

Development of Portfolio-Based Modules with Enrichment Model to Improve Creative Thinking in Middle School

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ABSTRACT

One of the objectives of learning Mathematics in Indonesia is for students to get various provisions when facing challenges in the global era. Therefore, the ability to understand is emphasized in the development of thinking processes. Teaching materials are obviously needed to bridge the material so that it is conveyed to students correctly according to the learning objectives. One of the appropriate and necessary teaching materials in Mathematics learning is an Enrichment based portfolio module. The objectives of this research were to find out the condition of learning Mathematics in the Surakarta State Middle School nowadays. The second objective was to know the development of portfolio learning modules with the Enrichment model to improve creative thinking. The third objective was to determine the effectiveness of the portfolio learning module with the Enrichment model that can improve creative thinking. The type of research used in this research was development research. The instruments used in this research were material expert and media assessment sheets on teaching materials, student response questionnaires and learning outcomes tests. After the teaching material was made, it was then validated by the expert team. Validation was carried out by two material experts and design experts. After the medium was validated and revised, then a user trial was then carried out, namely the trial of small groups and large groups. Based on the results of these trials, the teaching materials were revised again if weaknesses were found again. Next was the implementation stage of teaching materials for 8th grade students in one of the Surakarta City Middle Schools.

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Keywords:

Printed Module, portfolio, enrichment, creative thinking.

INTRODUCTION

Mathematics is one of the subjects taught starting from the lowest to the highest level. Therefore, every math subject should be a subject that everyone likes and is relatively easy. On the other words, students' mathematical achievements are classified as good. Nevertheless, the results of several studies show that the quality of education in elementary schools is low. In fact, Wulandari and Jailani (2015) mentioned TIMSS 2011 results, the mathematics achievement of students in Indonesia was at a low level, which was ranked 36 out of 40 participants, while the 2012 PISA results stated that Indonesia was ranked 64 out of 65 participation. Spangenberg (2012) also said that mathematics is known as an abstract subject so that learning mathematics is a mental activity to understand the meaning of structures, relationships, and symbols, then assign the concepts produced to real situations and cause a change in behavior.

Mulyanto et al (in Istuningsih,W., Baedhowi,B.,& Sangka,K.B., 2018) said that student learning outcomes can be influenced by several factors from internal factors such as intelligence, talents or interests of students in learning, as well as external factors such as environmental conditions, models, or learning media used. However, the low learning achievement can be caused by several factors among teachers, the fact that some teachers do not pay attention to the nature of science as a process and product, teaching tends to use conventional approaches (Widiana and Jampel, 2016). Moreover, the material on the flat side building at the junior high school level is one of the difficulties often faced by students. The TIMSS assessment (Vebrian, Darmawijoyo, Hartono, 2016) also stated that the geometry dimension gets the lowest score compared to the number domain and algebra scores namely 377. Problems that arise usually occur because of the understanding of the dimensions of space is still relatively low, even though at the elementary school level ever discussed.

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The development of thinking of students, especially in Mathematics, moves from concrete thinking activities to abstract thinking or vice versa. Therefore the task of a teacher is not to impose students' thinking skills with subject matter that is considered difficult without a solution. Besides, a teacher also needs an obligation to hone a student's thinking skills so that each student has the ability to think creatively. This is similar to Ayllón M.F, Gómez I.A, Claver J.B (2016) which stated that creative thinking is a dynamic mental process and includes divergent and convergent thinking. Pehkonen (1997) stated that creativity does not only occur in certain fields, such as art, literature, or science, but can be found in various fields of life including Mathematics. Therefore, creative thinking is included in the abilities that need to be developed in solving mathematical problems.

Krutetski (in Husain, 2012) stated that mathematical creative thinking skills are considered as the ability to find solutions to mathematical problems easily and flexibly, whereas according to Husain (2012) mathematical creative thinking abilities are defined as the ability to generate new ideas or ideas consisting of many possibilities answer to a mathematical problem that doesn't have to be new. Therefore the benefits of creative thinking, namely with the ability to think creatively, students are able to achieve achievements that are far above the average achievement (Sun: 2011).

The existence of students is known to be divided into 2 categories, which are high ability and low ability. A teacher must be able to guide all the conditions of students, including students with high abilities. In this study, researchers took research samples at Public Middle School 1 (SMP Negeri 1) and Public Middle School 4 (SMP Negeri 4) Surakarta where the schools are categorized as a school with high-quality students based on national exam results and based on daily scores in the previous school year. Students with high abilities need to be guided so that the quality of students who are already good is still directed. Therefore, Joseph Renzulli introduced an enrichment model that is well-known for its school enrichment model for gifted students (in Huda, 2015). Olszewski-Knobilus (in Miller, Gentry, 2010) also argued out that gifted students can be given deep knowledge and opportunities to work in projects, so that experience is not given in regular classes.

The Enrichment model, especially in the field of Mathematics, can be contained in teaching materials, namely the portfolio module. Ronis (2009) explained that portfolios visually capture the learning process while showing the growth that students will experience for a long period of time. Surapranata and Hatta (2007) also added that portfolios are said to be a collection of learning outcomes or the work of students who show business, development, student achievement over time. Gronlund and Knotek (in Santrock, 2009) also stated the same thing with the Ministry of National Education in the Portfolio Development Guidelines for Assessment that portfolios are collections of work that have certain intentions and tell the story of progress and achievement of students.

However, Hatch (in Santrock, 2009) underlined there is something important in portfolios, namely portfolios, more than a compilation of essays by students included in a manila map or a collection of memorabilia taped to a scrapbook. Crowley (in Abidin and Walida, 2014) also added that mathematics portfolio is a collection of works of selected students. Thus that the portfolio can be widely applied in education as an innovative method of assessing student achievement and progress (Czura, 2013).

In other words, students not only receive material from learning resources (teachers) but are also required to process it at a higher level. The result is that the knowledge that students have is more than just memorizing products that will not disappear after the exam ends. Moreover Chan (in Ifeoma and Ezeoba, 2015) noted that enrichment activities are generally good for the purpose of knowledge and the development of thinking skills.

Situation of the Problem

Based on this background of the research, the problems in this research are as follows: 1) what is the current condition of learning mathematics in Surakarta State Middle School? 2) How is the development of a portfolio learning module with an Enrichment model to improve creative thinking? 3) How can the effectiveness of the portfolio learning module with the Enrichment model improve creative thinking?

Aim of the Study

The objectives of this research are to find out the conditions of learning Mathematics in Surakarta State Middle School today, to know the development of portfolio learning modules with Enrichment models can improve creative thinking, and to find out the effectiveness of portfolio learning modules with Enrichment models can improve creative thinking.

METHOD

The objectives of this research are to find out the conditions of learning Mathematics in Surakarta State Middle School today, to know the development of portfolio learning modules with Enrichment models can improve creative thinking, and to find out the effectiveness of portfolio learning modules with Enrichment models can improve creative thinking. The subjects of the research were 64 students in SMP Negeri 1 Surakarta and 64 students in SMP Negeri 4 Surakarta. The schools were chosen because both of them were categorized as a school with good quality students based on national exam results and daily scores in the previous school year. Not only that, the achievement of good quality students can also be seen from the daily value of the teaching and learning process every day. Students who are accepted in both schools are the special ones, because they go through a very strict process. Therefore it is not surprising if the schools are pilot international standard schools and are the best favorite schools in Solo. Students of SMP Negeri 1 and SMP Negeri 4 also come from various backgrounds, some of the parents work as doctor, teacher, entrepreneur, and so on.

This research was classified as Research and Development. Borg & Gall (1983) stated that research and development is a process used to develop and validate educational products. Sukmadinata (2013) added that development research follows a step that begins with the need, problems that require solving using a particular product. Therefore, researchers developed a product of portfolio learning modules with an Enrichment model to enhance creativity thinking.

The learning model used the approach of Dick and Carey (2009), which was developed by Walter Dick, Lou Carey and James O. Carey where there are similarities with the model developed by Kemp, but coupled with the components of implementing learning analysis and there are several components that will be passed inside the development and planning process.

The stages in the Dick and Carey approach models include identifying goals, carrying out analysis of teaching, identifying initial behavior or characteristics of students, formulating performance goals, developing benchmark reference tests, developing teaching strategies, developing and selecting teaching, designing and implementing formative evaluations, writing device, and teaching revisions.

The first stage was identification of objectives. At this stage, the researcher determined what students wanted when they had completed the teaching program. The definition of teaching goals may refer to a particular curriculum or it may also come from a list of objectives as a result of need assessment or from practical experience with student learning difficulties in the classroom.

The second stage was to carry out teaching analysis. This stage was related to determining the type of learning needed by students. Teaching analysis will produce diagrams about skills (concepts) and show the linkages between these skills (concepts).

The third stage was to identify the initial behavior or characteristics of students. When conducting an analysis of skills that need to be trained and the stages of the procedure that need to be passed, the things that must be considered are the skills that have been possessed by students when they begin to follow the teaching. The thing to note is the identification of the specific characteristics of students related to the design of teaching activities.

The fourth stage was formulating performance goals. This stage was based on instructional analysis and statements about students' initial behavior, then a special statement will be formulated about what students should do after completing learning.

The fifth stage was the development of a benchmark reference test. The development of benchmark reference tests is based on the objectives that have been formulated. The purpose of developing assessment items was to measure students' abilities as predicted in the objectives. At this stage it was determined that the effectiveness test was carried out using the SPSS application with the Paired Sample T-Test.

The sixth stage was the development of teaching strategies. This stage identifies what will be used to achieve the final goal. The strategy includes pre-instructional activities, information delivery, practice, testing carried out through activities. Implementation is carried out in limited group trials and broad groups to get input from students.

The seventh stage is developing and choosing teaching. This stage uses teaching strategies to produce teaching that includes instructions for students, lesson material, tests and teacher guidance. The teaching strategy used is the module. Researchers began to draw descriptions and design of portfolio-based modules with the Enrichment model that will be developed. In the development of modules, researchers used 2 experts which were material experts and teaching materials design experts.

The eighth stage is designing and implementing formative evaluations. Evaluation was conducted to collect data that will be used to identify how to improve teaching.

The ninth stage is writing a device. The results at the above stage are used as the basis for writing the required devices. The device results were then validated and trialled or implemented in the class. Implementation was conducted in the control class and experiment class.

The tenth stage was teaching revision. This stage repeated the development cycle of the teaching device. Data from summative evaluations that have been carried out in the previous stages are summarized and analyzed and interpreted to identify difficulties experienced by students in achieving learning objectives. Similarly, input from the results of implementation from experts or validators. In addition, this stage aims to identify the shortcomings of the initial products that have been designed through two stages, namely expert validation and product testing before being applied. The evaluation results were used as a reference as to whether the media does not require more revisions and is feasible to be used on a broad scale and can be said to be the final product. If the product developed is feasible and effective, the product can be socialized and disseminated to the general public. The determination of the eligibility criteria for the products produced is as follows:

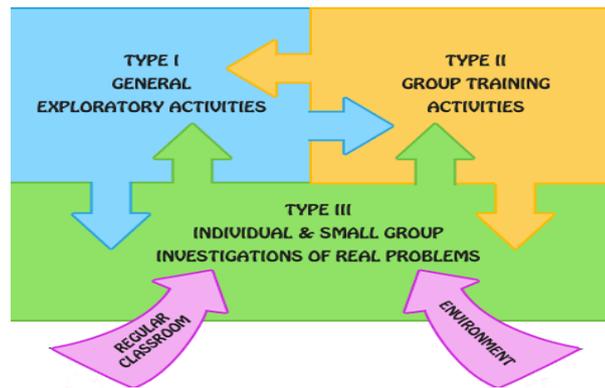
Tabel 1. Product Eligibility Criteria

Percentage	Qualifications	Value
90%-100%	Very Good	A
75%-89%	Good	B
65%-74%	Enough	C
55%-64%	Less	D
0-54%	Very Less	E

RESULT, DISCUSSION, AND SUGGESTIONS

Teaching materials developed is in the form of printed modules. The development of Enrichment based on portfolio modules for 8th grade in Surakarta Junior High School was carried out using the Borg and Gall model development procedures. This research used gifted student subjects or students who had good quality. The criteria used in identifying individuals as gifted also refer to the concept proposed by Renzulli. Renzulli stated that the concept the Three Ring Conceptions, which are above average abilities, high commitment to duty, and high creativity. Renzulli (in Huda, 2015; Garcia, 2008; Beecher and Sweeny, 2008) described enrichment models into three types, namely enrichment type I (general exploratory experiences), enrichment type II (activity- group training activities or skill development), and enrichment type III (small and individual investigations on real problems).

Figure 1 Enrichment Model

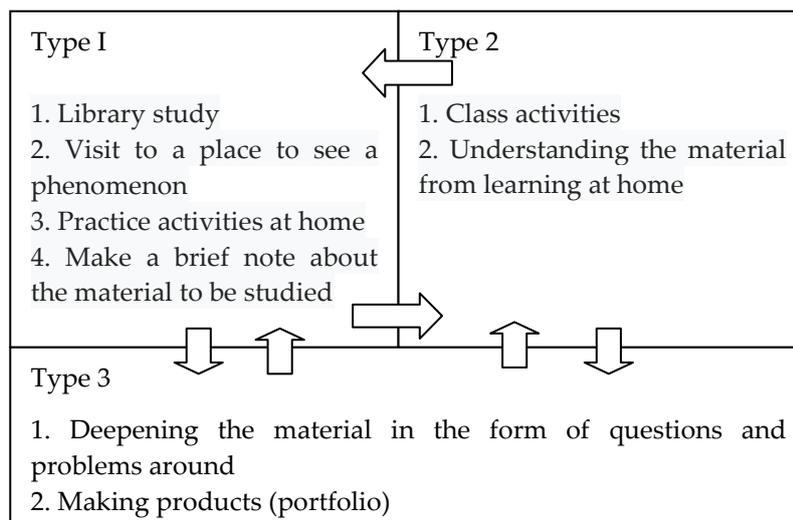


Furthermore, the Enrichment model was applied to the portfolio-based learning module. This means that in the use of module there is an Enrichment model that aims to make gifted students able to explore every potential in mathematics learning.

In the use of portfolio-based module, type I is designed to explore the potential of students. This potential is related to the topic of learning activities. Extracting potential will be an important factor in attracting students' interest in following the learning process. Type I activities can be carried out by students at home, so that students become more prepared and motivated with the provision of knowledge with type I activities. Activities in type I can be reading literature related to material topics, observations, or watching learning videos.

Type II is the advanced phase or impact of Type I where students are required to develop ideas or ideas. Activities in type II have been conducted at school. In this activity, students will carry out skills development activities in the form of solving problems from given problems and discussions. The last phase is in type III, students are given the opportunity to work independently by mobilizing every potential. Activities in Type III can be done by creating a project, where the end result is a collection of activities in the learning process.

Figure 2 Draft Portfolio-Based Modules with Enrichment Model



In other words, students are directed to basic activities to develop all their potential, explore interests and interests in a particular focus of material, and develop a thinking process in activities of type I and type II. Furthermore, students will focus on inquiry activities and develop experiences independently. Activities in type I also tend to cause activities in Type II and Type III. In addition, producing a product on Type III will provide a good experience in Type I.

Teaching materials developed in the form of print modules. The development of Enrichment based portfolio models for 8th grader of Junior High School in Surakarta was carried out using the development procedures of the Borg and Gall model. In his book Borg and Gall (1983) described 10 stages of research and development, which are research and information collecting, planning, develop preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, and dissemination and implementation.

The portfolio-based learning module is about the development process of students in mathematics lessons arranged in the form of modules. In line with Wijaya (in Surgawi, T., Joebagio, H. & Djono, 2018), the module can be seen as a program package arranged in the form of certain units for learning needs. Therefore, this learning module is structured according to the learning needs of mathematics subjects and in line with the learning objectives contained in the standard competency and basic competencies.

The components of the mathematics learning module will be developed by researchers in accordance with the module components according to Mustaji (in Irfan and Wanarti 2014). Mathematics learning modules will be modified with concept maps, formulations of instructional objectives, module usage instructions, learning activities, enrichment / student worksheets, evaluation sheets (competency tests), and glossaries.

During the development process several revisions were made to the devices developed, namely at the time of expert validation to the field trials. The development of teaching materials is expected to improve creativity thinking.

The ability to think creatively is the ability of a person to think using certain new ways or steps in problem solving efforts. The importance of the ability to think creatively in solving problems is explained that the process of problem solving is strategic steps with comprehensive consideration and has important characteristics, namely flexible work and can modify the steps in changing situations and conditions, so that it can be determined a degree the level of how well students can overcome a new situation.

The ability of creative thinking in mathematics is the ability to produce new solutions in solving problems and applying mathematical principles in many different ways to produce the right solution. It is often seen that the ability of creative thinking is the ability of a person to see the various possible solutions to a problem, both in academic life and everyday life. The ability of creative thinking is very necessary for students. Students at each school level have the ability to think creatively in solving problems. Therefore, it does not rule out the possibility of students in junior high school having the ability to think creatively in solving problems.

Therefore the ability of creative thinking can be helped by the existence of modules. The portfolio learning module in which students are required to be independent in the process, collecting materials that are in accordance with the material and answering questions that are not only based on formulas are expected to improve ability of creative thinking.

Based on the problems taken from the results of field reality observation, a module is needed by incorporating elements of questions that contain creative thinking can be used as independent learning content for students and useful for effective learning. The use of this learning module results that students tend to be more active in looking for things that are around by linking to learning material. Modules that contain the results of the student's work can be used as material for notes and exercises, so that students do not need to work twice which are taking notes and working on the questions.

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