

Analysis of Students' Conceptual Understanding Ability and Learning Independence Reviewed From Students' Learning Motivation Assisted by Macromedia Flash in Class X of SMA Kesatuan Meranti

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ABSTRACT

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This research aims to: (1) To find out whether there is a difference in students' ability to understand concepts between students who were given Macromedia Flash media and students who were given Power Point media (2) To find out whether there is a difference in students' independent learning abilities between students who were given Macromedia Flash media. with students who were given power point media. This type of research is a quasi experiment. This research was carried out in SMA Kesatuan Meranti in the even semester of the 2021/2022 academic year. The results of the research show that: 1) There is a difference in students' ability to understand concepts between students who were given Macromedia Flash media and Power Point media, where the application of Macromedia Flash media was better than students who received Power Point media for their ability to understand concepts; 2) There is a difference in students' independent learning abilities between students who were given Macromedia Flash media and Power Point media, where the application of Macromedia Flash media was better than students who received Power Point media for students' independent learning abilities; 3) There is an interaction between learning media and student learning motivation which is used on students' ability to understand concepts; 4) There is no interaction between learning media and student learning motivation which is used on students' independent learning abilities.

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A. INTRODUCTION

Mathematics plays a big role in life, especially schooling. Math is taught from kindergarten to university to help students answer problems critically, thoughtfully, successfully, and efficiently. Due of its focus on numbers, formulae, and arithmetic, some students find math intimidating. Math takes effort to recall learned content so pupils may understand the concepts.

Understanding concepts is crucial to solving arithmetic issues. Kesumawati said "Students understand concepts if they can define concepts, identify and give examples or non-examples, develop mathematical connection skills between ideas, understand how mathematical ideas relate to each other for a comprehensive understanding, and use mathematics in contexts outside mathematics (Ismawati et al., 2019).

The objectives of mathematics learning in Minister of National Education Regulation no. 22 of 2006 emphasize understanding mathematical concepts, explaining their relationships, and applying algorithm concepts flexibly, accurately, efficiently, and precisely in problem solving. According to the mathematics learning objectives above, pupils should understand a mathematical concept so they can solve mathematical problems. Concept understanding is related to teacher-given concepts. Comprehension is understanding the material (Purwanto: 1994). He defines understanding as a student's ability to comprehend a topic, circumstance, or reality. A person should be able to recognize the object, its relationship to other objects of the same type, and its relationship to other theories to grasp something. A notion is an abstract idea that lets us classify objects and events as within or outside it (Hudojo, 2003, pp. 124). Unfortunately, pupils still don't understand arithmetic ideas taught in classrooms. Thus, pupils still struggle to grasp academic concepts. To avoid students misinterpreting learning concepts, teachers must always pay attention to them.

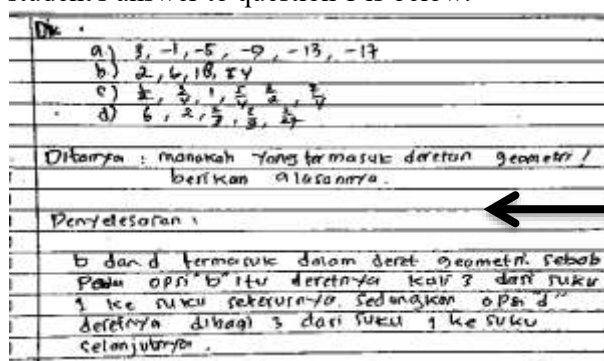
According to the Ministry of National Education, learning mathematics requires demonstrating understanding of mathematical concepts, explaining their relationships, and applying concepts or algorithms in a flexible, accurate, efficient, and precise manner to solve problems. (Arifah & Saefuddin, 2017, pp. 266). Understanding mathematical concepts is important because it is one of the goals of learning mathematics and helps students not only memorize formulas but also understand what math is about (Mathematics, 2022). As explained above, students need to understand concepts to explain and argue for mathematical problems they solve, so they are not confused. Math comprehension remains low, with an average score below 40. According to these criteria for classifying kids' mathematical understanding:

Tabel 1 Category Ability Understanding Draft Student Math

Mark	Category
$\bar{X} < 40$	Very Low
$40 \leq \bar{X} < 56$	Low
$56 \leq \bar{X} < 66$	Currently
$66 \leq \bar{X} < 80$	Tall
$\bar{X} \geq 80$	Very Tall

(Modification Arikunto, 2013:271)

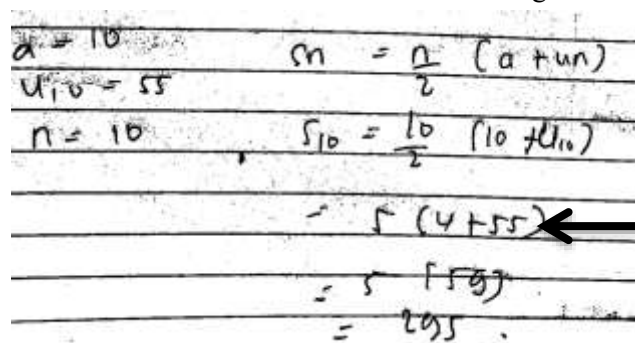
This was confirmed when the researcher conducted an initial observation test to assess class X SMA Kesatuan Meranti students' mathematics comprehension. Students are given various questions to assess their mathematics understanding. Figure 1 lists sequences and series instances and non-examples; Figure 2 summarizes contextual issue arithmetic series principles. The initial observation test findings show this: A low-ability student's answer to question 1 is below.



Severals mathematical and geometric sequences don't help students understand the situation. What is an example of an arithmetic and geometric sequence?

Figure 1 Student Answers with Examples/Non-Examples Indicators

Arithmetic and geometric sequence examples and non-examples are needed to solve Figure 1's challenge. The Figure 1 question presents arithmetic and geometric series. Student just states geometric series on answer sheet, but question instructions say sequence is not about series. Researchers found that pupils misunderstood the difference between arithmetic and geometric series after interviewing them.



Students make blunders and don't examine their arithmetic series solutions.

Figure 2 Student Answers with Concept Restatement Indicator

The problem in Figure 2 requires knowledge of arithmetic series. In problem image 2, students must calculate the 10th arithmetic series sum. Students comprehend arithmetic series, yet they write (4+55)

instead of $(10+55)$, which causes calculations and final result errors. The researcher interviewed pupils and found that.

According to Ismawati et al. (2019), high school pupils' inadequate concept understanding is caused by their lack of interest in learning. They merely acquire information. Without knowing draft, teacher delivers. Students remain mute and don't ask questions about what they've learnt. Meranti Unity High School class X mathematics instructors were interviewed by researchers. The interview with Mrs. Elvida Manurung, S.Pd found that Meranti Unity High School class X pupils were still struggling in maths. Students who score over the Minimum Completion Criteria (KKM) of 75 have completed. In classical education, 85% completion is required.

Apart from the aforesaid elements that create low concept understanding, student learning freedom is important. Math comprehension and student independence are linked. Good defines learning independence as learning without outside help (Slameto, 2003, pp. 146). Independence is the ability to meet one's own requirements without outside help. Independence denotes being able to meet one's own requirements without outside help. Independent learning is based on students' own actions and responsibilities, not others' directives or suggestions. Mudjiman (2006, pp. 1) defines learning independence as students' ability to engage in active learning activities to master a competency they already possess. Syaputra (2017, pp. 370) defines independent learning as students learning without the help of friends or teachers to master material or knowledge and solve problems. issues in daily life.

The concept of independent study comes from adult education. Independent learning suits all ages. Thus, middle and primary schools can benefit from independent learning to boost student achievement. Sumarmo (2006, pp. 5) states that independent students learn better, can monitor, assess, and arrange their learning, save time, direct and manage their thinking and actions, and do not feel dependent on others. otherwise sentimental. Students that lack independence in learning will struggle and lack the motivation to succeed, therefore they cannot reach their learning goals.

Raising awareness of the significance of assessing pupils' autonomous math skills in school is crucial. This low student learning independence affects learning outcomes. Student learning results improve with learning independence. High learning outcomes are more likely for teaching participants with higher learning freedom. Researchers observed class X pupils at Meranti Unity High School and discovered that math learning is teacher-centered. This one-way learning makes students dependent on the teacher. Thus, students are inert throughout math sessions. Students listen, take notes, and memorize the material, then perform practice questions following the teacher's formula without knowing the objective or benefits.

A researcher teacher interview with Mrs. Elvida Manurung supports this. Additionally, class X high schoolers Unity Meranti cannot yet employ good teacher-used learning media. Teachers' explanations are the only sources students use to learn. Students won't read and study books and worksheets unless the teacher asks them to. "When teachers assign homework, some pupils don't do it.

According to the opinion above, independence is the ability to accomplish one's wishes without others' help. During the learning process, students should be able to set their own study hours, choose activities that support academic achievement, develop learning strategies, and other behaviors that show they are responsible for themselves to achieve learning goals. Teachers must work to enhance the mathematics learning process at school, specifically the ability to understand concepts and study independently, which leads to low math learning outcomes.

Learning motivation affects student success in school. In learning, motivation is complete. Learning activities continue because of self-student power. Non-intellectual psychological factors motivate learning. An intelligent student can fail due to a lack of learning drive. Motivation drives a person to adjust their conduct to suit their requirements (Uno, 2008, pp. 53). Similarly, motivation is an effort to move, control, and guard someone's conduct to urge students to take action to attain goals. Motivation is strength that can increase level D's inherent will to do anything, according to Suprihati (2015, pp. 75). Motivation is the motivating force within students that creates, maintains, and directs learning activities to attain topic goals.

The student learning motivation questionnaire during observations in class X of Meranti Unity High School showed an average score below 50. Category-based student learning motivation criteria are still low. This lack of desire contributes to draft and independence study student understanding issues. Motivation inspires pupils to learn and master their subjects. To prevent this issue, employ appropriate learning tools to motivate pupils in math classes. If an idea is delivered in clear, entertaining, and suitable phases, children will understand and retain it. By improving student learning motivation, cooperation and comprehension will rise. Learning media simplifies information transfer for students. Flash is an animation program.

According to Hadi (2003), Macromedia Flash is internet-based animation software that may be used to create interactive multimedia for CDs, networks, and the web. Text, graphics, animation, and digital video appear together in multimedia, and buttons are interactive. In accordance with Hadi, Hakim (Rahmi et al., 2019, pp. 180) says Macromedia Flash creates animations and professional web apps. In addition, Macromedia Flash is used to create games, animated cartoons, and interactive multimedia applications like product demos and tutorials. Macromedia flash processes photos to create movement. Macromedia Flash can motivate pupils to learn instructional concepts and complete activities independently.

B. RESEARCH METHODS

This investigation was a quasi-experimental study. Not all external variables affecting quasi-experiments can be controlled. Research subjects are also grouped by pre-existing groups. This research was chosen because the researcher planned to employ existing classes at the research school. This study did not have an experimental group II since the sample group was treated simultaneously. This research will involve two experimental classes, class 1 and class 2, with different treatments. Experimental classes 1 and 2 were taught arithmetic sequences and series utilizing macromedia flash and power point, respectively.

The research was done at Meranti Unity High School. We chose this school because no research has been done on students' conceptual understanding and independent learning abilities who are taught using macromedia flash and power point. Additionally, Meranti Unity High School students' conceptual understanding and independent learning abilities are still relatively low, according to initial observations. Meranti Unity High School attracts researchers for this reason.

This research will occur in the 2021/2022 even semester. Each sample class will undergo study in December–January. According to the research school principal, the research schedule is altered. This inquiry will use Lines and Series content from the Class X syllabus for that semester.

Researchers study a population of objects or persons with specified attributes and characteristics to draw conclusions (Sugiyono, 2016, pp. 80). Class X-1 to X-3 of Meranti Unity High School comprised this study's population.

Population numbers and attributes include the sample. If populous. Due to limited funding, energy, and time, researchers cannot investigate the entire population, therefore they can employ samples (Sugiyono, 2016, pp. 81). The study sample was selected via cluster random sampling. This random sampling method uses already constructed population groupings with varied individuals (Arikunto, 2010, pp. 96). Researchers randomly sample a huge population based on groups/classes, hence they utilize cluster random sampling. This study separated its sample into Experiment Class 1 and Class 2. Macromedia Flash was used for Experiment Class 1 and Power Point for Class 2.

This study uses quantitative methods. Quantitative research is deductive-inductive. This approach begins with a theoretical framework, expert opinions, and researchers' experience-based understanding, then develops problems to be justified (verified) or rejected using field empirical data (Tanzeh, 2009, pp. 99). Quantitative methods evaluate hypotheses, create facts, illustrate variable relationships, provide statistical descriptions, and estimate and predict research findings.

This research is quasi-experimental. This study had two experimental classes, each of which was treated using a learning model. Experimental class 1 used macromedia flash learning media, while experimental class 2 used power point. Both samples take a post-test after learning.

Table 1 Research Design

Class	Treatment	Post test
Experiment-1	X ₁	O

Experiment-2	X_2	0
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(Modification Sugiyono, 2012, pp. 77)

The final test (post-test) of students' conceptual comprehension capacity and the independent learning ability test will provide quantitative data for this study. The students' final test results were assessed to see how they completed the conceptual understanding ability test and the independent learning capacity non-test. The research data was processed by verifying the statistical requirements for hypothesis testing, data normality and variance homogeneity. The hypothesis test used two-way variance analysis, the F test, and 0.05 significance. To guide data analysis, the hypothesis must be statistically expressed. Each pair of data groups was analyzed quantitatively according to the problem.

ANOVA is one of the univariates that may be used to describe student skills and the interaction of two components with one interval or ratio dependent variable and multiple nominal or ordinal independent variables. Kadir (2015:346) uses a two-way ANOVA to determine interaction. Two-way ANOVA was used to examine independent-dependent interactions. ANOVA linear model, two-way:

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ijk} ; i = 1,2,3; j = 1,2; k = 1,2,3, \dots, n$$

Table 2 Two-Way ANOVA Research Design Table

A \ B		Instructional Media (B)	
		Macromedia flash (B ₁)	Power Point (B ₂)
Student Learning Motivasion (A)	High (A ₁)	A ₁ B ₁	A ₁ B ₂
	Medium (A ₂)	A ₂ B ₁	A ₂ B ₂
	Low (A ₃)	A ₃ B ₁	A ₃ B ₂

C. RESULT AND DISCUSSION

1. Student Learning Motivation Description

Mean and standard deviation were calculated to describe student learning motivation. The overall results are shown in the following table:

Tabel 4 Student Learning Motivation Test Score

Class	N	$X_{\max}$	$X_{\min}$	$\bar{x}$	SD
Class Eksperimen I	30	100	40	71	14,01
Class Eksperimen II	30	95	45	70	14,83

The value of student learning motivation was used to group it into high, medium, and low. Student learning motivation scores $\geq + SD$ indicate high motivation, moderate motivation is between $- SD$ and $+ SD$, and low motivation is under $- SD$. The macromedia flash learning media class value is 71.83 and SD is 13.81, thus $+ SD = 85.64$ and $- SD = 58.02$. The power point learning media class value is 70.00 and SD is 15.38, thus $+ SD = 85.38$ and $- SD = 54.61$.

According to experimental class I data, 8 students were high, 15 were moderate, and 7 were low in learning motivation. Student learning motivation in experimental class II is 9 high, 13 moderate, and 8 poor.

2. Student Concept Understanding Ability Test Description

To evaluate students' concept knowledge posttest, the mean and standard deviation were determined. The following table summarizes the results:

Tabel 5 Description of Posttest of Students' Concept Understanding Ability

Class	N	$X_{\min}$	$X_{\max}$	$\bar{X}$	SD
Class Eksperimen I	30	65	95	80,00	8,26
Class Eksperimen II	30	70	90	81,83	4,40

Two-way ANOVA statistical analysis is performed because students' concept understanding ability test results demonstrate that the data groups come from a normally distributed population with uniform variance.

Tabel 6 Two-way ANOVA Test Results with SPSS
Tests of Between-Subjects Effects

Dependent Variable: Nilai

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1922,232 ^a	5	384,446	27,594	,000
Intercept	357448,568	1	357448,568	25655,868	,000
Model_Pembelajaran	60,805	1	60,805	4,364	,041
KAM	1606,093	2	803,046	57,639	,000
Model_Pembelajaran * KAM	308,288	2	154,144	11,064	,000
Error	752,351	54	13,932		
Total	395525,000	60			
Corrected Total	2674,583	59			

a. R Squared = ,719 (Adjusted R Squared = ,693)

Based on the above, the learning model factor Sig. (p-value) was 0.041. Since Sig. (p-value) = 0.041 < 0.05, reject H₀ and accept H_a. The type of learning material impacts idea comprehension. Thus, pupils taught with macromedia flash media and power point media interpret concepts differently.

A significant relationship between learning medium and student motivation was found (Sig. (p-value) = 0.000 < 0.05), rejecting H₀ and accepting H_a. Thus, learning media and motivation affect concept understanding. Learning media and student motivation affect concept understanding as follows:

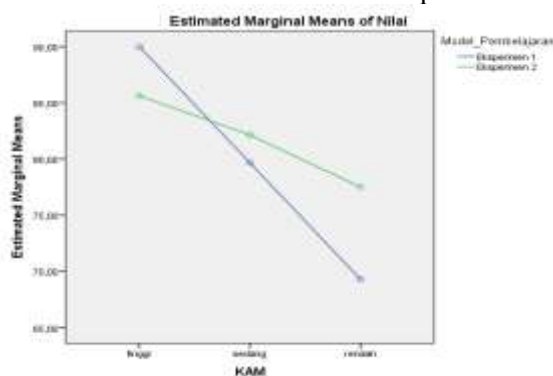


Figure 3 Interaction between Learning Media and Student Learning Motivation on Students' Concept Understanding Ability

3. Student Learning Independence Ability Test description

Calculating the mean and standard deviation of the posttest test of students' learning independence gives an overview. The following table shows the summary results:

Tabel 7 Description of Posttest of Student Learning Independence Ability Test

Class	N	X _{min}	X _{max}	$\bar{X}$	SD
Class Eksperimen I	30	65	95	80,33	9,33
Class Eksperimen II	30	55	95	77,67	10,93

The two-way ANOVA statistical analysis is performed because the student learning independence ability test results show that the data group comes from a normally distributed population with the variance of each pair of homogeneous data groups.

Tabel 8 Two-way ANOVA Test Results with SPSS
Tests of Between-Subjects Effects

Dependent Variable: Nilai

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5310,089 ^a	5	1062,018	58,525	,000
Intercept	339711,511	1	339711,511	18720,503	,000
Model_Pembelajaran	83,724	1	83,724	4,614	,036
KAM	5128,458	2	2564,229	141,307	,000
Model_Pembelajaran * KAM	31,856	2	15,928	,878	,422
Error	979,911	54	18,146		
Total	380750,000	60			
Corrected Total	6290,000	59			

a. R Squared = ,844 (Adjusted R Squared = ,830)

Learning media factor information had a Sig. (p-value) of 0.036. Since Sig. (p-value) = 0.036 < 0.05, reject H₀ and accept H_a. This indicates learning media influences student learning independence. A difference in student learning independence is seen between macromedia flash and power point media.

Also, the learning media component with student learning motivation had Sig. (p-value) = 0.422. Since Sig. (p-value) = 0.422 > 0.05, accept H₀ and reject H_a. No significant interaction between learning media and student motivation on student learning independence. The following figure shows how learning media and student motivation affect student learning independence:

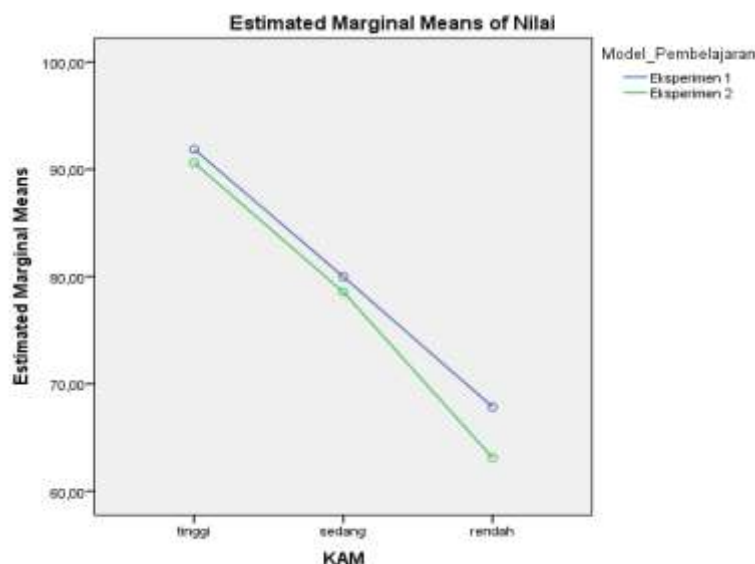


Figure 4 Interaction between Learning Media and Student Learning Motivation on Students' Learning Independence Ability

D. CONCLUSION AND SUGGESTIONS

Based on the study, findings, and discussion in the previous chapter, some conclusions were drawn about Macromedia Flash and Power Point and students' capacity to absorb concepts and learn independently. Some of these conclusions: (1) There is a difference in students' ability to understand concepts between students who are taught with Macromedia Flash media and Power Point media, where the application of Macromedia Flash media is better than students who receive Power Point media for students' concept understanding abilities; (2) There is a difference in students' independent learning abilities between students who are taught with Macromedia Flash media and Power Point media, where the application of Macromedia Flash media is better than students who receive Power Point media for students' independent learning abilities; (3) There is an interaction between learning media and student learning motivation on students' ability to understand concepts; (4) There is no interaction between learning media and student learning motivation on students' independent learning abilities. Based on the preceding conclusions, scholars can advise the following: (1)

Schools should supply books, movies, and teaching aids to help kids learn more and engage in the process; (2) According to research, children are still struggling to integrate mathematical concepts internally and outwardly, thus teachers should help and push them to do so; (3) Students should be more involved in the learning process and follow the teacher's recommendations to understand the material's fundamentals; (4) Increase experience and feedback for other researchers so they can use it as a reference for research on related issues and to gain writing and research knowledge.

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