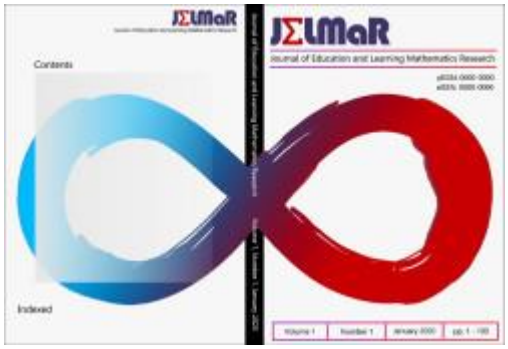

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Mathematical Communication Skills in Terms of Student Learning Motivation on ARCS Model with Immediate Feedback

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Abstract: *This purpose research to describe mathematical communicarion skill through ARCS- IF Model based on learners motivation. Type of this research is Mixed Method with concurrent embedded designs. This research population was Eight grader of SMP Maarif Kyai Gading Demak 2020/ 2021. Result of this research showed that ARCS- IF learning is effective in learners mathematical communication skill. Result of learners description with high learners motivation categories were able to complete mathematical communication skill with the indicator ability to express mathematical idea to write and convey them visually. Ability in stating idea or situation of problem into mathematical models (pictures, graphs, diagrams, tables and equations), ability to use right formulas in solving problems, students with motivation categories students are being able to complete communication skills mathematical with indicators Motivation learners were Ability to express mathematical ideas in writing and express them visually, Ability to use right formula to solve problems, students with low motivation categories were able to complete mathematical communication skills with Low Motivation indicators Ability to express mathematical idea to write and convey them visually.*

Keyword: ARCS-IF, Mathematical Communication, Motivation on learn

INTRODUCTION

Mathematical communication skills became a determinant of weather learners already comprehend mathematical concept that had been learned during teaching learning activity. (Ramellan, 2012). According to Solekha (2013) communication in mathematics is the ability to understand student concepts during learning activities. The most important part of the mathematical communication standard that students need to had been ability to convey mathematical idea from several text, both written and oral. (Hadi, 2016). That could be asserted that mathematical communication is a process of conveying mathematical information from a person to others through oral or written means aimed at clarifying a given problem. However, the problem that occurs is that students had not been able to expand mathematical communication skills properly, such as students at Ma'arif Kyai Gading Junior High School in Figure 1.

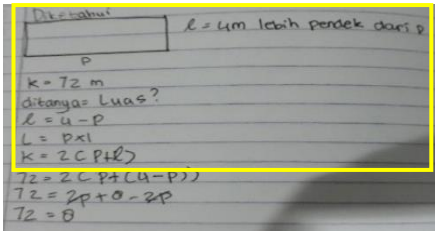

Figure 1. Student Worksheet Results

It can be seen in Figure 1 that students can already model problems in the form of pictures, explain thoughts through excuses, students wrote what is known then what is asked, next students interpreted ideas mathematic but students had not been able to solve problems because the excuses in the rectangular area are wrong and at the end of the answer is not given a conclusion. This showed that learners' mathematical communication skills in a story questions were low. Learners' mathematical communication skills rarely received much attention. Teachers tried to make learners able to answer questions correctly without asking learners for reasons or answers. learners found it difficult to communicate mathematics orally or in writing. Learning Motivation became internal then external impulse in learners who were learning to construct behavioral changes in a common with several elements that supporting" (Hamzah, B.U, 2013).

Attention Relevance Confidence and Satisfaction model became an alternative that could be taken. Sulistyawan (2017) assumed that Attention Relevance Confidence and Satisfaction approach is a series of learning activity that start from steps to arouse student attention (attention), provide a relationship between learning and student goals and needs (relevance), arouse student confidence (confidence), and make students satisfied with the achievement of their learning outcomes (satisfaction) in the hope of building a meaningful learning experience. According to Winaya et al (2013) A good learning process has a good effect on students. Through feedback the student can feel that he is noticed by his teacher. Zulfa, et al (2021) stated that teachers rarely give feedback after a thematic assessment and only teach the material to finish quickly without thinking about student learning. One type of feedback is immediate feedback. Feedback can simply be interpreted as a reciprocal interaction between teachers and students either directly or indirectly. The sooner students get reverse information, of course, the better, so that misinformation can be corrected immediately through the next learning activity. How giving feedback should be polite, this is intending so that learners were more confident to face the next learning task. Teacher must consistently check results of learner's work and present notes and comments. (Hamdani, 2010).

This study describes mathematical communication skills through models based on student motivation. The Attention Relevance Confidence and Satisfaction (ARCS) learning model is a form of problem-solving approach to design aspects of motivation and the learning environment in encouraging and maintaining student motivation to learn (Keller, 1987). This learning model prioritizes student attention, adapts learning materials to student learning experiences, creates self-confidence in students and creates a sense of satisfaction in these students. The ARCS learning model was developed based on the expectancy value theory which contains two components, namely the value of the goal to be achieved and the expectation to succeed in achieving that goal. From these two components Keller developed into four components. The four components of the learning model are Attention Relevance Confidence and Satisfaction with the acronym ARCS (Keller, 1987).

May (2018) in his research results showed that the effect of the ARCS learning model on student learning motivation in the Coordinate System material was 12.5%, while the effect of the ARCS learning model on student learning outcomes in the Coordinate System material was 11.2%. Yulianti (2019) shows that students' early learning motivation is measured using a motivational questionnaire in the form of 10 statements and a probability value of 0.229 is obtained. Students' early learning outcomes are measured using a test measuring tool in the form of 18 multiple choice questions about learning outcomes in the cognitive domain which have previously been tested with a reliability of 0, 91 is in the very good category. The difference in student learning motivation in the experimental and control classes of 5.88 is in the high criteria. The difference in student learning outcomes in

the experimental and control classes of 2.738 is in the high criteria. The influence of students' learning motivation in the experimental class has a probability value of 0.029. The influence of experimental class student learning outcomes obtained a probability value of 0.000. There is a significant influence on the application of the ARCS learning model to learning motivation and student learning outcomes. Evy (2013) shows that there are differences in learning motivation between students who learn through the ARCS learning strategy and students who learn through the direct learning model (F_count = 248.549; p <0.05), it is concluded that the ARCS strategy can be used to increase student learning motivation. Nabilla (2019) shows that the mathematical communication abilities of students who learn using the Attention Relevance Confidence Satisfaction (ARCS) learning model are better than the mathematical communication abilities of students who learn using the direct learning model.

METHOD

Researcher applied mix method, while research design used concurrent embedded. Population of research was all eight grader of SMP Maarif Kyai Gading 2020/ 2021. Subjects of this research were 40 students. While, sample of this research was selected with random cluster sampling to formulate both control and experimental class. Learners motivation questionnaire is presented to learners in experimental class. The questionnaire given only covers the motivation of the students. The purpose of providing the questionnaire is to group students based on 3 categories, such as: learners who have a high motivation, learners who have a moderate motivation, then learners who have a low motivation Each category was selected by 2 students so that there were 6 people as research subjects.

Researcher applied instrument of worksheet for learning ARCS- IF models, questionnaire of learners' response to ARCS- IF Models learning and a final test of mathematical communication. ARCS- IF learning model is said to be effective in this study if it meets the criteria of (1) average value of mathematical communication skills of learners in experimental class is equal to minimum completion criteria, which is an average of 0.25 standard deviations, (2) learners' mathematical communication skill applying learning models of ARCS- IF learning classical completion, that is, students who achieve learning completion more than or equal to 75% (3) average mathematical communication skills in the class by using ARCS- IF is better than average mathematical communication skills in the class by using SARCS learning, (4) proportion of students in classes subject to ARCS-IF learning models had reached value of 70 more than 75%, (researcher applied independent t test and Gain test). Student response to ARCS-IF learning based on student questionnaire results.

RESULT AND DISCUSSION

The student's mathematical communication ability test is carried out after receiving treatment. After learning was carried out in both control and experimental class. Next, posttest of a mathematical communication skill was carrying out. Data acquired were then analyzed with normality tests then homogeneity test as pre-condition tests. Below is the calculation of normality test of posttest by using SPSS.

Table 1 .Calculation Results of Posttest Data Normality Tests

	Kolmogorov-Smirnova		
	Statistic	Df	Itself.
Value	,104	40	,200*

From those results calculation of normality test acquired significance value 0,200. This showed that is declared accepted. so, data comes from normal distribution population. While, calculation of posttest data homogeneity tests assisted by applying SPSS program with the results in Table $0{,}200 > 0{,}05H0$ below.

Table 1. Calculation results of the Posttest Data Homogeneity Test

Tests of Homogeneity of the Variance

Value			
Levene Statistic	df 1	df 2	Itself.
,931	1	38	,341

From those results of homogeneity tests with SPSS using the Levene Statistic Test with a real level, it was obtained that the signifative value was 5%0,341. This shows that it is declared accepted and the final data comes from a homogeneous population.$0{,}341 > 0{,}05H0$

Criteria to complete mathematical communication skill in ARCS- IF Learning

Determination of completeness of mathematical communication ability is acquired from results of initial tests of mathematical communication skills that carried out before learners if experimental class were presented treatments. The analytical data of complete limit aktual the initial test of mathematicalcommunication skill is applied as references for completion of a final test of mathematical algebraic thinking skills.

Due diligence individual mathematical communication skills in ARCS-IFlearning

Individualized due diligence objectives to determine whether learners' mathematical communication ability in ARCS- IF learning achieved completion. This research completeness is if average mathematical communication of learners who are subjected to ARCS- IF learning model is more than BLA who is 68 and can be known using the right party's t tests. Table below is following results of individual calculation due diligence calculated using SPSS.

Table 3. Individual Due Diligence Calculations

Statistics	Exact Sig. (2-tailed)	Decision
TKKM	0,000	H0 rejected

There is the significance levels of 5% acquired value of Sig. =0. 000 = 0.7%. This shows that the nilal Exact Sig < 0.05 =5 %, H0 is rejected. So, average value of mathematical communication ability of learners in experimental class reached BLA =68).

Classical due diligence of the mathematical communication ability in ARCS- IF Learning

Classical due diligence, the classical completion criteria set are at least 75% of students who exceed the BLA. Calculation of classical due diligence with program SPSS assisted binomial test with results in Table 4.

Table 2. Results of Classical Due Diligence Calculation posttest data

Statistics	Exact Sig. (1-tailed)	Decision
TKPMS	0,415	H0 rejected

P there is the significance levels of 5% acquired value of Sig. = 0.415 = 41%. This showed a nilal Exact Sig > 0.05 = 5% so it H0 is rejected. So, the classical completion of the mathematical reasoning skills of experimental class learners who acquiring ARCS- IF learning was more than 75 %. So, 75% number of students in experimental class scored ≥ 68.

Test difference in average mathematical communication skills in ARCS- IF Learning

Average difference test was applied in determining wheather mathematical communication of experimental class who acquiring ARCS-IF learning were better than those of control class students who obtained ARCS learning. Calculation of the average difference test with independent sample t test assisted by the SPSS program with the results in Table 5.

Table 3. Test Calculation Results Differences Average Posttest Data

Statisics	Sig. (2-tailed)	Decision
TKKM	0,473	H0 rejected

Accroding to table above, we knew that pthere is the significance levels of 5% acquired value of Sig = 0.473 47 %. It sugested that nilal Sig >0.05 =5 %, H0 is rejected. This showed significantly average mathematical communication skills of learners who acquiring ARCS-IF learning was better than average mathematical communication skills of the class by using ARCS learning.

Test to improve mathematical communication skills in ARCS- IF Learning

Researher applied improvement tests of normalized gain tests. It was used to determine improvement of learners' mathematical communication ability. According to results of gain calculation, that is known a classically there is an increase in learners' mathematical communication ability. Results of calculation activities could be described below.

Table 6. Results of Gain Calculation of Learners' Mathematical Communication Skill

Pretest	Posttest	(**g**)	Gain
66, 25	75,15	$(g) = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}} = \frac{75,15 - 66,25}{100 - 66,25} = 0,26$	Low

From those calculations, we knew $(g) = 0,26$ it is obtained that the value lies in a range conclusion acquired that a mathematical communication skill of learners with $(g)0 \leq (g) \leq$ 0,3.ARCS-IF learning increases with a low category.

Based on individual due diligence, classical due diligence, average difference test, and improvement test. So, that could be asserted that ARCS- IF learning is effective.

Description of learners' mathematical communication skill in the terms of learners' learning motivation

From the results of learners' learning motivation questionnaire, 6 students were selected as informants to be interviewed, namely 2 learners came from a high motivation. While, 2 learners came from a medium motivation, then 2 learners came for low motivation. This research subject could be described on the table below.

Table .7 Research Subjects

Student code	Questionnaire Score	Criterion
A 9	76	Tall
A 11	70	Tall
A 17	55	Keep
A 18	53	Keep
A 4	44	Low
A 7	42	Low

Students with a high learning motivation category in completing mathematical communication ability question could achieve all indicators. Subjects A9 and A11 are already able to explain what is known from the question orally. It can be shown in Figure 2 that the subject has written down what is known and what is asked of the question.

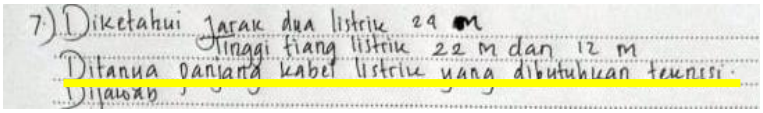

Figure 1. Top Group Student Answers

Hamzah, *B.U* (2013) stated that motivation played an essential role in learning, such as to clarify learning aims to be achieved.

Learners with category of learning motivation were to solve mathematical communication problems meeting two indicators, like being able to express mathematical idea to write and convey them visually and ould use a rigjt formula in solving all problems. Subjects A17 and A18 have not been able to express the idea of the problem into a mathematical model. It can be seen from the work of the middle group students, which is that they have not changed what is known in the problem into a mathematical model. There is no step in stating ideas and problem situations into mathematical models.

Students of the middle group are able to express what formulas should be used appropriately. However, if you don't use the right image illustration, it is feared that it would be wrong to solve problems. So, that could be asserted that learners in the middle

group had not been able to state situation into mathematical model. Below is following result of learners' answers.

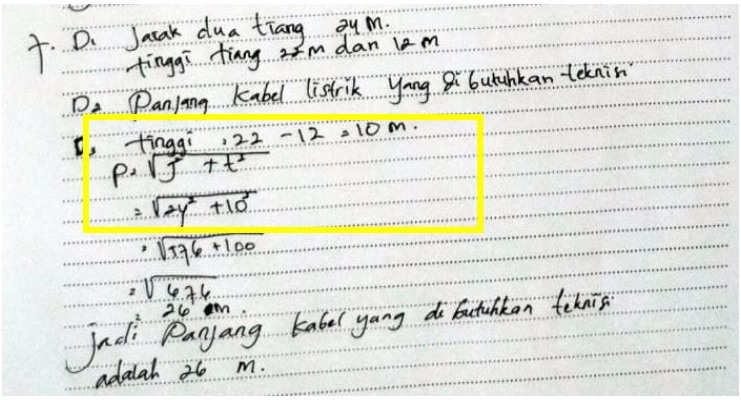

Figure 3. Middle Group Learners Answer

Hamzah, *B.U* (2013) explained that a cause of learners' learning motivation is the desire to succeed learners with a category of low learning motivation were able to solve mathematical communication problems with the indicator of being able to express mathematical idea to write and convey them visually. Students of the low learning motivation category tend to concentrate at the beginning of learning.

The students of the lower group have not been able to use the right formula in solving the problem. It can be shown in Figure 4 that the subjects of A4 and A7 have not been able to choose the right way to solve the problem using the Pythagorean theorem. The following students' answers could be described below.

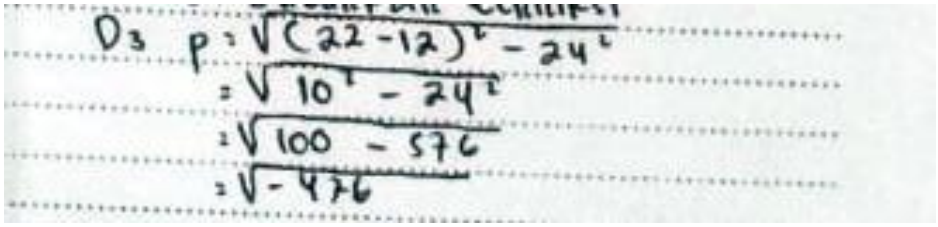

Figure 4. Answers of Lower Group Learners

A.M, Sardiman (2014) stated that one of the causes of low learning motivation is that students feel bored quickly on routine tasks. In addition, Gustian (2002) in his book also explains that classmates also have an influence on children. Dinda (2011) stated that Students cannot always follow the mathematics learning delivered by the teacher. It is in a line with opinion that assuming by (Rachman, 2018). He said that learners' mathematical communication skill is a part of fundamental process in increasing then expand learners' mathematical skills.

This skills became the most essential process then focused on learning mathematical because the essence of mathematical is a language science. (Nuraeni, 2018). This is reinforced by the opinion of Fatimah et al (2019) who stated that mathematics is a compulsory subject in the educational level as a handle in everyday life to draw conclusions logically, analyze then find mathematical form to make generalizations. Aminah et al (2018) stated that influence of ARCS learning model on learners motivation on coordinate system material 12. 5%. While, influence of ARCS learning models on learners learning outcomes on coordinate system material was 11. 2%. Research conducted by Evy (2014). It showed

that the differences in learning motivation between learners who learning between arcs learning and direct learning model strategies. ($F_{hitung} = 248{,}549 ; p < 0.05$). that could be asserted that ARCS could be applied to expand learners learning motivation. While, ARCS-IF could be applied as alternative In learning process.

CONCLUSION

According to results and discussion of this research, all could be stated that improvement of mathematical communication ability of learning is Based on the results of the research and the discussion of the conclusions of this study, it can be stated that the improvement of mathematical communication skills of learning is more directed at being able to complete contextual problem exercises and hone student communication skills to train students to develop ideas and ideas. Result of learners description with high learners motivation categories were able to complete mathematical communication skill with the indicator ability to express mathematical idea to write and convey them visually. Ability in stating idea or situation of problem into mathematical models (pictures, graphs, diagrams, tables and equations), ability to use right formulas in solving problems, students with motivation categories students are being able to complete communication skills mathematical with indicators Motivation learners were Ability to express mathematical ideas in writing and express them visually, Ability to use right formula to solve problems, students with low motivation categories were able to complete mathematical communication skills with Low Motivation indicators Ability to express mathematical idea to write and convey them visually. As a result, students tend to become active in solving problem solving related to mathematical communication.

This study recommends suggestions for developing mathematic communication skills by creating special modules related to mathematical communication skills. Mentoring by the Teacher is necessary so that students can confirm the correctness of the answer. The need for direct action or practice by the Teacher is related to the learning motivation conveyed to the students so that students can follow their example.

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