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The Effect of Self-Directed Learning Model on Critical Thinking Ability and Learning Independence in Geography Subjects

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ABSTRACT

The problems in geography learning are difficulties in submitting and providing answers related to material and teacher-centered learning activities. This research aims to examine of the effect of the self-directed learning model on critical thinking ability and learning independence in geography subjects. This research is a quasi-experiment with a pretest-posttest control group design. Data collection methods include written test of essay questions about critical thinking ability and questionnaires regarding learning independence. The subjects of this study were class X-3 as the experimental class and class X-1 as the control class with a total of 34 students every class. Based on the results of Mann-Whitney U hypothesis testing, it is known that critical thinking ability has an Asymp. Sig 0.000 <0.05. So, H_0 is rejected and H_1 is accepted, meaning that there is an effect of the self-directed learning model on critical thinking ability in geography subjects. Meanwhile, the learning independence shows the value of Asymp. Sig value of 0.000 <0.05. then H_0 is rejected and H_1 is accepted, which means that there is an effect of the self-directed learning model on learning independence in geography subjects. The research findings show that the syntax of the self-directed learning model, namely implementation and evaluation as well as the syntax of identifying learner abilities and learning resources, affects critical thinking ability. Meanwhile, the syntax that affects learning independence is the syntax of identifying learner abilities and learning resources. Therefore, this research is expected to make a significant new contribution in understanding the self-directed learning model as an effort to improve critical thinking ability and learning independence in geography subjects.

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1. Introduction

In the learning process geography subjects often poses challenges. Students are faced with real problems and their solutions regarding natural phenomena that occur (Manek, 2023). Geography learning is associated to the application of geographical concepts, principles, and methods that aim to solve the problems of natural phenomena (Apriyani, 2023). Although, geography contains a series of knowledge that describes various natural phenomena on earth related to human life (Oktavianto, 2019). However, based on observations made at Kepanjen Islamic High School, some problems occur in geography learning, namely students experience difficulties when asking a question about material that is not understood in the material that has been taught, difficulty in providing answers or opinions about questions asked by the teacher. These problems cause students to be not interested and inactive in learning activities. This can arise as a result of a deficiency in critical thinking ability which results in students becoming passive. However, when learning activities still apply conventional models that are teacher-centered. Consequently, students are less inclined to engage learn independently and are less accustomed to seeking knowledge other than teachers. Thus, the learning process implemented will influence independence of students. Therefore, teacher are faced with the need to develop interesting and innovative learning.

In facing these challenges, there are various ways to create effectiveness in learning which is done by implementing learning models. Each learning model has a goal that benefits students understanding of what is needed and increases curiosity when looking for various information (Wulandari et al., 2021). The use of a self-directed learning model can be one of the solutions to provide interesting and innovative learning. Students in the self-directed learning model will be responsible for planning, implementing, and evaluating learning outcomes (Samini et al., 2023). The self-directed learning model aims to form independence, and initiative in individuals, and improve students' abilities (Sidmewa et al., 2021). The advantages of self-directed learning are that students are able to adjust their learning style and speed according to their skills and interests and determine appropriate needs including learning tools and learning materials (Baharuddin et al., 2022). Thus,

the self-directed learning model has the capacity to motivate activeness in using thinking skills and learning independence.

In implementation of the self-directed learning model, students have the opportunity to organize learning that is oriented towards critical thinking ability and learning independence. Cognitive processes and reflective thinking are related to the critical thinking ability of students when facing a problem (Saputra, 2020). Critical thinking ability include activities related to solving a problem, deciphering hypotheses, providing logical understanding, evaluating, investigating, and decision-making (Nuryanti et al., 2018). Meanwhile, learning independence is regarded a person's ability to realize his desires without involving others, have responsibility for their learning process, and be able to determine their learning actions (Mulyadi, 2020). Therefore, the self-directed learning model has potential for encouranging an ability to solve problems independently.

Critical thinking ability can be measured using indicators. According to Darnella et al., (2020), indicators of critical thinking ability include questions, explanations and giving reasons, assessing opinions, drawing conclusions, and re-correcting. The opinion expressed by Ennis, (2011) includes providing elementary clarification, basic support, inference, anvanced clarification, strategy and tactics. Based on the critical thinking indicators presented above, researchers chose the opinion indicators from Ennis, (2011) which include various aspects of critical thinking ability to measure thoroughly and systematically and the indicators put forward are concrete making it easier to design research instruments. Meanwhile, indicators of learning independence include initiative, having a sense of responsibility, self-confidence, and discipline (Fitriana et al., 2021). According to another opinion by Tresnaningsih et al., (2019), namely, self-confidence, being able to work alone, being able to make decisions, being responsible, desire to compete forward, being disciplined, active in learning. Based on the indicators of learning independence presented, researchers chose indicators based on the opinion of Fitriana et al., (2021) that is aligned with the objectives of the ongoing research., and the indicators are presented so that it is easier for researchers to collect data.

There are several previous studies, research by Handayani, (2017) showed that the implementation of self-directed learning has a significant effect on independence and learning achievement in Science. Another study by Puspita et al., (2024) proves that the self-directed learning model based on local wisdom has a significant effect on student learning outcomes by increasing student learning outcomes. Another study by Baharuddin et al., (2022) proved that the self-directed learning model using the website notion at SMAN 1 Tumpang had an impact on critical thinking ability. Based on previous researchers, this research lies in the variables used, namely combining two variables including critical thinking ability and learning independence. In addition, utilizing geography subjects. Therefore, the purpose of the research to be carried out is to determine the influence of the self-directed learning model on critical thinking ability and learning independence in geography subjects.

2. Method

2.1. Time and Place of Research

The research was carried at Kepanjen Islamic High School, located at Diponegoro Street No. 152, Adirejo, District. Kepanjen, Malang Regency, East Java 65163. This research was conducted on February 1-25, 2025 in even semester for the 2024/2025 school year.

2.2 Research Subject

The participants of this study consist of 34 students from class X-1 and 34 students from class X-3, bringing the the total to 68. The acquisition of research subjects through a purposive sampling technique based on certain criteria. This is by considering the same characteristics when viewed in terms of student population and the average value of the final semester exam which is relatively the same, namely class X-1 is 73.36 and class X-3 is 72.21. Meanwhile, class selection through a random sampling technique, where class X-1 serve as the control class and class X-3 functions as the experimental class.

2.3 Types and Design of Research

This research is a quasi-experiment with a pretest-posttest control group design. Pre-test and post-test were conducted to analyze the variations in the results of the two classes before and after treatment. Table 1 is a table of research design, namely:

Table 1. Research design

Class	*Pre-test*	*Treatment*	*Post-test*
Experimental Class (E1)	O_1	X	O_2
Control Class (E2)	O_1	-	O_2

Source: (Sitompul, 2021)

Information:
E1 : Experimental Class
E2 : Control Class
O_1 : Pre-test
O_2 : Post-test
X : Applying a self-directed learning model
- : Applying conventional learning model

2.4 Data Collection Techniques

Data collection for this research was conducted through a written test in the form of 5 essay questions regarding critical thinking ability and a questionnaire totaling 20 statements regarding students learning independence. The preparation of written tests in the form of essay questions used for pre-test (before) and post-test (after) is based on indicators of critical thinking ability. The pre-test is conducted to determine the initial knowledge of critical thinking ability and learning independence. The post-test evaluates the knowledge of the final results of critical thinking ability and learning independence following the implementation of the model to students. Meanwhile, the questionnaire was prepared based on indicators of learning independence.

2.5 Data Analysis Techniques

Validity and reliability tests are conducted to assess the feasibility of an instrument. Then analyze the variation in data comparing the pre-test and post-test with a gain score (Wahab et al., 2021). The reason researchers choose the n-gain score is that it is relevant and credible to research in determining the effectiveness of learning models that focus on measurements between pre-test and post-test. Interpretation of the ngain in Table 2 and its categories in Table 3.

$$Gain\ Score\ \langle g \rangle = \frac{N2-N1}{SM-N1}$$

Information:
N_1 = Pre-test Score
N_2 = Post-test Score
SM = Maximum Score

Table 2. N-gain interpretation

N-Gain Value	Classification
$g \geq 0,7$	High
$0,7 \geq g \geq 0,3$	Medium
$0,3 \geq g$	Low

Source: (Rismayanti et al., 2022)

Table 3. Categories N-gain Effectiveness

Percentage (%)	Effectiveness Level
<40	Ineffective
40-55	Less Effective
56-75	Effective Enough
>76	Effective

Source: (Andriyanti & Prihastari, 2023)

The prerequisite test performs a normality test through the Kolmogorov-Smirnov technique, while the homogeneity test through Levene's test. Hypothesis testing analysis techniques with non-parametric statistical tests, namely the Mann-Whitney U test. Statistical data analysis using SPSS software version 25. The hypotheses of this study, among others:

Hypothesis 1
H_0 = There is no significant influence of the self-directed learning model on students' critical thinking ability in geography subjects.
H_1 = There is a significant influence of the self-directed learning model on students' critical thinking ability in geography subjects.
Hypothesis 2

H_0 = There is no significant influence in the self-directed learning model on students' independence in geography subjects.
H_1 = There is a significant influence of the self-directed learning model on the independence of students in geography subjects

The foundation for decision-making in hypothesis testing are as follows (Hidayati & Alufiana Sari, 2024).
If Asymp. Sig (2-tailed) > 0,05, then H_0 is accepted and H_1 is rejected.
If Asymp. Sig (2-tailed) < 0,05, then H_0 is rejected and H_1 is accepted.

3. Results and Discussion

Data for this research were derived from 2 classes, each consisting of 34 students in the control class and the experimental class. This study applied the self-directed learning model and the conventional model to collect data on critical thinking ability and learning independence. The research results are categorized into three, including (1) data description, (2) prerequisite test, and (3) hypothesis testing. Data descriptions are grouped to determine the abilities possessed by treated and untreated classes. The following is a data recapitulation table of the scores of the four variables.

Table 4. Data recapitulation of the results of the calculation of the ability score Critical thinking and independent learning

Variable	A_1Y_1	A_1Y_2	A_2Y_1	A_2Y_2
Mean	90,29	89,11	75,29	78,73
Median	90	88,5	75	78
Modus	90	95	80	78
Std. Deviasi	5,63	5,62	8,61	9,18
Varians	31,72	31,68	74,15	84,32
Range	20	20	30	37
Minimum Score	80	80	60	63
Maximum Score	100	100	90	100

Source: Primary data processed

Information:
A_1Y_1 = Critical thinking ability score that follows self-directed learning
A_1Y_2 = Learning independence score that follows self-directed learning
A_2Y_1 = Critical thinking ability score that follows conventional learning
A_2Y_2 = Learning independence score that follows conventional learning

In the Table 4 above, it can be observed that the critical thinking ability that applying the self-directed learning model has an average score calculation result of 90,29 including the interval category is very good. However, the critical thinking ability that applied the conventional model had an average score of 75,29 indicating a good interval category. The average score on learning independence when using the self-directed learning model is 89,11 which is included in the interval category very good. Meanwhile, the average score on learning independence under the conventional model of 78,73, including the good interval category.

The N-gain test was employed to evaluate the effetiveness of the self-directed learning model in enchancing critical thinking ability and learning independence based on the level of effectiveness. The findings of the N-gain test are presented in the table below.

Table 5. N-gain Results

Class	Experimental Class	Control Class
N-gain score	0,77	0,32
N-gain percent	77,06%	32,98%

Source: Primary data processed

In Table 5 the N-gain findings acquited from the experimental class, namely 0,77, are above 0,7 and are included in the high classification. When viewed based on the N-gain percent, 77,06% is included in the effective level. The control class has an N-gain value of 0,32 which is above 0,3 so that it includes a medium classification. Meanwhile, the N-gain percent of 32,98% is included in the ineffective level. The findings

indicate that a significant difference in the N-gain values, with experimental class achieving higher score than the control class.

Before analyzing the hypothesis, the necessary prerequisites tests include the normality test and homogeneity test. The normality test has the purpose of determining whether the distribution of data is distributed normally or not. The normality test the through Kolmogorov-Smirnov technique supported by SPSS 25. The normality test criteria can be determined when the value of sig. > 0,05 can be interpreted as distributed normally, but the value of sig, < 0,05, which is abnormally distributed data (Sholihah et al., 2023).

Table 6. Normality Test Results

	Class	Kolmogorov-Smirnov		
		Statistic	df	Sig.
Critical Thinking	Experiment Pre-test	0,146	34	0,064
	Experiment Post-test	0,181	34	0,006
	Control Pre-test	0,147	34	0,062
	Control Post-test	0,149	34	0,054
Learning Independence	Experiment Pre-test	0,068	34	0,200
	Experiment Post-test	0,122	34	0,200
	Control Pre-test	0,097	34	0,200
	Control Post-test	0,094	34	0,200

Source: Primary data processed

According to Table 6, the significance of the experimental class critical thinking pre-test is 0,064 > 0,05, which is the data is normally distributed. The post-test significance value for critical rhinking in the experimental class is 0,006 <0,05 indicating that the data is not normally distributed. Meanwhile, the control class critical thinking pre-test has significance value 0,062 > 0,05, suggesting that the data is normally distributed and the control class post-test significance value of 0,054 > 0,05, indicating that the data is normally distributed. However, the pre-test and post-test significance values for learning independence in the both experimental class and control class are 0,200 > 0,05, confirming that the data is a normal distribution. Then the homogeneity test through Levene's technique is conducted to determine whether the subjects of the two data groups come from a population of uniform variants. The data included homogenity when the value of sig. > 0,05 means that the variant between group is homogeneous. However, if the value sig. < 0,05 means that the variants between groups are not homogeneous (Faruq et al., 2023). Table 7 presents the findings of the homogeneity test.

Table 7. Homogenity Test Results

	Levene Statistic	df1	df2	Sig.
Critical Thinking Pre-test	0,185	1	66	0,669
Critical Thinking Post-test	5,829	1	66	0,019
Learning Independence Pre-test	0,470	1	66	0,495
Learning Independence Post-test	5,625	1	66	0,021

Source: Primary data processed

Data that have been tested for homogeneity pre-test critical thinking ability obtained results are 0,669 > 0,05 indicating the data is homogeneous. Meanwhile, the post-test of critical thinking ability is 0,019 < 0,05, so the data is not homogeneous. The pre-test of learning independence has a sig value of 0,495> 0,05 indicating homogeneous data and the post-test of learning independence is 0,021 < 0,05 so the data is not homogeneous. The results of the prerequisite test show if there is data that is not normally distributed and not homogeneous. According to Amanda et al., (2018) if the data obtained is not normally distributed and not homogeneous, there is an alternative, namely by using the Mann-Whitney U test. Therefore, the hypothesis employed is based on non-parametric with the Mann-Whitney U test to assess the effect of each variable.

Table 8. Mann-Whitney U Test Results

	Critical Thinking	Learning Independence
Mann-Whitney U	84,500	195,500
Wilcoxon W	679,500	790,500
Z	-6,121	-4,699
Asymp. Sig. (2-tailed)	0,000	0,000

Source: Primary data processed

The findings of the Mann-Whitney U hypothesis test are persented in Table 8. Hypothesis testing and decisions from the analysis, are as follows: The analysis indicates that the critical thinking ability has an Asymp. Sig value of 0,000. So, Asymp. Sig < 0,05 so that H_0 is rejected and H_1 is accepted, there is an effect of the self-directed learning model on critical thinking ability in geography subjects. Meanwhile, on learning independence, it can be seen that the Asymp. The sig value is 0,000. So, it has Asymp. Sig < 0,05 so that H_0 is rejected and H_1 is accepted, there is an effect of the self-directed learning model on learning independence in geography subjects. The following is an explanation of the effect of the model on each variable.

Effect of self-directed learning model on critical thinking ability, the analysis results indicate that self-directed learning has an effect on students' critical thinking ability. The impact is observable through the Asymp. Sig value which is 0,000 < 0,05. In line with Baharuddin et al., (2022) research the self-directed learning model with the help of the notion website has an effect on critical thinking ability. The use of this model makes students actively engage their thinking skills in learning activities. In line with research by Izzatanur & Rachmadtullah, (2024) learning carried out using the self-directed learning model can affect the critical thinking ability of students because it provides opportunities to explore and analyze information. The following is a diagram of each indicator of critical thinking ability.

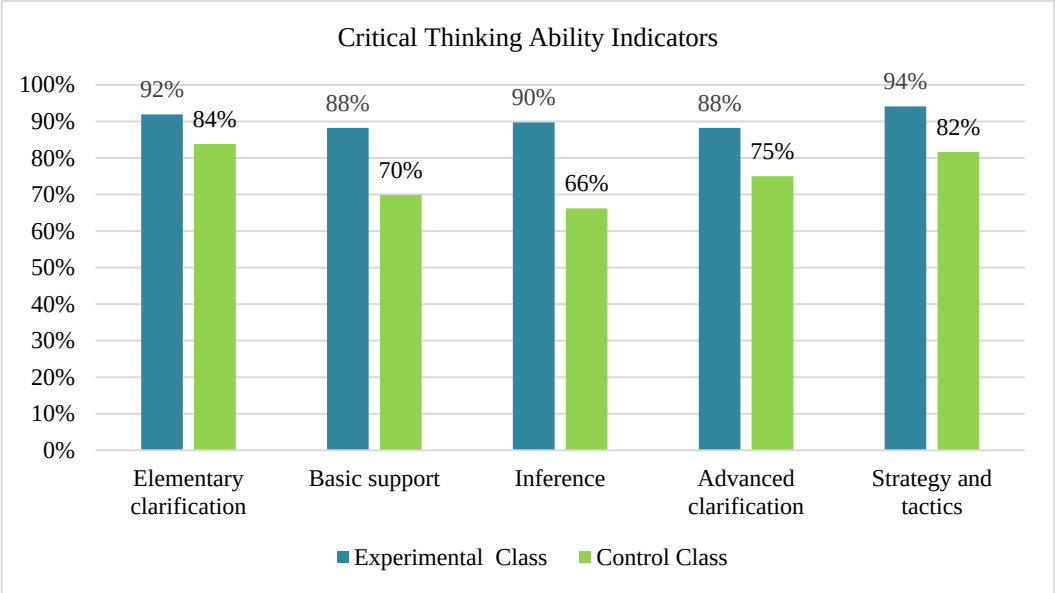

Figure 1. Critical thinking ability diagram
Source: Primary data processed

The diagram above Figure 1 shows that the highest indicator control class is in the bar chart of the section providing elementary clarification, which is 84%. Conventional learning models are dominated by educators who act as teachers and students act as listeners, leading to a lack of growth in students critical thinking ability (Siahaan et al., 2022). Meanwhile, the highest indicator in the experimental class was in strategies and tactics, namely 94%. In the self-directed learning model, the implementation and evaluation syntax is related to students critical thinking ability because they are able to describe and provide solutions to the problems presented. So, in agreement with Ardiyanti, (2016) states if students are given the opportunity to explain the problems that occur for improvement in critical thinking ability. In addition, the syntax of identifying learner abilities and learning resources is also related to critical thinking ability. This is in line with research by Ibenegbu et al., (2024) that learning with a self-directed learning model affects critical thinking ability because

it is tailored to comprehension capacity learners to take the initiative regarding suitable educational resources. In addition, learners show good understanding and critical thinking about each instruction given.

Effect of self-directed learning model on learning independence, according to the analysis conducted, it can be seen that the self-directed learning model has an influence on learning independence as indicated by the Asymp. The sig value is 0,000 <0,05. The results of this study align with the findings of Rahman et al., (2024) that the implementation of the self-directed learning model is effective enough to enhance learning independence, because of the involvement of students in managing their learning process with their own initiative in order to achieve optimal learning independence. The implementation of the self-directed learning model requires learning independently and responsibly, so as to increase learning independence. In line with Handayani, (2017) the application of the self-directed learning model proves to be effective for increasing learning independence throughout the learning process. In addition, the model offers opportunities for students to build knowledge, developing their abilities, discussing, and giving opinions on learning activities. The following is a diagram showing each indicator of learning independence.

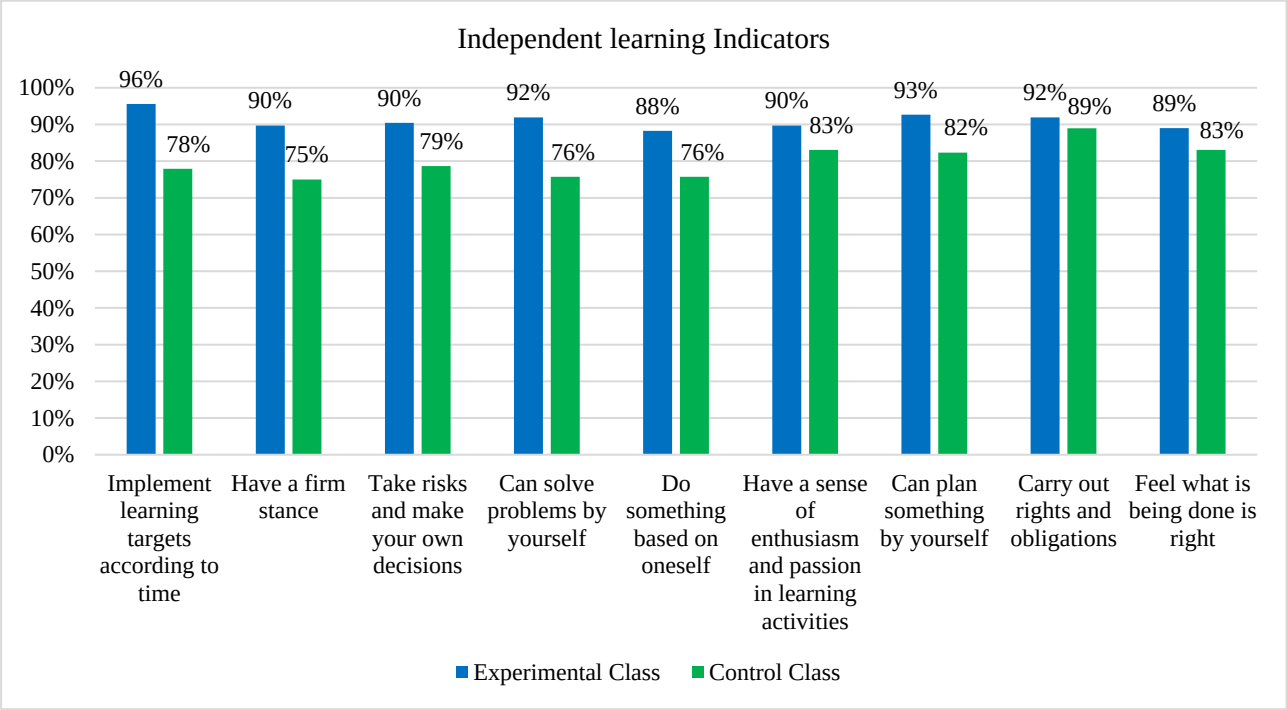

Figure 2. Independence learning diagram
Source: Primary data processed

Figure 2, shows that the control class with the highest indicator has a sense of responsibility shown by the sub-indicator of carrying out rights and obligations of 89%. Learning by using a conventional model, students only get information explained by the teacher by lecturing and recording on the board or dictating, which can affect learning independence (Ajib et al., 2024). Meanwhile, in the experimental class, the highest indicator is discipline with sub-indicators carrying out learning targets according to time. Agreeing with research by Nurhidayanti et al., (2022) disciplined behavior has the highest score compared to other indicators which shows that students attend lessons and collect assignments on time. One of the syntax in self-directed learning, namely the identification of learner abilities and learning resources, is related to learning independence when students look for learning resources from various references. This agrees with Sari et al., (2024) that the self-directed learning model is effective for involving learning independence in the learning process by constructing knowledge through finding other learning resources. The independent attitude of students can be seen in independence in learning activities (Woi & Prihatni, 2019).

This study involved an experimental class that received a treatment and a control class that did not. The control class was taught using a conventional model. The conventional model is a model whose teaching style is centered on the teacher so that the teacher is more active in learning than students in the classroom (Noka Saputra et al., 2019). At the beginning of the activity before learning, conduct a pre-test to assess the students baseline abilities with essay questions totaling 5 questions about beach problems in Malang Regency and fill

out a learning independence questionnaire totaling 20 statements. In the first syntax, the teacher conveys the learning objectives that will be implemented. The second syntax is presenting the beach problem material assisted by PowerPoint and youtube videos using the lecture method so that the teacher plays more of a role than the students. In the third syntax, namely conducting question and answer activities with students to find out understanding of the material presented. Furthermore, the fourth syntax is working on LKPD which is carried out in groups regarding beach problems. Then, at the end of the activity, students work on post-test questions and questionnaires with the same number of questions.

The self-directed learning model was applied in the experimental class. Just like the control class, at the beginning of the pre-learning activities, the experimental class participated in a pre-test and questionnaire with the same number of questions. Furthermore, the first syntax of self-directed learning is setting the learning atmosphere achieved by the teacher giving a learning style questionnaire to students. This is carried out to help students to adapt to learning styles independently. Learning style is a way used by learners to absorb and understand information easily (Sitorus et al., 2023). The second syntax is the diagnosis of needs in learning, namely the teacher directs learners to analyze learning styles based on the questionnaire that has been done and conveys the categorization needed in learning. Then, learners analyze and understand the categorization of their respective learning styles. According to Simbolon & Harahap, (2022) the important role in understanding learning styles in learning activities is to get the suitability of information obtained based on the nature of learning styles that vary among students.

Based on the results of the questionnaire conducted, the distribution of visual learning styles is 44% (15 students), auditory learning styles are 32% (11 students), and kinesthetic learning styles are 24% (8 students). The third syntax is the formulation of learning objectives, namely the teacher conveys the learning objectives to be achieved in learning activities and provides knowledge related to beach problem material through PowerPoint and YouTube videos. In the fourth stage, the identification of learner abilities and learning resources is that the teacher provides one example of reference regarding examples of beach problems and gives directions to students to look for other literature to support understanding. Then, students look for learning resources that come from a variety of valid sources or references as needed. This syntax influences the critical thinking of learners who review the various sources used. Critical thinking is thinking by using reasoning rationally, and systematically, gathering information to solve the problems face (Kurniawati & Ekayanti, 2020). In addition, this stage also affects learning independence. This agrees with Ningsih & Nurrahmah, (2016) in learning independence when students dig up information related to material not only comes from the teacher but comes from other sources including the internet or reading books.

In the fifth syntax of implementation and evaluation, students work on the Learner Worksheet (LKPD) individually by implementing their learning style. It can be seen that learning styles are divided into three, namely visual, auditory, and kinesthetic (Syarif & Nugraha, 2019). In working on LKPD, students can apply those who have a visual learning style, namely relying on the sense of sight in obtaining information, not being distracted by noise, reading with focus and diligence, using highlighters and sticky notes to highlight important words and make small notes, and can use the internet to get visuals to imagine. Meanwhile, the auditory learning style relies on the sense of hearing, reading questions slowly, conducting discussions with peers, listening carefully to the teacher explanation, and listening to explanations from friends regarding statements that are not understood. Furthermore, the kinesthetic learning style can make gestures such as finger movements or stationery to point to information on the questions presented when reading or answering questions and move by walking briefly to solve difficult problems but with restrictions only in the classroom. The evaluation is carried out with students presenting the LKPD that has been done. Finally, students take a post-test and questionnaire with the same number of questions as the control class.

The self-directed learning model places students at the center of the learning process. Corresponding to the opinion of Umamah et al., (2023) that self-directed learning emphasizes the involvement of the role of students actively in learning activities which can increase learning independence. Independence is a behavior that can take the initiative, overcome the problems faced, and be confident when learning activities (Gusnita et al., 2021). The self-directed learning model is a learning activity carried out to master material independently or with the help of others based on self-motivation. So, the learning results are useful for solving a problem (Rifanti & Pujiharsono, 2018). However, teachers also play a role in helping to find out the learning needs or abilities that will be mastered by students (Sugerman et al., 2022). Through self-directed learning model connects students academic abilities in everyday life to obtain meaningful goals (Sidmewa et al., 2021).

As for some obstacles experienced by researchers during the research, namely 1) learning hours are sometimes not carried out according to the schedule determined by the school. This resulted in learning activities being disrupted because learning hours were decreasing, 2) in presentation activities by delivering the results of students work, many were still shy and not loud when speaking in front of the class because they were not used to it.

4. Conclusion

According to the findings of the study and hypothesis testing above, the findings indicate that there is an effect of the self-directed learning model on critical thinking ability in geography subjects and there is an effect of the self-directed learning model on learning independence in geography subjects. The findings of this study are that the self-directed learning model syntax includes implementation and evaluation as well as the syntax of identifying learner abilities and learning resources that affect critical thinking ability. Meanwhile, the syntax that affects learning independence is the identification of learner abilities and learning resources. Suggestions from this study for further research are to manage time well so that learning can run optimally and provide motivation when students deliver their work. In addition, future researchers can explore the application of self-directed learning models at various levels of education, add other variables, and use mixed research methods to obtain more detailed and in-depth data.

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