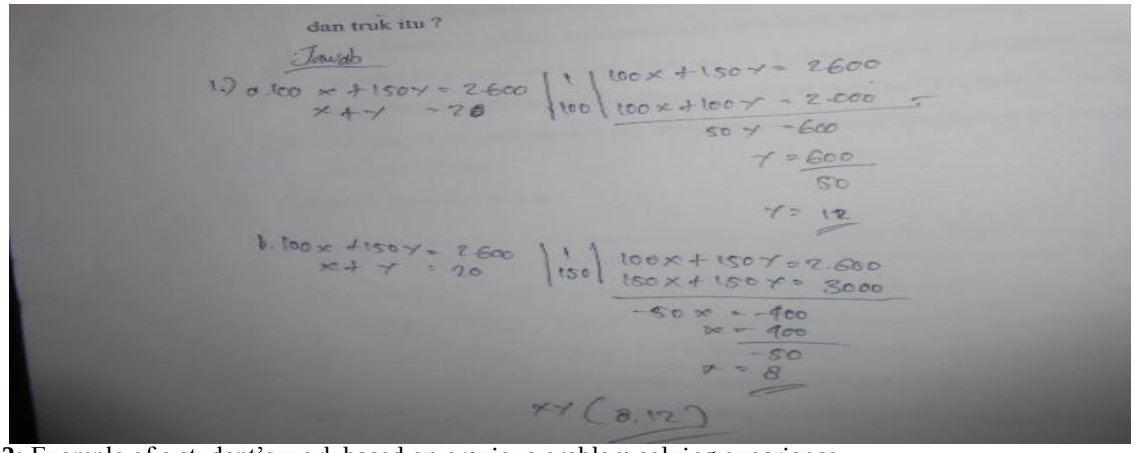

Fig. 3: Example of a student's work based on previous problem solving experience

Previous experiences in solving contextual problems related to simultaneous equations have helped several students in identifying the pattern of the solutions and generalizing the process of solving simultaneous equations.

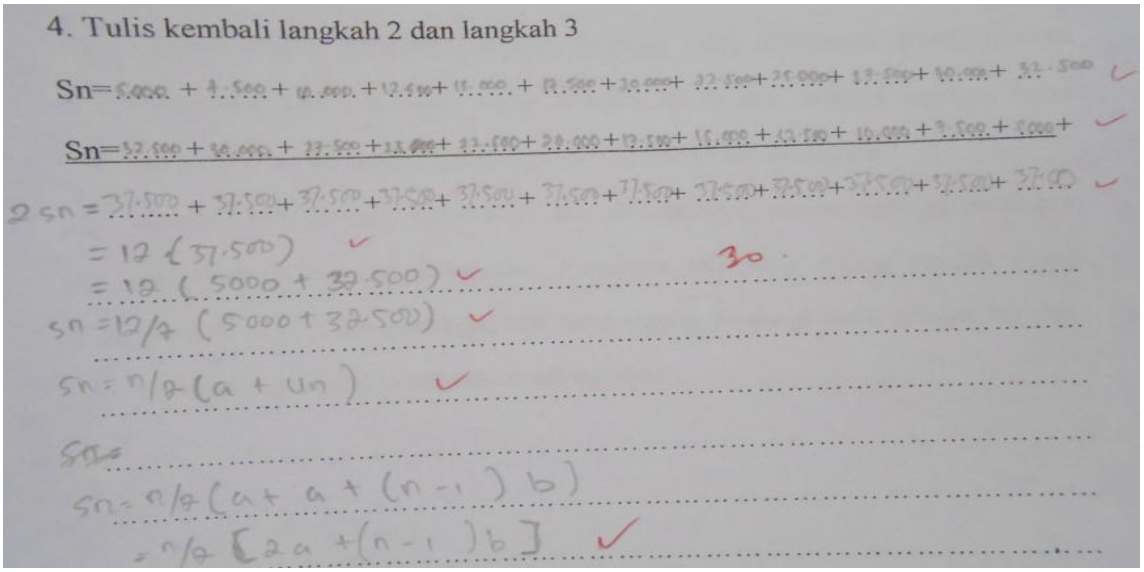

Fig. 4: A student's work to determine the pattern for making generalization

The next contextual problem given to the student was as follows:

In January 2015, Habibi saved up Rp. 5,000 at the Pekanbaru Riau Bank. For each of the consecutive months, Habibi saved Rp. 7,500; Rp. 10,000; Rp. 12,500 up until December 2006.

A student's work in solving the above problem is as shown in Figure 4.

Discussion:

The findings indicate that realistic approach is effective and contributed to the increase in mathematical analogical reasoning and generalization among the students. This finding is supported Freudenthal's (1991) view that RME is relevant for teaching Mathematics. The students' performance in mathematical analogy reasoning and generalization was better for the group that used realistic approach compared to the performance of those within the group exposed to the conventional approach. The students also have a more positive mind-set in learning Mathematics were able to discover mathematics concepts by themselves without relying on their teacher's transmission of input. RME seemingly supported the view of (Arsaythamby & Rosna, 2009) in which students should be active and allowed to explore ideas by themselves. Hence they become responsible for their own learning. The students were actively involved in constructing their knowledge and also felt appreciated because they were given the trust and opportunity to explore by themselves. The realistic approach used in the teaching and learning of Mathematics had established a student-centred learning environment and they felt that learning Mathematics is not difficult because they view that this approach relates the learning of Mathematics with everyday lives (Ifada Novikasari, 2007).

Conclusion:

Since the sample is limited to a public secondary school, any generalization drawn from this paper should be done with cautions. Nevertheless, the findings suggest RME approach is an approach that can be used in mathematics classrooms, especially in schools with similar characteristics as public secondary schools in Riau, Indonesia.

REFERENCES

Arsaythamby, V., and Rosna Awang-Hashim, 2009. Kesahan dan kebolehpercayaan alat ukur orientasi pembelajaran Matematik (OPM). International Journal of Management Studies, 16(1): 57-73.

Crouch, R., and C. Haines, 2004. Mathematical modeling: trasitions between the real world and the mathematical model. International Journal of Mathematics Education in Science and Teknologi, 35(2): 197-206.

Diezmann, C.M., J.J. Watters and L.D. English, 2002. Teacher behaviours that influence young children's reasoning. In A. D. Cockburn & E. Nardi (Eds.), Proceedings 27th Annual Conference of the International Group for the Psychology of Mathematics Education 2 (pp. 289-296). UK: Norwich.

Edy, 2008. Ubah cara pengajaran matematika. Harian Umum Kompas. Retrieved from

http://aingkumaha.blogspot.com/2008/07/ubah-cara-pengajaran-matematika.html

Fadjar Shadiq, 2007. Inovasi pembelajaran matematika dalam rangka menyongsong sertifikasi guru dan persaingan global. Paper presented at Seminar Matematika P4TK (PPPG), Yogyakarta.

Freudenthal, H., 1991. Revisiting mathematics education: China lecturers. Dordrecht: Kluwer Academic Publishers.

Gravemeijer, K., 1994. Developing realistic mathematics education. Utrecht: CD-b Press.

Ifada Novikasari, 2007. Realistic Mathematics Education (RME): Pendekatan pendidikan Matematika dalam konsep dan realitas. Jurnal Pemikiran Alternatif Pendidikan Insania, 12(1): 93-106.

Isjoni, 2007. Saatnya pendidikan kita bangkit. Yogyakarta: Pustaka Pelajar.

Jack, R.F., and E.W. Norman, 1993. How to design and evaluate research in education. New York: Mc Graw-Hill.

Kamaliyah, Zulkardi, and Darmawijoyo, 2013. Developing the sixth level of PISA-like Mathematics problems for secondary school students. Indonesia Mathematics Society Journal on Mathematics Education (IndoMS. J.M.E), 4(1): 9-28.

Ondi Saodi and Siti Khudriyah, 2009. Korelasi penggunaan model pembelajaran klasikal dengan kemampuan penalaran analogi Matematika siswa (Studi Kasus Pada Siswa Kelas VIII SMP N I Gegesik Kabupaten Cirebon). EduMa, 1(1): 17-24.

Saragih, S., 2007. Mengembangkan kemampuan berfikir logis dan komunikasi matematik siswa sekolah menengah pertama melalui pendekatan Matematika realistic (Unpublished Doctoral Dissertation). Universitas Pendidikan Indonesia, Bandung.

Yanto Permana and Utari Sumarmo, 2007. Mengembangkan kemampuan penalaran dan koneksi Matematik siswa SMA melalui pembelajaran berbasis masalah. Educationist, 1(2): 116-123.

Zulkardi., Nieveen, N., J. van den Akker and J. de Lange, 2002. Designing, evaluating and implementing an innovative learning environment for supporting Mathematics Education reform in Indonesia: The CASCADE-IMEI study. In P. Valero & O. Skovsmose (Eds.), Proceedings of the 3rd International Mathematics Education and Society Conference (pp. 1-5). Copenhagen: Centre for Research in Learning Mathematics.