Creative thinking ability on the integrating mathematical habits of mind in missouri mathematics project learning

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Abstract. The method in this study, Mixed Method Design with concurrent embedded strategy. This research was conducted mathematical creative thinking skills of students class VII-B of Indramayu State Middle School 1, Academic Year 2018/2019. Sampling technique used snowball sampling technique. There were three stages in this research, the first was designing learning process stage that consisted of syllabus, lesson plan, learning syntax and expert validated test items. The second was the implementation. It was conducted to see the students' respond and activity during the learning process. The third was evaluation stage. This was conducted to know the learning effectiveness. The result, it was obtained that (1) the learning design integrated Mathematical Habits of Mind (MHM) and Missouri Mathematic Project (MMP) consists of syllabus, lesson plan, learning syntax, students’ worksheet and TKBKM were valid; (2) The respond of students and teacher were 82.9% good and happy to involve in the process of learning design that integrates Mathematical Habits of Mind (MHM) and Missouri Mathematic Project (MMP); (3) the learning that integrates Mathematical Habits of Mind (MHM) with Missouri Mathematics Project (MMP) learning is effective in improving mathematical creative thinking students with moderate categories.

1. Introduction

One important ability highlighted in 21st century education is creative thinking [1-3]. The fundamental aspects of creative thinking involve cognitive abilities, personality characteristics, education, family, social and cultural [2]. Students who have the ability to think creatively are able to imagine to produce different ideas or ideas [4]. Therefore, based on a report from the National Advisory Committee on Creative and Cultural Education (NACCCE) [5] creative thinking helps students to develop the capacity and capacity of students to generate new ideas and actions and solve various problems needed for life.

Given the importance of creative thinking, the Indonesian Government has promoted it in the 2013 Curriculum [6]. However, based on the report Florida, Mellander & King [7] in the 2015 The Global Creativity Index states that the level of creative thinking in Indonesia is still ranked 115th out of 139 countries with a score of 0.202 and still below Cambodia which is ranked 113. That too, in line with the results of relevant research which concluded that the level of creative thinking of students, especially in mathematics in Indonesia is still relatively low [8-11].

These results are in line with the preliminary study of mathematics students and teachers at Sindang 1 Public Middle School, the ability of mathematical creative thinking of most students at 1 Sindang Middle School is still low. The low ability of creative thinking of students is one of them because the teacher does not try to explore students' knowledge and understanding of creative thinking [12].
During this time the teacher only carried out procedural learning, which was only giving formulas then working on practice questions, without giving students the opportunity to improve their creative thinking skills [13]. So far, the learning model in Indonesia has not been able to improve students’ ability to think creatively [14].

The success of students in improving their mathematical creative thinking skills is determined by one of them as an educator. Many studies promote the use of learning models to improve students’ creative mathematical thinking skills in Indonesia. Such as using problem-solving approach, solving open-ended problem, problem based learning, discovery learning, ASSURE model assisted by software autograph, 5e learning cycle with metacognitive technique [15-19].

In addition to using these learning models, there is one way to promote creative thinking by using the Missouri Mathematics Project (MMP). The Missouri Mathematics Project (MMP) learning model will be better if it is integrated with the Mathematical Habits of Mind because according to Mawaddah, Kartono, & Suyitno [20] creative abilities which are cognitive abilities require the involvement of affective and psychomotor abilities. Therefore, this study is related to promoting creative thinking skills through the integration of the Mathematical Habits of Mind in Missouri Mathematics Project (MMP) learning by paying attention to design aspects, implementation and evaluation.

2. Method
The method in this study is quantitative research design (Mixed Method Design) with concurrent embedded strategy. This research was conducted in mathematical creative thinking skills of students of class VII-B of Indramayu State Middle School 1 Academic Year 2018/2019. In this research the sampling technique used is the snowball sampling technique, which starts from one more and more time. The key informants in this study were: Principal; Math teacher; Family; Students with mathematical creative thinking abilities are low.

The instrument used is the Observation Sheet; Mathematical Habits of Mind (MHM) Questionnaire and Test questions for mathematical creative thinking skills. Data analysis with the following stages. The first stage is to analyze qualitative data to produce learning designs and the process of using learning designs. The second stage is quantitative data analysis to determine the effectiveness of the use of learning that integrates MHM with the Missouri Mathematics Project to improve students’ creative mathematical thinking skills. To see the effectiveness criteria, namely: (1) An increase in the results of the creative thinking ability test before and after learning that integrates MHM with the Missouri Mathematics Project learning uses the t test one sample and N-gain normalized.

3. Result and Discussion
MHM integration in the Missouri Mathematics Project learning, is in three phases, namely the initial phase, the core phase and the final phase. In the initial phase MHM integration takes place when students are given apperception. On giving student perceptions it is inculcated about applying the past knowledge to new situation. For more detail can be seen in Table 1.

| Table 1. MHM Integration |
|--------------------------|
| **Initial Phase**        |
| 1. Applying past knowledge to new situation. |
| a) Students are given questions that relate previous knowledge to the material to be learned; |
| b) Students know the learning objectives or basic competencies to be achieved; |
| Know the learning goals and indicators of achievement of competency |
| c) Resolve problems related to triangles; |
| d) Students form heterogeneous groups consisting of 5-6 students. So that students can work in teams well. |
| **Core Phase**           |
| 1. Applying past knowledge to new situation. |
| Review: Students can remember and re-improve the previous material in a new situation. |
2. **Creating, imagining, and innovating.**

   **Development:**
   a) Students can work, imagine and innovate by giving a brief explanation of triangular material by the teacher.
   b) Students can work, imagine, and innovate by giving examples of questions.

3. **Persisting, Striving for accuracy, Creating, imagining, and innovating, Responding with wonderment and awe, Thinking interdependently.**

   **Controlled exercise or training with teacher guidance**
   a) Students are directed to be firm, try carefully, work, imagine, innovate, and work in teams to work on worksheets or worksheets for each group given by the teacher.
   b) The process of group work is observed by the teacher.
   c) The group that already understands is directed to be able to account for the answer by giving an explanation to other group friends who have not understood it by being guided.

4. **Persisting, Striving for accuracy, Creating, imagining, and innovating.**

   **Seat work**

   Students are directed to be firm, try carefully, work, imagine, and innovate in working on the problem exercises that have been given by the teacher to be able to better understand and apply the triangular material to the questions given.

   **Assignment**
   a) Students are directed to be firm, try carefully, work, imagine, and innovate in doing the tasks that have been given by the teacher.
   b) This assignment will then be subject to review in subsequent learning.

**Final Phase**

1. **Striving for accuracy**
   a) Students are guided to draw conclusions from the results of learning that has been carried out.
   b) Ending learning with greetings and prayers.

In the student core phase there are 4 (four) MHM components integrated. Integration occurs at the stage of review, development, controlled exercises or exercises with teacher guidance, independent work and assignments presented in Figure 1. In the final phase integrate Striving for accuracy to ensure that students complete in understanding geometry material.

![Figure 1](image-url)  
*Figure 1. Integration Learning Implementation*

The integrated learning implementation of MHM in the Missouri Mathematics Project starting from the teacher leads students to remember and re-improve the previous material to the new situation by giving questions about the core of previous learning and or discussing the assignments given at the previous meeting. Furthermore, students carry out development activities, namely by working, imagining, and innovating by being given a brief explanation of the triangle material by the teacher, and given a sample question. In another process to see the extent to which students’ conceptual understanding is done by providing controlled training or training with teacher guidance in a way students are directed to be steadfast, try carefully, work, imagine, innovate, and work in teams to work
on worksheets or worksheets at each group that has been given by the teacher. Then the group work process is observed by the teacher that can be seen in Figure 2.

![Figure 2. Teamwork Activities in Learning Implementation](image)

The group that already understands is directed to be able to account for the answer by giving explanations to other group friends who are not yet understood by being guided. After the training process, Seat work is given. At this stage students are directed to be steadfast, try carefully, work, imagine, and innovate in working on the problem exercises that have been given by the teacher to be able to better understand and apply the triangular material to the questions given. In addition there is an assignment with the way students are directed to be firm, try carefully, work, imagine, and innovate in doing the tasks that have been given by the teacher. This assignment will then be a review material for further learning.

Based on observational data collection on learning, it was found that the implementation of MHM integrated learning at the Missouri Mathematics Project, starting at the first and second meetings was in accordance with the stages of the implementation of learning with a percentage of 100% or good category. In addition, based on the student's response questionnaire to learning, in this study there was the highest value on the relevance indicator 82.9% and the lowest satisfaction 75.8%.

Table 2. Learning Evaluation

| Test         | Score | Minimum | Maximum | Rata-rata Score | Gain $<g>$ | Category |
|--------------|-------|---------|---------|----------------|------------|----------|
| Pre-test     | 100   | 46      | 92      | 62             | 0.551053   | Average  |
| Post-Test    | 100   | 71      | 96      | 82.94          |            |          |

Table 2 shows that students' creative thinking skills are in the medium category. The maximum posttest score is 96 and 92 pretest. These results indicate that MHM integration in the Missouri Mathematics Project learning can improve creative thinking skills with moderate categories. In addition, one sample t test was conducted to prove the increase in the average posttest results compared to the minimum completeness value (KKM) of 70. Based on the calculation results of the value of one sample, namely 5.88. Therefore, with the number of students 37 and a significance level of 1% obtained by $t_{crit}$ which is 2.43145. That means there are significant differences with the KKM value, meaning that there is a significant increase.

4. Conclusion
MHM integration in the Missouri Mathematics Project learning takes place in the initial, core and final phases. Implementation of learning starts from preliminary activities, core activities and closing activities. The results of MHM integration in the Missouri Mathematics Project learning, can improve creative thinking skills with moderate categories.

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