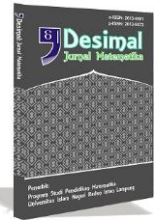




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The effect of classroom management using the visual auditory kinesthetic learning model on mathematics learning outcomes on the material of a system of linear equations of two variables

Tiara Widia Kemri*, Lily Rohanita Hasibuan, Sakinah Ubudiyah Siregar

Universitas Labuhanbatu, Indonesia

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*Correspondence: E-mail:
tiarawidya2001@gmail.com

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ABSTRACT

This study aims to find out the effect of the implementation of classroom management with the Visual, Auditory and Kinesthetic learning model (VAK) on the results of students' mathematics learning on the material system of linear equations of two variables (SPLDV) in SMPN 2 Rantau Selatan. This study used a quasi-experimental type of research with a pretest-posttest control group design. Data were collected through closed questionnaires and test questions in the form of pre-test and post-test each of which totaled 5 questions for each test—data analysis technique using multiple linear regression analysis technique. The results of the study show that the application of classroom management and the VAK learning model individually and together has a positive and significant effect on students' mathematics learning outcomes. The contribution of classroom management and the VAK learning model explains about 73.6% of the variation in student mathematics learning outcomes, according to the coefficient of determination ($Adj R^2$) of 0.736. While the rest is influenced by other variables that are not examined by the researcher. This study concludes that classroom management using visual, auditory, and kinesthetic learning models affects students' mathematics learning outcomes, especially in the context of SPLDV. The implications of these findings guide educational practitioners in improving the effectiveness of mathematics learning in schools.

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INTRODUCTION

A teacher has a great responsibility to advance education. In the classroom, the teacher controls the learning process. A conducive learning situation is a support

factor for students in achieving learning objectives (Jamaludin et al., 2023). The quality of learning activities depends greatly on how the teacher plans and implements the learning process. Therefore, teachers should meet the

learning needs of students by providing a good learning environment.

According to Munir & Rahmat (2017) The problems that arise in the world of education are the main obstacles in the development of the world of education. Low student learning outcomes, especially in mathematics, are among the most vulnerable issues in education today. Low student learning outcomes can be influenced by various factors such as an uncondusive classroom environment, less diverse teaching methods, and another aspect that affects low student learning outcomes that needs attention is individual differences. Individual differences include differences in student learning styles. Where in the knowledge acquisition process, students have a unique learning style (Anas & Munir, 2016).

The ability of students to understand mathematics and use it to solve mathematical problems is a benchmark to achieve the goal of learning mathematics (Renanda et al., 2023). Student learning outcomes can be influenced by several factors, namely the student's effort to achieve learning outcomes, their initial intelligence and mastery of the material to be taught, and the opportunities given to students to explore the learning material. (Sulistiyarini & Sukardi, 2016).

The achievement of learning outcomes is influenced by the learning process that takes place in the classroom. Based on the observations made by the researcher at SMPN 2 Rantau Selatan, it was found that the student's learning outcomes still need to be fully completed. One of the factors that influence the low learning outcomes of mathematics students at SMPN 2 Rantau Selatan is ineffective classroom management. There is a tendency for classroom management to focus more on teacher activities in arranging physical classroom equipment and student seating. On the other hand, in

non-physical aspects of classroom management, teachers' attention is more focused on students' readiness to learn, which includes attendance, perception and motivation (Susanto, 2017).

In the learning process in the classroom, teachers still use less varied learning techniques, such as lecture techniques and giving assignments to students, so that the students' learning experience is less diverse. Most students, in their daily lives following the teaching and learning process, just try to memorize every time a daily test or learning outcome test is held. The student's ability is only focused on memorizing and remembering the information that is finally piled up without understanding the information obtained. For this reason, a learning process is needed in which students do not only act as receivers. Students should experience themselves in understanding this knowledge so that it can be used in everyday life. Therefore, a learning process is needed that can provide direct experience to students (Suwandewi, 2020).

So, from the above problems regarding low student learning outcomes, action needs to be taken to improve student learning outcomes. The way a teacher can improve student learning outcomes is by conducting effective classroom management and implementing a learning model in the classroom. Because with good classroom management and implementing changes in the learning model can be an alternative strategy to improve student learning outcomes. A learning model that can activate students to explore their ideas through seeing, listening, and directly practicing what they see and hear is the VAK learning model (Suwandewi, 2020).

Classroom management is a critical component in education management, where in the classroom, the application of other management will be felt directly by students, whether related to

infrastructure, curriculum, or learning (Hamidah, 2018). Management plays an important role in the learning process every day because a good learning process will affect students, and a comfortable and pleasant teaching and learning process will affect the achievements obtained by students. So that more and more achievements are obtained, reflecting the success of the teacher in the activities of the teaching and learning process (Niayah & Ariani, 2022).

All aspects of learning meet and process in the classroom: teachers with all their abilities, students with all their backgrounds and potentials, curriculum with all its components, media with all its devices, methods with all their approaches, learning materials and resources with all their subject aspects meet and interact in the classroom. Therefore, the class should be managed adequately and professionally (Yanti, 2015). In order to create harmony and patterns of interaction between teachers and students, a robust classroom management system is required, while to create a conducive learning climate, the availability of facilities and infrastructure is necessary (Wahid et al., 2018).

Not only as educators, mentors, motivators, mediators, and facilitators, but teachers must also act as classroom managers. Whether classroom learning is effective or not depends on how the teacher manages the class and the classroom conditions. A class that is not managed well will hinder learning activities, on the other hand if the class is managed correctly, it will support the course of educational interaction thus affecting the learning outcomes of students (Dian, 2017). Therefore, good classroom management is important to create a conducive learning environment to improve the quality of learning.

In addition, implementing a classroom learning model such as the Visual Auditory Kinesthetic (VAK)

learning model can promote the growth of students' enjoyment of learning. Students are given hands-on experience, making it easier for students to understand the lesson to enable students to achieve better learning outcomes. Learning will be more successful because it combines three learning styles, namely visual, auditory, and (Mustari et al., 2022). This learning model is effective and can foster students' interest. With the growth of student interest, it can affect learning achievement (Elisa et al., 2019).

The right learning style is the key to students' success in their learning process. Therefore, in learning activities, students must be guided and assisted in identifying the appropriate learning style for them. This is necessary so that learning objectives can be achieved effectively. As a professional teacher, this is the task of a teacher, where the teacher must understand the characteristics of each student (Majidah, 2023).

As a professional educator, teachers must pay attention to the differences in students' learning styles. Students who have a visual learning style will understand and accept lessons more quickly when shown pictures, media or props used by the teacher in implementing class learning. Unlike students who have an auditory learning style, they will understand and accept the lesson faster when the teacher explains the learning with the lecture method. Meanwhile, students with a kinesthetic learning style will feel bored if they only listen to the teacher's explanation using the lecture method (G. Salsabila et al., 2023).

Teachers can use many learning models for innovation, one of which is to apply learning models that suit the needs of students to increase learning motivation, such as the VAK learning model. The VAK learning model is learning that focuses on providing a direct and enjoyable learning experience using learning by seeing (visual), learning by

listening (auditory), and learning by moving and feeling (kinesthetic). A hands-on and engaging learning experience using visual, auditory, and kinesthetic. This approach gives students the opportunity to learn directly by using the various modalities they have, thus achieving understanding and practical learning (Lestari, 2023).

Every student whose needs are met will be motivated to learn mathematics. Motivated student learning can increase student achievement in mathematics learning. Based on the problem, the researcher was interested in examining "The Effects of Classroom Management Using Visual Auditory Kinesthetic Learning Model on Students' Mathematical Learning Outcomes on Two-Variable Linear Equation System Materials at SMPN 2 South Region". This study combines the effects of effective classroom management with the use of the VAK learning model on students' mathematics learning outcomes. This approach has not yet been widely explored. From the literature review, there has not yet been a study that comprehensively examines these two aspects simultaneously. Thus, this study can not only offer important new insights but also open up opportunities for educators to create a more effective and enjoyable learning environment for students.

METHOD

This research uses a quasi-experimental research type with a pretest-posttest control group design. The variables to be studied are classroom management (X1) and the VAK learning model (X2) as independent variables and learning outcomes (Y) as dependent variables.

Table 1. Research design

Class	Pretest	Treatment	Posttest
Experiment	O ₁	X ₁	O ₂
Control	O ₁	X ₂	O ₂

Description:

X1: Classroom management using the VAK learning model

X2: Classroom management using a Conventional model

O1 : Pretest

O2 : Posttest

This research was conducted at SMP Negeri 2 Selatan Rantau, located in Perdamean Village, South Rantau District, South Rantau Regency, North Sumatra Province. In this study, the population used is all eighth grade students of SMP Negeri 2 Rantau Selatan, who are in eight classes as shown in the following table:

Table 2. Number of classes and students

No	Class	Number of Students
1	VIII ¹	32
2	VIII ²	31
3	VIII ³	34
4	VIII ⁴	34
5	VIII ⁵	33
6	VIII ⁶	33
7	VIII ⁷	31
8	VIII ⁸	32
Total		260

The sample in this study was determined through a simple random sampling technique. Simple Random Sampling is a planned sampling technique through the population with members of the sample taken randomly regardless of the specific criteria of the population (Sugiyono, 2017). The sample is students of classes VIII2 and VIII8 of SMP Negeri 2 Rantau Selatan consisting of 63 students. Class VIII2 students as an experimental class that is a class that follows learning by applying classroom management using the visual auditory kinesthetic (VAK) learning model and class VIII8 students as a control class that is a class that follows conventional learning with classroom management methods. used by teachers.

The data collection technique used by the researcher to obtain data from

three variables namely classroom management, visual auditory kinesthetic learning model (VAK) and mathematics learning outcomes of SMP Negeri 2 South Region is by using questionnaire instruments and math tests.

A questionnaire was used to obtain data on classroom management at SMP Negeri 2 in the South Region. The instrument used for classroom management is a closed questionnaire distributed to the sample. The questionnaire uses a Likert scale with four answer options: Strongly Agree (SS), Agree (S), Disagree (TS) and Strongly Disagree (STS). In comparison, test measuring tools are used to determine students' mathematics learning outcomes. It aims to see to what extent the ability of

the initial stage (pretest) and the ability of the final result (posttest) after the application of learning activities using the visual auditory kinesthetic learning model (VAK) and giving test questions in the form of pretest and posttest each amounting to five questions with equation system material linear bivariate (SPLDV).

The data analysis technique in this study uses the multiple linear regression analysis technique. Before running the multiple linear regression test, prerequisite tests namely normality test and linear test as well as hypothesis test using partial test (t-test), simultaneous test (F test) and coefficient of determination (R^2), are carried out. using SPSS version 24.

RESULTS AND DISCUSSION

Table 3. Statistical Analysis of Student Learning Outcomes of Experimental & Control Classes

	Pre-Test Control	Post-Test Control	Pre-Test Experiment	Post-Test Experiment
Min	60	65	58	61
Max	80	90	79	87
Mean	70.20	72.41	60.22	79.39
Std. Deviation	4.386	6.986	6.541	5.678

Based on the results of Table 3, it is known that there are different results between the average value of the learning outcomes of the experimental class and the control class. From these results, the pretest average in the experimental class was 60.22, and the control class was 70.20.

Nevertheless, after the treatment was given to the experimental class, it can be seen that the post-test of the experimental class showed a better improvement than the control class. This can be seen from the control class post-test average is 72.41, while the

experimental class students' average math learning results are better than the control class which is 79.39. It can be concluded that classroom management with the application of the VAK learning model can improve students' mathematics learning outcomes compared to the application of the conventional learning model.

The results of the study that has been carried out at SMPN 2 Rantau Selatan are obtained from the results of data processing collected using questionnaires and math tests. The results of the linear regression test in this study are as follows:

Table 4. *T* Test Results

Model		Unstairdairdizeid Coefficieints		Stairdairdizeid Coefficieints		T	Sig.
		B	Std. Eirror	Beitai			
1	(Constant)	12.408	2.820			4.401	.000
	Classroom management	.217	.084	.312		2.569	.013
	VAK learning model	.265	.106	.303		2.495	.016

a. Deipeindeint Vairiaiblei: Learning outcomes

Table 5. *F* Test Results

Model		Sum of Squares	Df	Mean Squarei	F	Sig.
1	Regression	87.888	2	29.296	6.767	.001 ^b
	Residual	242.445	56	4.329		
	Total	330.333	59			

a. Dependent Variable: Learning outcomes

b. Predictors: (Constant), VAK learning model, Classroom management

Table 6. Coefficient of Determination Test Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.858 ^a	.736	.264	3.28057

a. Predictors: (Constant), VAK learning model, Classroom management

The results of the linear regression test above will be discussed explicitly in the following subsections:

The Effect of Classroom Management (X1) on Students' Mathematical Learning Outcomes (Y) at SMPN 2 Rantau Selatan

Based on the results of the partial regression test or t-test in Table 4, the Classroom Management variable (X1) has a value of $|t_{\text{test}}| > |t_{\text{table}}|$, which is $2.569 > 2.000$, with a significance value of $0.013 < 0.05$ until H_0 is rejected and H_1 is accepted. Thus, the classroom management variable has a positive and significant effect on the mathematics learning outcomes of students at SMPN 2 Rantau Selatan.

This study found that effective classroom management significantly affects students' mathematics learning outcomes for two-variable linear equation system material. Therefore, the better the

classroom management carried out by the teacher, the higher the mathematics learning results obtained by the students. Therefore, teachers must have good classroom management so that students can achieve the maximum learning outcomes in mathematics.

Good classroom management involves providing a supportive learning environment using appropriate learning media and teaching strategies that actively engage students. A neat and orderly classroom environment creates a conducive learning environment, while the use of visual aids and diverse learning media help students understand concepts better. Teaching methods that involve active student participation, such as group discussions and collaborative projects, encourage student involvement in the teaching and learning process and

increase student understanding of the subject.

The above conclusion is in line with the statement of Damanik et al. (2021) in their book titled "Basic Teacher Teaching Skills" that teachers who conduct classroom management in learning will help students achieve optimal learning outcomes. Therefore, a teacher needs to continue honing his skills in managing the classroom optimally.

Classroom management is a process of controlling student behavior in the classroom and conditioning the classroom so that it is safe, comfortable and enjoyable for learning. So, the teacher's role here is to create and maintain a disciplined situation in the classroom. (Niyayah & Ariani, 2022). Classroom management next not only includes the teacher's ability to create and control an orderly, safe and calm classroom environment but also includes the planning of activities for the administration, organization, structuring, implementation, and supervision of all the classes contained in the environment of the educational institution both in terms of quality and quantity, use and so on (Yanti, 2015).

In classroom management, teachers have the responsibility to maintain the classroom environment in order to create a conducive atmosphere, as well as guide intellectual and social processes in it. The task of managing this class is challenging for a teacher. A teacher must understand the current classroom situation and must know the character of each student. If the teacher does not understand this, then the teacher will make mistakes in managing the class so that the learning objectives are not achieved (Dian, 2017). In fact, the effectiveness of classroom management can only guarantee the success of teaching, but with it, it can achieve success in learning. Proper classroom management can set the stage for cognitive learning. Teachers can avoid failing to deal with

crowded classrooms by doing classroom management in this area (Harahap et al., 2023).

In line with the results of Idawati's (2019) study, there is a significant correlation between classroom management and the learning outcomes of students who are in the strong or high category. Class management can affect student learning outcomes by 50.55%.

Then in a previous study by Afsari et al. (2023) which focuses on two main aspects namely classroom management and learning facilities shows that classroom management and learning facilities both contribute positively and have a significant impact on the mathematics learning outcomes of Mts Al-Washliyah Aek Nabara students. This study is consistent with these findings, but it needs to investigate in depth the learning model used in the context of classroom management. This study adds another dimension by showing that supportive classroom management and the use of appropriate learning media are also important factors in improving student learning outcomes.

The Effect of the Visual Auditory Kinesthetic (VAK) Learning Model (X₂) on Student Mathematics Learning Outcomes (Y) at SMPN 2 Rantau Selatan.

Based on the results of the partial regression test or t-test above, the VAK Learning Model variable (X₂) has a value of $|t_{test}| > |t_{table}|$, which is $2.495 > 2.000$ with a significance value of $0.016 < 0.05$ until H_0 is rejected and H_1 is accepted. Therefore, the variables of the VAK learning model have a positive and significant effect on the mathematics learning outcomes of students at SMPN 2 Rantau Selatan (Y). From the results of the statistical data processing of the learning results of the experimental class and the control class in Table 3, the learning results of the experimental class using the visual auditory kinesthetic (VAK) learning model show that the average result of the

pre-test value of 60.22 increased to 79.39 for the post-test value. The learning results of the control class using the conventional learning model showed results with an average pre-test value of 70.20, increasing to 72.41 for the post-test value.

Based on observations during learning activities in experimental classes, students are generally more active in understanding the material and solving problems. The activity in the experimental class is better when compared to the activity of students in the control class that uses conventional learning. Students taught using the VAK model show increased understanding of math concepts, higher engagement in learning, and better test results. The VAK learning model allows students to learn in a way that suits their learning style, thus increasing the effectiveness of learning. Thus, the VAK learning model has a positive impact on students' mathematics learning outcomes; by using the VAK learning model, student learning outcomes improve compared to conventional learning models.

The Visual, Auditory and Kinesthetic (VAK) learning model is a new alternative that is modified with the student's learning style. It combines the three categories of learning styles by coordinating learning activities to meet all these aspects. The application of this learning model in the classroom has the advantage of being able to relate students' experiences with their modalities, such as sight (visual), hearing (auditory) and body movement (kinesthetic). Finally, students experience better learning outcomes, showing that the combination of visual, auditory and kinesthetic modalities makes it easier for students to absorb, filter and process learning information. S. A. Salsabila et al., (2024). This is supported by Bobbi DePotter and Hernacki's opinion that knowing different learning styles has helped students, thus giving students a

positive perception of how teachers teach (Ramadani et al., 2017).

The above conclusion is in accordance with the results of Aziz et al. (2021) there is an influence of visualisation, auditory, kinesthetic learning model (VAK) on the history learning results of class X MA Al-Khairiyah Lampung Selatan academic year 2021/2022. In addition, the average history learning results of students who were taught with the visualisation, auditory, kinesthetic (VAK) learning model was higher (72.17) compared to students who were taught using the conventional learning model (62.39).

This research is in line with previous studies conducted by Noorbaiti et al. (2018), who found that the learning outcomes of students in learning mathematics using the VAK learning model are excellent qualifications. In addition, students respond positively to learning mathematics using the VAK model. This is shown by the fact that, after therapy using the VAK learning model, the average value of all student learning outcomes increased. However, studies have not linked the VAK learning model to effective classroom management. This study adds perspective by showing that implementing the VAK model in the context of good classroom management can lead to higher learning outcomes.

The Effects of Classroom Management (X1) Using the Visual Auditory Kinesthetic (VAK) Learning Model (X2) Simultaneously on Student Mathematics Learning Outcomes (Y) at SMPN 2 South Region

Based on the results of the simultaneous test or F test in Table 5, the calculated value of $F_{test} > F_{table}$ of the table is $6.767 > 3.150$, with a significance value of $0.001 < 0.05$. Thus, the results of the F test on the variables of classroom management and the VAK learning model together have a positive and significant effect on the variables of students'

mathematics learning outcomes at SMPN 2 Rantau Selatan.

The result of calculating the coefficient of determination in Table 6 shows that the coefficient of determination (Adj R²) is 0.736, which shows that the contribution of the independent variable, which is classroom management and the VAK learning model to the learning outcome variable (dependent), is 73.6%. In comparison, the remaining 26.4% is influenced by other variables that have not been studied or are not included in the regression in this study.

Based on field data, this study found that the application of classroom management with the VAK learning model had a positive and significant effect on students' mathematics learning outcomes for the two-variable linear equation system material at SMPN 2 South Rantau. With a contribution value of 73.6%, it shows that both classroom management and the VAK learning model have an important role in improving student learning outcomes. Therefore, the better these two aspects are, the better the student's learning outcomes. On the other hand, the low quality of classroom management and the VAK learning model will have a negative impact on student learning outcomes.

The implementation of good classroom management in this context includes providing a learning environment that supports a variety of learning styles, the use of appropriate media, and the use of learning tools. The learning environment supports a variety of learning styles, the use of appropriate media, and strategies that involve students actively in the teaching and learning process. Students taught with a VAK approach in a well-managed classroom demonstrate better conceptual understanding and problem-solving skills and begin to show an interest in mathematics. Effective classroom

management allows teachers to accommodate the individual needs of students, thus creating an inclusive and interactive learning environment.

A previous study conducted by Harahap et al. (2023) only studied the effect of classroom management on students' mathematics learning outcomes. The study found that classroom management can influence mathematics learning outcomes in quadratic function lessons. However, studies have not investigated in depth the learning models used in the context of classroom management.

On the other hand, a study by Nurhuda et al. (2021) on the effect of the VAK learning model with the help of corner clock media on student learning achievement. The findings of the study show that there is a difference between the experimental class treated with the VAK learning model and the control class treated with the conventional model. The VAK learning model in conjunction with the corner clock has an impact on the student's learning achievement on the corner material. However, the study should discuss how classroom management can support or optimize the application of the VAK learning model.

This study reinforces previous studies that show effective classroom management and the use of the VAK learning model can each improve student learning outcomes. However, what differentiates this study from previous studies is the emphasis on combining both aspects and how they work together to create a more optimal learning environment that can improve students' mathematics learning outcomes.

Based on the discussion that has been mentioned, the implementation of classroom management with the VAK learning model can improve students' mathematics learning outcomes, especially in SPLDV materials. The implications of this finding can provide

guidance to educational practitioners in improving the effectiveness of mathematics learning in schools. Combining good classroom management with the VAK learning model can create a more inclusive and interactive learning environment. Thus, the implementation of supportive classroom management and learning models that suit the student's learning style can improve student learning outcomes. Because, when students feel that their learning style is recognized, they tend to be more engaged and motivated, which ultimately improves understanding and retention of mathematical material.

This research makes a new contribution to the education literature by showing the importance of integrating classroom management and the VAK learning model for optimal learning outcomes. This finding can be used as a practical guide for educators to improve the quality of learning in schools, especially in the field of mathematics. In addition, this study paves the way for further studies that can explore the combination of classroom management and other learning models in various learning contexts.

CONCLUSIONS AND SUGGESTIONS

Referring to the research results obtained from the data and data analysis in this study, the conclusions can be made as follows: (1) Based on the results of the t-test, it can be seen that the classroom management variable (X1) has a value of $|t_{test}| > |t_{table}|$ that is $2.569 > 2.000$, with a significance value of $0.013 < 0.05$, thus classroom management has a positive and significant effect on student mathematics learning outcomes (Y) at SMPN 2 Rantau Selatan. (2) Based on the results of the partial regression t test, the VAK learning model (X2) has the value $|t_{test}| > |t_{table}|$ i.e. $2.495 > 2.000$ with a significant value of $0.016 < 0.05$, then

the VAK learning model has a positive and significant effect on the mathematics learning outcomes of students (Y) at SMPN 2 Rantau Selatan. (3) Based on the results of the simultaneous test, it is known that the calculated value of $F_{test} > F_{table}$ of the table is $6.767 > 3.150$, with a significance value of $0.001 < 0.05$. Thus, the results of the F test show that the variables of classroom management and the VAK learning model together have a positive and significant effect on the variables of students' mathematics learning outcomes at SMPN 2 Rantau Selatan, with a coefficient of determination of 73.6% and the remainder. 26.4% is influenced by other variables that have not been examined in this study.

Recommendations for future researchers are to apply the VAK learning model to other subjects, analyze in more depth the specific components of classroom management that are most effective when combined with the VAK learning model and expand the research subject by involving more schools from various regions. The next suggestion is that the school conduct training for teachers on the application of the VAK learning model and effective classroom management techniques. Teachers need to understand how to integrate the three learning styles of students into lesson plans. Schools also need to provide facilities that support the implementation of the VAK learning model, such as teaching aids, audio-visuals, and flexible classrooms. Based on the above recommendations, a more conducive learning atmosphere will be created and can improve students' mathematics learning outcomes.

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