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Student Mathematical Communication Ability Viewed from Self-Confidence in the ARIAS Model Nuanced Ethnomathematics

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Abstract

This study aims to (1) find out whether the mathematical communication abilities of students in ethnomathematics-nuanced ARIAS learning can reach the actual completeness limit, and (2) describe students' mathematical communication abilities based on self-confidence in ARIAS learning with nuanced mathematics. This study uses a mixed-method with sequential explanatory type. The population of this study is class VIII of Junior High School 1 Karangampel 2018/2019. The research subjects were selected based on self-confidence categories, namely high, medium, and low. Data collection techniques used tests of mathematical communication abilities, self-confidence questionnaires, and interviews. The results showed that (1) students in the class with ethnomathematics ARIAS learning had reached the actual completeness limit, and (2) the description of students' mathematical communication abilities in the high self-confidence category, moderate self-confidence and low self-confidence had the same able to listen, discuss, and write about mathematics, all three are also able to read with an understanding of a written presentation, but have not been able to formulate a definition, for students with moderate self-confidence and low self-confidence also have the same that is able to express objects - real objects, situations, and everyday events in the form of mathematical models (images, tables, diagrams, graphs, algebraic expressions) and able to make mathematical questions according to the information contained in the questions, and only students in self-confidence are who is able to explain mathematical ideas and models into ordinary languages.

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INTRODUCTION

The times and 21st-century technology require the education sector to continue to grow. Quality education will produce quality individuals. One important key that affects the quality of education is the learning process. The 2013 curriculum is a national education curriculum that encourages students to be better at observing, asking questions, reasoning and communicating (presenting), what they get or know after receiving subject matter and it is expected that students have far more competence in attitudes, skills, and knowledge well.

NCTM (Hendriana, Rohaeti & Sumarmo, 2017) revealed that mathematical communication is one of the essential basic competencies of mathematics and mathematics education. Therefore, every student must have good mathematical communication. Follan (Noviyanti, Kartono & Suhito, 2014) states that mathematical communication is a mathematical language that is seen based on everyday language.

The results of Wijaya's research, Panhuizen, Doorman & Robitzsch (2014) states that the results of the analysis show that most Indonesian students experience difficulties in the early stages of completing tasks, namely to understand context-based tasks and turn them into problems or mathematical models. This is in line with the results of observations conducted in class VIII of Junior High School 1 Karangampel that students' mathematical communication skills are classified as low, seen based on the results of tests that students who can reach the actual completeness limit score are 14 students from 31 students taking the test. Another factor that causes low mathematical communication skills is suspected because in the learning process communication between students and teachers is still lacking during learning.

Mathematical communication ability is one of the important abilities possessed by students. Barrody (Asikin & Junaedi, 2013) revealed that there are two reasons that make communication skills important in mathematics learning including (1) mathematics is language, mathematics is not only a thinking aid but also as a tool to find patterns, or solve mathematical problems; and (2) mathematics learning as social activity, meaning mathematics as a social activity in learning, interaction between students, such as communication between teachers and students which is an important part in maintaining children's mathematical potential.

Tinungki (2015) revealed that the mathematics communication ability is very important for students so that they can solve mathematical ideas into a mathematics model, and then connect the process into various mathematical concepts, into everyday life context, as well as into the other disciplines. It can be said that important mathematical communication skills are owned by students, so students can solve mathematical problems using good reasoning, describe mathematical ideas into mathematical models, and connect mathematical concepts into the context of everyday life and other sciences.

Webb and Coxford (quoted by Sumarmo & Nishitani, 2010; Dewi & Kusumah, 2014) states that there are two categories of mathematical thinking, including thinking of high-level mathematics and low-level mathematical thinking. Dewi & Kusumah (2014) concluded that generally high-level mathematical thinking includes mathematical problem-solving abilities, mathematical reasoning abilities, mathematical communication skills, and mathematical connection skills.

Clark (2005) states that discourse communities are those who feel free to express their thinking, and take responsibility for listening, paraphrasing, questioning, and interpreting one another's ideas in whole-class and small-group discussions. It is intended that mathematical communication skills are the freedom of students to express their thoughts by reading, asking questions, and communicating ideas they have in discussion activities that contain mathematical material students learn.

In addition to students' mathematical abilities, self-confidence (self-confidence) is also important to be possessed by students. Lie (quoted

by Agustyaningrum, 2013) reveals that someone confident then someone will be confident in his ability to solve a problem. Bandura (quoted by Hendriana, Slamet, & Sumarmo, 2014) defines self-confidence as a person's perception of himself to show his motivation and abilities which are reflected through actions that are relevant to the task given. Therefore, it is important to foster self-confidence in students, as Perry's opinion (quoted by Sadat, 2016) that self-confidence is an important key in achieving success in personal and work life.

Henningsen & Stein (quoted by Frasticha, et al., 2016) argues that to develop students' mathematical abilities the learning process must be a place where students can be actively involved with many useful activities, not just copying or following examples without understanding their meaning. Siahaan (quoted by Wardana, Edoh & Harwida, 2017) states that the ARIAS learning model can be used by teachers as a basis for implementing good learning and can increase motivation and results of student learning achievement. There are five components in the ARIAS model including assurance (confidence), relevance (according to student life), interest (interest and attention of students), assessment (assessment/evaluation) and satisfaction (reinforcement). Rahman & Amri (quoted by Noviyana, 2016) ARIAS learning model is the first attempt in learning activities to instill a sense of confidence or confidence.

Albanese & Perales (2015) state that ethnomathematics is a research program that focuses on relationships between mathematics and culture. In other words, ethnomathematics is learning that focuses on the relationship between mathematics and culture. Rosa & Orey (2011) argue that ethnomathematics refers to group members in a cultural environment that is identified by cultural traditions, codes, symbols, myths, and specific ways that are used to reason and conclude. In this study, the ethnomathematics in question is the culture of the Indramayu region, including the tepakan gambar, ngarot, cimplo, and telitian pari.

ARIAS learning with etnomathematics nuances links mathematical material that is being taught with culture from Indramayu so that in the learning process students get knowledge about mathematical material as well as knowledge about Indramayu culture. Lee (cited by Kusuma et al, 2016) argues that ethnomathematics is a concept to increase knowledge about the development of mathematics in various cultures. Ethnomathematics can be used as a bridge to find out how the relationship between academic mathematics and the real world is realized through the learning process by teachers and students.

Based on the description of the background, the objectives of this study are (1) to find out whether the mathematical communication abilities of students with ethnomathematics ARIAS learning can reach the actual completeness limit, and (2) describe the students' mathematical communication abilities based on self-confidence in ARIAS learning with Ethnomatematic nuances.

METHOD

This study uses a mixed-method with sequential explanatory type. The population of this study is class VIII of Junior High School 1 Karangampel 2018/2019. The sampling technique in this study used simple random sampling, selected two classes as samples namely class VIII-C as the experimental class and class VIII-B as the control class. The research subjects were selected using a purposive sampling technique, consisting of six students of class VIII-C in the academic year 2018/2019. Following the research objectives, the research subjects were determined based on three categories of self-confidence.

Data collection techniques carried out were tests of mathematical communication skills, self-confidence questionnaires, and interviews. Each subject interviewed was based on the results of student answers to the test of mathematical communication skills. Quantitative data analysis techniques were tested using normality, homogeneity, and completeness. The qualitative data analysis used is the validity of the data, data reduction, data presentation, and conclusion (Sugiyono, 2013).

RESULT AND DISCUSSION

Based on quantitative analysis with prerequisite test shows that the results of students' mathematical communication skills test in the experimental class and the control class are normally distributed, this can be seen from the significance of the experimental class mathematical communication skills 0.058> 0.05, and the significance of the control class mathematical communication skills 0.200> 0.05. Based on these results, at the level of $\alpha = 5\%$, it can be concluded that the value of students' mathematical communication skills in both classes is normally distributed. The homogeneity test results showed that the significance value was 0.252> 0.05, meaning that the results of the tests of mathematical communication skills of the students from both classes were homogeneous. The average completeness test results of students' communication skills on learning using the ARIAS model with ethnomathematics nuances obtained a value of $t_{count} = 2.140 > t_{table} = 1.706$ then it can be interpreted that the average value of mathematical communication skills has been completed or more than the Actual Completeness Limit.

The results of student completeness cannot be separated from the learning model applied in the classroom. The selection of learning models must be theoretical, to be able to improve mathematical communication skills which in turn can help students overcome problems in daily life (Alhaddad, 2015).

In the learning process using the ARIAS model with ethnomathematics nuances, the first stage is assurance. At this stage students' self-esteem begins to grow. As the opinion of Rahman & Amri (Dewi, Riastini & Pudjawan, 2017) which states that it is important for teachers to instill confidence in students to encourage students and motivate students to succeed and achieve optimally. According to Tandiling (quoted by Rizqi, Suyitno, & Sudarmin, 2016) that learning with self-confidence possessed by students can be used to think so students are brave in expressing new ideas.

Next is the stage of relevance, at this stage, the material taught must be following the daily lives of students. In the learning process, the opportunity material taught is related to ethnomathematics originating from Indramayu. In the learning process using the ARIAS model with ethnomathematics nuances students are actively involved in learning and group discussion even though some students tend to be passive which causes less understanding of the material being studied. Like the opinion of Hadi (2017) students who are lazy to learn and difficult to remember the material will experience difficulties in following the learning with the ARIAS model.

Students in the class that use the ARIAS model with ethnomathematics nuances are more active in learning, both when discussing or asking questions. This can be seen during the learning process, students become more courageous to ask questions about things they do not understand. In line with the opinion of Alsa (2010) that the learning process with a small group will affect the psychological of students, so students will have more opportunities and courage to argue and discuss and ask questions. Mahmudi (Permata, Kartono, & Sunarmi, 2015) argues that a good communication process has the potential to trigger students to develop ideas and build mathematical knowledge. This shows that the stages in the ARIAS model with ethnomathematics can foster self-confidence and students' mathematical communication skills.

The role of ethnomathematics in this research is as a link between the material opportunities that are taught in the classroom with Indramayu culture. The use of ethnomathematics is carried out during the selection of examples when learning and inserted in the test questions of mathematical communication skills. The use of local culture is also important to be inserted in the learning process, such as the opinions of Velasquez and Lobo (Dahlan & Nurrohmah, 2018) that the use of culture in learning is an important component of culturally relevant education.

In qualitative analysis, the use of questionnaires is intended to see whether the cell

confidence that students have is in the category of high, medium, or low. Determination of categories based on the self-confidence questionnaire given at the beginning of the meeting. According to Siffudin (Kurnia, Royani, Hendriana, & Nurfauziah, 2018) categorization is done by finding the lowest value and the highest value of the questionnaire. After getting the value, then calculate the ideal mean and standard deviation with the following formula.

$$\text{ideal mean} = \frac{1}{2} \times (\text{highest value} + \text{lowest value})$$

$$\text{standard deviation} = \frac{1}{6} \times (\text{highest value} - \text{lowest value})$$

Categorizing the results of the self-confidence questionnaire can be seen in Table 1 below.

Table 1. Self-Confidence Category

Interval	Category
$X < 64{,}8$	Low
$64{,}8 \leq X < 72{,}4$	Medium
$72{,}4 \leq X$	High

Source: (Kurnia, Royani, Hendriana, & Nurfauziah, 2018)

Based on the results of the study obtained the percentage of self-confidence of students for each category can be seen in Figure 1.

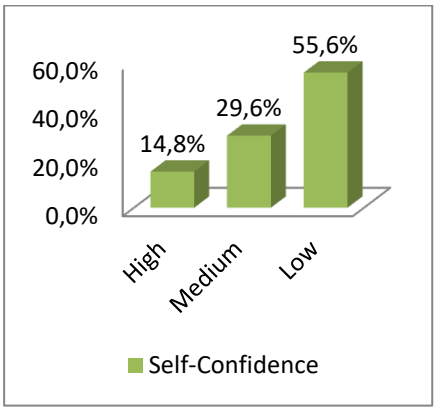

Figure 1. Self-Confidence Analysis

Figure 1 shows that in the high category there were only 14.8% of students or as many as 4 of 27 students who had high self-confidence. In the medium category, there were 29.6% of students or as many as 8 of 27 students who had moderate self-confidence. Furthermore, as many as 55.6% of students had low self-confidence categories. This shows that ownership of self-confidence in students is dominated by low categories.

In this study, mathematical communication abilities were seen based on six indicators according to Sumarmo. Indicator of mathematical communication abilities according to Sumarmo (quoted by Hendriana, Rohaeti & Sumarmo, 2017), among others: (1) states real objects, situations, and daily events in the form of mathematical models (pictures, tables, diagrams, graphs, algebraic expressions); (2) explain mathematical ideas and models (images, tables, diagrams, graphs, algebraic expressions) into ordinary languages; (3) explain and make mathematical questions learned; (4) listening, discussing and writing about mathematics; (5) reading with an understanding of a written presentation; and (6) making conjectures, compiling arguments, formulating definitions and generalizations.

The results of the analysis show that mathematical communication abilities based on self-confidence categories are quite diverse. Description of mathematical communication abilities based on self-confidence there are several similarities and differences between students who have high self-confidence, moderate self-confidence, and low self-confidence in each indicator as follows.

The indicators that state real objects, situations, and daily events in the form of mathematical models show that students with high self-confidence are less able to express real objects, situations, and everyday events in the form of deep mathematical models this case is a tree diagram. For students with moderate self-confidence and low self-confidence, they have the same ability to express real objects, situations, and daily events in the form of mathematical models. This shows that not all students who have high self-confidence will also have high mathematical abilities. This is contrary to the results of Jahani & Behzadi's (2014) study that there is a strong relationship between self-confidence and mathematical abilities.

The indicators explaining mathematical ideas and models into ordinary languages show that students with high self-confidence and low self-confidence have similarities, that is, they have not been able to explain mathematical ideas and models into ordinary languages. Based on interview results, high self-confidence and low self-confidence still felt confused in explaining mathematical models into ordinary language, so students did not answer the question. While for self-confidence students, they have been able to explain mathematical ideas and models into ordinary languages. This is like the results of a study by Subekti & Kusuma (2017) that respondents with moderate self-confidence tend to be capable of mathematical communication abilities.

The indicators explaining and making mathematical questions learned shows that students with high self-confidence have not been able to make mathematical questions learned, students only write the answers but do not make the questions. The results of the interview indicate that the reason students do not write questions according to the information on the questions is that students forget to write them. Students with moderate and low self-confidence have both been able to make mathematical questions learned.

The indicators listening, discussing, and writing about mathematics showed that students with high self-confidence, moderate self-confidence, and low self-confidence had similarities, namely that all three were able to listen, discuss, and write mathematics. Students in each category This is in line with the results of research by Rizqi, Suyitno, & Sudarmin (2016) that mathematical communication abilities of students who have high and moderate beliefs are classified as good, appear active in group discussions. However, this is contrary to the research of Subekti & Kusuma (2017) which shows that respondents with low self-confidence have not been able to develop mathematical communication abilities.

The indicators of reading with understanding a written presentation shows that there are similarities namely students with high self-confidence, moderate self-confidence, and low self-confidence have been able to read with an understanding of a written presentation. Students can complete empty parts of the tree diagram that has been presented in the problem.

The indicators to make conjectures, compile arguments, formulate definitions and generalizations on students with high self-confidence, moderate self-confidence, and low self-confidence, all three showed that they both encountered obstacles in the indicator. This is indicated because students still feel confused to write a definition, so make a conjecture, arrange arguments, formulate definitions and generalizations included in the low category. This is in line with the results of previous studies from Purwandari, Astuti & Yuliani (2018) that of the six indicators of mathematical communication abilities there are three indicators that have a low category, namely the ability of students to express daily events in mathematical language or symbols or compose a mathematical model events of 18.18%; students 'ability in explaining and making mathematical questions learned at 7.58% and students' ability to make conjectures, compile arguments, formulate definitions and generalizations at 7.58%.

CONCLUSION

Based on the results and discussion described above, it can be concluded that (1) students in the class with ethnomathematics ARIAS learning have reached the actual completeness limit, and (2) description of students' mathematical communication abilities in the high self-confidence category, self-confidence confidence is moderate and low self-confidence has similarities, namely being able to listen, discuss, and write about mathematics, all three are also able to read with understanding a written presentation but have not been able to formulate a definition, in students with moderate self-confidence and Low self-confidence also has similarities, namely being able to express real objects, situations, and daily events in the form of mathematical models (images, tables, diagrams, graphs, algebraic expressions) and being able to

make mathematical questions according to the information contained on the question, and only students on self-confidence are being able to do it in men explain mathematical ideas and models into ordinary languages.

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