



RESEARCH ARTICLE

Enhancing Cognitive Learning Outcomes in Geography Through Self-Directed Learning: A Pre-Experimental Study

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ABSTRACT

This study aims to examine the effect of the self-directed learning model on students' cognitive learning outcomes in Geography among grade XI students at SMA Negeri 10 Bandar Lampung in the 2025/2026 academic year. The study was motivated by the relatively low level of students' cognitive achievement in Geography, indicating the need for a learning model that can promote learning independence and improve students' understanding. This research employed a quantitative approach using an experimental method with a one-group pretest–posttest design. The sample was selected through purposive sampling, with class XI M.4 as the research sample. The research instruments included pretest and posttest questions to measure students' cognitive learning outcomes and a self-directed learning questionnaire to assess students' learning independence. Data were analyzed using a paired sample t-test and simple linear regression. The results showed a significant increase in students' cognitive learning outcomes, with the mean score improving from 51.44 on the pretest to 85.89 on the posttest ($p < 0.05$). Furthermore, the self-directed learning model had a statistically significant effect on students' cognitive learning outcomes in Geography. However, this study is limited by the use of a one-group experimental design without a control group, which may affect the generalizability of the findings.

Keywords: self-directed learning, cognitive learning outcomes, geography education, pre-experimental design, student independence



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1. INTRODUCTION

Education plays a crucial role in developing human resources and supporting national development. Law of the Republic of Indonesia Number 20 of 2003 states that education is a conscious and planned effort to develop students' potential, including spiritual strength, self-control, personality, intelligence, and skills needed for themselves and society (Hakim, 2016). In the educational process, learning becomes a central activity that involves interaction between teachers, students, and learning resources to facilitate the acquisition of knowledge, skills, and attitudes (Sarahono et al., 2024). Therefore, the effectiveness of

learning greatly depends on the appropriate management of learning components such as objectives, materials, methods, media, and evaluation (Rosita, 2018).

Despite its important role, the quality of learning in schools still faces several challenges. The results of the Programme for International Student Assessment (PISA) 2022 show that Indonesia ranked 70th out of 80 participating countries in reading literacy. This condition indicates that the learning process has not yet fully developed students' cognitive abilities and higher-order thinking skills (Susanto et al., 2024). One of the contributing factors is the limited use of innovative learning models that encourage active student participation. Teachers therefore play an important role in selecting appropriate learning models that can support meaningful learning and improve students' understanding (Aisyi & Rahmanto, 2025; Widodo et al., 2022).

In Geography learning, instructional practices are still frequently dominated by lectures and memorization activities, resulting in teacher-centered learning. Such conditions may reduce student participation, limit opportunities for critical thinking, and make it difficult for students to relate geographic concepts to real-world situations (Insani et al., 2023). As a result, students may experience difficulties in understanding and applying geographic concepts meaningfully.

Initial observations conducted at SMA Negeri 10 Bandar Lampung revealed that students experienced difficulties in understanding the topic of Indonesia's Strategic Position. Many students were unable to clearly explain Indonesia's geographical location, relate it to astronomical and geological conditions, or analyze its implications for various aspects of life. In addition, classroom activities tended to be teacher-centered, which limited students' active involvement in the learning process. To support these observations, data from the odd semester midterm examination in the 2024/2025 academic year were analyzed. The results are presented in Table 1.

Table 1. Midterm Examination Results of Grade XI Geography Students at SMA Negeri 10 Bandar Lampung

Class	Student Learning Outcomes		Number of Students
	Score <76	Score ≥76	
XI M.2	24	12	36
XI M.3	21	15	36
XI M.4	24	12	36
Total	69	39	108
Percentage	63.89%	36.11%	100%

Source: State Senior High School 10, Bandar Lampung, Academic Year 2024/2025

Based on Table 1, it can be seen that only 63.89% of students achieved the Minimum Passing Grade (KKM) of 76, while 36.11% scored below the required standard. These results indicate that students' learning outcomes in Geography have not yet reached optimal levels. This condition suggests the need for a learning approach that can encourage students to become more active and independent in the learning process.

One learning approach that can potentially address this issue is self-directed learning. Self-directed learning encourages students to take responsibility for their own learning process, including planning, implementing, and evaluating their learning activities (Cahyaningsih et al., 2020). According to Knowles, the self-directed learning model consists of several stages: preplanning, creating a conducive learning environment, developing a learning plan, identifying appropriate learning activities, implementing and monitoring learning activities, and evaluating learning outcomes (Sidmewa et al., 2021). This model encourages students to become active learners who are able to construct knowledge independently.

The application of self-directed learning is also consistent with the principles of the Merdeka Curriculum, which emphasizes deep learning and the development of students' analytical and reflective thinking skills (Mahardika & Afriyanti, 2023). Previous studies have shown that the implementation of self-directed learning can improve students' independence and responsibility in learning (Rahmaningrum & Suprijono, 2023). From a theoretical perspective, this approach aligns with cognitive learning theory,

which views learning as an active mental process in which students organize, interpret, and connect new information with prior knowledge. In Bloom's revised taxonomy, cognitive learning outcomes include several levels of thinking skills, namely remembering, understanding, applying, analyzing, evaluating, and creating (Oktaviana & Prihatin, 2018).

However, previous studies have generally focused on the influence of self-directed learning on students' learning independence or motivation, while studies examining its direct effect on cognitive learning outcomes in Geography at the senior high school level are still limited. In addition, empirical research that integrates the self-directed learning model with Geography learning topics such as Indonesia's Strategic Position remains scarce. Therefore, this study seeks to fill this gap by examining the effect of the self-directed learning model on students' cognitive learning outcomes in Geography. The novelty of this research lies in its focus on measuring the impact of self-directed learning on students' cognitive achievement in Geography learning within the context of Indonesian senior high schools. Based on these considerations, this study aims to analyze the effect of the self-directed learning model on the cognitive learning outcomes of grade XI students at SMA Negeri 10 Bandar Lampung.

2. LITERATURE REVIEW

1. Self-Directed Learning

Self-directed learning is a learning approach that emphasizes students' independence in managing their own learning process. According to (Cahyaningsih et al., 2020), self-directed learning allows students to take initiative in determining learning needs, setting learning goals, selecting appropriate learning strategies, and evaluating their own learning outcomes. In this model, students are not only recipients of information but also active participants who are responsible for directing their own learning activities.

Knowles proposed several stages in the implementation of self-directed learning. These stages include: (1) preplanning, where students prepare themselves for the learning process; (2) creating a conducive learning environment that supports motivation and active participation; (3) developing a learning plan by determining strategies and learning objectives; (4) identifying relevant learning activities based on students' needs and interests; (5) implementing and monitoring learning activities; and (6) evaluating learning outcomes to measure the achievement of learning objectives (Sidmewa et al., 2021). Through these stages, students are encouraged to become independent learners who are able to regulate and evaluate their own learning processes.

The implementation of self-directed learning is also aligned with the direction of the Merdeka Curriculum, which emphasizes deep learning and student-centered learning. In this curriculum, students are expected not only to understand concepts but also to analyze and apply knowledge in meaningful ways (Mahardika & Afriyanti, 2023). Therefore, self-directed learning is considered an appropriate learning approach to support the development of students' learning independence and critical thinking skills.

2. Cognitive Learning Theory

The concept of self-directed learning is closely related to cognitive learning theory. Cognitive theory views learning as an active mental process in which learners construct knowledge by processing information, organizing ideas, and connecting new knowledge with previous experiences. In this perspective, students play an active role in building their own understanding through exploration, analysis, and reflection (Rahmaningrum & Suprijono, 2023).

Cognitive theory emphasizes that effective learning occurs when students are actively involved in the learning process. Learning activities that encourage exploration, discussion, and problem-solving can help students develop deeper understanding and higher-order thinking skills. Therefore, learning models

that promote active student participation are considered more effective in improving students' cognitive learning outcomes.

The application of self-directed learning supports the principles of cognitive learning theory because it encourages students to actively regulate their own learning processes. Through independent planning, monitoring, and evaluation of learning activities, students are able to develop meaningful understanding and strengthen their cognitive abilities.

3. Cognitive Learning Outcomes Based on Bloom's Taxonomy

Learning outcomes represent the abilities acquired by students after participating in the learning process. In educational assessment, learning outcomes are often categorized into three domains: cognitive, affective, and psychomotor. Among these domains, the cognitive domain is commonly used to measure students' understanding and mastery of subject matter.

According to Bloom's revised taxonomy, the cognitive domain consists of six levels of thinking skills: remembering, understanding, applying, analyzing, evaluating, and creating. Anderson and Krathwohl explain that these levels represent a hierarchy of cognitive processes that range from basic knowledge recall to higher-order thinking skills (Oktaviana & Prihadin, 2018). In the learning process, students are expected to gradually develop these cognitive abilities in order to achieve deeper understanding of the subject matter.

In Geography learning, cognitive learning outcomes are particularly important because students are required not only to memorize geographical concepts but also to analyze spatial relationships, interpret geographic phenomena, and apply their knowledge to real-world situations. Therefore, learning approaches that encourage active engagement and independent exploration are expected to improve students' cognitive learning outcomes.

4. Previous Studies and Research Framework

Several previous studies have shown that the implementation of self-directed learning can positively influence students' learning processes. Research conducted by Rahmaningrum and Suprijono (2023) found that the self-directed learning model improves students' learning independence and responsibility in the learning process. Other studies also indicate that student-centered learning approaches can enhance student engagement and promote deeper understanding of learning materials.

However, most previous studies mainly focus on the impact of self-directed learning on students' motivation or learning independence. Empirical studies that specifically examine its effect on students' cognitive learning outcomes in Geography learning at the senior high school level are still limited. In addition, research that integrates the self-directed learning model with Geography topics such as Indonesia's Strategic Position remains relatively scarce.

Based on these considerations, this study seeks to examine the effect of the self-directed learning model on students' cognitive learning outcomes in Geography. The conceptual framework of this study assumes that the implementation of self-directed learning encourages active student participation, independent learning processes, and deeper understanding of learning materials, which ultimately contribute to improved cognitive learning outcomes.

3. METHOD

This study employed a quantitative approach using an experimental method. The research design applied was a quasi-experimental one-group pretest-posttest design, in which students were tested before and after the implementation of the self-directed learning model. The pretest was conducted to measure students' initial cognitive learning outcomes, while the posttest was administered after the learning intervention to determine changes in students' achievement. Through this design, the effect of

the self-directed learning model on students' cognitive learning outcomes in Geography could be examined.

The research was conducted from July 21 to July 31, 2025, following the academic calendar and the learning schedule for the odd semester of the 2025/2026 academic year at SMA Negeri 10 Bandar Lampung. The research location was selected based on several considerations, including the suitability of the learning materials, the readiness of teachers and students, and the availability of supporting learning facilities.

The population of this study consisted of all grade XI students at SMA Negeri 10 Bandar Lampung who selected Geography as a subject in the current academic year. The sample was determined using purposive sampling, resulting in one class, XI M.4, with a total of 36 students. This class was selected based on several considerations, including a conducive classroom atmosphere, relatively stable student attendance, and recommendations from the Geography teacher. In addition, the academic abilities of students in this class were considered representative of the general characteristics of grade XI students.

Data were collected using tests, questionnaires, and documentation. The test instruments consisted of pretest and posttest questions used to measure students' cognitive learning outcomes in Geography. A self-directed learning questionnaire was used to measure students' level of learning independence during the learning process. Meanwhile, documentation techniques were used to collect supporting data related to the implementation of the learning process and the research setting.

Before being used in the research, the test instruments were examined for validity, reliability, difficulty level, and discrimination index to ensure the quality of the assessment items. The questionnaire instrument was tested for validity and reliability to ensure that it accurately measured students' learning independence. Data analysis was conducted using descriptive statistics, followed by prerequisite tests including normality and linearity tests. Hypothesis testing was performed using the paired sample t-test to determine differences between pretest and posttest scores, and simple linear regression analysis to examine the influence of the self-directed learning model on students' cognitive learning outcomes.

Although the one-group pretest–posttest design allows researchers to measure changes before and after the learning intervention, this design has certain methodological limitations. The absence of a control group may reduce the internal validity of the study because changes in learning outcomes could potentially be influenced by external factors such as history effects, maturation, or testing effects. However, this design was selected due to practical considerations, including the limited number of available classes and school policies that did not allow the formation of separate control groups during the learning process. Despite these limitations, the use of pretest and posttest measurements still provides useful information about the changes in students' learning outcomes after the implementation of the self-directed learning model.

Future studies are therefore recommended to employ experimental designs that include control groups, such as a pretest–posttest control group design, in order to strengthen internal validity and provide more robust evidence regarding the effectiveness of the self-directed learning model in Geography learning.

4. RESULTS AND DISCUSSION

4.1 Results

The research location map in Figure 1 shows the location of SMA Negeri 10 Bandar Lampung in Lampung Province, Indonesia. The school is located at Jalan Gatot Subroto No. 81, Kelurahan Tanjung Gading, Kecamatan Teluk Betung Utara, Bandar Lampung City, Lampung Province, with the postal code 35226. Geographically, Bandar Lampung City is located at coordinates 5°20'–5°30' South Latitude and

105°28'–105°37' East Longitude. The school is located in an easily accessible urban area and is supported by adequate educational facilities. SMA Negeri 10 Bandar Lampung has an area of 7,395 m², consisting of classrooms, learning support facilities, and a school environment that supports teaching and learning activities. The relatively conducive school environment was one of the considerations in conducting this study, as it can affect the comfort and involvement of students during the learning process.

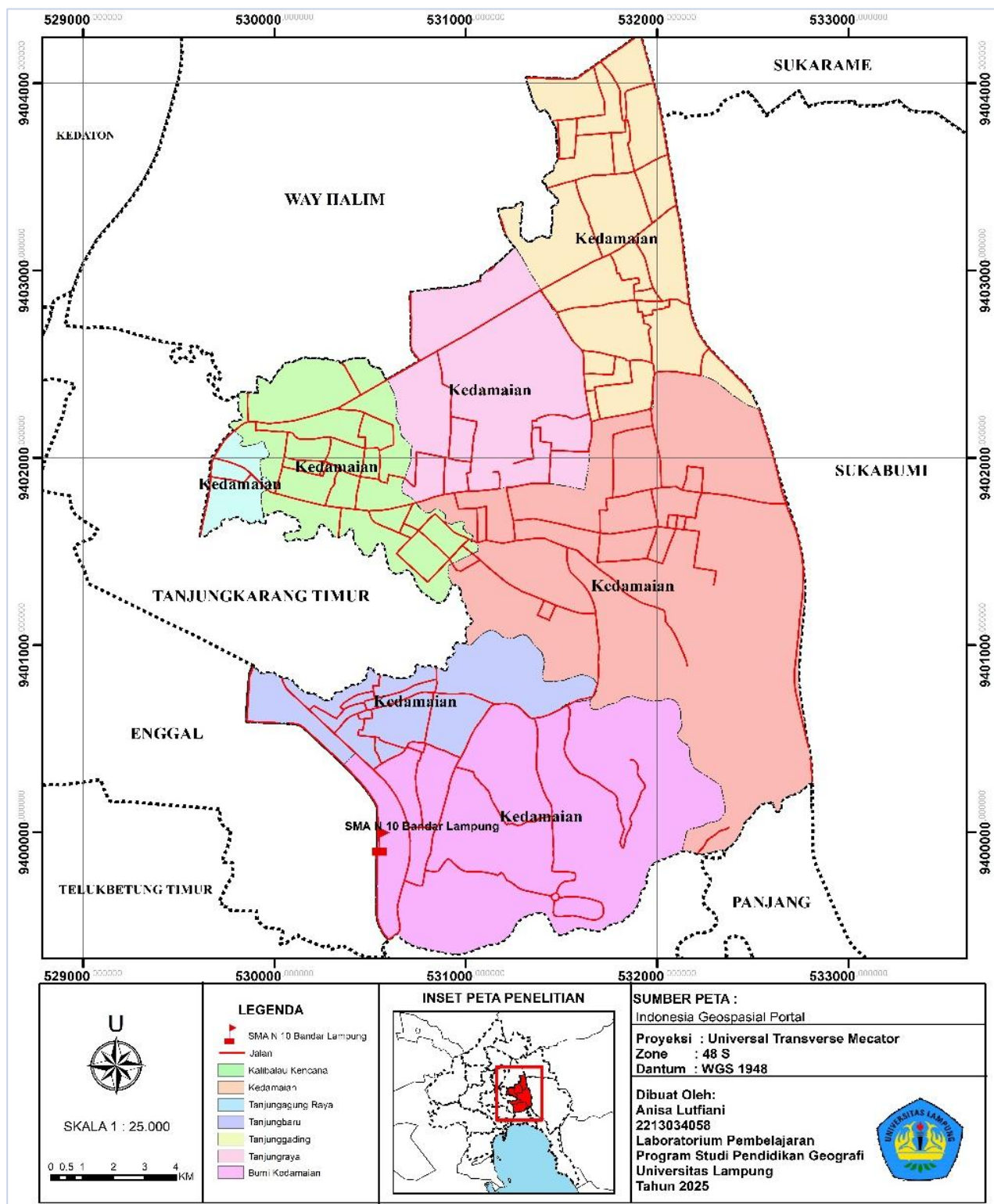


Figure 1. Location Map of Research at State Senior High School 10 Bandar Lampung in 2025

Source: ArcGIS Mapping Results, 2025

Descriptive Analysis

State Senior High School 10 Bandar Lampung was the research location used by researchers to test the effect of self-directed learning on students' geography learning outcomes. The data or results of this study were in the form of pretest and posttest scores, as well as self-directed learning questionnaires in the experimental class, which were analyzed descriptively to determine the maximum, minimum, average, and standard deviation scores.

Table 2. Pre-test Score Data (Complete and Incomplete)

No	Class	Grade	
		≥76 (Pass)	≤76 (Fail)
1	Experimentation	0	36
	Total	0	36

Source: Recapitulation of Pre-test Results, 2025

Based on Table 2 above, it can be explained that the analysis of pretest and posttest data on cognitive learning outcomes obtained the average pretest scores of students in one sample class. Furthermore, based on the pretest score data in Table 2, the pretest score data for the experimental class can be interpreted in intervals using the Struges formula. The researcher calculated the length of the interval using the Struges formula (Sugiyono, 2017), as follows:

Class Range = Maximum Score - Minimum Score

Number of Classes = 1 + 3.3 Log n

Class Interval Length = Class Interval Length / Number of Classes

Table 3. Frequency Distribution of Pre-test Scores

No	Class Interval	Frequency (f) — Experiment
1	24 – 30	3
2	31 – 37	3
3	38 – 44	6
4	45 – 51	4
5	52 – 58	7
6	59 – 65	7
7	66 – 72	6
—	Total	36
—	Mean	51.44
—	Median	52
—	Mode	52

Source: Recapitulation of Experimental Class Test Results, 2025

Based on Table 3, the frequency distribution of pretest scores ranged from a low of 24 to a high of 72. The dominant score intervals in the class were 52–58 and 59–65. After administering the pretest at the beginning of the lesson, a posttest was administered at the end of the lesson. The following are the posttest scores for the experimental class.

Table 4. Post-test Score Data (Complete and Incomplete)

No	Class	Grade	
		≥76 (Pass)	≤76 (Fail)
1	Experimentation	33	3
	Total	33	3

Source: Recapitulation of Post-test Results, 2025

The analysis of the final posttest data on student learning outcomes shows a significant difference. There is a difference in the number of students who achieved the Learning Objective Achievement Criteria (KKTP) (complete) in one class as shown in Table 4 of the experimental class posttest data (Complete and Incomplete). The following is a table of the experimental class posttest score intervals.

Table 5. Frequency Distribution of Post-test Scores

No	Class Interval	Frequency (f) — Experiment
1	68 – 72	3
2	73 – 77	2
3	78 – 82	6
4	83 – 87	6
5	88 – 92	13
6	93 – 97	4
7	≥98	2
—	Total	36
—	Mean	85.89
—	Median	88
—	Mode	88

Source: Recapitulation of Experimental Class Test Results, 2025

Based on Table 5, the frequency distribution of posttest scores in the experimental class shows that students’ scores are spread across the range of 68 to 100. The lowest score is in the interval 68–72 with a frequency of 3 students, while the highest score is in the interval above 98 with a frequency of 2 students. The most dominant score interval is 88–92 with 13 students, indicating that most students obtained high scores after participating in the learning process. The mean score is 85.89, the median is 88, and the mode is 88, indicating that the students’ scores tend to be in the high category and relatively centered in that interval.

The distribution of posttest scores shows a fairly even increase in learning outcomes in the experimental class after the implementation of the learning process. This can be seen from the dominance of scores in the middle to high range, particularly in the 78–97 range, which covers most of the students. After the learning process began with a pretest to determine the students’ initial abilities and ended with a posttest, these results show that the learning process implemented was able to significantly improve the students’ understanding. Furthermore, to clarify the comparison of learning outcomes, graphs of pretest, posttest, and N-Gain measurements are presented.

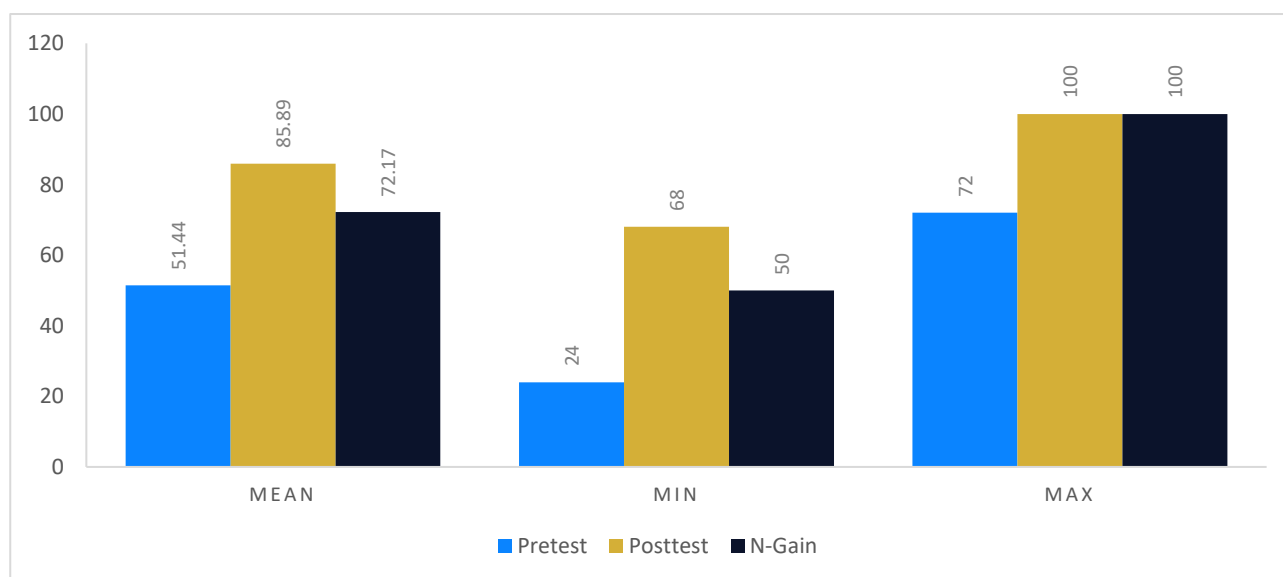


Figure 2. Graph of Pretest, Posttest, and N-Gain Measurement Results

Source: Recapitulation of Experimental Class Test Results, 2025

Based on the results of the pretest, posttest, and N-gain measurements, there was a clear improvement in ability after the lessons were delivered. The students' average score increased from 51.44 on the pretest to 85.89 on the posttest, indicating a strong improvement in understanding. The minimum score also rose from 24 to 68, showing that even the lowest-achieving students experienced significant progress. Meanwhile, the maximum score increased from 72 to 100, indicating that some students were able to achieve optimal results. The N-gain score, which ranged from 50 to 100, with an average of 72.17, indicated a high level of improvement. Overall, the data showed that the learning methods used were able to consistently improve student learning outcomes across all ability groups.

After obtaining the results regarding cognitive learning, the following is an analysis of the questionnaire data used to support the learning outcome data and show the positive responses of students to the implementation of the independent learning model.

Table 6. Descriptive Statistics of Self-Directed Learning

Statistic	Value
Minimum	2
Maximum	5
Mean (M)	4.21
Std. Dev. (SD)	0.79

Source: Results of the Experimental Class Questionnaire, 2025

Based on Table 6, self-directed learning data shows that all indicators K1 to K30 are in the range of 2 to 5, with an average that is generally above 4. This indicates that students' independent learning abilities are high in almost all aspects. Several indicators, such as K15 and K30, have the highest average scores, namely 4.50 and 4.56, indicating that students are very strong in terms of initiative and the ability to manage their learning process. Meanwhile, indicators with lower averages, such as K10 (3.94) and K11 (3.97), show that although they are still in the good category, there is room for improvement in consistency and self-evaluation. The standard deviation values ranging from 0.599 to 0.955 also indicate that the data distribution is relatively stable, so that students' perceptions of self-directed learning tend to be evenly distributed. Overall, this table illustrates that students in the experimental class have a strong level of self-directed learning across various competency indicators.

Data Analysis Prerequisite Test Results

Then, research prerequisite tests were conducted. Before testing the research hypothesis, the research prerequisites were tested first, namely normality and linearity tests. These research prerequisite tests used pretest and posttest data from the experimental class. First, the data was tested for normality to determine whether the research data was normally distributed or not. The normality test used IBM SPSS 27 for Windows, with the following results:

Table 7. Normality Test Results

Class	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-test	.099	36	.200*	.963	36	.268
Pos-test	.131	36	.124	.961	36	.231

Source: SPSS Data Processing Results based on Pretest-Posttest Results, 2025

Based on Table 7, it can be explained that the significance values in the Kolmogorov-Smirnov^a column indicate that the significance values listed in the normality test are greater than 0.05 in the pretest and posttest. The next normality test, listed in the Shapiro-Wilk column, shows that the significance values listed in the normality test are greater than 0.05 in the pretest and posttest. Thus, based on the normality test, it shows that the pretest and posttest data are normally distributed.

Next, to prove the validity of the data, a second prerequisite test was conducted, namely a linearity test. The linearity test was used to determine whether the independent and dependent variables had a linear relationship. The linearity test was calculated using IBM SPSS 27 for Windows. The results of the linearity test were obtained based on the pretest and posttest scores of the students in the experimental class, as follows:

Table 8. Linearity Test Results

		Sum of Squares	df	Mean Square	F	Sig.
Posttest * Pretest	(Combined)	1728.889	12	144.074	5.931	.000
	Linearity	1219.524	1	1219.524	50.207	.000
	Dev. from Linearity	509.365	11	46.306	1.906	.093
	Within Groups	558.667	23	24.290		
	Total	2287.556	35			

Source: SPSS Data Processing Results based on Pretest-Posttest Results, 2025

Based on Table 8, the linearity test results show a significance value for linearity of 0.000 (< 0.05) and a significance value for deviation from linearity of 0.093 (> 0.05). This indicates that the relationship between the pretest and posttest scores is significant and linear, so the hypothesis test uses a parametric test.

Hypothesis Test Results

The research prerequisites have been met, so data analysis can proceed to the hypothesis testing stage. Hypothesis testing in this study uses quantitative data obtained from the results of applying the self-directed learning model in the experimental class. The quantitative data used in hypothesis testing includes students' cognitive learning pretest and posttest scores and the relationship between the application of the self-directed learning model as an independent variable and cognitive learning outcomes as a dependent variable.

The first hypothesis test aims to determine the difference in students' cognitive learning outcomes before and after the implementation of the self-directed learning model. This hypothesis test was conducted using a paired sample t-test, because the data compared were the pretest and posttest scores of the same subjects. The decision criterion in this test is that if the significance value (sig. 2-tailed) is less than 0.05, there is a significant difference between the pretest and posttest scores.

Table 9. Paired Sample T-Test Results

		N	Correlation	Sig.
Pair 1	Pretest & Posttest	36	.730	<.000

Source: Data Processing Results Using SPSS Application, 2025

Based on Table 9, the paired samples correlations test, it is known that the sample size (N) was 36 students with a correlation coefficient of 0.730 and a significance value of 0.000 (< 0.05). These results indicate that there is a strong and significant relationship between pretest and posttest scores. A positive correlation value indicates that the higher the students' pretest scores, the higher their posttest scores tend to be. Thus, it can be concluded that there is a close relationship between students' learning outcomes before and after the implementation of the self-directed learning model.

The second hypothesis in this study aims to determine the effect of the self-directed learning model on students' cognitive learning outcomes. In this hypothesis, the self-directed learning model acts as the

independent variable, while students' cognitive learning outcomes act as the dependent variable. To test this hypothesis, simple linear regression analysis was used, as this study only involved one independent variable and one dependent variable. Decision making in simple linear regression testing is based on the significance value (Sig.). If the significance value is less than 0.05, it can be concluded that the independent variable has a significant effect on the dependent variable.

a. Simple Linear Regression Test

Table 10. Simple Linear Regression Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1722.119	1	1722.119	103.552	<.000
	Residual	565.436	34	16.630		
	Total	2287.556	35			

a. Dependent Variable: Post-test

b. Predictors: (Constant), Questionnaire

Source: Data Processing Results Using SPSS Application, 2025

Based on Table 10, the results of simple regression analysis in the ANOVA table show a calculated F value of 103.552 with a significance value of < 0.000 (< 0.05). These results indicate that the regression model is significant, so it can be concluded that the self-directed learning model has a significant effect on students' cognitive learning outcomes. Thus, the research hypothesis stating that the self-directed learning model has an effect on students' cognitive learning outcomes can be accepted.

b. Coefficient of Determination Test

The determination coefficient test is used to measure how well the independent variable (X) explains the dependent variable (Y) in regression analysis.

Table 11. Coefficient of Determination Test Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.868 ^a	.753	.746	4.078

Source: Data Processing Results Using SPSS Application, 2025

The coefficient of determination test resulted in an R^2 value of 0.753. The higher the R^2 value, the better the regression model is at explaining the dependent variable. A value of 0.753 indicates that the model has a strong ability to explain the relationship between the self-directed learning model variable (X) and cognitive learning outcomes (Y) by 75.3%. The remaining 24.7% is influenced by other factors.

Discussion

This discussion aims to interpret the results of data analysis related to the effect of implementing a self-directed learning model on the cognitive learning outcomes of 11th grade students at SMA Negeri 10 Bandar Lampung.

Based on the results of the Paired Sample T-Test, a significance value of $0.000 < 0.05$ was obtained, indicating a significant difference between students' learning outcomes before and after the implementation of the self-directed learning model. These results prove that the implementation of self-directed learning has a real impact on improving students' cognitive learning outcomes in geography. Thus, it can be concluded that the self-directed learning model is effective in improving the cognitive learning outcomes of 11th grade students at SMA Negeri 10 Bandar Lampung.

In addition, the results of simple linear regression analysis show that self-directed learning has a significant effect on students' cognitive learning outcomes. The significance value obtained is less than 0.05, indicating that an increase in the level of student learning independence is directly proportional to

the increase in cognitive learning outcomes achieved. This finding confirms that students' ability to manage and direct their learning process independently contributes significantly to the success of geography learning.

The results of this study are in line with research conducted by Nurholifah et al. (2024), which states that independent learning-based learning has a positive effect on students' cognitive learning outcomes. Another study by Pujiantiningtyas et al. (2022) also found that learning models that emphasize independent learning planning and management can significantly improve learning outcomes compared to teacher-centered learning. These findings reinforce the results of this study that self-directed learning is an effective learning model in improving students' cognitive achievements.

Theoretically, the self-directed learning model provides learners with the opportunity to take control of their learning process, from planning learning strategies and selecting learning resources to conducting self-evaluations. This process encourages students to actively engage in higher-order thinking, such as analysis, synthesis, and evaluation. This type of learning, which places students as active subjects, is in line with cognitive theory, which emphasizes that learning is an active mental process that occurs within learners. This condition enables learners to develop a deeper and more meaningful understanding of the learning material (Salahuddin et al., 2025).

These research findings are also supported by Baharuddin et al. (2022), who state that the application of self-directed learning can increase students' learning independence and academic achievement. In line with this, Handayani (2017) also shows that the self-directed learning model can improve learning achievement because it provides space for students to independently organize, control, and evaluate their learning process. This empirical support further confirms that the application of self-directed learning contributes positively to improving students' cognitive learning outcomes.

Although there was a general increase in cognitive learning outcomes, the results of the study also showed that there were still some students who did not achieve the Minimum Passing Criteria (KKM) on the post-test results. Nanda and Handayani (2025) state that internal and external factors influence students' learning difficulties, such as student involvement in various activities outside the classroom that affect concentration, learning time management, and academic readiness. Students who are unable to manage their learning time well tend to have difficulty following the learning process optimally.

These findings are in line with research by Fadhilah and Mukhlis (2021), which states that concentration disorders in the learning process can have an impact on low student learning outcomes. In addition, Anggreni and Agustang (2023) also found that excessive student involvement in extracurricular activities can cause fatigue and decreased focus on learning in the classroom.

The implications of this research show that teachers need to transform from their role as instructors to facilitators of learning who guide students in developing independent learning skills. Teachers can provide guidance to students in setting learning goals, choosing appropriate strategies, providing diverse learning resources, and conducting structured reflection and self-evaluation. Thus, the application of the self-directed learning model can not only improve students' cognitive learning outcomes but also shape independent learning skills that are essential for 21st-century learning.

5. CONCLUSION

Based on the research findings and discussion, it can be concluded that the implementation of the self-directed learning model has a positive effect on the cognitive learning outcomes of grade XI students at SMA Negeri 10 Bandar Lampung in the 2025/2026 academic year. The application of this learning model encourages a more active, independent, and student-centered learning process, which is in line with the principles of deep learning promoted in the Merdeka Curriculum. The results of the study indicate that students' cognitive learning outcomes improved significantly after the implementation of the self-directed learning model.

From a theoretical perspective, this study contributes to the development of learning theory by providing empirical evidence that the self-directed learning approach can support the improvement of students' cognitive learning outcomes, particularly in Geography learning at the senior high school level. The findings also reinforce the relevance of cognitive learning theory, which emphasizes the importance of active student participation in constructing knowledge.

In terms of practical implications, the results of this study suggest that teachers can utilize the self-directed learning model as an alternative learning strategy to promote student independence and improve learning outcomes. The implementation of this model can encourage students to take greater responsibility for their own learning process and develop higher-order thinking skills.

However, this study has several limitations. The use of a one-group pretest–posttest design without a control group may limit the internal validity of the findings. In addition, the research was conducted in a single class within one school, which may limit the generalizability of the results. Therefore, future research is recommended to employ experimental designs involving control groups and larger samples across different schools or subjects in order to obtain more comprehensive evidence regarding the effectiveness of the self-directed learning model. fully capture the sustained effects of active learning strategies on geographical literacy development.

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