



## The Effect of Interactive Multimedia Based Learning on Students' Mathematical Communication Ability

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**Abstract:** This research aims to improve students' mathematical communication ability through interactive multimedia-based teaching materials to support the smooth running of learning activities, especially in online learning. The method used in this research is experimental, with the research design being a quasi-experimental nonequivalent control group carried out at two universities, Universitas Islam Riau (UIR) and Universitas Pasir Pengaraian (UPP). The data from this study were collected through tests. The test questions given relate to communication ability. The sample of this research was prospective mathematics teacher students who contracted the Structure Algebra course at UIR (experimental class) and prospective mathematics teacher students at UPP (control class) in the 2021/2022 academic year. The data collection method used is a mathematical communication ability test and a statistical test processes the test result data. Normality test using Kolmogorov-Smirnov and homogeneity test using Levene and the T-test. Based on the T-test result, a significance value of  $0.016 < 0.05$  was obtained. It means that there is an increase in the mathematical communication ability of a student who receives learning using interactive multimedia-based teaching material.

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## Introduction

Media is a channeling tool that can provide information and can make it easier for users to motivate them to learn (Faqih, 2021; Nasaruddin, 2018). Learning media is one of the learning resources that can be used to communicate information in the form of material to students and can be used to stimulate the thinking power of students. So, it can be concluded that besides being able to overcome boredom for students, learning media can also create effective learning activity (Permansah & Murwaningsih, 2018; Tafonao, 2018). Interactive multimedia is used to facilitate the learning process in achieving learning objectives (Anggraeni, et al., 2021; Wahyuni & Yolanda, 2021). Interactive multimedia is a medium that can help a teacher's role in the learning process and can be used repeatedly so that the learning process becomes unlimited. The use of interactive multimedia can overcome several problems in classroom learning and create more enjoyable learning (Banowati, 2021; Kusumawati & Mustadi, 2021; Mustofa, 2018; Riayah & Fakhriyana, 2021; Sakiah & Effendi, 2021).

Utilization of media in learning can be used to optimize the learning process and motivate to be active in learning (Karo-Karo & Rohani, 2018; Tjahyanti1, 2021; Zayyadi, et al., 2017). The use of interactive multimedia is very influential on learning activity, especially at the university level. Students will be much more active, creative, and able to develop their knowledge when learning using interactive multimedia. Interactive multimedia-based teaching materials can be used as a substitute role when the lecturer is not present in the



classroom where students can learn independently in solving questions that can train students' communication ability and can keep up with the times. This is in line with what Ali (2019) said, learning in the digital era requires innovation with digital nuances so that students can understand the concepts of courses and can follow them.

Mathematical communication is one of the abilities needed because it can state and illustrate ideas or ideas in the form of mathematical models correctly (Amalia, 2020; Andini & Marlina, 2021; Dimiyati, 2020). By mastering mathematical communication ability, it will be easier for students to solve a mathematical problem according to the ideas they have. Mathematical communication must be possessed especially in learning mathematics to be able to express ideas or ideas in the form of relevant descriptions (Kadarisma, 2018; Sugandi & Akbar, 2020; Sumartini, 2019; Shah & Sofyan, 2021). According to Annisa (2017), there are several markers of mathematical communication abilities, such as: a) Using an oral, written, and algebraic way to model a scenario or an issue. b) Using mathematical language and symbols to describe daily living. c) Reading a written mathematical presentation and comprehending it. d) Describe the mathematics being studied and pose inquiries concerning it. In connection with the indicators of mathematical communication ability, it can be concluded which mathematical communication ability play a very important role because in addition to developing the ability that exist in ourselves, this ability is also able to make us exchange ideas and train students to be able to communicate mathematical thoughts both verbally and verbally writing.

However, in practice, mathematics communication ability are still not very strong (Nuraeni & Afriansyah, 2021). Students struggle to develop their mathematics communication ability (Sumartini, 2019). The mathematical communication ability of junior high school students in Cimahi city is low according to research (Wijayanto, et al., 2018) on triangle and quadrilateral material, which is followed by research (Niasih, et al., 2019) for statistical material. Further research (Aminah, et al., 2018) demonstrates that in the identified literature, the mathematical communication ability According to Supriyatin et al. (2021), current data indicate that students' mathematical communication ability are still lacking.

Based on the results of interviews with lecturers who teach algebraic structure courses at UIR and UPP, students' mathematical communication ability are still low, this can be seen in the results of the midterm exams conducted, information obtained that (1) students have not been able to reflect and clarify their thoughts on mathematical ideas through oral and written, and students have not been able to demonstrate and describe it visually; (2) students have not been able to connect everyday language using mathematical symbols.

The best way to address these shortcomings is to use interactive multimedia learning, where the teacher has enough time to explain the subject matter and can make connections to other mathematics or non-mathematics-related topics. 2020 (Junedi & Sari). According to Supriyatin (2021), to increase students' capacity for understanding mathematical communication, it is necessary to ask them several questions that are relevant to daily life and are therefore simple to comprehend. The researcher wants to know the impact of interactive multimedia-based learning on students' mathematical communication ability in the algebraic structure course. Therefore, the researcher plans to conduct research based on the description above.

Research has been done on the significance of mathematics communication ability by (Aminah et al., 2018; Deswita et al., 2018; Luh & Ekayani, 2021; Nurhayati, 2017; Sari, 2017; Sumartini, 2019; Supriyatin & Arfa; Syah & Sofyan, 2021; Khodijah, 2018). Then interactive multimedia-based teaching materials have been the subject of research to



determine how to improve learning effectiveness and efficiency (Gufron, et al., 2018; Lutfi, et al., 2021; Winarso, et al., 2017; Khotima, 2021; Sina, 2019). While adopting interactive multimedia-based teaching resources can enhance students' mathematics communication ability, this research relates learning in that regard. This study looked at how well interactive multimedia-based teaching resources for math lessons improved students' mathematical communication ability.

### **Research Method**

The approach utilized in this study was experimental with a quasi-experimental non-equivalent control group because the researchers did not select respondents at random but instead randomized the existing class. This study examined learning's lone impact. Thirty-two students who were enrolled in two classes—an experimental class and a control class—in the Algebraic Structure course for the 2021–2022 academic year were the subjects of this study, which involved two universities simultaneously, Universitas Islam Riau (UIR) and Universitas Pasir Pengaraian (UPP). While the control class received instructional materials in worksheets, the experimental class received learning utilizing interactive multimedia-based teaching resources (SW). Each educational tool fosters successful learning so students can communicate more effectively.

The control class's student worksheets are organized following the levels that must be attained in mathematical communication abilities. The experimental class uses interactive multimedia constructed by considering the stages of mathematical communication, while the control class uses student worksheets, which contain the same content and activities but are structured according to student achievement requirements. The SW is also organized as attractively as possible by considering students' issues. There are several reasons why researchers conduct research at UIR and UPP, including: (1) Both groups have homogeneous variances; (2) In order to obtain better generalization results; (3) UIR and UPP have established collaborations (partners) in the field of research (4) Lecturers who support algebraic structure courses at UIR and UPP conduct intense communication on problems in algebraic structure lectures, and some of the same problems are found, including low mathematical communication ability of students.

Tests were used to gather the data for this investigation. The test's questions focus on communication ability. Additionally, the T-test can assess the results after specialists have validated the test. The Normality Test, Homogeneity Test, and T-Test are the three stages that will be carried out in doing data analysis, respectively. The Normality Test, Homogeneity Test, and T-Test are the three stages that will be carried out in conducting data analysis, respectively.

### **Results and Discussion**

According to Sari & Tanzimah (2017), the statement made by NCTM that student communication ability is one of the benchmarks in the process of learning mathematics shows the significance of student communication ability. According to research by Aminah et al. (2018), students can increase their comprehension of mathematics by explaining it to others. It is in line with their findings. Additionally, it states that one skill necessary after understanding mathematics is the capacity to convey mathematics (Sugandi & Akbar, 2020). Here are the results of data processing students' mathematical communication ability:



**Table 1. Normality Test**

Class	p-value
Experiment	0,355
Control	0,347

According to Table 1, the experimental class's p-value is  $0.355 > 0.05$  and the control class's is  $0.347 > 0.05$ . Therefore, it may be concluded that, at a significance level of  $= 0.05$ , the mathematics communication ability of experimental class students and control class students are regularly distributed. The results of the homogeneity test are obtained as follows:

**Table 2. Homogeneity Test**

Levene Statistic	df	p-value
2.247	30	0,539

Table 2 provides the p-value, which is  $0.207 > 0.05$ . It indicates that the variation between the two learning groups is homogeneous. Additionally, the T test's outcomes are as follows:

**Table 3. T-test**

T-test	p-value
Learning	0,016

Table 3 provides the p-value, which is  $0.016 < 0.05$ . It implies that students who receive interactive multimedia-based teaching materials enhance their mathematics communication ability more than students who receive conventional learning. The results showed an increase in students' mathematical communication ability who were taught using interactive multimedia-based teaching materials. *Media* is a channelling tool that can provide information and make it easier for users to motivate to learn (Faqih, 2021; Nasaruddin, 2018). Learning media is one of the learning resources that can be used to communicate information in the form of material to students and can be used to stimulate the thinking power of students. So, besides overcoming boredom for students, learning media can also create effective learning activities (Permansah & Murwaningsih, 2018; Tafonao, 2018). The following are documentations of the implementation of learning using interactive multimedia based on teaching materials:



**Figure 1. The Learning Process of The Experimental Class**

The learning process depicted in the image above was conducted using interactive multimedia-based instructional materials. When the lecturer provided practice questions during the course, students enthusiastically participated. They each offered to respond to the activity in turn.



The photo at the top was taken using interactive multimedia-based teaching resources to document the ongoing learning process. Students actively participate in learning by responding to the lecturer's practice questions. Additionally, they offered to respond to each query in turn. They respond to the drill questions one at a time. An example of interactive multimedia-based teaching materials is seen in the image above. The media includes (1) precondition materials meant to pique students' initial aptitude; (2) core content meant to instill key concepts; and (3) practice questions meant to test their understanding of the subjects they studied that day. Some of the buttons in the display above have the following functions: (1) the Back button to the previous material, which is designed to let students rapidly access the material if they forget the principles they are learning; (2) the home button, which functions to determine what meeting materials they will study. It makes it easier for students who have high ability to learn faster than those who have medium and low ability, thereby minimizing the boredom they experience (3) The practice button is directly connected to Quizizz. It is done so that students can do exercises like playing games so that their boredom and boredom disappear and are replaced with curiosity.

The following stages can be completed by students who study with interactive multimedia-based teaching resources, according to the posttest results: a) Using an oral, written, and algebraic approach to a situation or problem model. b) Using mathematical language and symbols to describe daily living. c) Reading a written mathematical presentation and comprehending it. d) Describe the mathematics being studied and pose inquiries concerning it. The capacity of students to communicate mathematically can increase depending on the choice of learning resources. There are variations between traditional and interactive multimedia learning in terms of how well students' mathematical communication ability grows for the algebraic structure course. Researchers and lecturers use the application of the study's findings as a source of information. Their understanding of how to teach in relation to students' mathematical communication ability has improved due to focusing on the appropriate learning resources to be employed in algebraic structure lectures.

### **Conclusion**

According to the research findings, students who learn with the aid of interactive multimedia-based teaching materials see an improvement in their capacity to communicate mathematically compared to students who learn using traditional learning systems.

### **Recommendation**

It is important to consider how interactive multimedia teaching resources affect students' mathematical communication ability based on Initial Mathematical Ability in addition to providing information for lecturers and researchers (IMA). Good thinking ability levels are often correlated with good levels of mathematical aptitude, and vice versa.

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