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Analysis of students mathematics communication ability based on Keirsey personality type through accelerated learning model

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Abstract

Mathematics communication ability needs to be improved so that students can solve math problems well. The purpose of this research was to: (1) determine whether the average students' mathematics communication ability are taught using Accelerated Learning (AL) model reached 65 and finished the classical; (2) describe the mathematics communication ability of students based on personality types Keirsey through the AL model. This research method using mixed methods with sequential explanatory design. Sampling with cluster random sampling technique, the determination of the subject by using purposive sampling. The population in this study is a class VIII student in one of the Junior High Schools in Semarang by taking a class sample. The results showed that the average students' mathematics communication ability are taught using a model of the AL reached 65 and completed the classical with the percentage reached 75%. Description of mathematics communication abilities of students based on Keirsey personality types: (a) Artisan students able to two indicators; (b) Guardian students able to two indicators; (c) Idealist students able to two indicators; and (d) Rational students able to two indicators.

1. Introduction

Math stems from problems in human life, so that mathematics was developed to meet human needs. Math is a language, which means not only the Mathematics thinking tools or tool finds a pattern, but also as a means of communication between students and communication between teachers and students (Umar, 2012: 2). Communication is indispensable in the learning process. As said Morgan (2014: 844) that communication in the practice of mathematics education is of primary importance, although sometimes it is difficult to observe the communication is going on. One appropriate way to describe the language in math class example by observing the linguistic and Mathematics symbolism used such as charts, graphs, and so on.

According to the NCTM (2000: 60), communication is an important part of mathematics and learning. Through communication one can share knowledge and clarify their understanding of other people. Mathematics communication ability particular attention to education in Indonesia, in the Minister of Education and Culture No. 58 2014 Curriculum 2013 SMP / MTs stated that one of the purposes of mathematics learning is that learners can communicate ideas, reasoning and be able to construct Mathematics proofs using complete sentences, symbols, tables, diagrams, or other media to clarify the situation or problem. Not only in Indonesia abroad no ability or math ability, especially communication is also considered important as the expression on NCTM (2000:

Mathematics communication ability are important, but in fact the Mathematics communication ability in Indonesia tend to be not as expected. Low Mathematics communication ability can be seen from the survey results in PISA (Program for International Student Assessment). The results of PISA 2015 survey conducted by the OECD, Indonesia ranks 63 out of 72 countries. One of the capabilities assessed by PISA

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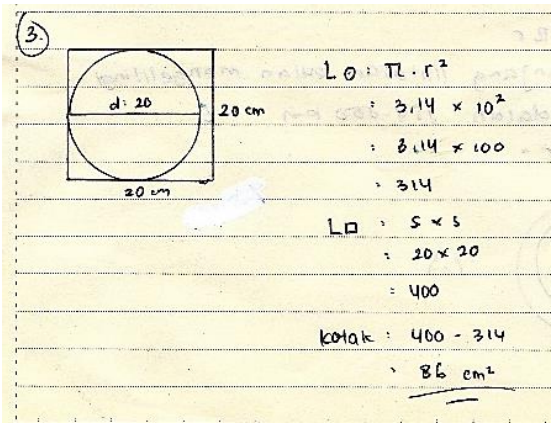
Mathematics literacy that includes the student's ability to analyze, justify, and communicate ideas effectively, formulate, solve, interpret Mathematics problems in a variety of forms and situations. Likewise, students mathematics communication ability in one of the Junior High School in Semarang, which tends to be low. Supported by the results of preliminary studies to measure the initial Mathematics communication ability students, average test Mathematics communication ability class VIII is 54. Following the completion of one student's picture when it is given about the ability of Mathematics communications loop material, namely, "A vynil record without holes with a radius of 10 cm will be placed in a square place measuring 20 cm to 20 cm. Determine the area of the square place which is not occupied the vynil record and make sketches!

Answer students:



Based on the above image can be obtained information that the students answer questions without writing stage what is known and asked, and write the final conclusion the answer. the sketch is still not reflecting about and what to look for less precise in giving information to the image. Writing symbols, terms, formulas, and calculations are correct only less write unit of measure on several stages. Therefore by answering as shown above, the ability of students mathematics communication needs to be improved.

In addition to writing one's way of communicating which can also be seen from the spoken word. There are several factors that influence differences in someone to communicate or convey the idea of one of them is their personality. This is supported by Duckworth (2012: 8), which revealed that personality type influences student interest and student achievement in itself. Pervin (in Masrukan, 2015: 344) states that personality is characteristic of the person who causes the appearance of consistency juice, thinking, and behavior. A teacher would never see the students always look active and always wants to be number one, while another student looks very passive, not wanting to be noticed by others, and tend to dislike a long association.

Keirsey (1998) classify personality into four types, namely Guardians, Artisans, Rationals, and Idealist. The classification is done by Keirsey is based on the idea that a real difference can be seen from someone's behavior. One way to find out the thinking of students is discussed in the classroom activities so that students are willing to say what was in his thought at the time to solve the problem. According to Anthony & Walshaw (2009: 158), teachers have a vital role in regulating the discussion, the teacher invites students to listen to and respect the opinions of others and to evaluate differences of opinion.

Keirsey (1998) argues that the way students communicate both orally and in writing is a personality configuration that can be observed. Mathematics communication ability will also thrive when in the same time also developing emotional intelligence (Armiati, 2009: 278). According to Goleman cited by Adiyanti et al. (2018: 911). Emotional intelligence is the ability to motivate oneself, overcome frustration, impulse control, regulate mood, recognizing emotions in others (empathy), and prayers. Therefore we need a model of learning that can explore knowledge and raise students mathematics communication ability the model of learning that focuses on student activity both in terms of psychological, emotional, and cognitive.

One model to explore the ability of mathematics communication students is a model of Accelerated Learning (AL), according to Meier (2000: 194), the purpose of Accelerated Learning is evocative fully learning abilities of the students, making learning fun for students, and contribute fully to the happiness, intelligence, competence, and their success as a human being. Powered cognitive acceleration programs in applied mathematics in Australia and has been implemented at all over the world where the purpose of the program is to boost the ability to think, and performance, positive attitudes towards mathematics. Finau (2016: 4) also revealed that objective of the CAME program is to contribute to the teaching of mathematics

in secondary schools, where students have the opportunity to move quickly concrete thinking to abstract thinking. The results showed that the program CAME (Cognitive Acceleration in Mathematics Education) succeeded in improving the understanding of Mathematics concepts and improve students' cognitive abilities mathematics (Finau, 2016: 15).

According DePorter and Hernacki (2016: 14), the AL can allow students to learn at an impressive pace, with normal effort accompanied by excitement. This method brings together elements that at first glance seem to have similarities, such as entertainment, games, color, positive thinking, physical fitness, and emotional health. All these elements work together to produce an effective learning experience.

Kinard & Parker (2007) states that learning model of Accelerated Learning has five phases, namely, (1) The preparatory phase; (2) the phase connection; (3) phases of creative exposure; (4) the activation phase; (5) the integration phase. Coach leading the CBC is Joyne Nicholl says there are six basic steps instructional model of Accelerated Learning can help the achievement of this learning process, as quoted by Kusbiantoro (2016: 2), namely, Motivating your Mind, Acquiring the Information, SearchingSAT Out the Meaning, triggering the Memory, exhibiting What You Know, Reflecting How've You Learned. To make it easier to remember the six steps are often commonly called AL type MASTER

Based on the above background, the formulation of the problem to be examined in this study were (1) whether the average Mathematics communication ability eighth grade students in learning to use the model of Accelerated Learning is more than 65 ?; (2) whether the proportion of students who are taught using a model AL with Mathematics communication ability test scores greater than or equal to 65 to 75% ?; (3) how the descriptions of students mathematics abilities of each personality type Rational, Idealist, Guardian, and Artisan ?.

The research aimed to determine: (1) an average of eighth grade students communication ability are taught using Accelerated Learning models can exceed 65; (2) the proportion of students who are taught using a model AL with Mathematics communication ability test scores greater than or equal to 65 to 75%; (3) a description of the communication ability of class VIII is based on the type of personality they have.

Indicators Mathematics communication ability used in this study is an indicator according to Elliot & Kenney (in Sumartini, 2017: 170)which has been modified and elaborated namely (1) understand the questions and write down any information obtained from the mathematics discourse; (2) interpreting mathematics problems into the form of drawings or sketches; (3)solving mathematics problems by connecting it with the formula or mathematics concepts; (4) communicate the conclusions answers to Mathematics problems in accordance with its own language questions,

The hypothesis of this study as follows: (1) the average value posttest Mathematics communication ability eighth grade students are taught using Accelerated Learning models exceed 65; (2) The proportion of students who are taught using a model AL with Mathematics communication ability test scores greater than or equal to 65 to 75%; (3) there are differences in Mathematics communication ability class VIII by each personality type.

2. Methods

The research design used in this study is a sequential explanatory design, which combines methods of quantitative and qualitative methods by collecting quantitative data prior to the study and then collecting qualitative data. The population in this research is class VIII SMP Negeri 3 Semarang academic year 2018/2019. Sampling using cluster random sampling technique. This is done by randomly selecting one class of the population consisting of groups of classes. In this study, the chosen one class as the experimental class is class VIII E. learning materials used in this study is the material circle. Subjects were selected using purposive sampling technique. Subject selection is based on the criterion that each personality type according to Keirsey.

The independent variable in this study is a model of accelerated learning. The dependent variable in this research is the Mathematics communication ability and personality types according to Keirsey. Data collection techniques used in this study were (1) a method of documentation used to obtain data related research; (2) The test method for the provision of posttest (many items are 6 questions); (3) The classification of personality type questionnaire (many grains questionnaire is 16); and (4) The interview method is used to get an answer from the respondent by means of frequently asked questions about the students' answers on tests of Mathematics communication ability. Subjects selected each two students of each personality type.

3. Results & Discussion

Based on preliminary data normality test results and grade experimental class test showed that the initial data are normally distributed. The results of the final tests of Mathematics communication ability students taught using AL models also indicate that the normal distribution of data. Therefore, the calculation using parametric statistics can be used to test hypotheses 1 and 2 which is the average of the test sample and test the proportion of the sample. Here are the data values initial test and posttest Mathematics communication ability in the experimental class.

Table 1 Preliminary test and posttest data KKM

limit Values	**Initial tests**	***posttest***
test scores≥ 65	9	28
test scores< 65	26	7

Hypothesis 1 testing uses the one-party average test (left side) and use the t test. Based on calculations with a significance level of 5% and $df = 35 - 1 = 34, t_{1-\alpha} = 1{,}6909, t = 4{,}34, t \geq -t_{1-\alpha}$, H_0 is accepted. So, it can be concluded that the average posttest value of mathematics communication ability of students taught using AL models is more than or equal to 65, while the second hypothesis testing using a test that is testing the proportion of one hand the proportion of left parties and use z test, Based on calculations by the 5% significance level was obtained $z = 0{,}683, z_{\frac{1}{2}-\alpha} = 0{,}173$. Therefore, because $z \geq -z_{\frac{1}{2}-\alpha}$ then H_0 is accepted. Thus, it can be concluded that the proportion of students taught using the model AL with mathematics communication ability test scores greater than or equal to 65 to 75%. It is also common in Mulyati research (2015: 5) which states that the average value of test capabilities that previously taught mathematics understanding using a model of the type AL MASTER also completed a classical with a proportion of 81%.

Based on the test results of hypothesis 1 and 2 showed that the AL general learning model can improve students mathematics communication ability. According to the Putra (2014: 10), learning to use the model AL positively affect students mathematics communication ability. That is because the AL learning requires students preparing for learning, reasoning, discussion and exercises, analyze, present, and make inferences to find concepts, procedures and, mathematics principles individually or in groups. This Peelitian also implements cooperation activities in groups with a variety of personality types and did not look at students' cognitive abilities strata. Through such activities, communication ability students will develop well. Not only that, their ability to value the opinions and play a role in solving the problem were also trained despite of different pastures.

The next stage is the selection of research subjects. After the classification of personality types questionnaire class VIII E as the experimental class is analyzed, the data obtained as follows. Furthermore, of each type of personality, selected two students who memenui criteria with consideration of Mathematics communication ability test scores and activeness in class. Finally selected eight subjects presented in the following table.

Table 2 Data Subject Research

Personality type	**Student**	**Code**
Artisan	E-1	A-1
	E-3	A-2
Idealist	E-18	I-1
	E-32	I-2
Guardian	E-22	G-1
	E-31	G-2
Rational	E-8	R-1
	E-17	R-2

The subjects were interviewed to make sure that the data obtained valid. The technique used is triangulation techniques. Triangulation techniques are different data collection techniques, but from the same source, in this case the data collection techniques using means test and an interview.

3.1. Mathematics Communication Ability type of Artisan

The results of the analysis of students mathematics communication ability described artisan according to Keirsey (1998) as a communicator concrete. Type artisan is able to write what they know and ask the question, although not all numbers are written in full. Three of the six questions were able to be written correctly and completely at this stage are unknown and were asked about the number 1, 2, and 6, the rest of the other questions are only able to be written in part by both the subject A. It happened because of several factors one of which is the inaccuracy and attitude rush -gesa subject A, as the opinion of Keirsey and Bates cited by Yuwono (2010), states that a person with type artisan wants to do things quickly, and often tend to be in a hurry.

There are similarities between the two subjects artisan that the process can be said to be coherent answer. Most of the answers were written coherently from the formula, calculation, until the final answer. Writing symbols / notation, symbols, and the term also did not forget to be included even though there are some numbers that are not. This is in tune with what is disclosed Keirsey (1998: 37) that the artisans are concrete characteristics communicator is someone who is detailed and specific. Keirsey and Bates (in Yuwono: 2010) suggests that students really like the type of Artisan learning a lot of demonstrations, discussions, and presentations. Researchers learning provided in accordance with the student's personality type A Artisan so that the subject easier to learn and understand the material presented. A subject had no difficulty in writing the steps to resolve the Mathematics problem with words, because every researcher familiarize students learning to write steps to resolve the Mathematics problem with words. Therefore, a subject capable of writing steps to resolve the Mathematics problem with words completely and accurately in a matter of numbers 1, 2, 4, 5, and 6.

Type artisan generally able to interpret Mathematics problems found in a matter of numbers 5 and 6 in the form of images. Subject A-1 and A-2 have described the situation on the matter with full details. Unhurried attitude possessed by artisans not only have an impact on ketilitian, but also at the stage of conclusion write answers. Both subjects artisan incomplete even in writing a conclusion on 3 of 6 items. As expressions of Pertiwi (2015: 203) who said that this type of artisan is able to write down the terms and Mathematics symbols as well as being able to make images relevant to the Mathematics problem, but less able to make inferences with its own language.

3.2. Mathematics Communication Ability of type Guardian

The results of the analysis of students mathematics communication ability described guardian in accordance with the Keirsey (1998) as a communicator concrete. Based on the results of the work and the interview subject G in answering questions often directly write without writing calculation formula first. Subject G write specific answer empirically and do not like to write a lot of words. Empirically means the subject G directly utilize the known data from matter to answer the problem. Specifically means G is no longer subject to write formulas in general, but directly substituting numbers into variables contained in the formula. Subject G also briefly write the note, asked and answered with symbols D1, D2, D3. Other than that, at the time of the interview also indicates that the subject G is more telling about how he found the answer does not wait to be asked before kenudian he explains. This is in line with the Keirsey (1998: 27) who argued that the guardian as a concrete communicator like speaking and writing empirically and specific, supported by the opinion Yuwono (2010) who argued that the guardian like debriefing.

G related subject's ability to make inferences in writing using the language itself including being able to subject the G-2 for 4 of 6 No conclusion about the final answer their work. Moreover, because the subject G prefers to directly calculate and write down the terms stands for the effect on the clarity of the concept or keruntutan answers. There are several formulas and calculation phase that is not written, no captions are not written down, but based on the results of the work and interview subjects G includes master in interpreting the question number 5 and 6 to form an image properly. The results are supported by Pertiwi (2015: 203), which revealed that the type of guardian is able to create images that are relevant to a given Mathematics problem, but less able to make their own conclusions written language. Thus, it can be concluded that the subject G is generally able to write indicator 1-4 but only controls the communication capabilities Mathematics indicators 2 and 4, while the less reachindicator 1 and 3.

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3.3. Mathematics Communication Ability of type Idealist

The results of the analysis of students mathematics communication capability in accordance with the idealist type described Keirsey (1998). Type communicators abstract idealist. Based on the results of interviews with the subjects I quote, he explains how to do the problem using the general thoughts. He uses a common formula, not specific numbers are known directly substituting the matter. Because idealist in the

use of symbols and well in generalizing a job, both subjects I was able to write symbols, converting words into the term, and write unit for each job even though there are some parts that are missing, it is in harmony with that expressed Keirsey (1998: 121) who said that the idealist has good sensitivity in symbols and ideas.

One of the characteristics of the abstract communicator is like using figures of speech or imagination. Associated with the ability to interpret mathematics problems in the form of an image, a subject I less able to complete the picture with a caption that appears on the matter. According to the interview, it is because the subject is less focus while drawing, they worry about the processing time is not enough, and then prioritize perform calculations beforehand. Associated with the subject's ability to write what I know and asked, Yuwono (2010) says that the idealist like reading and writing. Both subjects I write to complete what was asked in the problem but is not appropriate because the Mathematics model should not be written, Such small misunderstanding led to the ability to write what is known and asked the right be less than perfect. Thus, it can be concluded that the subject in general I was able to write indicator 1-4 but only controls the communication capabilities mathematics indicators 3 and 4, while the less reachindicator 1 and 2.

3.4. Mathematics Communication Ability of type Rational

The results of the analysis of students mathematics communication capability in accordance with the rational type described Keirsey (1998). Judging from the written answer, the subject R only write the key points contained in a matter of doing the calculations without writing formulas. Most likely the answer is written directly mesubstitusikan known figures on such matters in the image of their work. It is caused by a type of rational student communicators rational abstract which will not write the words that they think is not important (Keirsey, 1998: 165).

Aside from being a communicator abstract, subject R also show other properties as a rational namely utilitarian character. A utilitarian would use an effective way to solve the problem according to them, therefore they directly perform calculations without writing the formula in advance. According to Keirsey (1998: 165) the rational generally like pictures and like to imagine, it supports their ability to interpret Mathematics problems in the form of images. They were able to describe the situation on the questions well along with full details, it is in harmony with the Earth (2015: 203), which revealed that the type of rational able to make a relevant image on Mathematics problems and were able to make conclusions in writing with their own language properly, but still lacking in terms of answering questions and writing down terms, Mathematics symbols. Answer the subject R was seen that type of rational able to write conclusions from the answers that they write. Related to the ability to understand the discourse on the matter, both the subject of R is less able to write what they know and asked to complete and precise. Subject R only able to write down what is asked and pinpoint on item number 1, 2, and 6. Thus, it can be concluded that the subject R is generally able to write indicator 1-4 but only control indicator communication ability Mathematics 2nd and 4, while the less reachindicator 1 and 3. Related to the ability to understand the discourse on the matter, both the subject of R is less able to write what they know and asked to complete and precise. Subject R only able to write down what is asked and pinpoint on item number 1, 2, and 6. Thus, it can be concluded that the subject R is generally able to write indicator 1-4 but only control indicator communication ability Mathematics 2nd and 4, while the less reachindicator 1 and 3. Related to the ability to understand the discourse on the matter, both the subject of R is less able to write what they know and asked to complete and precise. Subject R only able to write down what is asked and pinpoint on item number 1, 2, and 6. Thus, it can be concluded that the subject R is generally able to write indicator 1-4 but only control indicator communication ability Mathematics 2nd and 4, while the less reachindicator 1 and 3.

4. Conclusions

Based on the results of research and discussion be concluded as follows.

(1) The average results of tests the ability of communication ability of students learning mathematics model accelerated learning is more than or equal to 65;

(2) The proportion of students who are taught using a model of accelerated learning with Mathematics communication ability test scores greater than or equal to 65 to 75%;

(3) There are differences in students mathematics communication ability by Keirsey personality type is as follows.

   a. Type artisan: less reach in the understanding of the questions and write down any information obtained from the discourse of mathematics, reach in interpreting the mathematics problem into the

form of drawings or sketches, reach in solving mathematics problems by connecting it with the formula or mathematics concept, less reach in communicating the conclusion answer mathematics problems according to the question with its own language.

b. Type guardian: less reach in the understanding of the questions and write down any information obtained from the discourse of mathematics, reach in interpreting the mathematics problem into the form of drawings or sketches, less reach in solving mathematics problems by connecting it with the formula or mathematics concept, reach in communicating the conclusion answer mathematics problems according to the question with its own language.
c. Type idealist: less reach in the understanding of the questions and write down any information obtained from the discourse of mathematics, reach in interpreting the mathematics problem into the form of drawings or sketches, less reach of solving mathematics problems by connecting it with the formula or mathematics concept, reach in communicating the conclusion answer mathematics problems according the question with its own language.
d. Type rational: less reach in the understanding of the questions and write down any information obtained from the discourse of mathematics, reach in interpreting the mathematics problem into the form of drawings or sketches, less reach in solving mathematics problems by connecting it with the formula or mathematics concept, reach in communicating the conclusion answer Mathematics problems according to the question with its own language.

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