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# The Increasing of Students' Mathematical Communication Ability through Somatic, Auditory, Visual, and Intellectual (SAVI) Approach at SMAN 1 Perbaungan

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**ABSTRACT**

*The purpose of this research was to know whether the increasing of students' mathematical communication ability taught by Somatic, Auditory, Visual, and Intellectual (SAVI) approach is higher than taught by ordinary mathematics learning. The type of this research is quasi experiment. The population of this research was all students at SMA Negeri 1 Perbaungan with the sample was two classes which each class consists of 30 students, XI A as experimental class taught by SAVI approach and XI B as control class taught by ordinary mathematics learning. The sample was taken by cluster random sampling. The Instruments used to collect the data were essay test of mathematical communication ability that given in the end of learning either in experimental class and control class and questionnaire of student responses. The instrument has been declared eligible content validity and reliability coefficient. Data were analyzed by t-test. Based on the analyis results obtained that the increasing of students' mathematical communication ability taught by Somatic, Auditory, Visual, and Intellectual (SAVI) approach was higher than taught by ordinary mathematics learning. From the data analysis of posttest score by using t-test with significance level* $\alpha = 0.05$ *obtained that* $t_{calculated} = 4.731$ *and* $t_{table} = 1.671$. *It means that* $t_{calculated} > t_{table}$ *then* $H_0$ *is rejected and* $H_a$ *is accepted. This study was supported with the result of questionnaire of student response which is classified in good category. Thus, researcher suggests applying SAVI approach to increase students' mathematical communication ability.*

*Keywords: Somatic, Auditory, Visual, and Intellectual (SAVI) Approach, Mathematical Communication Ability*

## I. INTRODUCTION

Mathematics is a subject taught at every level of education, starting from kindergarten, elementary, junior high school, senior high school, even to the college. One reason why mathematics should be taught at every level of educations due to problems in daily life related to mathematical calculations, thus we need to increase students' mathematical communication ability (Baroody, 2000; Ginsburg, Inoue, & Seo, 1999; NCTM, 2000; Rubenstein & Thompson, 2002; Whitin & Whitin, 2003). To develop students' mathematical communication ability, Pugalee (2001) suggested that in learning mathematics students should be encouraged to answer questions accompanied with relevant reason, and to comment a mathematical statement in their own language, so that students became to understand the mathematics concepts and arguments meaningfully.

Mathematical communication is an essential process for learning mathematics because through communication, students reflect upon, clarify and expand their ideas and understanding of mathematical relationships and mathematical arguments (Ontario Ministry of Education, 2006). According to NCTM (2000: 10), mathematical communication ability can occur when students work in groups, when the students describe an algorithm to solve an equation, when students construct and describe a graphical representation of the real-world phenomena, and when students give a conjecture on geometrical images.

The recent researchs show that students are less able in communicating to deliver information, such as expressing ideas, asking questions, and answering questions/opinions the other students. They tend to passive when teacher is asking a question to check student's knowledge. Students seem bashful to ask when teacher gives the opportunity. Even though there was student who answered the question, it seems clumsiness, less of variation, monotone, and not actual. It makes that the learning process in class "not alive". Majority teachers teach with lecturing method and writing notes on blackboard. It means that the learning process in class does rarely practice and rarely

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develop mathematical communication ability and interaction process among students, such as cooperative, expressing idea, asking question, and answering question/opinion the other students. Teacher has implemented discussion in learning model, however what has done is discussion in conventional way. In instructing the discussion, teacher only give some questions to students/groups that consist almost of materials in that topic, such that student's thinking is not developed and not stimulated to think critically. In writing mathematics, students can draw diagram, graph, or table, but they cannot draw it completely and clearly. Students also can write mathematical model or algebraic form, but not completely.

One alternative that can be applied to increase students' mathematical communication ability is Somatic, Auditory, Visual, and Intellectual (SAVI) approach. SAVI is a learning approach which emphasizes that learning should take advantage of all senses belonging to students by combining physical movement with intellectual activity and using all senses in the learning process. This approach is intended to increase the activity of students in learning activities to improve the result. SAVI is short term of Somatic, Auditory, Visual, and Intellectual implying the learning should use all senses of students. Somatic means that learning must be through moving and doing (hands-on, physical activity). Auditory means that learning must be through talking, hearing, presentation, argumentation, express opinions, and respond. Visual means that learning should use eye senses through observing, drawing, demonstrating, reading, and picturing. While the meaningful of Intellectual is learning should use the ability to think (mind-on), problem solving, and reflecting (Meier, 2000: 43). Learning can be optimal if the four elements of SAVI are in learning situation. Learning by combining these four modalities of learning in a learning situation is the essence of multisensory learning. Through the application of SAVI is expected capable to accommodate students with different characteristics to take advantage of all senses which belong to students.

Dave Meier as owner of SAVI concept suggested to teacher to manage the class using this learning approach. SAVI approach is a form of learning created by Dave Meier in his book "The Accelerated Learning Handbook" which is a guide book in designing creative and effective educational programs. The basic concept of learning is learning takes place in fast, fun, and satisfying. SAVI approach is an approach to learn mathematics that involves students during the learning process. The SAVI approach puts students as the subject of study. The role of the teacher in this approach is as a mediator and facilitator of learning. With this approach, students will learn to think critically and analytically to seek and find their own answer of a problem that is questionable. In addition the concept that they get, will longer they are stored in memory. Learning process cannot spontaneously increase when students were ordered standing and moving freely. However, combining physical movement with intellectual activity and using all senses of tools can have a significant effect on the outcome of learning process, especially students' mathematical communication ability.

The indicators of mathematical communication ability referred to in this research are the ability of students to express mathematical description into mathematical model; create mathematical model through diagram, graph, or table; and explain mathematical model and do calculation. Thus, through the SAVI approach, students can learn mathematics with an optimal intellectual activity and all the senses are combined in a learning process. So it can create a fun learning, student-centered, and actively involve students in order to develop their well potential by ability, interest, learning styles, experience, and can improve students' mathematical communication ability.

## II. METHOD

This study was a type of the quasi-experiment study. The population of this research was students grade XI of SMA Negeri 1 Perbaungan in even semester academic year 2013/2014 with the sample was two classes which each class consists of 30 students, class XI-A as experiment class taught by SAVI approach and XI-B as control class taught by ordinary mathematics learning.

The instruments used to collect data in this research were test and non-test. The test instrument was essay test of mathematical communication ability that given in the end of learning either in experimental class and control class and non-test instrument was questionnaire of student responses which consists of two question types, positive and negative. Each question type consists of some question items. Positive question consists of 12 items and negative question consists of 12 items. This questionnaire in checklist (√) form with each question item has 5 answer alternatives, namely: Strongly Agree (SA), Agree (A), Neutral (N), Disagree (DA), and Strongly Disagree (SDA). Before the treatment was given for experiment class, the both classes were given pretest (related to students' mathematical communication ability) to know the students' initial ability and after giving treatment, the both classes were given posttest and

also questionnaire of student responses. The research design used Pretest-Posttest Control Group Design as following table:

Table 1. Research Design

| Class | Pretest | Treatment | Posttest |
|---|---|---|---|
| Experiment | O | X | O |
| Control | O | | O |

## III. RESULTS AND DISCUSSIONS

### A. The Mathematical Communication Ability of Each Indicator

The result of posttest related to students' mathematical communication ability of Class A and Class B can be seen from the following table:

Table 2. The Result of Posttest for Each Indicator

| Indicator | Class | |
|---|---|---|
| | A | B |
| Express mathematical description into mathematical model | 95.88 | 62.14 |
| Create mathematical model through diagram, graph, or table | 77.78 | 47.94 |
| Explain mathematical model and do calculation | 76.95 | 66.94 |

From the table above, we can see the score of posttest of mathematical communication ability for Class A and Class B. It also can be seen from the following chart.

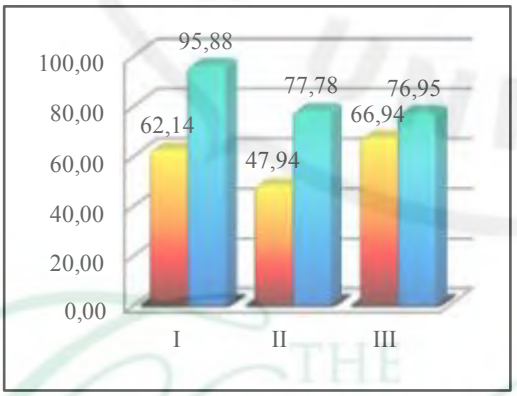


Figure 1. The Result of Mathematical Communication Ability for Each Indicator

Note:

I : Express mathematical description into mathematical model.

II : Create mathematical model through diagram, graph, or table.

III : Explain mathematical model and do calculation.

### B. The Increasing of Mathematical Communication Ability

Based on the mathematical communication ability test results, Class A had average score 55.40 for prestest and 81.89 for posttest, while Class B had average score 52.26 for pretest and 62.31 for posttest. It can be seen in following table:

Table 3. The increasing Average Score of Math Communication Ability

| Class | Pretest | Posttest | N-Gain | Criteria |
|---|---|---|---|---|
| Class A | 55.40 | 81.89 | 0,59 | Medium |
| Class B | 52.26 | 62.31 | 0,21 | Low |

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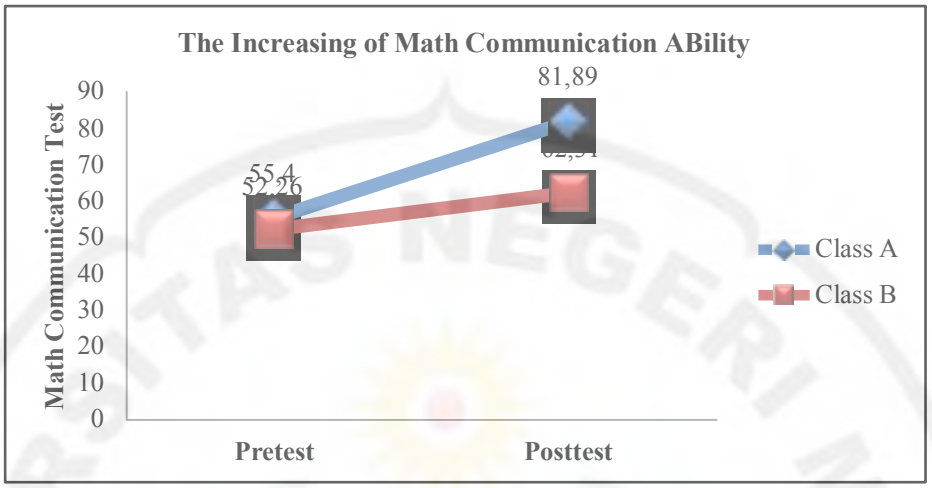


Figure 2. The Increasing of Mathematical Communication Ability

Figure 2 shows the increasing of students' mathematical communication ability taught by SAVI approach for class A and taught by ordinary mathematics learning for class B. Class A as experiment class obtained N-Gain score is 0.59 in medium category while Class B as control class obtained N-Gain score is 0.21 in low category

**C. Description of Student Response's Questionnaire**

The result of questionnaire of student responses also can be seen for each indicator in the following table:

Table 4. The Results of Student Response for Each Indicator

| | Indicator | | |
|---|---|---|---|
| | I | II | III |
| Total Score | 204 | 88 | 302 |
| Percentage | 95.25% | 81.50% | 85.03% |
| Category | Very Good | Good | Good |

It obtained that the first indicator of mathematical communication ability gained value 95.25% which is in very good category, the second indicator, learning instrument gained value 81.5% which is in good category, and the third category, implementing of SAVI approach gained value 85.03% which is in good category.

Based on hypothesis test by using t-test with significance level $\alpha = 0.05$ obtained $t_{calculated} = 4.731$ and $t_{table} = 1.671$ shows that $t_{calculated} > t_{table}$ then $H_0$ is rejected and $H_a$ is accepted. It means that the increasing of students' mathematical communication ability taught by Somatic, Auditory, Visual, and Intellectual (SAVI) approach was higher than taught by ordinary mathematics learning.

The implementation of mathematical learning by applying SAVI approach is seen that researchers have looking good enough in organizing and implementing learning and teaching activities, but there are students who have not actively participate in group discussions. Researchers should give more motivation to students to interest in learning and in guiding the study groups when they perform the task.

Learning theories that support SAVI approach is the flow behavior psychology proposed by Gagne. Gagne proposed a five-course group of learning outcomes, i.e. intellectual skills, cognitive strategies, attitudes, verbal information, and motor skills. Learning by Gagne (Slameto, 2010: 13) are grouped into eight types of learning, namely: signal, stimulus response, a series of movements (motor learning), a series of verbal (verbal learning), discernment, concept formation, principle formation, and problem solving. The eight types of learning is ordered difficulty from the most simple (learning signal) to be the most complex (problem solving).

The eight types learning by Gagne who is closely related to the SAVI approach is a stimulus response, a series of movements, a series of verbal, and problem solving. Stimulus is response to a condition that there is no intentional learning and physical response. For example, students imitate the teacher writing on the blackboard. The series is the act of physical motion sequences of two or more activities in the framework of stimulus response. For example, students painted a circle by using the tools. The series is the act of oral verbal sequences of two or more activities in the framework of stimulus response. For example, state or express opinions about concepts, symbols, definitions, axioms, propositions, and others. While problem solving is the most complex types of learning and usually there are five steps that must be done, namely: (a) present an issue in a clearer form, (b) state the problem in a more operational, (c) formulate alternative hypotheses and procedure is

expected to work ell, (d) test the hypothetical and do the work to get results, (e) check the return results that have been obtained. Overall this research appropriate with Dave Meier theory that learning by *Accelerated Learning* with SAVI approach be able to accelerate the learning, maximize the ability of students, and learning that takes enjoyable.

From the results and discussions, there was increasing of students mathematical communication ability taught by using SAVI approach because during learning process the students can combine physical movement with intellectual activity and using all senses of tools can have a significant effect on the outcome of learning process, especially students' mathematical communication ability. We can see from the research results that aspect of mathematical communication ability, express mathematical description into mathematical model, students had reached the increasing high score. It is because in elements of SAVI approach there are auditory and visual elements. Students are in habit to express their opinions and then be able to realize that in mathematical model. Students are able to create mathematical model through diagram, graph, or table because in elements of SAVI approach there are somatic and visual elements. It makes students are in habit to create mathematical model through diagram, graph, or table on their worksheet and have discuss with their group. Students are able to explain mathematical model and do calculation because in elements of SAVI approach there are auditory and intellectual elements. Students are able to do calculation because their intellectual have sharpened to solve problem that given. This results appropriate with journal result (Sari et al., 2014) showed learning mathematics instruction using the integrated school programs with SAVI models can improve learning outcomes. In addition, character education can reduce negative behaviors that impede students' academic success (Muslich 2011: 29) as well as school programs can support student discipline. This research results is also related to Mujiem & Suparwati (2011) study that in teaching and learning activities, teachers should adapt learning approaches to the material presented. SAVI is an appropriate approach when it is used on the circle material because this approach helps students to understand the circle material easier. A different student's motivation give a different effect on Mathematics achievement in the circle material. Therefore teachers should carry out the learning that raises students' motivation.

After seeing the research results, we can conclude that implementing SAVI approach in learning process increases the students' mathematical communication ability.

## IV. CONCLUSION

The increasing of students' mathematical communication ability taught by Somatic, Auditory, Visual, and Intellectual (SAVI) approach was higher than taught by ordinary mathematics learning at Grade XI SMA Negeri 1 Perbaungan where experiment class taught by SAVI approach obtained N-Gain score is 0.59 in medium category while control class taught by ordinary mathematics learning obtained N-Gain score is 0.21 in low category. It happened because during learning process by SAVI approach students can combine physical movement with intellectual activity and using all senses of tools can have a significant effect on the outcome of learning process, especially students' mathematical communication ability. This study was supported with the result of questionnaire of student response which is classified in good category. Teacher should give more motivation to students to interest in learning and in guiding the study groups when they perform the task.

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