

The Influence of Learning Independence and Self-Regulation on Chemistry Learning Outcomes XI IPA

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ABSTRACT

This study aims to determine the effect of learning independence and self-regulation both partially and simultaneously on the chemistry learning outcomes of class XI IPA students of SMA Negeri 1 Agats. This study uses a quantitative approach with the ex-postfacto method. The population of the study was all class XI IPA students of SMA Negeri 1 Agats in the 2024/2025 Academic Year, totaling 84 students. The sample was selected by simple random sampling, so that a sample of 45 students was obtained. Data collection used questionnaire instruments and learning outcome tests, so that data was obtained that were analyzed using descriptive and inferential statistics, namely simple regression techniques and multiple regression techniques. The results of the study showed that 1) learning independence has a positive effect on the chemistry learning outcomes of class XI IPA students of SMA Negeri 1 Agats, 2) Self-Regulation has a positive effect on the chemistry learning outcomes of class XI IPA students of SMA Negeri 1 Agats, 3) learning independence and self-regulation together have an effect on the chemistry learning outcomes of class XI IPA students of SMA Negeri 1 Agats.

INTRODUCTION

Every student in the world of education has different characteristics and learning difficulties, which ultimately affect their learning outcomes. Learning outcomes do not occur automatically, but are the output of a complex teaching and learning process, influenced by internal factors such as motivation, intelligence, and independence, as well as external factors such as family support, school environment, and community (Mulia et al., 2021). This variation in learning outcomes is a real phenomenon at various levels of education, including at SMA Negeri 1 Agats, where based on observations, the majority of students show chemistry learning outcomes below the Minimum Completion Criteria (KKM) standard.

The phenomenon of low learning achievement is strongly suspected to be related to the low level of learning independence and self-regulation of students. Learning independence, as the ability to actively manage the learning process without relying on others (Nurfadilah, 2019), has been shown to bring positive changes to intellectual abilities (Rosyida, 2023). Conversely, a lack of independence has implications for unproductive learning behavior, such as studying close to exams, skipping class, and cheating (Nugroho, 2021). On the other hand, good self-regulation is an important indicator in improving academic achievement (Farah, 2019; Musarropah, 2024).

This study was conducted in a unique context, namely grade XI IPA students at SMA Negeri 1 Agats, who have their own demographic and geographical characteristics, so that the results of this study are expected to enrich the treasury of educational research, especially related to the variables of learning independence and self-regulation in the context of remote areas. In addition to providing theoretical contributions in the form of enriching the understanding of the relationship between psychological variables and learning outcomes, this study also has the potential to provide practical contributions in the form of recommendations for strategies to improve learning outcomes based on strengthening independence and self-regulation.

Based on this background, this study aims to examine the influence of learning independence and self-regulation on the chemistry learning outcomes of class XI IPA students at SMA Negeri 1 Agats, as well as to provide a new understanding of the importance of strengthening internal psychological factors to improve students' academic achievements.

LITERATURE REVIEW

Learning outcomes

Learning outcomes are manifestations of behavioral changes that are expected to occur after students experience the learning process. According to Sudjana (2010), learning outcomes include cognitive (knowledge), affective (attitude), and psychomotor (skills) domains. This means that measuring learning outcomes is not only limited to achieving test scores, but also how students change holistically. In this context, understanding the factors that influence learning outcomes is important to improve learning approaches.

Dimiyati and Mudjiono (2013) expanded this concept by stating that learning outcomes are influenced by synergy between internal factors, such as students' mental readiness, and external factors such as the learning environment. This means that teachers and educational institutions do not only focus on transferring knowledge, but also on creating a supportive learning climate.

Factors Affecting Learning Outcomes

Mulia et al. (2021) categorizes the factors that influence learning outcomes into two: internal and external factors. Internal factors such as motivation, interest, intelligence, and learning habits have a direct influence on students' daily learning processes. External factors, such as parental support and teacher teaching methods, function as supports that strengthen or hinder student development.

Hasanah (2020) emphasized that internal factors are often more influential than external factors in the long term. In other words, learning success depends more on the extent to which students are able to manage themselves than on environmental conditions.

Learning Independence

According to Zimmerman (2002), learning independence is an ability in which students actively initiate learning goals, choose learning methods, and monitor and evaluate their own learning process. This reflects the transition from dependence to complete independence in managing learning.

Nurfadilah (2019) defines learning independence as the attitude of students who are able to determine learning steps without relying on intensive external guidance. In her research, Rosyida (2023) found that students with a high level of learning independence showed rapidly developing intellectuality compared to those who were passive in learning.

This fact is in line with the findings of Nugroho (2021), which revealed that low learning independence has an impact on negative behavior, such as delaying learning until the exam, cheating, or even looking for leaked questions. These behaviors ultimately hinder the achievement of optimal learning outcomes.

Self-Regulation in Learning

Pintrich (2000) refers to self-regulation as an active and constructive process in which learners set their own learning goals, then try to monitor, control, and regulate their cognition, motivation, and behavior. This suggests that self-regulation is key to keeping the learning process on track even without direct teacher supervision.

Zimmerman (2000) describes self-regulation through three phases: planning, implementing, and reflecting. Learners who successfully regulate themselves in all three phases are more likely to achieve higher academic outcomes.

Farah's (2019) research strengthens this idea by showing that self-regulation has a very significant contribution to learning outcomes, even surpassing the influence of external factors. In his study, Musarropah (2024) also emphasized

that the combination of learning independence and self-regulation creates a positive synergy that has a major impact on academic achievement.

The Relationship between Learning Independence and Self-Regulation on Learning Outcomes

Schunk and Zimmerman (2012) in their study emphasized that students who are able to integrate learning independence and self-regulation simultaneously have the ability to not only maintain high academic results, but also face academic challenges more adaptively. They develop a strong sense of self-confidence and resilience in the face of learning difficulties.

In the context of SMA Negeri 1 Agats, limited educational facilities and geographical challenges make learning independence and self-regulation crucial factors in determining success. Therefore, this study not only contributes theoretically to the understanding of internal factors in education, but also provides practical contributions in the context of education in remote areas.

METHODOLOGY

This study is an ex post facto study with a quantitative approach and using a correlational study method. The study was conducted in the odd semester of the 2024/2025 academic year at SMA Negeri 1 Agats, Asmat Regency, South Papua Province. The population in this study were all students of class XI IPA of SMA Negeri 1 Agats in the 2024/2025 academic year, totaling 84 students from three classes (XI IPA 1, XI IPA 2, and XI IPA 3). The sampling technique used simple random sampling, so that 45 students were obtained as research samples.

This study involved two independent variables, namely learning independence and self-regulation, and one dependent variable, namely student learning outcomes. Data collection techniques were carried out using questionnaires to measure learning independence and self-regulation, as well as learning outcome tests to obtain student academic achievement data. The data analysis techniques used were descriptive statistics to describe data characteristics, and inferential statistics to test research hypotheses. Analysis prerequisite tests included normality tests, linearity tests, and multicollinearity tests.

The data were analyzed using simple regression techniques to see the influence of each independent variable partially, as well as multiple regression to examine the simultaneous influence of learning independence and self-regulation on learning outcomes. Multiple regression analysis includes the calculation of the coefficient of determination, t-test, and F-test to test the significance of the relationship between variables.

RESEARCH RESULT

Descriptive Statistical Analysis Results

a. Descriptive Analysis of Learning Independence

Descriptive analysis results Descriptive analysis was conducted with the help of excel. The data obtained were median, mean, mode, maximum value, minimum value, range, and standard deviation. The data obtained can be seen in Table 1.

Table 1 Descriptive Learning Independence

Statistics	Statistical Values
Median	70
Mean	67.78
Mode	70
Minimum Value	34
Maximum Value	90
Range	56
Standard Deviation	12.55

Table 1 shows that the learning independence of students at SMA Negeri 1 Agats obtained through the instrument shows that the minimum value is 34 and the maximum value is 90, the average score obtained is 67.78 and the standard deviation is 12.55.

Table 2 Distribution of Learning Independence Scores

No	Interval	Frequency	Percentage
1	0-20	0	0
2	21-40	3	6.6
3	41-60	10	22.2
4	61-80	25	55.6
5	81-100	7	15.6
	amount	45	100

Table 2 shows that the percentage of learning independence in the 61-80 interval is 55.6, which is in the high category.

b. Descriptive Analysis of Self-Regulation

Table 3 Descriptive Self-Regulation

Statistics	Statistical Values
Median	74
Mean	69.22
Mode	70
Minimum Value	33
Maximum Value	90
Range	57
Standard Deviation	13.86

Table 3 shows that the self-regulation of students at SMA Negeri 1 Agats obtained through the instrument shows that the minimum value is 33 and the maximum value is 90. The average score obtained is 69.22 and the standard deviation is 13.86.

Table 4 Distribution of Self-Regulation Scores

No	interval	Frequency	Percentage
1	0-20	0	0
2	21-40	3	6.6
3	41-60	13	28.9
4	61-80	26	57.8
5	81-100	3	6.7
amount		45	100

Table 4 shows that the percentage of self-regulation in the 61-80 interval is 57.8, which is in the high category.

c. Descriptive Analysis of Learning Outcomes

Table 5 Descriptive Learning Outcomes

Statistics	Statistical Values
Median	72
Mean	71.62
Mode	70
Minimum Value	42
Maximum Value	90
Range	48
Standard Deviation	8.99

Table 6 Distribution of Learning Outcome Scores

No	interval	Frequency	Percentage
1	0-20	0	0
2	21-40	4	8.9
3	41-60	5	11.1
4	61-80	30	66.7
5	81-100	6	13.3
amount		45	100

Table 6 shows that the percentage of learning outcomes in the interval 61-80 is 66.7 which is in the good category.

Inferential Statistical Analysis Results

Before conducting the hypothesis test, several prerequisite analysis tests were carried out, namely the Normality test, Linearity test, Multicollinearity test. And heteroscedity test. The results of the prerequisite tests for analyzing this research data are:

a. Normality Test

Table 7. Normality Test

variable	Std.Deviation	Significance
Learning independence (X1)	8,068	0.200
Self-regulation (X2)		
Learning Outcome (Y)		

The results of the normality test calculations using SPSS for Windows version 26 showed that the three variables in this study were normally distributed.

b. Linearity Test

Table 8. Linearity Test

variable	F _{count}	Significance
Learning independence	8,253	0.009
Self-regulation		
Learning outcomes		

In Table 8, it can be seen that the linearity value is 0.009. This means that the linearity value is less than 0.05. It can be concluded that there is a linear relationship between the independent variable and the dependent variable. This means that learning independence, self-regulation and learning outcomes have a linear relationship.

c. Multicollinearity Test

Table 9 Multicollinearity Test

Variable	Tolerance Value	VIF Value
Learning independence	1,918	0.516
Self-regulation		

Table 9 shows that the Tolerance value is greater than 0.1 and the VIF value is less than 10.00. From Table 4.12, it can be seen that both independent variables have a Tolerance value of 0.516 which is above 0.1 and a VIF value of 1.938 which is far below 10. This shows that this model data does not experience multicollinearity.

d. Heteroscedity Test

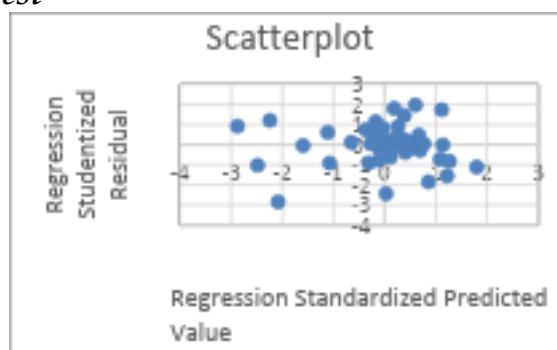


Figure 1. Heteroscedity Test

Figure 1 shows that the points are spread randomly without a particular pattern, it can be concluded that there is no heteroscedasticity problem.

- 1) First Hypothesis Test: The Effect of Learning Independence (X1) on Learning Outcomes (Y).

Table 10. Simple Regression Equation

Variable	Coefficient	R
constant	51,251	
X1	0.301	0.420

R ²	t value _{count}	Significance
0.176	0.302	0.004

Table 10 shows the regression coefficient value is positive, namely 0.301. The conclusion that can be drawn is that if learning independence increases by one unit, then chemistry learning outcomes will increase by 0.301 units, because it can be expressed in the equation $Y = 51.251 + 0.301X_1$.

The correlation coefficient value explained in Table 9 is 0.420. Because the value is positive, it can be concluded that there is a positive relationship between learning independence and learning outcomes. So, if learning independence increases, chemistry learning outcomes will also increase. The coefficient of determination is the square of the correlation coefficient. Based on Table 9, the coefficient of determination is 0.176. This shows the influence of the learning independence variable on learning outcomes by 17.6% while 82.4% is influenced by other variables not examined in this study. The significance test uses the t-test method. Based on the data analysis in Table 9, the significance value is 0.004, where $0.004 < 0.05$, while the t-test value_{table} seen at a significance level of 0.05 where $df = 45 - 2 - 1 = 42$ is 1.682 and the calculated t value is 3.032. This shows that $t_{count} > t_{table}$ ($3.032 > 1.682$) which means that learning independence has a significant influence on the chemistry learning outcomes of class XI IPA students at SMA Negeri 1 Agats.

- 2) Second Hypothesis Test: The Effect of Self-Regulation (X2) on Learning Outcomes (Y)

Table 11. Simple Regression Equation

Variable	Coefficient	R
Constant	54,236	
X2	0.251	0.150

R ²	t value _{count}	Significance
0.176	2,755	0.009

Table 11 shows the regression coefficient value is positive, namely 0.251. The conclusion that can be drawn is that if self-regulation increases by one unit, then the chemistry learning outcomes will increase by 0.251 units, because it can be expressed in the equation $Y = 54.236 + 0.251X_2$. The correlation coefficient value is 0.387, the value is positive, so it can be concluded that there is a positive relationship between self-regulation and learning outcomes. So, if self-regulation increases, chemistry learning

outcomes will also increase. The coefficient of determination is 0.150. This shows the influence of self-regulation variables on learning outcomes by 15.0% while 85% is influenced by other variables not examined in this study. The significance test uses the t-test method. Based on the data analysis obtained, the significance value is 0.009, where $0.009 < 0.05$, while the t-table test value is seen at a significance level of 0.05 where $df = 45 - 2 - 1 = 42$ is 1.682, and the calculated t value is 2.755. This shows that $t_{count} > t_{table}$ ($2.755 > 1.682$) which means that self-regulation has a significant influence on the chemistry learning outcomes of class XI IPA students of SMA Negeri 1 Agats.

- 3) Third Hypothesis Test of the Influence of Learning Independence (X1) and Regulation Self (X2) Towards Learning Outcomes (Y).

Table 12. Multiple Regression Equation

Variable	F Value _{count}	Significance
Independence Learn (X1) Regulation Self (X2)	5,047	0.005

Table 12 obtained a significance value of 0.005, this shows that $0.005 < 0.05$, and the F value_{table} of 3.23 while the calculated F value is 5.047, this shows that $F_{count} > F_{table}$ ($3.23 > 5.047$) which means that H_0 rejected and H_a accepted Thus, learning independence and self-regulation have a simultaneous influence on the chemistry learning outcomes of class XI IPA students at SMA Negeri 1 Agats.

DISCUSSION

The Influence of Learning Independence on Chemistry Learning Outcomes of Class XI IPA Students of SMA Negeri 1 Agats. Based on the results of the study of the influence of independence on chemistry learning outcomes in class XI IPA students of SMA Negeri 1 Agats, a significance value of 0.004 was obtained, where $0.004 < 0.05$, while the t-table test value was seen at a significance level of 0.05 where $df = 45 - 2 - 1 = 42$ was 1.682 and the calculated t value was 3.032. This shows that $t_{count} > t_{table}$ ($3.032 > 1.682$) which means that learning independence has a significant influence on the chemistry learning outcomes of class XI IPA students of SMA Negeri 1 Agats.

Previous studies have shown that learning independence has a positive and significant influence on student learning outcomes, including those stated by Wiriani (2021), stating that learning independence has a significant influence on learning outcomes. This shows that the higher the student's learning independence, the higher the learning outcomes achieved.

The implication in this study is the importance of educators to help students in increasing their learning independence so that they are able to carry out learning activities on their own initiative without relying too much on others and can monitor, evaluate and organize their own learning activities, make good use of

time, be able to direct and control themselves in thinking and acting so as to get good learning outcomes.

The Influence of Self-Regulation on Chemistry Learning Outcomes of Class XI IPA Students of SMA Negeri 1 Agats. Based on the inferential test data, it shows that the regression equation: $\hat{Y} = 54.236 + 0.251X_2$, from the analysis results obtained a significance value of 0.009, where $0.009 < 0.05$, while the t table test value is seen at a significance level of 0.05 where $df = 45 - 2 - 1 = 42$ is 1.682, and the calculated t value is 2.755. This shows that $t_{count} > t_{table}$ ($2.755 > 1.682$) which means that self-regulation has a significant influence on the chemistry learning outcomes of class XI IPA students of SMA Negeri 1 Agats.

Various studies have shown that self-regulation has a positive effect on student learning outcomes. Self-regulation, which includes the ability to regulate thoughts, feelings, and behaviors in the learning process, plays an important role in academic achievement.

A study by Suwanri (2024) at SMP Negeri 11 Sungai Penuh found that self-regulation had a positive and significant effect on student learning outcomes in Islamic Religious Education subjects. The results of the analysis showed that the better the students' self-regulation, the better their learning outcomes would be. Research conducted by Hastuti and Muhlisah (2019), at MAN 1 Bulukumba also stated that self-regulation had a positive and significant effect on the biology learning outcomes of class XI MIA students. In other words, the higher the self-regulation a student has, the better the learning outcomes achieved.

Overall, these findings confirm that self-regulation is an important factor that influences student learning outcomes. Therefore, efforts to improve self-regulation in students need to be a concern in the education process. The Influence of Learning Independence and Self-Regulation on Chemistry Learning Outcomes of Class XI IPA Students of SMA Negeri 1 Agats. Based on the results of the study and the results of data analysis, it shows that there is an influence of learning independence and self-regulation on chemistry learning outcomes in class XI IPA students at SMA Negeri 1 Agats, in accordance with the research data showing the results of the inferential test that the multiple linear regression equation has a statistical significance of 0.005, this shows that $0.005 < 0.05$, and the F table value is 3.23 while the F count value is 5.047, this shows that $F_{count} > F_{table}$ ($3.23 > 5.047$) which means that H_0 is rejected and H_1 is accepted. Thus, learning independence and self-regulation have a simultaneous effect on the chemistry learning outcomes of class XI IPA students at SMA Negeri 1 Agats.

In line with the theory put forward by Bandura (1986), that individuals who have learning independence have a direct impact on learning outcomes, because students who are able to manage themselves in learning tend to be more effective in understanding material, overcoming difficulties, and achieving academic goals. Similar to self-regulation, self-regulation is the ability or capability of a person in this case students to manage themselves, feelings, behavior and learning environment and will evaluate and monitor their learning activities. This self-regulation will help students to support their learning activities. Self-regulation has a major influence on learning outcomes, because if there is no good self-regulation in learning, students will have difficulty managing learning so that it

will affect their learning outcomes. Therefore, learning independence and self-regulation both have an influence on chemistry learning outcomes.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

1. Learning independence has a positive effect on the chemistry learning outcomes of class XI IPA students at SMA Negeri 1 Agats.
2. Self-regulation has a positive effect on the chemistry learning outcomes of class XI IPA students at SMA Negeri 1 Agats.
3. Learning independence and self-regulation jointly influence the chemistry learning outcomes of class XI IPA students at SMA Negeri 1.

Recommendation

1. For educators
 - a. Educators should provide more opportunities for students to learn independently.
 - b. Educators should use self-regulation-based learning strategies so that students are better able to manage their own learning process.
 - c. Providing guidance to students who have low learning independence and self-regulation with more flexible and adaptive learning techniques.
2. For Schools
 - a. Providing a learning environment that supports students' independent learning, for example with adequate library facilities, good internet access, and conducive study rooms.
 - b. Schools can hold training programs or workshops on self-regulation strategies in learning, both for students and teachers, to increase the effectiveness of learning.
 - c. Encourage teachers to apply a differentiated approach, so that teaching methods can be adjusted to the level of learning independence and self-regulation of each student.
3. For further researchers.
 - a. Further research could expand the scope by involving larger samples or using more in-depth research methods, such as qualitative approaches to understand the psychological factors that influence learning independence and self-regulation.
 - b. Using more specific and comprehensive learning independence and self-regulation measurement instruments so that research results are more accurate.

It is hoped that further researchers can examine other factors that can influence learning independence, self-regulation and student learning outcomes such as learning styles, learning interests and so on.

ADVANCED RESEARCH

Every study has limitations that need to be considered, including this study. One of the limitations is the limited sample size of only 45 students at SMA Negeri 1 Agats, which may not fully represent the wider population. In addition, this study only measured two psychological variables, namely learning

independence and self-regulation, without considering other factors that may also influence learning outcomes, such as learning styles, learning interests, or social support. Therefore, further research is recommended to expand the scope by using a larger and more representative sample, and involving additional, more specific variables, such as learning styles or other emotional factors. A more in-depth qualitative approach can also be used to further explore the psychological factors that influence independence and self-regulation, and to provide a more holistic insight into their influence on student learning outcomes.

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