Growing of the mathematical thinking imaginative to students in designing of the teaching aids for CWD towards to joyful learning

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Abstract. Government and the private parties had also organized of Special School (SS) and Inclusive School. SS requires of math teachers who were professional in the material, but also master the needs of Children with Disabilities (CwD) in teaching-learning process. The problem: How to design the Teaching Aids for CwD through Extra-Curriculum Training (ECT) activities to Joyful Learning? The purposes of this research: (1) To find new ways how to grow the imaginative in mathematical thinking for students of Mathematics Education. (2) To find a Teaching Aids Design that suitable for CwD who studying in SS. (3) In order to create a Teaching Aids for CwD through activities based on ECT to Joyful Learning. The research method was done by qualitative approach. The research subjects were 6 students of Mathematics Education Study Program of FMIPA UNNES who were interested in attending of the training activities based on ECT. The results: (1) ECT can be a place to grow an Imaginative in Mathematical Thinking of students, (2) created the design of the teaching aids for CwD through activities based on ECT to Joyful Learning as a mirror of the imaginative growth in mathematical thinking for students.

1. Introduction

Children with Special Needs are now called Children with Disabilities (CWD). Government and the private parties had also organized the Special School (SS) and Inclusive School. So SLB needs a math teacher. Mathematics Education Students of Universitas Negeri Semarang there was an interest to be a math teacher at SS. However, facilities, infrastructure, facilities, and regulations had not been possible to produce of mathematics teachers for CWD.

So, there was a gap between the real needs in the field with the fact in college. The novelty element to be found was to find a way to bring up the imaginative in mathematical thinking for Mathematics Education students in creating a Teaching Aids for CWD to Joyful Learning.

The formulations of the problems were as follows. (1) How to grow imaginatively in mathematical thinking for students? (2) How were students able to design a Teaching Aids for CWD to Joyful Learning? The objectives: (1) To grow imaginatively in mathematical thinking for students. (2) To find the mathematical Teaching Aids for CWD.

1.1. Special School and Inclusive School

The education service system for CWD can be done in a segregated and integrated manner. The segregation education system is an education system that separates from the normal child education
system. Education of CWD through segregation system means that the implementation of education is carried out specifically and separated from the provision of education for normal children.

The form of integrated education services is an education system that provides opportunities for the children with special needs to learn together with the normal children under one roof, known as Inclusive Education. Math lessons are often called difficult lessons, especially for the Children with Disabilities. Therefore, the researcher as the Head of Learning Study Center for CWD - FMIPA UNNES wanted to research how to grow imaginative in mathematical thinking for Mathematics Education students in creating a Teaching Aids for CWD to Joyful Learning through ECT-based activities toward the Joyful Learning. This is in line with the opinion of Wasukree, Suthisung, Kongthip and Inprasitha [1] and Conklin [2].

1.2. Bringing the Imaginative in Mathematical Thinking
It is difficult for conceptualize geometry, mathematical learning, or other science without imagination. According to Tsai [3], without imagination, the Egyptians would not be able to build the pyramids. With the imagination of people like Bill Gates and Steve Jobs, who can imagine that someday there will be computers/laptops in every home.

Imagination is a cognitive process that is a complex of mental activity in which elements in the mental activity are released from sensations of sensory. Imagination involves an integrating aspect of memories or experiences into a mental construct different from the past and becoming a new reality in the present or even the anticipation of reality in the future. Imagination is regarded as one of the "higher mental functions," and can also be associated with fantasies or the form of problem-solving originally that different from the ordinary. Cunningham [4] wrote that the emergence of imagination requires creativity. Imagination and creativity are needed in the future, including the labor demand, for example as a teacher. To elicit the imaginative in mathematical thinking, there are some opinions of experts who peek it.

Sanders [5] wrote that in order to elicit the imaginative mathematical thinking, this indicators are: (1) fluency, that is, the ability to generate many ideas; (2) flexibility, ie the ability to solve problems in a variety of ways or approaches; (3) originality, ie the ability to express ideas of itself and in its own way; (4) elaboration, ie the ability to explain something in detail; (5) redefinition, ie the ability to see a problem based on a different point of view than what others had found.

While Salmi et al [6] wrote that in order to elicit the imaginative thinking in mathematics, the indicators are: (1) flexibility, in solving problems that have many different strategies in the solution, (2) fluency, able to produce some different correct answers, (3) novelty, which has a new work.

To arise an imaginatively in mathematical thinking to create a Teaching Aids for CWD to Joyful Learning 1based on ECT, the indicators were: (1) Appearing an imagination or ideas which had characterized by the production of a Teaching Aids that are different from what others had found. (2) Fluency, i.e., the ability to produce a Teaching Aids which can be utilized to describe several different materials. (2) Flexibility, i.e., the ability to produce some Teaching Aids that can be used to describe a material. (3) Originality, the ability to produce a Teaching Aids as self-supporting works.

1.3. Extra-Curriculum Training (ECT) Activity to Joyful Learning
ECT activity is a semi-lecture activity that conducted outside of the formal lecture activities scheduled. Because of its implementation outside of officially scheduled lecture activities, this activity can be referred to as extra-curricular training. Resnick [7] wrote that learning activities from informal sources occurring in extra-curricular training or out-of-study environments had proven to be effective and able to motivate participants.

Furthermore, Miles and Huberman [8] suggested that out-of-study makes the learning environments particularly useful for students, both because of manipulation-oriented tool-oriented approaches and contextualized reasoning. Not associated with mere the thought or mere the symbols of manipulation.
Bernard et al [9], Harwell [10], and Kafyulilo et al [11] were experts who love to write articles about the teacher training or the candidate teachers. They said that the training is necessary for teachers or candidate teachers to have the ability to develop professions and have the high quality of the learning process needed for students. While Lee and Chen [12], stated that the training materials should be very useful for teachers and students faced and must be by current needs. If what is encountered is CWD then the material related to the learning of CWD is feasible to be studied and trained.

In this research, ECT training activities were filled with intensive materials and training on how to create and read the Braille letters and numbers, teach the school mathematics using Braille symbols, create mathematical teaching aids that will be used for CWD that schools in SS. With this Teaching Aids, it is expected that mathematics subject matter becomes easy and fun (Joyful Learning) for CWD. A pleasing perception of learning has a positive effect on student learning motivation.

2. Methods

2.1. Research Approach
In this research used research method with a qualitative approach. Qualitative approaches have natural characteristics with data retrieval through direct, descriptive, and process data sources are preferred to obtain accurate research results by the problems and objectives of the study.

2.2. Research Focus and Data Sources
Research Focus: The focus of this research was the mathematics teaching aids product that suitable for CWD, produced by six students of Mathematics Education Study Program of FMIPA UNNES who were interested to follow in training activity based on Extra-Curriculum Training.

The data were the results of Teaching Aids for CWD of the creation of students who would be analyzed their Imaginative in Mathematical Thinking, creativity, behavior, activity, and degree of its Joyful Learning.

2.3. Data Analysis
Data analysis in this study based on the theory of Miles and Huberman. Kramarz [13] wrote that the data analysis includes: data reduction, display data, data interpretation, and conclusion.

2.4. Indicators of the Imaginative in Mathematical Thinking
The indicators were as follows. (1) Growing of the imagination or ideas who characterized by the design of the Teaching Aids that differ from those found in others: fluency, the ability to design a Teaching Aids that can be used to describe different materials, or flexibility, namely the ability to design some Teaching Aids that can be utilized to describe a material. (2) Originality, the ability to produce a Teaching Aids as self-supporting works.

3. Result and Discussion
Table 1. Recapitulation of Result After Triangulation

| No | The category of the imaginative in mathematical thinking is characterized by designing of TeachingAids to Joyful Learning. | Able to design of TeachingAids to Joyful Learning as a form of the imaginative appearance in mathematical thinking of students: | The number of the research subjects, after completion of the assessment process, interviews, and triangulation |
|----|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 1. Growing is Very Good | There were 3 or more materials. | There were 3 or more Teaching Aids. | 1 |
| 2. Growing is Good | There were 2 materials. | There were 2 Teaching Aids. | 2 |
| 3. Growing is Enough | There was 1 material. | There was 1 Teaching Aids. | 1 |
| 4. Growing is Less | There is 1 material and less appropriate to use. | There is 1 Teaching Aids and less appropriate to use. | 2 |
| 5. Growing is Very Less | Fail. | Gagal. | 0 |

The results that achieved is shown in Table 1. It seems to be admitted that designing a Teaching Aids for CWD different from those found by others was not easy. Therefore it was not surprising that on the subject of the study there was only one student who had the category Very Good. There were two students who had the category Good, others were in the category of Medium or Less Grow.

The use of the props cultivated a pleasing learning perception and had a positive effect on students' learning motivation.
4. Conclusions
From the description above it can be concluded as follows. (1) Through the Extra-Curriculum Training (ECT), students would be attracted and interested to teach in the learning of SS students. (2) Through this ECT activity, it was very effective to cultivate the imaginative in mathematical thinking for Mathematics Education student. The students had a place to develop their imaginative power in mathematical thinking. (3) Students participating in ECT were able to design the Teaching Aids for CWD which was expected to be able to lead the learning process to Joyful Learning as a form or mirror the students' imaginative growth in mathematical thinking.

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