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Analysis of the Ability of Field Dependent and Field Independent Learning Styles in Biology Problem Solving

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ABSTRACT

One of the impacts of the Teacher Center Learning (CTL) learning model in the classroom is that students' thinking creativity is less developed and students ability to solve problems is low. This study aims to analyze the problem-solving ability of Animal Ecology Biology Education students based on field-dependent and field-independent cognitive styles. This research is a descriptive study using a qualitative approach. The subjects of this study were Biology Education students in the sixth semester (VI) who programmed animal ecology courses totaling 24 people. The research instrument was the Group Embedded Figure Test (GEFT) which amounted to 25 points. Problem-solving questions in the form of descriptions of 4 numbers and interview guidelines. Based on the results showed that the problem-solving ability of students with field-independent cognitive style is better than field-dependent because students with field-independent cognitive style are able to separate themselves from their environment while students with field-dependent cognitive style are still influenced by the surrounding environment.

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INTRODUCTION

Problem-solving is one of the objectives of the learning process in terms of the curriculum. Problem-solving ability is one of the skills demanded by the world of work today. Problem-solving is the ability to use the thinking process in solving problems by collecting

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facts, analyzing information, preparing alternative solutions, and choosing a more effective problem solution. This means that problem-solving is a search for solutions through a systematic thinking process (Mendrofa, 2021). Problem-solving skills for students need to be pursued so that students are able to find solutions to various problems. In solving problems, students need to have adequate understanding and knowledge and have various strategies that can be chosen when facing different problems (Dahar, 2011; Nugroho & Dwijayanti, 2019).

This study has examined the relationship between the dimensions of problem-solving ability and cognitive style. This is because cognitive style is one of the factors that influence problem-solving ability (Marfungah, Nugraheni & Yuzianah, 2020; Ranesa, 2021). Cognitive style refers to the way a person processes, stores, and uses information and solves problems based on their environment (Uno, 2016). Therefore, it is very important to develop students' problem-solving skills early on. The more often students solve problems, the students will easily find the right strategy to solve the given problem (Sumartini, 2016).

Cognitive style is a relatively permanent habit of action in a person in terms of thinking, remembering, receiving, and processing. information (Agoestanto & Sukestiyarno, 2017; Masni, 2018). Many experts distinguish the types of cognitive styles, but that will be the focus of this research is cognitive style Field-dependent and Field independent proposed by Witkin. This is because cognitive style field-dependent and field-independent is the most important dimension (Salameh, 2011; Siahaan, Dewi & Said, 2019). In addition, Field dependent and Field independent cognitive styles are cognitive styles that are able to overcome the effects of distraction on story problems (Istiqomah & Rahaju, 2014). This cognitive style is seen as one of the variables determining the ability of students to solve story problems (Andriyani, 2018).

Relevant research shows that there are significant differences in problem-solving ability between groups of students who have Field Independent cognitive styles with groups of students who have Field Dependent cognitive styles. Students who have a Field Independent cognitive style have higher Ecology problem-solving skills than groups of students who have a Field-dependent cognitive style. There is no interaction between learning strategies and cognitive styles on students' ecological problem-solving skills (Kasim, 2017).

Based on the results of interviews that have been conducted with lecturers and students of the Biology Education study program, information is obtained that the teacher's ability to develop interesting and meaningful learning for students is still very limited and the implementation of learning in general is still less dominated by teaching activities. Learning is more teacher-centered (Teacher Center Learning) and dominated by lecture and question-and-answer methods. One of the impacts of this kind of learning model is that students' creative thinking skills are less developed and their ability to solve problems is low. Thus the cognitive style of students needs attention in the learning process, especially in solving student problems in Biology Education FETT Tadulako University.

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This research was conducted on students of the Biology Education Study Program FKIP Tadulako University with the aim: (1) researchers want to test the differences in cognitive style field dependent and field independent in each student in the problem-solving process. solve biological problems, especially in Biology subjects. Animal Ecology course in semester VI of the 2020/2021 academic year. (2) problem-solving ability is one of the skills demanded by the world of work today. So biology education students are required to be able to solve problems before students enter the world of work. This research on cognitive style on problem-solving ability is expected to provide new knowledge so that in problem-solving students are not only oriented towards memorization skills but also on cognitive processes (ways of thinking) that can encourage students to think to a higher level (Rochmah, 2017).

Animal Ecology material in this study was chosen because the main objective of Animal Ecology is an understanding of the basic aspects underlying the appearance of animals as individuals, populations, communities, and the ecosystems they inhabit, including the recognition of patterns of interaction processes and the importance of factors that cause the success or failure of organisms and ecosystems in maintaining their existence. These various factors and processes are information that can be used as a basis in formulating models, forecasting, and their application for human interests, such as; habitat, distribution and abundance, food, behavior, and others.

After studying and understanding these things, we can use this knowledge, for example, predict its abundance and analyze its condition and role in the ecosystem, maintain its sustainability, and other activities related to the existence of these animals. For example, we study one type of animal starting from its habitat in nature, its distribution and abundance, its food, its behavior, and others. After everything is understood through careful and thorough observation and research, then we can use this knowledge, for example, in preserving its nature by maintaining the integrity of the environment, and its natural habitat, predicting the abundance of its population in the future, analyzing its role in the ecosystem, processing it and other activities by optimizing its environmental conditions to resemble its natural habitat. Animal Ecology for humans is quite important in providing applied values in human life. The benefits are mainly related to agriculture, plantation, animal husbandry, fishery, health, and wildlife processing and conservation. Tolerance range and limiting factors have been widely applied in this field. Thus, many problems can be solved by studying Animal Ecology which is always based on the concept of efficiency Ecology.

Based on the above problems, researchers are interested in conducting research with the topic "Analysis of cognitive styles field dependent and field independent in solving problems of Animal Ecology in Biology Education study program students at Tadulako University".

RESEARCH METHODS

The research method used in this study is a descriptive method with a qualitative approach, namely research that uses qualitative data and describes the data to produce an in-

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depth and detailed description of the thinking process of students who have a cognitive style field-dependent and field-independent (Sugiyono, 2012).

This research was conducted in the Biology Education study program at FKIP Tadulako University. The time of this research was carried out starting in the odd semester of the 2020/2021 academic year for sixth-semester students who took the Animal Ecology course. The research subjects in this study were 24 students of the Biology Education study program class of 2018. Taking research subjects in this study selected respondents who have field-dependent and field-independent cognitive styles. Before selecting respondents, researchers gave the GEFT (Group Embedded Figure Test) test to students and analyzed the test to determine the cognitive style of students so that respondents would be tested on problem-solving skills.

The instrument in this research is the researcher himself. Researchers as human instruments have the function of determining the focus of research, selecting informants as data sources, collecting data, assessing data quality, analyzing data, interpreting data, and making conclusions on their findings (Sugiyono, 2012). Instrument The supporters used in this study is as follows:

1) Group Embedded Picture Test (GIVEN)

GEFT test results were used to determine the research subjects. Determination of students in the cognitive style group field dependent and field independent based on the speed and accuracy of students in finding simple images in more complex images with a time limit that has been determined on the GEFT instrument.

2) Problem-Solving Ability

The problem-solving ability test used is a description that aims to measure the problem-solving ability of Animal Ecology with predetermined problem-solving indicators. The problem-solving ability test was conducted after the GEFT test with an interval of two days.

3) Interview Guide

Interviews will be conducted after students take the problem-solving ability test. The subjects to be interviewed are all students who have taken the test with 10 minutes for each student. The purpose of interviews conducted with students who have taken the GEFT test and the problem-solving test is to obtain data which will then be processed as information related to the completion of Animal Ecology based on the cognitive style of each student.

The data collection technique is an effort to collect data systematically in accordance with the procedure. There are several data collection techniques used in this study as follows:

(1) Group Embedded Picture Test (GIVEN)

The GEFT test is intended to test students' ability to find simple shapes hidden in complex images. The number of questions in the GEFT test is 25 numbers with a processing time of 20 minutes. Scoring is done by giving a score of 1 for correct answers and 0 for wrong answers. Thus, if the student is able to answer the question correctly then the maximum score is 25 and

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the minimum score is 0 (if there is no correct answer at all). To categorize the type of cognitive style used the following criteria (Wulandari, 2017).

a. If the score obtained less than 50%, then included in the cognitive style group field dependent.
b. If the score obtained more than 50%, then included in the cognitive style group field independent.

(2) Written Technique

The writing technique in this study is problem-solving in the form of descriptions with a total of 4 questions with a processing time of 60 minutes. Indicators of Animal Ecology material are (i) students are able to explain the concept of habitat and biological niches, (ii) students are able to explain animal populations.

(3) Interview Technique

The type of interview used is an unstructured interview because researchers want to reveal the actual situation and circumstances regarding the creative thinking process of students based on their cognitive style in solving problems of Animal Ecology. Subjects to be interviewed in this study are students who have a cognitive style field-dependent and field-independent in solving problems of animal ecology.

Data analysis is a way of processing the data collected so as to produce conclusions that are valid and can be accounted for. Data analysis of this research is a qualitative descriptive analysis of the data obtained. Analyze the data by describing the situation with a collection of existing data and draw conclusions.

The percentage of students' ability to solve problems based on cognitive style field dependent and field independent can be determined by the following formula.

Table 1: Categories of problem-solving ability based on field-dependent and field-independent cognitive styles.

Category	Percentage (%)
Very good	81 – 100
Good	61 – 80
Fair	41 – 60
Less	21 – 40
Very less	0 – 20

(Arikunto, 2010)

FINDINGS AND DISCUSSION

Findings

The subjects in this study were all Biology Education students of Tadulako University Class of 2018 who were taking an Animal Ecology Course. Subjects were determined using the GEFT (Group Embedded Figure Test) test instrument developed by Witkin and standardized. The GEFT instrument filling will be carried out on Monday, April 26, 2023, at 10.00-10.20 WITA. Analysis of the GEFT instrument filling, the data obtained as in Table 2.

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Table 2. Cognitive Style of Biology Education Students at Tadulako University

Number of Students Taking	Cognitive Style	
	Field Dependent	Field independent
22 Student	13	9

In this study, the research subjects worked on 4 problem-solving ability test questions. The category of the problem-solving ability of students with cognitive style field-dependent and field-independent can be seen in Figure 1.

In animal ecology material, the results showed that Field Dependent (FD) cognitive style is better than Field Independent (FI) learning style. However, keep in mind that there is no one definitive reason for why FD may be better than FI as it depends heavily on the context, research method and characteristics of the student sample. The following are some of the variables that could contribute: 1) Ketergantungan pada Konteks: Ketika mencari solusi untuk masalah, siswa FD cenderung bergantung pada konteks atau informasi di sekitar mereka. Dalam materi ekologi hewan, di mana pemahaman tentang lingkungan dan interaksi hewan sangat penting, siswa FD mungkin lebih baik dalam menghubungkan informasi kontekstual dan melihat hubungan antara elemen ekologi. 2) Social Interaction: FD students may be better at co-operating and interacting with fellow students. The ability to share ideas and knowledge with others can be beneficial in the context of group learning or team-based projects. 3) Holistic approach: FDs tend to see the big picture and relationships in context, which can help understand animal ecology involving multiple factors and complex interactions. FIs may tend to focus more on individual details. 4) Learning Methods: In research or learning animal ecology materials, methods that emphasise field observations, case studies, or holistic understanding of concepts can support the advantages of FD over FI. 5) Sample Characteristics: The characteristics of the students in the research sample may also be influential. FDs may have previous education or experience more suited to the topic of animal ecology.

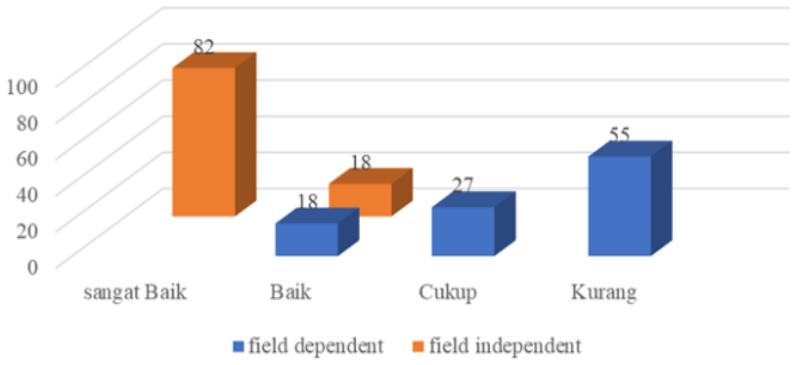

Figure 1: Average Percentage of Problem-Solving Ability of Students with Field Dependent (FD) and Field Independent (FI) Cognitive Styles.

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Based on Figure 1, it is known that students have different levels of problem-solving skills in Animal Ecology material. based on cognitive style field-dependent (FD) and Field Independent (FI) Biology Education students.

Discussion

This study was conducted with the aim of analyzing the problem-solving ability of students based on their cognitive style. The subjects of this study were Biology students class of 2018 which amounted to 114 people, but only 24 students could be used as research subjects. This is due to network factors so that other students cannot take the test. Based on the results of the GEFT test instrument analysis, 11 respondents had a cognitive style field dependent (FD) and 11 respondents had a cognitive style field independent (FI). Based on the research data that has been analyzed, of the 12 student respondents with field-dependent cognitive style on problem-solving Animal Ecology, obtained data as many as 6 respondents in the category of less, 3 respondents in the category of enough, and 2 respondents. in the category of good.

Respondents with problem-solving skills were categorized as less because the respondents did not understand the questions from the problem-solving problems given, the respondents' problem-solving solutions used problem-solving strategies and procedures that led to the correct answers, and at the time of the interview respondents with these category only checked the written answers but did not check the discourse in the question. Respondents with sufficient problem-solving ability because these respondents do not understand the questions from the given problem-solving questions, the respondents' problem-solving solutions use problem-solving strategies and procedures that lead to the correct answers, and at the time of the interview respondents in this category only checked the written answers but did not check the discourse in the questions.

Respondents who have good problem-solving skills are respondents who understand the problem well because these respondents understand the questions from the given problem-solving questions, the problem-solving solutions of these respondents use several strategies and procedures. Problem-solving leads to the correct answer and at the time of the interview respondents with this category only checked the written answer but did not check the discourse on the question. Based on the research data that has been analyzed, from 12 students with field-independent cognitive style on problem-solving Animal Ecology, obtained data as many as 2 respondents in the good category and 9 respondents in the excellent category.

Respondents with good problem-solving skills are able to understand the problem well because these respondents understand the questions from the problem-solving questions given, this respondent's problem-solving solution uses several problem-solving strategies and procedures that lead to the correct answer, and when interviewing respondents with this

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category read the discourse on the question and re-examine the answers written on the question.

Respondents with problem-solving abilities categorized as very good understand the problem well because these respondents understand the questions from the problem-solving questions given, this respondent's problem-solving solution uses several problem-solving strategies and procedures that lead to the correct answer. The problem-solving solution of this respondent uses several problem-solving strategies and procedures that lead to the correct answer, and at the time of interviewing respondents in this category read the discourse on the question and re-examine the answers written on the question.

Based on the results of the analysis of problem-solving ability obtained by students with cognitive style field dependent and field independent, it can be seen that the problem-solving ability of students with cognitive style field independent is better than students with cognitive style field dependent. In accordance with the theory of Witkin (1977) which states that in relation to the ability to solve problems, students with field-dependent cognitive style have difficulty in solving their own problems. So to overcome this they need help and motivation from fellow friends and teachers.

Unlike the case with respondents who have a field-independent cognitive style in learning, they tend to be more independent by prioritizing the ability to think analytically and systematically. In addition, in solving problems They are more independent and not affected by criticism and motivation from fellow friends and teachers. Animal Ecology material may be more suited to the FD way of thinking as it often involves understanding broader contexts, such as the interactions between different organisms in an ecosystem. FD students may be better able to see the relationships and dependencies between different elements in animal ecology. FDs may tend to be more sensitive to ecological aspects, such as population dynamics, ecosystem balance, and predator-prey interactions. They may have a natural intuition to understand and sense animal ecology. FDs tend to see the big picture and relationships in context, which is often important in understanding holistic animal ecology material. They may be better able to assemble information and see larger patterns. The teaching methods used may favor FDs more than FIs. Approaches that use case studies, simulations, or an emphasis on understanding the overall concept may favor FDs. There may be special characteristics in the group of students who are the subject of the study that make FD superior in understanding the material of Animal Ecology.

The results of this study are relevant to research conducted by Wulan (2019) that field-independent subjects (FI) are better than field-dependent subjects (FD). Also relevant to research conducted by Hasan (2020) students with field-independent cognitive style have more detailed characteristics in making explanations and are able to organize the information obtained and able to separate themselves from the influence of the surrounding environment while students with field-dependent cognitive style tend to only be able to accept the concepts

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given so that they have difficulty in understanding the concept, besides that students with field dependent cognitive style are still influenced by the surrounding environment.

Based on the results of the study several factors that influence the problem-solving ability of students with field-independent cognitive style are better than students with field-dependent cognitive style, among others, students with field-dependent cognitive style have difficulty in understanding the problem command. Problem-solving questions were given. when taking the exam. When respondents worked on problem-solving problems consisting of four problem-solving problems, only a few respondents understood the commands of the problem. Respondents only read the question instructions from the question but did not understand the content of the problem discourse from the questions given.

In the research or interview, an interesting result was the discovery that students have different levels of problem-solving ability in animal ecology material based on field-dependent (FD) and field-independent (FI) cognitive styles. This suggests that a person's cognitive style can influence how they understand and solve problems in certain situations. For example, the study of animal ecology in biology education is an example. finding that Field Dependent (FD) cognitive styles fare better in learning contexts than field-independent (FI) learning styles, it is important to ensure that providing approaches that support all types of cognitive styles and provide opportunities for all students to succeed. Here are some ways to address these differences in the learning environment Firstly, it is important to understand that differences in cognitive styles are natural. No one style is better than another. Understanding and respecting these differences is the first step in inclusive teaching. using a variety of teaching methods that include both approaches suitable for FDs and FIs. These can include visual presentations, stories, comparisons, assignments, discussions, case studies, and problem-solving. In this way, all types of cognitive styles have the opportunity to succeed.

Group-based learning or teamwork where FD and FI students can complement each other. FD students may provide broader context and understanding, while FI students may assist in analyzing specific details. Recognize the needs of individuals in your class. If you know that there are students with FI cognitive styles who need more guidance or more structured problem-solving, provide them with additional support. Give students choices in how they learn and complete tasks. This allows them to choose an approach that suits their cognitive style. As far as possible, let them design and manage their own learning. Facilitate collaboration between students so that they can learn from each other. FD students may be able to help FI students understand the context, and vice versa.

Respondents with field-independent cognitive style have better problem-solving skills than students with field-dependent cognitive style, because respondents understand the question well, before answering questions from the problem-solving problem first understand the content of the discourse on the question. Some other factors are caused by the conditions of teaching and learning activities that are taking place in the midst of a pandemic due to the

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Covid-19 virus which is not conducive. This is because the learning process is more directed at giving independent assignments so that students do not understand the material provided.

CONCLUSION

Based on the results of the research and discussion described in the previous chapter, the following conclusions are obtained, Problem-solving ability of students with field-dependent cognitive style in the category of less than 54.54%, sufficient category of 27.27%, and good category of 18.18%, Problem-solving ability of students with field-independent cognitive style categorized as good by 18.20% and very good by 81.20%, Problem-solving ability of students with cognitive style field independent better than field dependent.

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