

THE EFFECT OF STUDENTS' LEARNING ACTIVITIES AND CREATIVITY ON THE LEARNING OUTCOMES IN THE AERODYNAMICS

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ABSTRACT

Vocational education aims to prepare students to acquire knowledge and skills as provisions for work. The involvement of all aspects of students, both physical and spiritual, is needed to achieve the learning objectives. It shows that each student must be actively involved in the learning process. Creativity is an essential component of learning and problem-solving. Creative learning is related to cognitive development and the process of discovering and creating something new. This research was conducted to determine the effect of student learning activities and student creativity on learning achievement, both independently and simultaneously. The subjects of this study were students of class XI AP2 SMK Bina Dhirgantara Karanganyar. The data collection technique used tests and observations. Data analysis techniques used simple regression for the first and second hypotheses (independent effect) and multiple regression analyses for the third hypothesis (simultaneous effect). The results showed that student learning activities significantly affect learning achievement with a value of t arithmetic of 3.909, a higher value than the t table of 1.69. Student creativity significantly affects learning achievement, with the t arithmetic value of 4.281, higher than the t table of 1.69. The multiple regression analysis results showed that the coefficient of determination X1 and X2 against Y was 0.477 or 47.7%. It shows that the variables of student learning activities and student creativity have a contributing influence on learning achievement.

Keywords: Learning activities, Student creativity, Learning achievement

INTRODUCTION

Vocational education is a type of education designed to prepare students to work, a process that is more about techniques and practice (Clarke, Linda; Winch, 2007: 9) Preparation to be able to work includes providing information about the work chosen, developing student capacity by practising, and developing student performance continuously to maintain student performance (Billett, 2011: 4-5). Vocational education is related to the acquisition of knowledge and skills so that students can work productively, be able to become empowered individuals and be able to increase socioeconomic value.

The achievement of students' knowledge and skills is the goal of learning activities. The achievement of learning assessed on that which is uttered, written, and a person does (Schunk: 2012: 5). Hence need an active role in learning to students

these students learning. In the process of learning the involvement of all aspects, students suitable physical and spiritual needs to happen to make the student's behavioural changes include cognitive, affective or psychomotor aspects. The results of the study behavioural changes obtained through personal experience. Liveliness students are in the process of learning is things that need attention by teachers so that in the process of learning, get optimal results (Prasetya & Harjanto, 2020a). Election media learning appropriate will make students engaged active for learning (Marwanto et al., 2020).

As for the types of activity in learning were classified as Sardiman (Sardiman, 2011: 101) is as follows :

1. Visual activities are the activity of includes activities read, and student learning pays attention to the picture,

- notice, demonstration pay attention to, experiment and seen someone else job.
2. An oral activity is student learning activity includes activities of said, formulate, ask, gives advice, thought, discussion, and interruption.
 3. Listening activities are student learning activity includes activities of heard, the discussion, conversation, discussion, music, speech, etc.
 4. Writing activities are student learning activity includes activities of writing a story, a wreath, report, copy.
 5. Drawing activities are student learning activity includes activities of drawing, makes charts, map, diagram.
 6. Motor activity activities are student learning experiment, includes activities that make construction, model, refit, gardening.
 7. Mental activity activities are responding to student learning, includes activities remember, break about, analyze, judge.
 8. Emotional activities are student learning activity, for example, bored, nervous, was, bold, quiet.

It can be taken of some sense that the activity learning an involvement of physical and spiritual school tuition for the learning process includes visual, activities oral, activities listening, activities writing, activities drawing, activities, motor activities, mental activities emotional activities to produce change, behaviour, skills and attitudes. To research the activities observed includes visual activities, oral activities, listening activities, writing activities, drawing activities. Mental activities and emotional activities are challenging to measure using observation. At the same time, motor activity is challenging to emerge because aerodynamics is a theoretical subject.

Creativity is an essential component of learning and problem resolution. Creativity can be defined as capability owned someone to find and create

something new. Creativity is the ability to produce something original and valuable (Gaut, 2010).

Creativity is also apparent from students ability to solving problems. Students who have had several creative will have the answer to her problem. Creativity is capability owned by somebody to think about something, different and unusual and think a solution for a unique problem (Santrock, 2011; 21).

One of the characteristics of creative learning is that students are actively involved in learning the material they want to master. Creative learning not only fixated on cognitive development (reasoning) students but also about the feel a fun learning experience. Student satisfaction on the process of learning will affect learning achievements (Prasetya & Harjanto, 2020b). A pleasant learning experience can be obtained through a conducive learning environment. Through a conducive learning environment, students get the opportunity to think creatively.

Convergent thinking is different from divergent thinking. Convergent thinking is thinking which only produces one correct answer, whereas convergent thinking produces many answers to a question. This convergent thinking is a characteristic of creativity (Santrock, 2011: 21). In this study, the measurement of student creativity was done by verbal creativity tests. This test is structured based on the intellectual structure of Guilford, which consists of six sub-tests that all measure divergent thinking operations, which show the thoughts that produce many answers to the same question (Guilford, 1968). Baptiste Barbot explain divergent thinking is the essence of creativity, and divergent thinking will generate many ideas, allowing students to consider alternative answers, thereby increasing the possibility of finding original ideas and being adapted (Barbot, 2011).

The core of creativity is the development of the capacity to think diverging. Think diverging involves the

outlines the probability of solving a problem on several defined or can also look at the problem from various points of view. To develop this capacity, teachers need to create learning, and many provide opportunities for students to solve problems and develop a concept or idea.

From the observation was found that in learning, aerodynamics students had not engaged in active, teachers are still dominant use the model of learning that centred on the teacher, when the children not engaged in action in learning makes students tend to memorize what creativity by teachers and so less excite students in proposed the framework that they are learning. Liveliness student for learning needed in terms of increasing students ability as revealed by Dimiyati and Mudjiono (2013: 44) learning that is only possible if students active in itself.

From the above information, it needs to be research to see if liveliness student for learning, students in problem-solving and creativity to influence the study subjects aerodynamics.

METHOD

The research is the qualitative study. The problems raised is the associative, that is a question researcher connecting two or more variables. The independent variable in this study is the activity of student learning (X₁) and creativity students (X₂), while variable dependent is student learning achievements (Y).

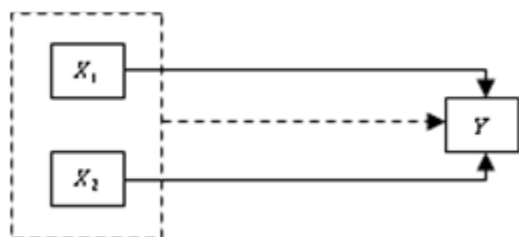


Figure 1. Research paradigm

The research subjects in this study were students of class XI AP2 Vocational

School Bina Dhirgantara Karanganyar, totalling 32 students.

The observation did by teachers collaborator as an observer to liveliness student for learning. Observation in this research was direct observation then noted behaviour and the chain that occurs in the actual state of things—observation conducted in learning.

The validity of the observation sheet uses content validity. The validity of the content is obtained from the assessment of the instrument by the expert (expert judgment). The expert was asked for his opinion on the lines of research instruments that had been prepared. The category liveliness is divided into very active, active, less active, inactive.

An instrument for creativity students uses verbal creativity test (Munandar, 2012: 68-69). The validity of tests using correlation Pearson product-moment. The significant standard used is 5 %. The item is said to be valid if the value $r_{xy} > r_{table}$ (Azwar, 2009: 48)

Correlation Pearson product-moment:

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N(\sum X^2) - (\sum X)^2][N(\sum Y^2) - (\sum Y)^2]}}$$

description:

X = The score of grains items a certain number

Y = Total score

r_{xy} = The coefficients validity

N = The number of the subject

To find out the level of reliability used the Alpha formula.

$$r_{11} = \left(\frac{n}{n-1}\right) \left(1 - \frac{\sum S_1^2}{S_t^2}\right)$$

description:

r_{11} = the reliability coefficient of a test

n = number of items in the test

1 = constant number

$\sum S_1^2$ = number of S squares for each item

S_t^2 = the square of S total of all items

Testing criteria:

If $r_{11} \geq 0.70$, the test is declared to have high reliability. If $r_{11} \leq 0.70$, then the test is declared not to have high reliability (unreliable) (Sudijono, 2008: 208-209).

Measurement of learning achievement is done using achievement tests (Azwar, 2009). The instrument used to measure student achievement in the form of multiple-choice objective tests consisted of 30 items with five alternative answers. Validation of multiple-choice objective tests in this study uses content validity and item validity. The validity of the content is obtained from the assessment of the instrument by the expert (expert judgment). The expert was asked for his opinion on the contents of the research instruments that had been prepared. The validity of items about multiple choice questions using the IteMan program (Sunarti; Rahmawati, 2012). The interpretation of the results of the IteMan program analysis can show the magnitude of the reliability, the level of difficulty of the questions, and the distinguishing features. To know the magnitude of reliability, the level of difficulty and distinguishing power can be seen in the value of Alpha, Prop. Correct, and Biser Point. (Sunarti; Rahmawati, 2012: 161-162).

In this study, the data analysis technique used is a regression analysis technique. The analysis is one method used to determine the causal relationship between one variable with another variable. The first and second hypothesis testing uses a simple regression analysis. The stages are: 1) Make a simple linear regression line equation (Sugiyono, 2012: 261-262); 2) Calculate the simple correlation coefficient between X_1 with Y and X_2 with Y (Hadi, 1987: 4); 3) Calculate the coefficient of determination (r^2) between the predictors X_1 with Y and X_2 with Y (Hadi, 1987: 25); 4) do the Significance test with the t-test (Sugiyono, 2012b: 259).

The third hypothesis testing uses multiple regression analysis. The stages are: 1) Making a two-precursor regression line

equation (Sugiyono, 2012: 275); 2) Look for multiple correlation coefficients (Hadi, 1987: 25); 3) Look for the coefficient of determination between X_1 and X_2 with Y criteria (Hadi, 1987: 22); 4) Test the significance of multiple regression with the F test (Nurgiyantoro, 2002: 288); 5) Looking for Relative Donations and Effective Donations (Nurgiyantoro, 2002: 301-304).

RESULTS AND DISCUSSION

A. The validity and reliability of an instrument

The validity of the observation sheet was carried out by two evaluation experts. From the results of assessment instruments, evaluation experts stated that the observation sheet instrument sheets are following the learning activities of students to be observed. It can be concluded that the observation sheet is valid for use in research.

The results of the validity of the verbal creativity test obtained all the r_{xy} value of each item is higher than r_{table} (0.388) so that all questions are declared valid. The results of the validity obtained value r_{11} of 0.743 so that an instrument expressed reliable.

The content validity test results of multiple-choice questions by experts (expert judgment) state that the questions used are valid. The results of testing the validity of multiple-choice items using items obtained 5 out of 30 multiple choice questions are declared null or not used, so the questions used are only 25 questions.

B. Analysis of Prerequisite Test Results

1. Test for normality

Normality test is carried out in order to find out whether the data obtained from each variable is normally distributed or not. In this study, the normality test using SPSS Statistics 21.

Table 1. Normality test results

No.	Variable	Significance	Conclusion
1	Activity (X ₁)	0.409	Normal
2	Creativity (X ₂)	0.980	Normal
3	Learning achievement (Y)	0.088	Normal

Table 2. Linearity test results

No.	Independent variables	Dependent variables	Linearity	F-value	F _{table}	Conclusion
1	Activity	Learning Achievement	0.001	1.415	3.37	Linear
2	Creativity	Learning Achievement	0.002	1.050	4.80	Linear

From the table above the calculated F_{value} is smaller than the F_{table}, so it can be concluded that the relationship between the independent variables is linear.

3. Multicollinearity Test

The purpose of the multicollinearity test is to determine whether there is a relationship between each independent variable. Regression analysis must be free of multicollinearity. A regression model is declared free from multicollinearity if it has a VIF value < 10 and has a tolerance value > of 10% (0.1). The results of multicollinearity testing can be seen in Table 3.

Table 3. Multicollinearity test results

Tolerance	VIF	Conclusion
0.744	1.345	Multicollinearity free
0.744	1.345	Multicollinearity free

Table 4. The results of the analysis regression the influence of activity learn to learn achievements

	Coefficient	r	r ²	t	t _{0,05} (31)	sig	Conclusion
Constants	54.652						Positive
Learning activity (X ₁)	1.979	0.581	0.337	3.909	1.69	0.000	Significant

From the regression analysis results obtained the regression equation $Y = 54.652 + 1.979X_1$. Of the equation were obtained the positive coefficients of 1.979. From the equation, it is found that if the value of X₁ increases by one unit, then the value of Y will increase by 1.979.

The purpose of the linearity test is to determine whether there is a relationship between two linear variables. Test criteria are done by comparing the calculated F_{value} with the F_{table} price with a significant level of 5%. Suppose the calculated F_{value} ≤ F_{table}, the relationship between independent variables is linear. Linearity test results can be seen in Table 2.

Based on table 3, the VIF value of the two variables is 1.345, so it is less than 10. The tolerance value of both variables is 0.744, which means more than 0.10. Based on these results, it can be stated that there is no multicollinearity.

C. The results of the testing of hypotheses

1. The influence of the activity of learning for learning achievements

Hypothesis testing of the effect of student learning activities on learning achievement is done using a simple regression analysis of one predictor. The results of the study were analyzed using the IBM SPSS Statistics 21 computer program. The results of the regression analysis can be seen in Table 4.

In table 4, it can be seen that the coefficient of correlation X₁ to Y (r_{x₁y}) is 0.581. The correlation coefficient value is positive, so it is known that there is a positive relationship between student learning activities with learning achievement.

The coefficient of determination is the square of the correlation coefficient (r^2). This coefficient is called the determining coefficient because the variance that occurs in the dependent variable can be explained through the variance that occurs in the independent variable. Based on the results of the analysis shows that the coefficient of determination X_1 to Y (r_{x_1y}) of 0.337. The value of the determination that the variable student learning activities have an influential contribution to learning achievement by 33.7% while other variables not examined by researchers influence 67.3%.

Significance testing was carried out to find out the significance of the X_1 variable

against Y . This test is carried out using the t-test from the test obtained a t-test value of 3.909. T_{value} (3.909) is higher than t_{table} (1.69). This shows that student learning activities have a significant influence on learning achievement.

2. The influence of the student creativity for learning achievement

Hypothesis testing increasing student creativity towards learning achievement is done by using a simple regression analysis of one predictor. The results of the study were analyzed using the IBM SPSS Statistics 21 computer program. The results of the regression analysis can be seen in table 5.

Table 5. The results of the analysis regression the influence of student creativity to learn achievements

	Coefficient	r	r^2	t	$t_{0.05}$ (31)	sig	Conclusion
Constants	48.106						Positive
Student creativity (X_2)	0.988	0.616	0.379	4.281	1.69	0.000	Significant

From the regression analysis results obtained the regression equation $Y = 48.106 + 0.988X_2$. Of the equation were obtained the positive coefficients of 0.988. From the equation, it is found that if the value of X_2 increases by one unit, then the value of Y will increase by 0.988.

In table 4, it can be seen that the coefficient of correlation X_2 to Y (r_{x_1y}) is 0.616. The correlation coefficient value is positive, so it is known that there is a positive relationship between student creativity with learning achievement.

The coefficient of determination is the square of the correlation coefficient (r^2). This coefficient is called the determining coefficient because the variance that occurs in the dependent variable can be explained through the variance that occurs in the independent variable. Based on the results of the analysis shows that the coefficient of determination X_2 to Y (r_{x_1y}) of 0.379. The value of determination that the variable of student creativity has an influential contribution to learning achievement of

37.9% while other variables not examined by researchers influence 67.3%. The other variable is quite significant, so it needs to be examined in subsequent research.

Significance testing was carried out to find out the significance of the X_1 variable against Y . This test is carried out using the t-test from the test obtained a t-test value of 4.281. T_{value} (4.281) is higher than t_{table} (1.69). This shows that student creativity has a significant influence on learning achievement.

3. Influence activity learning and creativity to students learning achievements

Hypothesis testing of the effect of student activity and student creativity on learning achievement is done using multiple regression analysis. The results of the study were analyzed using the IBM SPSS Statistics 21 computer program. The results of the regression analysis can be seen in Table 6.

Table 6. Results of multiple regression analysis

		Coefficient	r	R ²	F	F _{0.05} (2;31)	sig	Conclusion
Constants		43.432						
Learning activity (X ₁)		1.233						
Student creativity (X ₂)		0.694	0.690	0.477	13.206	3.30	0.000	Positive Significant

From the regression analysis results obtained the regression equation $Y = 43.432 + 1.233X_1 + 0.694X_2$. The regression line equation shows that the value of the regression coefficient X₁ is 1.233. If the value of X₁ increases by one unit, the value of Y will increase by 1.233, assuming X₂ is fixed. At the same time, the regression coefficient value X₂ is 0.694. This means that if the value of X₂ increases by one unit, the value of Y will increase by 0.694 units assuming X₁ is fixed.

The analysis shows the value of the correlation coefficient X₁ to Y (r_{y(1,2)}) is 0.690 because the correlation coefficient (r_{y(1,2)}) is positive then it can be concluded that there is a positive relationship between student learning activities and student creativity with learning achievement.

The coefficient of determination is the square of the correlation coefficient (R²). This coefficient is called the determining coefficient because the variance that occurs in the dependent variable can be explained through the variance that occurs in the independent variable. Based on the results of the analysis shows that the coefficient of determination X₁ and X₂ to Y (R²_{x₁x₂y}) is 0.477. The value of the determination that the variable student learning activities and student creativity have an influential contribution to learning achievement by 47.7% while other variables not examined by researchers influence 52.3%.

Significance testing is carried out to find out the significance of the variables X₁ and X₂ to Y. This test is carried out using the F test. From the test, the F test value was 13.206. F_{value} (13.206) is higher than

F_{table} (3.30). This shows that the learning activities of students and student creativity have a significant influence on learning achievement.

4. Relative Contributions and Effective Contributions

The results of the multiple regression analysis show the magnitude of the relative contribution and effective contribution of learning activity variables and student creativity to learning achievement.

The amount of effective contribution and relative contribution can be seen in Table 7.

Tabel 7. Relative Contributions and Effective Contributions

No	Variables	Contributions %	
		Relative *	Effective **
1	Learning activity	20.8	9.9
2	Student creativity	49.6	22.2
Total		70.4	32.1

In table 7 can be seen that the activity of student learning contributed relatively 20,8 % and creativity students contributed relatively of 49,6 % on learning achievements. Based on table 7, the effective contribution of student learning activities by 9.9% and the effective contribution of student creativity by 22.2%. The total effective contribution of student learning activity variables and student creativity by 31.1% on learning achievement, while 69.9% of other variables not examined.

CONCLUSION

In research in conclusions may be drawn as follows:

1. Student learning activity has a positive influence and significant impact on student learning achievements. This means an active role student in learning must be paid attention by teachers. Teachers need to create a learning process which involves activity students to students achievement can be optimal.
2. The creativity of students has a positive influence and significant impact on student learning achievements. Teachers need to create a situation to learn that a lot of providing opportunities for students to solve the problem and develop a conception or notion that creative students always are honed in thinking.
3. The activity of student learning and creativity students together have a positive influence and significantly correlates with student learning achievements.

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