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The Efect Of Discovery Learning Natural Environment Exploration Model on Digestive System Materials Towards Critical Thinking and Science Process Skills

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Abstract

Basic competence in digestive system material requires critical thinking skills, facts in the field students' critical thinking skills still need to be optimized. The ability to think critically is able to encourage students to find concepts and practice science process skills. The purpose of the study was to examine the effect of the Discovery Learning Natural Environment Exploration model on students' critical thinking and science process skills and determine the relationship between critical thinking skills and science process skills. This quantitative research used a pre-experiment one group pretest and posttest design. This study involved students of SMA N 1 Cawas Class XI MIPA with a research sample of 70 students. The data obtained are in the form of test results of critical thinking skills, science process skills and syntax implementation data. The N-gain results obtained increased critical thinking skills and science process skills at moderate levels, with N-gain scores of 0.7 and 0.67. The results of Wallis's crucial test obtained significance values of 0.001 and 0.04, meaning that the Discovery Learning Natural Environment Exploration model affects critical thinking skills and science process skills. The results of the Spearman correlation test obtained a coefficient value of 0.749 (strong). The conclusion of this study is that the Discovery Learning Natural Environment Exploration model is influential in improving students' critical thinking skills and science process skills, critical thinking skills are strongly correlated with science process skills.

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INTRODUCTION

The Digestive System in biology learning includes material that contains the mechanism, structure and function of digestive organs, nutrition and abnormalities in the digestive system. Basic competence in the digestive system demands a student's analytical understanding. The ability to analyze is one indicator of critical thinking, which is supported by habits and experiences possessed (Rahmawati *et al*., 2019). Judging from the 21st- century learning framework, critical thinking skills are one of the important abilities mastered by students so that they become more selective about the information obtained (Rini *et al*., 2021).

Based on the results of an interview with a Biology Teacher of SMA N 1 Cawas, students' critical thinking skills still need to be optimized, in answering students' questions, they have not optimally provided further explanations that support answering questions. As reported by Susilawati *et al*., (2020) the critical thinking skills of high school students are low with a percentage of 64% of students having low critical thinking skills. After further analysis, the evaluation instrument used has not reached KD and can still be improved using C4-level verbs. This is in line with Wayudi *et al*., (2019) low critical thinking skills caused in learning students are not accustomed to facing problems with cognitive levels C4-C6. According to Supriyati *et al*., (2018) in education there are two factors that cause critical thinking not to develop, namely teachers only focus on the completeness of the material to achieve curriculum targets and the use of learning methods that do not activate students. In terms of PPP in the teaching materials used, the integrated PPP aspect is still not optimal. According to Tyas *et al*., (2020), science process skills in addition to helping students find concepts are also able to encourage critical thinking skills. For this reason, it needs innovation in biology learning such as learning models that optimize students' critical thinking and science process skills.

The innovative use of learning models and approaches that support science process skills optimization in students is expected to improve students' critical thinking skills. Winangun *et al*., (2021) stated that the development of a discovery learning learning model with local content provides benefits in making students think based on their own ability to draw conclusions. Tyas *et al*., (2020) stated that the syntax in Discovery Learning is data collection data processing and generalization facilitating integrated science process skills such as data interpretation skills, controlling variables, making hypotheses, defining operationally and conducting experiments. Rachman, (2018) revealed that the discovery learning model is designed to make students find concepts in principles through their own mental processes. The process of constructing one's own knowledge is part of critical thinking (Sahubauwa *et al*., 2015).

Literature studies on critical thinking skills using an integrated learning model of local wisdom of the natural environment provide results in improving critical thinking skills Hunaepi *et al*., (2020) and Winangun *et al*., (2021). Firmansyah *et al*., (2019) The experimental-based Natural Environment Exploration Model improves students' critical thinking skills in both indoor and outdoor learning. Natural Environment Exploration approach can be elaborated with various strategies and models providing results that are active and cooperative learning that is student-centered (Ridlo & Alimah, 2013). The elaboration of the discovery learning model with the environmental exploration approach is carried out by integrating the components of the Natural Environment Exploration approach with the syntax of discovery learning syntax. The Discovery Learning Natural Environment Exploration model consists of six syntaxes, namely Stimulation, Identification, Exploration, Analyze, Confirmation and Abstraction.

Based on the description above, the objectives of this study are 1) testing the influence of the Discovery Learning model with an environmental exploration approach on students' science process skills and critical thinking levels, 2) knowing the relationship between critical thinking skills and science process skills.

RESEARCH METHODS

This type of research uses one group pretest and posttest design. This study involved students of SMA N 1 Cawas Class XI MIPA, which was conducted in the even semester of 2022/2023. A research sample of 70 students was obtained by random sampling technique. The independent variable in this study is the Discovery Learning Natural Environment Exploration model while the dependent variables are Critical Thinking and Science Process Skills. The research was conducted by applying the Discovery Learning Natural Environment Exploration model in the experimental classes. In the implementation of the study, a pretest was carried out to determine the initial ability and a posttest was carried out to determine the final ability after obtaining learning with the Discovery Learning Natural Environment Exploration model. The syntax of the applied learning model consists of 1) Stimulation, 2) Identification, 3) Exploration, 4) Analyze, 5) Confirmation, and 6) Abstraction. The material used in the experimental classes is digestive system material.

To measure students' critical thinking skills and science process skills, they used a test instrument

totaling 25 multiple-choice questions. The test instruments used contain indicators of critical thinking skills and science process skills with cognitive level questions ranging from C4-C6. Before being used for research, the test instrument has been tested and tested for validity and reliability using the *ANATES* application. The results of the analysis of 25 valid questions with a reliability of 0.96 are included in the very good category. To measure the level of syntax implementation in this study, a syntax implementation sheet was used. The syntax implementation sheet is filled directly by students after learning is complete and then the results are interpreted in very good, good, sufficient, and less levels. The analytical technique in this study used the N-gain test and non-parametric statistical techniques with the Kruskal Wallis test and the Spearman Correlation test conducted with *SPSS*. The results of the data obtained are analyzed with the help of the *SPSS* application. The N-gain test and the kruskal wallis test were conducted to determine whether or not there was an effect on using the Discovery Learning Natural Environment Exploration model. Furthermore, further tests were carried out with the spearman correlation test to determine the relationship between critical thinking skills and science process skills. The results of the spearman correlation test are interpreted in Table 1.

Table 1. Interpretation of Spearman Correlation Test Results

Coefficient Interval	Correlation
0.00 – 0.20	Very Weak
0.20 – 0.40	Weak
0.40 – 0.70	Moderate
0.70 – 0.90	Strong
0.90 – 1.00	Very Strong

RESULTS AND DISCUSSION

The data obtained in this study is in the form of data on critical thinking skills, science process skills and data on the implementation of the syntax of the Discovery Learning Natural Environment Exploration model. Aspects of critical thinking skills include giving simple explanations, summing up, and providing further explanations. Aspects for process science skills include drafting hypotheses, analyzing research, constructing hypotheses, analyzing research, and designing research.

Effects of Using the Discovery Learning Natural Environment Exploration model

The effect of the Discovery Learning Natural Environment Exploration model on students' critical thinking skills and science process skills is known by the difference in the average N-gain of pretest and posttest scores and Kruskal Wallis test results. Pretest and posttest data were analyzed using the N-gain test to determine whether there was an increase after obtaining learning using the Discovery Learning Natural Environment Exploration model. The results of the normality test with the Kolmogorov-smirnov test obtained a significance value of 0.10. The significance value obtained is less than 0.05, meaning that the data is not normally distributed. Based on the results of the homogeneity test with Box's test, a significance value of 0.188 was obtained, meaning that the data obtained were homogeneous. Because the data obtained are not normally distributed for statistical tests using non-parametric statistical tests with kruskal wallis tests.

Table 2. Pretest and Posttest Results Critical Thinking and Science Process Skills

Category	Critical Thinking			Science Process Skills		
	Pre-test	*Post-test*	*N-gain*	*Pre-test*	*Post-Test*	*N-gain*
Maximum	70,59	100,00		76,92	100,00	
Minimum	17,65	41,18	0.7	7,69	38,46	0.67
Rata rata	38,06	82,43		42,85	82,30	

The application of the Discovery Learning Natural Environment Exploration model provides positive results on students' critical thinking skills and science process skills. Based on the pretest and posttest data in Table 2. There was an improvement in both critical thinking skills and process science skills. In critical thinking skills, the average pretest score before obtaining learning of 38.06 increased to 82.43 after obtaining learning. Meanwhile, in science process skills, the pretest average score of 42.85 increased to 82.30. This shows that the application of the Discovery Learning Natural Environment Exploration model to digestive system material can improve both students' critical thinking skills and science process skills. In accordance with research conducted by Roheni *et al.*, (2019) there is an increase in science process skills in

Discovery Learning learning.

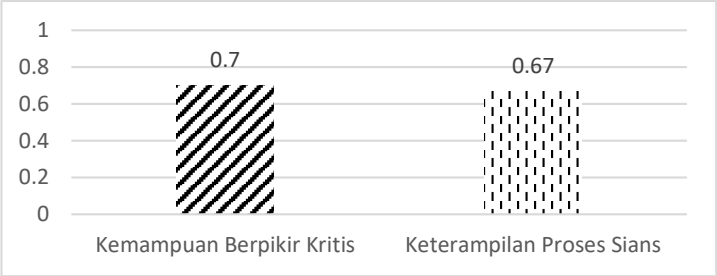

Figure 1. N-gain Results of Critical Thinking Skills and Science Process Skills

Based on Figure 1 on critical thinking skills, an N-gain value of 0.7 was obtained, while on science process skills, an N-gain of 0.67 was obtained. So that it can be known that Discovery Learning Natural Environment Exploration model has an effect on improving critical thinking skills and science process skills at a moderate level. This is because learning using Discovery Learning Natural Environment Exploration model provides meaningful and long-lasting new knowledge for students. According to Ausubel in Rahmah, (2013) meaningful learning occurs when a person learns there is a process of associating new phenomena into their knowledge structure.

Tabel 3 . Kruskal Wallis Test Results Critical Thinking Skills and Science Process Skills

Variable	Kruskal-Wallis H	Sig	Meaning
CT	20.443	.001	There are influence
SPS	11.849	.004	There are influence

Description :
CT : Critical Thinking
SPS : Science Process Skills

Based on the results of the Kruskal Wallis test in Table 3, Asymp.sig values of 0.001 and 0.004 were obtained, meaning that there is an influence between Discovery Learning Natural Environment Exploration model on critical thinking skills and science process skills. This finding is because the learning process trains students to use critical thinking skills and science process skills. Aspects of critical thinking skills and science process skills are illustrated in each syntic model of Discovery Learning Natural Environment Exploration. Thus providing positive results for improving critical thinking skills and science process skills. This is in accordance with research conducted by Hunaepi *et al*., (2020) and Winangun *et al*., (2021) the use of learning models that are integrated with local wisdom of the natural environment provides results in improving critical thinking skills. Ridlo & Alimah, (2013) revealed that Natural Environment Exploration approach can be elaborated with various strategies and models providing results that are active and cooperative learning that is student-centered.

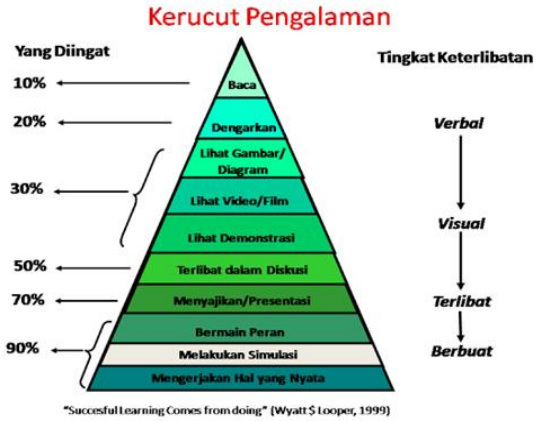

Figure 2. Edgar Dale's Cone of Experience (Wyatt &; Looper. 1999)

Based on the cone from Edgar Dale, it can be seen that the learning experience obtained by students in the Discovery Learning Natural Environment Exploration model by 90%, namely in food test practicum activities (Confirmation syntax). Practicum activities are one example of direct experience, because in this activity students use all their five senses and their own intuition and thinking. According to

Ahadia *et al.*, (2016) direct experience gives the fullest and most meaningful impression related to an information or idea from an experience because it involves all five senses. The more concretely students learn teaching materials, such as through direct experience, the more experience they gain.

The findings in this study cannot be separated from the implementation of the syntax of the Discovery Learning Natural Environment Exploration model. Syntax implementation data was obtained using a syntax implementation sheet questionnaire that was filled out directly by respondents after participating in the learning. A recapitulation of the data resulting from the implementation of syntax can be seen in Table 4.

Table 4 . Syntax Implementation Sheet Results Data

No	Syntax	Percentage (%)	Implementation
1	*Stimulation*	100	Very good
2	*Identification*	100	Very good
3	*Exploration*	100	Very good
4	*Analyze*	100	Very good
5	*Confirmation*	94	Very good
6	*Abstraction*	90	Very good
	Average implementation	**98,10**	Very good

Based on the data from the syntax implementation results in Table 4 shows a very good level of syntax implementation at 98.10%. This means that students feel the application of the syntax depicted in the Learning Plan to the learning process very well. The learning syntax of Discovery Learning Natural Environment Exploration model contains processes that support the development of students' critical thinking skills and science process skills.

The stimulation syntax presents several pictures of traditional foods and lighter questions to stimulate students' curiosity. At this stage, students are also given the opportunity to express their opinions. In expressing opinions, there is a process of analysis and discussion. In line with the opinion expressed by Bruner in Dafrita, (2017) stimulus in the form of asking questions can encourage students to solve problems and explore. The process trains students' critical thinking skills in analyzing questions and asking.

Learning in syntax identification requires students to formulate hypotheses and provide further explanations. The preparation of hypotheses is carried out after students directly identify the nutritional content of the traditional foods they bring. The identification process leads students to identify assumptions or conjectures, this includes critical thinking skills, namely in the aspect of providing a further explanation. As expressed by Octavia *et al.*, (2022) the purpose of the indicator providing further explanation is to collect information and draw conclusions, in this activity students are required to identify assumptions based on the information obtained.

The Exploration syntax contains exploration activities for the natural environment around students. Exploration activities are a component of exploring the environment. In research conducted by Palupi *et al.*, (2020) the use of EJAS-based learning tools is effective in improving student learning outcomes. With exploration activities, students can collect as much information as possible and decide on solutions to problems. According to Hamdani *et al.,* (2019) knowing problems more deeply and deciding on problem solutions is the ability to think critically.

Students' process science skills also develop on the syntax of Analyze, by designing experiments and communicating the results of the analysis of the food test experiment designs they conduct. This syntax also involves students' critical thinking skills in providing further explanations. The aspect of providing a further explanation is seen when students discover prejudices and predict the nutritional content of the food they consume. Finding prejudices and making predictions trains students to analyze a lot of information and draw conclusions. As stated by Octavia *et al.*, (2022) indicators provide further explanation illustrated in the GDL model by training students in identifying assumptions from various information obtained through the discussion process.

In the confirmation syntax, students conducted experiments testing the content of food substances from the traditional foods they chose. Through experimental activities, students can prove their hypothesis directly regarding the nutritional content of foods that are often consumed. Supported by the research of Hamdani *et al.,* (2019) learning activities with experimental methods students are actively involved in proving symptoms / an event directly through experiments, analyzing themselves, and concluding themselves. So that the abilities obtained are more profound because students acquire their own knowledge.

Re-exposure of experimental results and group discussions and giving other group members the

opportunity to respond. In communicating their opinions and providing feedback, students' critical thinking skills become trained. This activity is carried out in the syntax of confirmation and abstraction, both syntaxes can develop students' ability to draw conclusions. This is in line with (Octavia *et al.*, 2022) Indicators draw conclusions trained by making conclusions from investigation and discussion activities from the results of problem solving.

Interrelation of Critical Thinking Skills and Science Process Skills

Table 3 . Correlation Test Results of Critical Thinking Skills and Science Process Skills Sains

Correlations

			BK	KPS
Spearman's rho	CT	Correlation Coefficient	1.000	.749**
		Sig. (2-tailed)	.	.000
		N	70	70
	SPS	Correlation Coefficient	.749**	1.000
		Sig. (2-tailed)	.000	.
		N	70	70

**. Correlation is significant at the 0.01 level (2-tailed).

Based on Table 3 of spearman test results, the significance value obtained < 0.05. This shows that there is a correlation between critical thinking skills and science process skills, with a correlation value obtained of 0.749. The correlation value obtained shows the correlation level relationship at a strong level. In accordance with the research of Kurniawan *et al.,* (2020) science process skills and critical thinking skills have a strong correlation with a correlation value of 0.848. The ability to think critically supports students' science process skills, in this study it can be seen in the aspect of designing research and experimenting requires the ability to provide further explanations and conclusions. In the aspect of designing research, students need to identify problems, compile hypotheses, assume, analyze, conclude and communicate research results (Senisum, 2023).

The use of the Discovery Learning Natural Environment Exploration model is proven to be able to improve critical thinking skills and science process skills, this is because the syntax in the Discovery Learning Natural Environment Exploration model trains aspects of critical thinking skills and science process skills. There is a relationship between critical thinking skills and science process skills, critical thinking skills support science process skills.

CONCLUSION

The conclusion of this study is that the Discovery Learning Natural Environment Exploration model is influential in improving students' critical thinking skills and science process skills, critical thinking skills are strongly correlated with science process skills.

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