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Self-concept and self-efficacy's role in achievement motivation and physics learning outcomes

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Abstract

The aim of the study was to analyze the effect of self-concept and self-efficacy on achievement motivation and physics learning outcomes. The samples of the study were 126 students taken by means of the Sloven technique using questionnaires and test results of physics learning. The data of test results were analyzed by using Structural Equation Modeling with AMOS software. As a result, self-concept and self-efficacy have a direct positive effect on student's motivation achievement. In conclusion, the teacher also must investigate and analyze the basic needs of the student in learning to achieve the objective of learning.

Keywords: Achievement motivation, Learning, Self-concept, Self-efficacy.

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El autoconcepto y el papel de la autoeficacia en la motivación al logro y los resultados del aprendizaje de la física

Resumen

El objetivo del estudio fue analizar el efecto del autoconcepto y la autoeficacia en la motivación al logro y los resultados del aprendizaje de la física. Las muestras del estudio fueron 126 estudiantes tomados mediante la técnica de Sloven utilizando cuestionarios y resultados de pruebas de aprendizaje de física. Los datos de los resultados de la prueba se analizaron mediante el uso del modelado de ecuaciones estructurales con el software AMOS. Como resultado, el autoconcepto y la autoeficacia tienen un efecto positivo directo en el logro de la motivación del estudiante. En conclusión, el profesor también debe investigar y analizar las necesidades básicas del alumno en el aprendizaje para lograr el objetivo del aprendizaje.

Palabras clave: Motivación de logro, Aprendizaje, Autoconcepto, Autoeficacia.

1. INTRODUCTION

Learning achievement in a subject matter is affected by several factors. The source of the factors can come both from the student himself and the environment. The positive view of someone to himself or often called self-concept will create positive energy in one's self. Positive self-concept will result in high learning motivation as long as the other factors are under control. The study by ZIMMERMAN (2000) shows that cognitive component and affective self-concept correlate significantly but only in its domain. English competence has no positive correlation with the result of physics learning but interest in learning English has a positive correlation with the involvement in physics.

The result of the study indicates student's self-concept in learning physics probably does not correlate with self-concept in learning English due to the basic needs analysis in learning physics is different from learning English. Therefore, needs analysis in learning preparation is important for the teacher. In line with this, KAHARUDDIN & ARAFAH (2017) found a methodology in English material development based on a needs analysis that can be taken for granted and is effective for the student to master English.

From the studies by KAHARUDDIN & ARAFAH(2017), it can be concluded that in learning English or physics needs analysis of the student must be done first. The needs analysis of the student can be useful to find out the congruency between characteristic and self-concept of the student. By knowing the characteristics and self-concept of the student, it is hoped to find out the basic needs of the student for meaningful learning. Besides that, knowing the student cognitive style OLAGBAJU (2020) can help the student to express himself and learn according to the orientation of their cognitive style. In that way, the student can learn in unstressed condition because self-management will cause cognitive burden (LEWIS, 1990; ARAFAH, 2019).

The student who has high achievement motivation will lead the student to achieve higher achievement motivation as well. In relation to this ARAFAH (2014) reported his finding that student's achievement motivation has a positive correlation with applied physics learning outcomes of the student at State Polytechnic of Makassar. In general, the student who has high achievement motivation tends to have high physics learning achievement as well. This means that if someone wants to have

high-applied physics learning outcomes, the teacher must always motivate the student for achievement. It turns out that the role of a teacher is still needed in the learning process. This also happens to SMAN 8 in Makassar, Indonesia (ARONSON, WILSON & AKERT, 2007).

2. METHODOLOGY

This study was ex-post facto in the form of correlation with the structural equation modeling (SEM) technique. The study aimed to find out the direct effect of independent variables: self-concept, self-efficacy, and achievement motivation on physics learning outcomes as the dependent variable. The paradigm of the relationship between research variables is illustrated as follows:

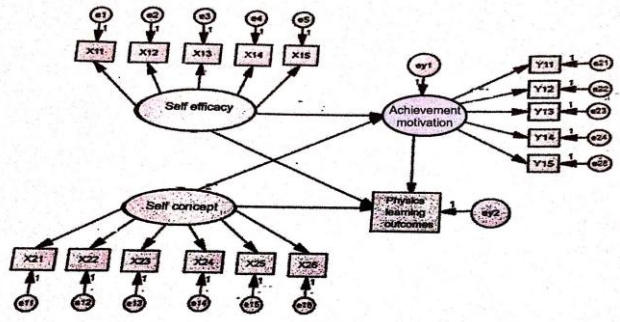

Figure 1: The paradigm of the relationship between research variables

The population of the study was 185 students of six classes XI IPA SMA Negeri 8 in Makassar, the odd semester of academic year 2019/2020. The number of samples was 126 students selected by the Slovin technique. The instrument used to collect the data on self-concept, self-efficacy and physics learning motivation was questionnaire; whereas, physics learning outcomes were collected by using the test.

The two instruments were validated before they were applied for content validity using the GREGORY formula (2015) and then empirically tried to find out the validity of the criteria of each point. Product moment correlation formula was applied to compute the validity of each point of the questionnaire (WATSON, 2002); while the test of physics learning outcomes used r-point biserial. Lastly, computation on the reliability of the questionnaire instrument was done by using Alpha Cronbach KAHARUDDIN & ARAFAH (2010) and KR-20 for the test of physics learning outcomes. After the tryout, all instruments are declared to be valid and reliable.

The data were analyzed using descriptive statistics and inferential. The basic assumption required by SEM was fulfilled. Descriptive statistics for computation of mean, standard deviation, and variance used IBM SPSS version 22.0. The analysis of confirmatory factor and test of compliance model used software AMOS version 22.0. To test the effect of indicators on the latent variable, a model must meet the criteria of Goodness of Fit and for this Chi-square, CMN/df, TLI, CFI, and RMSEA were employed.

3. RESULT AND DISCUSSION

The descriptive summary of each research variable is presented in table 1 below. The table shows the number of points of the questionnaire used in collecting the data: 34 points each for self-concept, 32 points for self-efficacy variable, and 32 points for achievement motivation variable, and 25 points for the test of physics learning outcomes. The result of the study indicates that the average mean score of self- the concept was 120.86 of the ideal score 34 – 170 which might be achieved by them. For the self-efficacy variable, the mean was 101.75 of the ideal score 32 – 160 which might be achieved by them (ZIMMERMAN, 2000).

Likewise, for achievement motivation, the average score was 115.39 of the ideal score 32 – 160 that the respondent achieved. This shows that the achievement motivation of the student at SMA 8 in Makassar was high enough. Lastly, for the learning outcomes variable, the average score was 21.66 of the ideal score 0 – 75 which might be achieved by them. This indicates that the student's learning outcomes can be categorized as high enough.

Table 1

Statistics	**Self-efficacy**	**Self-concept**	**Achievement motivation**	**Physics learn out**
Number of respondents	126	126	126	126
Number of item	32	34	32	25
Mean	101.75	120.86	115.39	21.66

Std. Error of Mean	1.47	1.35	1.42	0.17
Median	101.00	120.00	112.50	22.00
Mode	101.00	130.00	111.00	23.00
Deviation Standard	16.45	15.19	15.92	1.91
Variance	270.79	230.74	253.55	3.67
Skewness	0.40	0.41	-0.05	-1.70
Kurtosis	0.38	0.07	0.01	4.76
Range	87.00	73.00	77.00	12.00
Minimum	60.00	86.00	76.00	12.00
Maximum	147.00	159.00	153.00	24.00

Source: research data that have been processed

Before the hypothesis testing was conducted, the first pre-requirement test was done on the data of each variable by using the level of significance 0.01. The data are said to have normal distribution when the critical ratio (cr) of curtosis is between ± 2.58. Based on the output of the normality test of the assessment of normality, the multivariate cr curtosis score was 6.37 > 2.58. This means the data of the population are not distributed normally; therefore, outlier data must be looked for to be the cause of the abnormality of the distribution. So, Mahalanobis distance must be seen by removing outlier data from the analysis. After removing the outlier data, the score of multivariate cr curtosis was 2.25. Since the score was 2.25 < 2.58, this shows that processed data come from a population that has a normal distribution and is reliable for further analysis.

Linearity test shows that the effect of both self-concept and self-efficacy on physics learning outcomes has sig linearity 0.001. This

means that the effect of both self-concept and self-efficacy on linear physics learning has fulfilled the requirement for further analysis. Likewise, after doing the multicollinearity test, it proves that between self-concept variable and self-efficacy there is no multicollinearity. This means that between self-concept variables and self-efficacy are mutually free from each other.

The congruency test between the theoretical model and empirical data can be seen at the level of Goodness of Fit Statistics. After testing the model, the result shows that at the first level the model does not fit because the index does not meet the cut off value. For this, the improvement of the model is done through the modification index. One of the indicators causing the unfit of the model is chi-square has a great quantity. The result of modification was then reanalyzed with the result as shown in the following figure 2.

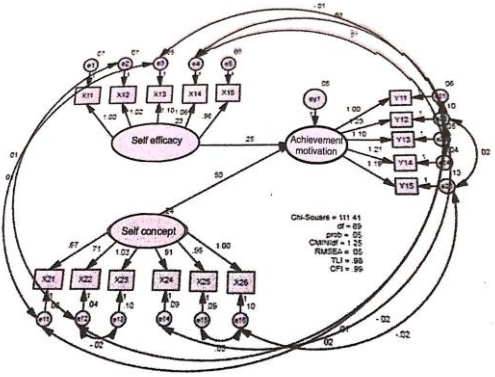

Figure 2: End factor model of the latent variable.

The last result shows that all indices have met the criteria and the model is said to be fit. As a consequence, this last model can be accepted and analyzed further. The analysis result of Standardized Regression Weights indicates the effect of indicator on the latent variable is shown in table 2.

Table 2. Standardized Regression Weights of Latent Variable

Estimated influence			
X_{31}	<---	X_3	0.86
X_{32}	<---	X_3	0.85
X_{33}	<---	X_3	0.90
X_{34}	<---	X_3	0.93
X_{35}	<---	X_3	0.80
X_{26}	<---	X_2	0.83
X_{25}	<---	X_2	0.84
X_{24}	<---	X_2	0.83
X_{23}	<---	X_2	0.85
X_{22}	<---	X_2	0.86
X_{21}	<---	X_2	0.80
X_{11}	<---	X_1	0.87
X_{12}	<---	X_1	0.88
X_{13}	<---	X_1	0.92
X_{14}	<---	X_1	0.88
X_{15}	<---	X_1	0.85

Source: research data that have been processed

Table 2 above shows that all theoretical indicators represent the latent variable of self- concept, self-efficacy, and achievement motivation. As a consequence, all points that produce scores can be further analyzed. The further theoretical model that was developed then was verified based on empirical data obtained. The result of

empirical data verified produced first level structural equation model as can be seen in figure 3.

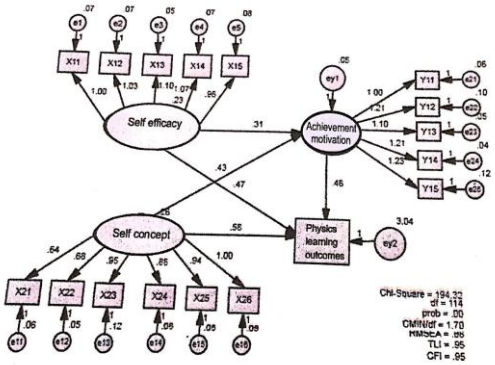

Figure 3: First Level of Structural Equation Model

The result analysis of this model cannot be taken as a benchmark in estimating the parameter since the model does not show an acceptable index fit. Therefore, a further step is needed to improve the overall index fit model. The approach applied to improve the overall index fit model is a building-trimming model approach to the parameter by considering modification indices prepared by AMOS version 22.0. To improve support to the fit model, doubling Lagrange in the matrix of variance-covariance in AMOS software version 22.0 called modification indices. In this case error in a particular indicator can be connected with error in other indicators. Random error or other indicators that are not studied must be made zero. By considering all

that, the last level analysis result was obtained through the modification index is presented in figure 4.

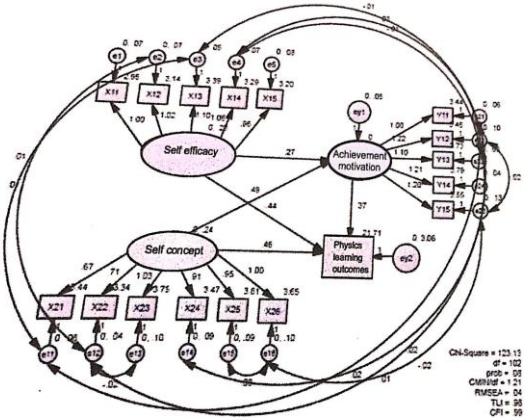

Figure 4: Final Stage of Structural Equation Model

The overall model fit for this model is chi-square = 123.12, CMIN/df (relative chi-square) = 1.21 < 2.00, p-value = 0.102 >0.05, RMSEA = 0.04 <0.08, TU = 0.98 >0.90 and CFI = 0.96 >0.90. The results indicate that the model index fit that it is good marginally and supports the model improvement. Further, the estimation result of the parameter is presented in table 3. This table gives information that there are 2 (two) affecting parameters that are not significant at the level of $\alpha = 0.05$. Therefore, it can be said that the data do not support the hypothesis posed: self-concept and self-efficacy have an effect on physics learning outcomes.

Table 3: Final Model Regression Weight

Estimate				S.E.	C.R	P
X_3	<---	X_2	0.49	0.09	5.31	0.001
X_3	<---	X_1	0.27	0.08	3.17	002
Y	<---	X_3	0.37	0.07	3.43	0.02
Y	<---	X_2	0.46	0.71	0.64	0.52
Y	<---	X_1	0.44	0.62	0.71	0.48

Source: research data that have been processed

Based on table 3 above and the result of intercepts computation and squared multiple correlations R2, the final structural equation model becomes:

$Y = 2.7 + 0.44\ X_1 + 0.37\ X_3$; R2 = 0.778

$Y = 4.8 + 0.63\ X_2 + 0.42\ X_3$: R2 = 0.718

Where:

X_1 is self-efficacy, X_2 is self-concept, X_3 is achievement motivation, and Y is physics learning outcomes.

Squared multiple correlations R2 >0.60 indicate a close correlation between self-efficacy and self-concept and achievement motivation. Regression equation $Y = 2.7 + 0.44\ X_1 + 0.37X_3$ shows that

77.8% of physics learning achievement can be explained by self-efficacy variation and achievement motivation. Likewise, regression equation $Y = 4.8 + 0.63\ X_2 + 0.42\ X_3$ indicates that 71.8% of physics learning outcomes can be explained by self-concept variable and achievement motivation.

Hypothesis testing of this research on the direct effect of self-concept on achievement motivation was explained by the final model regression weight. The result of estimation shows $\beta x_2 x_3 = 0.49$ with the p-value = 0.0001 <0.05. This result gives information that self-concept has a direct positive effect on the achievement motivation of students at SMAN 8 in Makassar. This result is congruent with the research conducted by ZIMMERMAN (2000) that self-concept owned by teenagers correlates positively with achievement motivation. The more positive the self-concept of the teenager, the higher the achievement motivation owned by the student and vice versa.

The hypothesis testing of the research on the direct effect of efficacy on achievement motivation was explained by estimation result $\beta x_1 x_3 = 0.27$ with the p-value = 0.02 <0.05. This finding was supported by ZIMMERMAN (2000) that there is a great correlation between self-efficacy belief and improvement of achievement motivation. Besides that, ZIMMERMAN (2000) found that self-efficacy has a significant effect linearly on achievement motivation. The higher the self-efficacy, the higher the student's achievement motivation. The same research was also conducted by ZIMMERMAN (2000) to grade IV SD/MI student of Wates district, Kulonprogo regency. She found

that self-efficacy has a significant effect on student's achievement motivation.

The hypothesis testing of the research on the direct effect of self-concept on physics learning achievement indicates that the estimation result $\beta x_2 y = 0.46$ with the value of $p = 0.52 > 0.05$. The value shows that there is no direct effect of self-concept on student's physics learning outcomes at SMAN 8 in Makassar. This finding was different from the research conducted by ZIMMERMAN (2000) who found that there is a positive and significant correlation between self-concept and student's learning outcomes that will be meaningful if the self-concept is through achievement motivation.

This research finding does not reject that to be able to see the effect of self-concept on direct physics learning outcomes but it needs the help of other variables. In this case, the achievement motivation variable is needed. This finding is strengthened by the research done by ZIMMERMAN (2000) that there is a significant effect of self-efficacy on accounting student's learning achievement at SMK Negeri 1 Surakarta of the academic year 2013/2014. In line with the finding by ZIMMERMAN (2000), self-efficacy simultaneously affects learning outcomes. This is due to the self-efficacy of students that was not established yet. As a consequence, the self-efficacy variable still needs support from other variables to be able to have high physics learning outcomes.

The fifth hypothesis that has been tested in this research was the direct effect of achievement motivation on physics learning outcomes with estimation result $\beta x_3 y$ with the p-value = 0.02 < 0.05. The value shows that achievement motivation has a positive direct effect on physics learning outcomes. One of the things assumed to affect was the placement of the student in the class. This placement must be in line with the student's characteristics to be able to learn well (LEEDS & MOKHER, 2019). At last, this congruence will have a positive effect on their learning outcomes.

4. CONCLUSIONS

Based on the data analysis of this research, the conclusions can be drawn as follows:

1. Self-concept has a direct positive effect on student's motivation achievement at SMAN 8 in Makassar.

2. Self-efficacy has no positive direct effect on the achievement motivation of students at SMAN 8 in Makassar.

3. Self-concept has no direct positive effect on physics learning outcomes but it has a positive effect on physics learning outcomes of the student at SMAN 8 in Makassar through achievement motivation.

4. Self-efficacy has no positive direct effect on physics learning outcomes but it has a positive effect on physics learning outcomes of the student at SMAN 8 in Makassar through achievement motivation.

5. Achievement motivation has a positive direct effect on the physics learning outcomes of the student at SMAN 8 in Makassar.

Concerning the result of this research, it is suggested to the teacher that in teaching she should know well the self-concept and self-efficacy of the student. The teacher also must investigate and analyze the basic needs of the student in learning to achieve the objective of learning.

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