

## Creating Joyful Atmosphere In Mathematics Learning For Elementary School Students By Implementing *Kopermatik* Aids

Sri Subarinah

*Study Program of Mathematics Education, FKIP Universitas Mataram  
Jl. Majapahit 62 Mataram. Email: s.subarinah@gmail.com*

### Abstract

The goal of the present study is to create joyful atmosphere in mathematics learning by implementing *Kopermatik* (the Box Games Realistic Mathematics), a set of mathematical teaching aids that are equipped with realistic mathematics worksheets and they are designed in the form of the game. *Kopermatik* development is an attempt to enrich the variety of aids and math games, for which its implementation in schools is to create a joyful atmosphere. The population of this research is students of SDN 44 Ampenan the academic year 2009/2010 (high grade classes) and 2010/2011 (low grade classes). The classroom setting uses cooperative model, four students in one group, who learn while playing *Kopermatik* aids and fill in worksheets that contain developing concepts and realistic problems. Based on a questionnaire filled out by teachers who are involved in the study, all teachers feel good, easy and helpful to learn to use *Kopermatik* aids. Students have good attitude and appreciation by learning using *Kopermatik*, where 97.1% students enjoy learning with *Kopermatik*, 93.1% enjoy learning in groups, and 81.2% of students feel confident to be in front of the class. The effectiveness of learning with *Kopermatik* is high, i.e the understanding of the concept of learning outcomes achieved a score of 82.5, while the ability to solve realistic problems reaches a score of 76.4. These results indicate that the implementation of *Kopermatik* for all grades of students in SDN 44 Ampenan can make students more active, creative and joyful in mathematics learning.

**Keywords:** *Kopermatik* aids, understanding concepts, realistic problems, joyful atmosphere, elementary school

## I. INTRODUCTION

The study was based on some learning problems in elementary school, especially for Mathematics subject. SEAMEO (2010) state that some identified problems in mathematics learning among others are partial concept explanation or just defining the formulas, monotonous and tedious learning process, authoritarianism in class, and difficulties to focus on learning. Learning mathematics problems in elementary school in general are (1) student achievement in mathematics subjects tend to be less nicely, (2) students are less be interested to study mathematics seriously, and (3) teachers to teach mathematics in a conceptual difficulties, so did the students asked to memorize formulas and substitute numbers in the formula and calculated the results of its operations. These problems are thought to arise because of the difference between the abstract mathematical characteristics and mental condition of elementary school age children according to Piaget (in Subarinah, 2006) included in the thinking stage of concrete operations. Also, learning mathematical problems are also caused by the

*This paper has been presented at International Seminar and the Fourth National Conference on Mathematics Education 2011 "Building the Nation Character through Humanistic Mathematics Education". Department of Mathematics Education, Yogyakarta State University, Yogyakarta, July 21-23 2011*

learning approach used in learning mathematics are still theoretical, abstract and less attention to context (Karnasih and Soeparno, 2000), as well as less meaningful because it is far from word problems (Somerset, 1997). These findings also occur in the learning mathematics in Mataram, Bahri and Prayitno (2005) stated that based on questionnaires filled and observations found that many teachers already implementing student-centered learning that only 37%.

The results of preliminary observations in reserach of Subarinah (2006a) found the conditions of learning mathematics in an elementary school in Mataram city are still conventional. This is indicated by the following conditions: (1) teachers to teach mathematics by giving formulas and exercises (expository method), (2) students are unactive in learning, even looks afraid to raising questions or ideas, and (3) for several classes, teacher use monotone method, less use of aids and games. This condition results in lower students' appreciation of mathematics, so that was allegedly a precursor to the low achievement of students studying mathematics.

Age of elementary school students included in the category of critical periods in the encouragement of achievement, which is a period piece that will form the habit of children to achieve success, not success, or very successful later in life (Hurlock, 1997). While Piaget states that the age of elementary scholl students (7-12 years) at the stage of concrete operational, so that elementary school children in learning to manipulate real objects as objects of study. Of the two views of elementary age students shows that learning in primary schools needs to be done by manipulating real objects as objects of study. Learning activities of students can be pursued actively, bringing out innovative ideas creatively, and joyful learning during the classing process. This kind of learning requires an aids and strategies in accordance with the characteristic of students and mathematics subject. In this study developed the aids called *Kopermatik* (Box Games Realistic Mathematics) and its learning activity desingned by games shades.

This study aimed to develop *Kopermatik*, namely a set of aids designed its use of mathematics in the game form and uses realistic mathematics worksheets. The slogan that carried the *Kopermatik* learning is "Learning while playing", the student in learning activities so that learning math mathematics play into an exciting and fun activities. *Kopermatik* development for elementary school children in accordance with the views of Piaget and Dienes (Subarinah, 2006b), which states that elementary school children

in learning the necessary concrete aids for manipulated and mathematical concepts will be easy and successful for all six studied through the following stages: (1 ) free-games, (2) game, (3) review of the same of properties, (4) representation, (5) symbolization, and (6) formalization. Reality on the ground the sixth stage of the ideal can not be implemented all of them (most teachers eliminate phase 1, 2 and 4). *Kopermatik* is one to help overcome this problem, aids or manipulation of objects in the form of the game to help realize the stage 1 and stage 2, while the development of realistic mathematical activities to familiarize stage 4. According Sadiman (in Khaeruddin, 2002), a game is a contest between the players interact with each other by following certain rules to achieve certain goals as well. Learning that is packaged in the form of the game has several advantages, including (1) The game is something fun to do, (2) The game allows the active participation of students to learn, (3) The game is flexible and not rigid.

Posamentier (in SEAMEO, 2010) states that the whole society has to welcome mathematics not only as an advantageous subject but also a beauty even a joyful thing. In experiencing learning process, students are highly motivated by an entertaining activity. For that reason, mathematics teachers are expected to develop ideas to motivate students by integrating joyful activity in the teaching and learning process. The activities such as discovering, exploring, constructing, designing, setting strategy, and solving the problems are wrapped in mathematics games, puzzles and hands-on activities.

## II. RESEARCH METHOD

The type of research is the research and development (R & D), the research done to produce certain products, and test the effectiveness of the product (Sugiyono, 2009). Model development used on this study relate at common education development model by Plomp ( 1977), loading five phases, that are (1) preliminary investigation, (2) design, (3) realization/construction, (4) test, evaluation and revision, and (5) implementation. The products developed and tested its effectiveness in learning in elementary schools is *Kopermatik* aids, through research conducted by Subarinah and Prayitno (2009, 2010).

The population of this research is students of SDN 44 Ampenan, Mataram, NTB academic year 2008/2009 and 2009/2010. The sample was determined by purposive sampling technique, namely the determination of samples with a particular

consideration. This research has been conducted over the past two years, which the sample at first year is high grade students and at second years is low grade students.

The variables considering of this research consist of (1) learning achievement, (2) attitude towards learning that apply *Kopermatik* aids. Learning achievement variables used to measure the effectiveness of learning, while the attitude variables used to measure student enjoyment for learning mathematics in class.

The data stem of this research constructed from students in class I, II, III, IV, V, and VI of SDN 44 Ampenan implemented *Kopermatik* aids. The data and way of uptake is as follows: (1) data of learning achievement, taken through a written form of essay tests, (2) data of attitude towards learning mathematics implemented *Kopermatik* aids, taken by filling a questionnaire after the subject matter is resolved.

Analyze of the data done by data collecting for the purpose of the analysis performed inferences descriptively and qualitatively. The data analysis includes: (1) Analysis of learning achievement, tabulated results of student achievement learning, then sorted into three components, namely the total value, understanding concepts and solving realistic problems. The values obtained were compared with the minimum criteria for completeness (KKM in bahasa Indonesia) mathematics courses that the school has been established previously, that is 70, (2) Analysis of attitudes towards learning mathematics implemented *Kopermatik* aids. Questionnaire results were tabulated, and then sorted into three sections, namely (a) enjoy learning to use *Kopermatik* aids, (b) enjoy learning in groups, (c) feel confidence to the front the class presenting the results of group work. Each component is calculated percentage of results. This data is used to describe attitude or student assessment of teaching and learning processes that apply *Kopermatik* aids, (c) analyzing of teachers' assessment of learning mathematics implemented *Kopermatik* aids.

### III. RESULT

The research focused on designing, producing, and implementing *Kopermatik* aids and its worksheets for elementary school students class I, II, III, IV, V, and VI in the SDN 44 Ampenan, Mataram, Nusa Tenggara Barat. The results of research that has been achieved studied as follows.

#### 1. *Kopermatik* aids developed

*Kopermatik* aids already developed in this study were aids for all classes, each consisting of three aids based on subject matter that existed at the ongoing curriculum. The *Kopermatik* aids have been developed are as follows:

- a. Grade I, includes
  - 1) The sum of numbers 1 through 20, using picture card
  - 2) Substraction of numbers 1 through 20, using picture card
  - 3) Solve problems related to time, using miniature of watch
- b. Grade II, includes
  - 1) Addition and Substraction Numbers to 500, using rainbow tube
  - 2) Measurement of time, using miniature of watch
  - 3) Measurement of length, using ruler, stick and unstandar measurement
- c. Grade III, includes
  - 1) Solve problems related to money calculations, using money imitation
  - 2) Select the measuring apparatus according to function (meter, scales, or hours)
  - 3) Using the measurement tool in problem solving, using some tools
- d. Grade IV, includes
  - 1) GCD and LCM, using magnetic numbers board
  - 2) Circumference and Area of Triangle Region, using the puzzle in grid paper
  - 3) Circumference and Area Regional parallelogram, using a puzzle in grid paper
- e. Grade V, includes
  - 1) Integer, using a card integers
  - 2) Trapezoid, using the puzzle in grid paper
  - 3) Cube and beam, using a transparent chamber model and build cubes unit.
- f. Grade VI, includes
  - 1) Build Area Combined, using puzzle grids
  - 2) Area of circle, using the circle puzzle
  - 3) Volume of Prisms and tube, using a transparent chamber puzzle wake model

Detail of the *kopermatik* aids developed visible in Subarinah and Prayitno (2009 and 2010).

## **2. Learning achievement**

Evaluation of learning mathematics implemented *Kopermatik* aids at end of teaching of a subject. Analysis of the results of study conducted on the total value, understanding

the concepts and applications, as well as the ability to solve realistic problems. For each component of the analysis of the value observed in the mean(average). As for the intended learning achievement are presented in table 1 below.

Table 1. Learning achievement of students after attending *Kopermatik* aids in terms of total value, understanding of concepts and solve realistic problems

No	Class	Subject matter	Code	Total value	Understanding of concepts	Solve realistic problem
1	I	Addition	M1.1	80.9	84.1	74.4
2	I	Substraction	M1.2	77.7	80.3	72.4
3	I	Measurement of time	M1.3	83.1	86.3	76.8
4	II	Add and substract	M2.1	90.7	92.4	87.2
5	II	Measurement of time	M2.2	91.5	91.4	91.8
6	II	Measurement of length	M2.3	90.4	92.3	86.5
7	III	Money	M3.1	74.3	76.3	70.3
8	III	Measurement tool	M3.2	75.7	77.4	72.4
9	III	Measurement of time	M3.3	76.2	78.2	72.1
10	IV	GCD and LCM	M4.1	78.5	82.7	72.1
11	IV	Triangle	M4.2	80.9	84.7	73.3
12	IV	Parallelogram	M4.3	84.3	89.8	78.7
13	V	Integers	M5.1	74.7	75.0	73.7
14	V	Trapezoid	M5.2	85.3	89.6	76.7
15	V	Cube and beam	M5.3	76.2	76.7	74.6
16	VI	Build combained	M6.1	72.3	71.8	73.2
17	VI	Circle	M6.2	75.2	75.6	74.3
18	VI	Prism and Tube	M6.3	78.6	80.2	75.2
		Average		80.4	82.5	76.4

### 3. Attitudes Against Students Learning with *Kopermatik*

After *Kopermatik* aids implemented in the class, the low grade classes were given a questionnaire to ask teachers to students in the classical style of learning with his feelings after attending *Kopermatik* aids. While in high grade classes, students completed questionnaires directly given by the teacher. Student attitude questionnaire tabulated results are presented in table 2 below.

Table 2. The results of questionnaires of students about his attitude towards learning mathematics that apply *Kopermatik* aids

The substance in question	Percentage / grade						Mean
	I	II	III	IV	V	VI	
Glad to learn using <i>Kopermatik</i> aids	98.2	99.4	97.9	94.2	96.5	96.3	97.1
Enjoy learning in groups and use student worksheet	90.7	95.2	96.4	90.2	94.6	91.3	93.1
Feel confident to front in class convey the group result	78.4	83.5	86.2	82.4	79.5	77.4	81.2

Written comments provided from student of high order class state that prefer to learn used *Koprematik* aids, more easily and quickly understand the subject matter, learning mathematics seemed to play an interesting and exciting, and lesson does not feel the time because of preoccupation practice mathematics problems with some equipment. While the results of interviews with low-or high-grade students to give information that they prefer to learn by *Kopermatik* aids because in learning the subject matter more easily and more quickly understood. In addition, learn mathematics by playing *Kopermatik* aids, according to them is fun, not tiring and fun. However, there are still a fraction of students who do not like studying in groups with a variety of reasons, among them is incompatible with friends in his groups, fight aids that sometimes can not practice alone, an aids sometimes used playful, and was learning a few (undeep) mathematics.

#### IV. DISCUSSION

This study examines the learning of mathematics in the elementary school who raised the slogan of learning while playing (or vice versa) is called *Kopermatik* aids. Learning mathematics implemented *Kopermatik* in SDN 44 Ampenan Mataram has been developed for nine subject matter in low-grade and nine subject matter in high grade. The things that were examined after implementation are (1) demonstrated the effectiveness of the achievement learning by total value, understanding concepts and solving realistic problems, and (2) the attitude of students about learning implementer *Kopermatik* aids by analysis of the completed questionnaires. and (3) constraints still raising by teachers and researchers are currently trying out *Kopermatik* aids.

Effectiveness of learning used *Kopermatik* aids can be assessed based on the evaluation of student learning are presented in table 1. Traditionally, the average rating was above the value of minimum achievement criteria, although there are still some students who have not been completed. Subsequent analysis was developed to assess the



effectiveness of learning implemented *Kopermatik* aids on aspects of understanding concepts and solving realistic problems. Evaluation of student learning achievement in table 1 can be presented in diagram form in Figure 1 below.

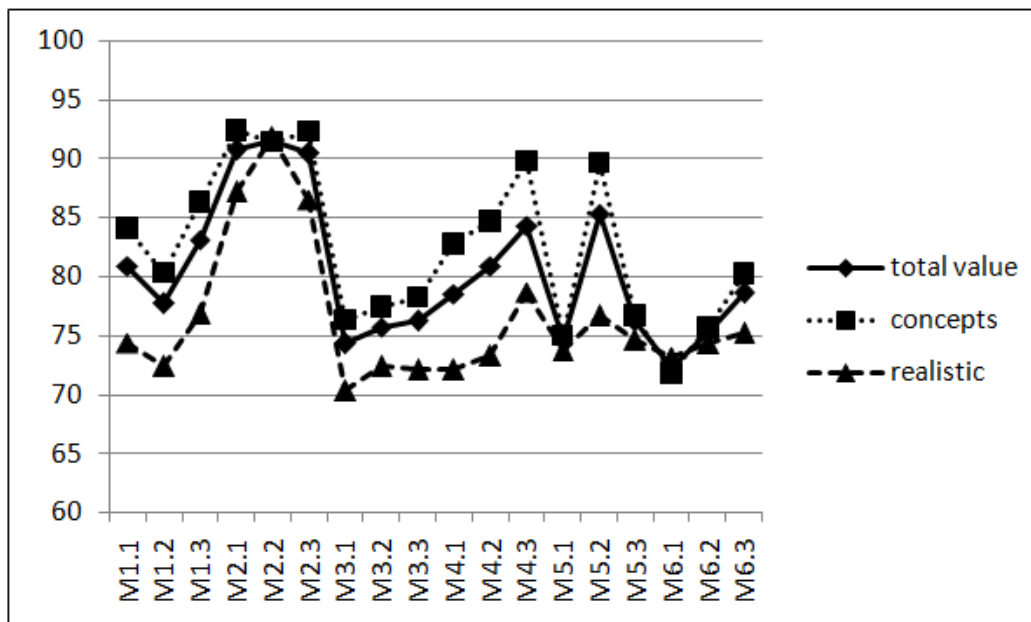


Figure 1. Comparison of learning achievement in learning mathematics implemented *Kopermatik* aids based on average of total value, understanding concepts, and solving realistic problems.

Based on Figure 1 can be observed that the average student learning outcomes in the classical style has been above the minimum criteria for completeness (KKM) studied mathematics at SDN 44 Ampenan Mataram, namely 70. Score understanding of the concept is in the range of 71.8 to 92.4, while the solving realistic problems score is in the range 72.1 to 91.8. From the graphic in Figure 1 can be observed that the realistic problem-solving score was always under the understanding of the concept, except on the subject matter M2.1 (Measurement of time) and M6.1 (Build combined). This is reasonable because this material has been learned since the previous class, so the ability of solving realistic problems is equivalent to the ability of understanding the concept.

The completed questionnaires of students presented in Table 2 can be presented in the form of bar charts as shown in figure 2 below.



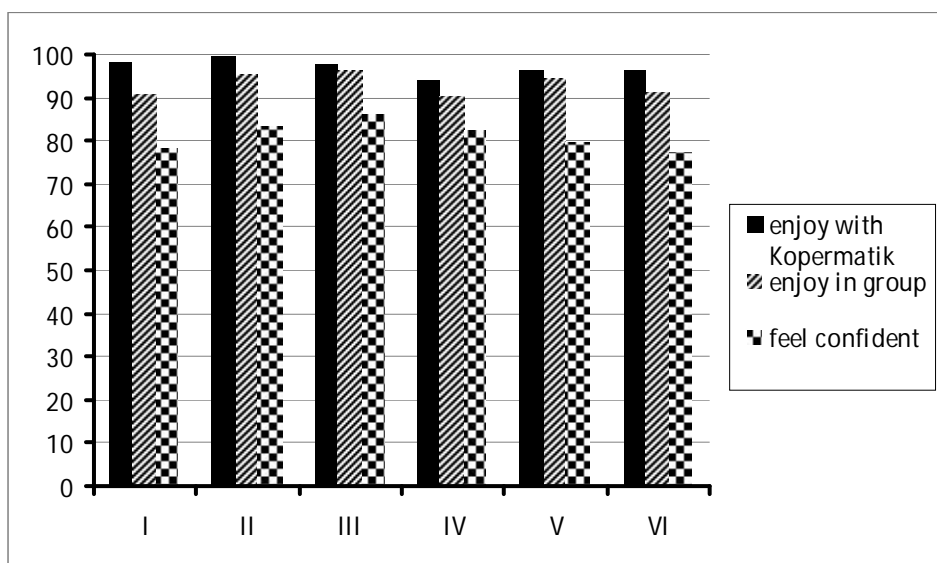


Figure 2. The results of the questionnaire students' attitudes towards learning used *Kopermatik* aids.

Questionnaires results are visualized in Figure 2 shows that 97.1% of students enjoy learning mathematics by *Kopermatik* aids, 93.1% of students enjoy learning in groups and 81.2% of students feel confident to submit his work in front of class. This suggests that learning mathematics implemented *Kopermatik* aids arranged in an acceptable form of cooperative learning and fun for students.

Result of this research also as according to opinion Sugiman ( 2002) expressing that mathematics study model better emphasize invention existence by student which relate at real problem, and place student as perpetrator learn non as obyek study. In order to the mathematics can be learned by student as activity, mathematics study have to be started confrontedly is student to contextual problems, exploiting learning aids maximally. In addition, the results of this research contributed significantly to increase the variety of teaching methods and style of a teacher. This is very beneficial, according to the opinion of Marie (2006) which states that the behavior of teachers and teaching style will result in significant differences in student learning. Monotonous style of teaching that tends to elicit attitudes on students bored. Learning varies with the element is equipped with a game or practice will be preferred by students. Therefore, learning which collaborated with the game will be an effective learning strategy and can be accepted by the students.

## V. CONCLUSION AND SUGGESTION

Implementation of *Kopermatik* aids for students of SDN 44 Ampenan have been able to create joyful learning mathematics in the classroom. This is indicated by the facts that the research results summarized as follows:

1. Effectiveness of learning with *Kopermatik* aids is high, i.e learning achievement of students in aspects of understanding the concept of achieving scores 82.5, while the realistic aspects of the problem-solving ability achieve a score of 76.4.

2. Attitudes of students for implemetation of *Kopermatik* aids in mathematics learning towards learning are very supportive, i.e 97.1% of students enjoy learning with *Kopermatik* aids, 93.1% enjoy learning in groups and using worksheets, and 81.2% of students who feel confidence to the front of the class present the results of group work.

## VI. BIBLIOGRAPHY

- Bahri, S. and S. Prayitno. 2005. *Evaluasi Penerapan Kurikulum Berbasis Kompetensi Pada Sekolah Menengah Pada Sekolah Menengah di Provinsi Nusa Tenggara Barat*. Proyek Penelitian Pengembangan Kapasitas Daerah (PPKD) NTB.
- Hurlock and B. Elizabeth. 1997. *Psikologi Perkembangan*. Erlangga. Jakarta.
- Karnasih, I. and Soeparno. 2000. *Pengajaran Matematika Berfokus pada Penalaran Logika*. Kompas, 17 Mei 2000.
- Khaeruddin. 2002. *Remi Fisika sebagai Model Pembelajaran Suplemen di SMP 11 Mataram*. Sripsi S1. Pendidikan Fisika FKIP Universitas Mataram.
- Marie, C.O. and J. Van Damme (2006) Teacher Characteristics and Teaching Style of Effectiveness Enhancing factors of Classroom Practice, *Teaching and Teacher Education*: 22
- Plomp, T. 1997. *Education & Training System Design*. Enshende: Faculty of Educational Sciences and Technology, University of Twente, Netherlands.
- SEAMEO. 2010. *QITEP in Mathematics: Joyful Learning*. tersedia di <http://www.qitepinmath.org/index.php?id=enA5oOF3fofDk>. diunduh tanggal 1 Juni 2011.
- Somerset, A. 1997. *Strengthening Quality in Indonesia Junior Secondary School: An Overview of Issue and Initiatives*. Jakarta: MOEC.
- Subarinah, S. 2006a. *Pengembangan Model Pembelajaran Matematika Realistik untuk Meningkatkan Aktifitas dan Hasil belajar Siswa kelas IV SDN 27 Ampenan*. Laporan Penelitian PTK DIKTI.
- Subarinah, S. 2006b. *Inovasi Pembelajaran Matematika Sekolah Dasar*. Jakarta: Direktorat P2TK dan KPT Dikti.
- Subarinah, S. and S. Prayitno. 2009. *Pengembangan Kopermatik (Kotak Permainan Matematika Realistik) Untuk Mendukung PAKEM di Sekolah Dasar*. Universitas Mataram: Laporan Penelitian Hibah Bersaing Tahun Pertama
- Subarinah, S. and S. Prayitno. 2010. *Pengembangan Kopermatik (Kotak Permainan Matematika Realistik) Untuk Mendukung PAKEM di Sekolah Dasar*. Universitas Mataram: Laporan Penelitian Hibah Bersaing Tahun Kedua
- Sugiman. 2002. *Konstruktivisme Melalui Pendekatan Riilistik Dalam Pengajaran Matematika*, Proseding Seminar Nasional Pengembangan Pendidikan MIPA di Era Globalisasi, 6 Juli 2002, pp.165-170.
- Sugiyono. 2009. *Metode Penelitian Pendidikan, Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.