THE DEVELOPMENT OF *HAND OUT* FOR HIGH SCHOOL MATHEMATICEMATICS OLYMPIAD TRAINING

Puteri Aprilianti[1], Somakim[2], Muhammad Yusuf[3]
Sriwijaya University
puteri.tiara@ymail.com[1]

Abstract

The purpose of this research is to produce a hand out for high school mathematicematics olympiad training that valid, practical, and have the potential effect. Subjects of this research are members of the mathematic club in high school 1 Indralaya. To get a good quality olympiad training hand out so we must implemented the stages of development consists of two stages: a preliminary stage includes the analysis and design and formative evaluation include self- evaluation , expert review, a one - to-one , small group and field tests . Then, Hand out tested to subject and we get data about problem-solving ability of students especially for problem in Olympiad collected with test and interview. Based on the analysis of the documents seen students' answer sheets and the time for solving an olympiad problem, it is known that students are understanding the material with the average of time for students to answer one question was 4 minutes 45 seconds . From these results it can be concluded that using a hand out for high school mathematicematics olympiad training in the activity have good potential effect for problem-solving ability of students especially for problem in Olympiad.

Keywords: Hand Out, High School Mathematicematics Olympiad, Strategy of Problem Solving

INTRODUCTION

Learning in school especially mathematicematics learning have a purpose for made students who have a form of factual, conceptual, procedural, and metacognitive knowledge in mathematicematics, as well as have the ability to think and follow an effective and creative in the abstract and the concrete in solving problems independently (Kemdikbud, 2013). However, in the implementation of education there are some problems that occur. In fact, the educational objectives can not be achieved fully. In Olympiad competition that tested the ability of solving the problem, it appears that the ability of Indonesian students is still low. National Science Olympiad (OSN) is one way to improving the quality of compulsory education (basic education), and is an opportunity to find the best student who have achievement in Mathematicematics and Natural Sciences (MIPA) as potential participants in the international Olympiad. (Kemendikbud, 2013). OSN is held every year by Kemendikbud, This is in accordance with the program plan at the same time to improving the quality of education in order to prepare students who have the potential in science to be developed further in order to participate Olympiad in international level.

According to the definition of OSN guidebook published by the Directorate General of Primary Education, OSN is a vehicle for students to develop the academic competition to encourage the spirit of fair competition courage while improving capabilities in science,

mathematicematics, and social studies, and in order improve the quality of education (DIKDAS,2013). From the organization of the event OSN, there are difference between the students from Java with other students. It shown in Olympiad, the winner dominated by students from Java (Eddy, 2011). More specifically regarding the lack of problem solving ability of students especially in Sumatra, according to the National Science Olympiad medalist (OSN) 2013 in highschool level inform by the Directorate General of Secondary Education in mathematicematics, there are only two students who came from Sumatera from 30 medalists, one student come from Banda Aceh who get silver medals and one student from Lampung who won a bronze medal while all the gold medals won by the students who came from Java (Dikmen, 2013).

There are many to students in answer the questions in mathematicematic Olympiad which one is mostly a problem of solving non-routine problems that do tend to be difficult and require the analysis and good understanding about material. One of the difficulties experienced because there are many students who unfamiliar with Olympiad problem which incidentally is about a problem that involves material enrichment that not every teacher teach (Kusnandi, 2009). In mathematic Olympiads for high school, about being tested is non-routine problem. non-routine problem, is a problem which required to complete further thought because the procedure is not as clear or not the same as the procedures learned in class (Sunarno, 2011). Questions about the Olympiads is the type of problem solving is to test the depth mastery of the students and their problem-solving abilities.

Any comparison between the olympiad problem with routine or usual problem , olympiad problem use any strategies in a problem-solving but ordinary problem whereas no specific strategy used. Problem Olympiad also require modifications in advance to be able to solve problems that required students' thinking and reasoning in changing complicated problems into simpler ones. Problem Olympiad consists of 2 types of questions about the discovery and verification. Coverage of material tested in mathematics Olympiads for high school including Algebra, Geometry, Combinatorics and Number Theory. In preparation for the Olympiads, students should multiply exercises and practice their skills in solving problems. In addition to more exercises in coaching should also be taught the steps in problem solving and problem-solving strategies that can be used along with example problems and exercises. Budhi (2004: 4-54) explains that in solving the problem, there are several strategies completion of which saw patterns, using variables, using the definition or nature, draw a diagram, step back; and counting. Explanation about the settlement measures, problem-solving strategies, example problems and exercises would be even better if not only given through oral but also in writing as outlined in the teaching materials.

In accordance with the definition of instructional materials in the technical guidance curriculum guide (Dikti, 2009), in which teaching materials are all kinds of materials that are used to help teachers / instructors in implementing the teaching and learning activities in the classroom. Teaching materials are good learning tools to be developed because it has a good role and benefits not only for teachers but also for students, with teaching materials to enable students to learn with or without the presence of teachers so that students become more independent. Develop an appropriate teaching materials and the appropriate addition can assist teachers in implementing development activities

olympiads would also help a lot and familiarize students with the Olympiads problem because in teaching material,already there are examples of exercises that can be read by themself if the teacher does not have time to explain.

One form of printed teaching materials that can be used in Olympiads training is hand out . Hand out is the basic material for students made by teachers or education institutions to then deepened and expanded both in learning activities, field activities, and through the study of literature or sourced from books and other references. Hand out can be interpreted as the student handbook which contains a complete lesson on the material (Munawaroh, 2009) . Excess hand out according to guide the development of a hand out made by FIP UPI (2012) among which can be developed either by individuals or educational institutions, can be adapted to the circumstances and may be a grain of the material to be taught, a detailed description with pictures, charts , questions, tasks and reference material. Given the many advantages compared to hand out than other printed teaching materials, then hand out an appropriate instructional materials used for a lot of learning material and with a high degree of difficulty. Based on the explanation above, Develop a Hand out for Mathematic Olympiads training for High School is expected to can improve problem-solving ability of students olympiads.

RESEARCH METHODOLOGY

This research is depelopment research that consists of two stages: a preliminary which include analysis and design, while the formative evaluation stage consists of self evaluation, expert reviews, one to one, small group, and a field test. Subjects in this research are students from SMA Negeri 1 Inderalaya who are members of the an extrakurikuler is mathematic club. To obtain the data carried in expert review stage, this research use walkthrough, in stage one to one use document analysis and observation also in small group stage. This research use tests and interviews in the field test stage. Data results of the expert review stage, one to one and small group stage such as suggestions and comments are used to hand out while in the revision stage of the field test, the data obtained in the form of student answer sheets and the time usage data about time that students use to solve one problem and then all of data will analyzed with qualitatively .

RESULTS AND DISCUSSION

Research development consists of two stages: a preliminary stage of the analysis of the design and formative evaluation such as self evaluation, expert review, one-to-one, small group, and a field test stage and revision process based on advice validator and students on a one-to-one and small groups so that the results of this research is form of handouts for mathematic olympiad traning for high school that valid and practical. Hand out validity based on the content, construct, and language. Hand out validity based on the content it shown materials developed in accordance with the Olympiads material where the material development activities for example problems and exercises in the handouts used problem that use in olympiad that held before. Based constructs developed handouts that is in good order by the characteristics of hand out which hand out complete by description of the material, include example problems, exercises and references in accordance with the criteria handouts so students can use the handout properly. While based on language, developed handouts have good language and correct where there is no misunderstanding of students and have a double interpretation when they read.

Hand out that developed has practical, it shown at the small groups stage, students can use the teaching material based on observations and the results of their study that use hand out. Students are only occasionally asked about the material they did not understand because they have not been studied previously in class considering the Olympiads is a problem of material enrichment. For the study, the four students on small group stage can answer the questions in practice the handout with the use of appropriate strategies even though there are little error in their calculations, the rest no significant barriers in the use of hand out for mathematic olympiad training for high school.

Hand out for mathematic olympiad training for high school that valid and practical then tested in field test stage to mathematicemathics club in SMA Negeri 1 Inderalaya which consists of 10 members with 6 students of grade XI and 4 students of grade X to see the potential effects of hand out to student's Olympiad problem-solving ability. In this trial the learning process refers to an Olympiad training activities where the first meeting, students are taught step-by-step of problem solving and problem-solving strategies that can be used to answer questions in Olympiad, which explained by using the example problems. The results of a field test stage, can be seen that during the training there is no constraints occur, even in the presence of a hand out make student's activities become more effective because students can read by theirself and understand their own material in handouts even if only get a little explanation in front of the class by teacher. At the end of the training, students are given exercises to know their olympiads problem-solving ability.

Hand outs that have been developed have potential effects on problem-solving ability of students olympiads. It shown from the results of a field test, the student's answer sheet of exercises that have been given. Eleventh students who are members mathematic club have been able to resolve a given problem using strategies which taught in handout. Their answer sheet also shows that the students' understanding of the material is good enough even there are any students who their final answer is still not correct. From interviews with students, it is known that errors due to wrong answers they count, less conscientious, and passes the information on the problem. Students' answers to questions problem algebra and geometry can be seen in Figure 1:

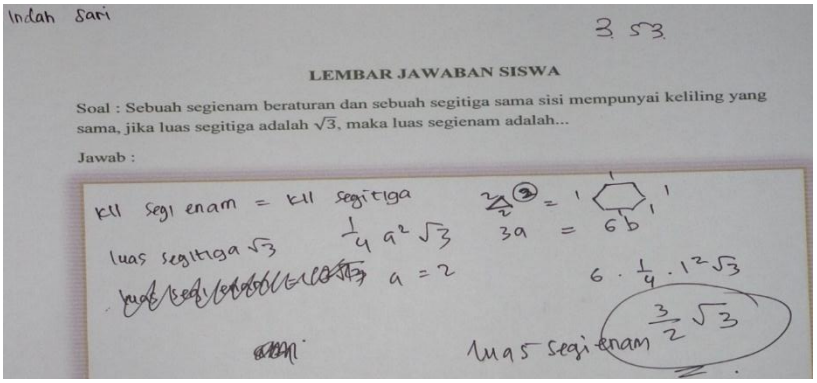

Figure 1. Student's Answer Sheet

In addition to students' understanding of the material, one of the indicators of Olympiad problem-solving ability of students is time average in resolving a problem. Hand out that

have been developed have a potential effect on the students rapidity to solve a problem, it shown from the results of a field test in students time usage in solve a problem. Student's data usage time which is one indicator of the potential effects of the use of hand out for mathematic olympiad training for high school can be seen in Table 2 :

Table 4.11 Data Usage Time

Problem	Quantity of students with time usage			Time average
	$< 6\ minute$	$6 - 10\ minute$	$> 10\ minute$	
1	4	3	3	7.58
2	8	2	0	2.44
3	4	4	1	7.10
4	6	1	1	5.34
5	5	2	1	6.34
6	1	4	3	8.35

Time average = 4 minute 45 second / problem

The result that the average time spent by students to answer one question was 4 minutes 45 seconds , meaning that the average time used is less than 6 minutes which is the standard time in answering the questions the Olympiads . With the results of the study it can be concluded that hand out for mathematic olympiad training for high school has potential effect on students' in the activity mathematicematics olympiad coaching studio members SMA Negeri 1 Inderalaya mathematic .

CONCLUSION AND RECOMMENDATIONS

Through this research , the conclusion was obtained that after the two stage of development research , there are preliminary stage that includes analysis and design prototype and then, formative evaluation includes self- evaluation , expert review, one - to-one , small group , and field test stage . Hand out for mathematic olympiad training for high school has developed is valid and practical for students based on content , construct , and language . Hand out for mathematic olympiad training for high school also practical which handout can be easily used by students in an Olympiad training activities.

Handouts have potential effects on problem-solving ability of students olympiads . Students have been able to resolve a given problem by using the strategies taught in the handout . Of their answer sheet also shows that the students' understanding of the material is good enough with the average time spent by students to answer one question less than 6 minutes which is the standard time in answering the questions olympiads which is 4 minutes 45 seconds .

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