Trigonometry Mathematical Problem-Solving Ability Viewed from Cognitive Style

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Abstract— Problem solving is a significant skill for students to resolve obstacles in their daily lives. To stimulate a problem solving among the variations of student's characteristics, students are necessary to solve problem at a time. This study aims to investigate students' skill to get over trigonometry problem in the perspective of cognitive style of field independent (FI) and field dependent (FD). Qualitative descriptive research is employed with a purposive sampling technique. The participants of this study consisted of students of Islamic High School (MA) and a student is taken from each type of cognitive style to be interviewed in which these students are able to know indicators of problem solving. Data were collected through test and interview. Data analysis technique was conducted using a model Miles and Huberman with three steps: data reduction, data presentation, and drawing a conclusion. The research findings showed there were a difference between students' characteristics on each cognitive style to solve problem. Students with field independent (FI) cognitive style tended to be independent, able to identify with their own language, select a practical method, re-explain easily the process that has been done and have a good creativity. Meanwhile, students with field dependent (FD) cognitive style were likely to depend on teacher's information, write step including completion and calculation in details, lack in ability to describe the process of accomplishment again, and be not able to provide an alternative solution.

Keywords— problem solving, cognitive style, trigonometry, field independent, field dependent.

INTRODUCTION

Mathematics is one of the subjects that is taught and studied at every level of school education, from elementary school to high school. Mathematics is needed and useful in everyday life. The general objectives of mathematics subjects at the school level are 1) to prepare students to face the changing times that are always evolving, through practicing behavior based on logical, rational, critical, careful, honest, effective and efficient thinking, 2) encouraging students to have an attitude of appreciating the usefulness of mathematics and apply it in everyday life, and 3) prepare students to be able to use mathematics to study various sciences [1], [2].

Learning mathematics is very important to develop problem solving skills in mathematics and in everyday life [3], [4]. For many people, mathematics is synonymous with solving problems, working on story problems, making patterns, interpreting numbers, developing geometric constructions, proving theorems, solving problems, and analyzing data [5]. Problem solving ability in mathematics is the ability to solve mathematical problems by using the knowledge possessed and applying various strategies to find a solution [6]. Problem solving ability is important and needs to be owned by students. Because, through problem solving skills, students are trained to always think critically and creatively in solving problems, as well as finding solutions to problems related to everyday life [5]. Mathematical problem solving is the heart of mathematics learning, because skills are not only for learning, but also emphasize the development of thinking skills methods [5]. Students apply their knowledge and problem-solving skills to be useful in everyday life. So that today's students need problem solving skills, communication skills, mathematical thinking skills, mathematical propensity, as well as attitudes and self-confidence towards mathematics.[7], [8].

Mathematical ability including problem solving is influenced by many variables. Individual differences play an important role in students' academic achievement [9]. Several attempts were made to address the problem of low mathematics achievement and several factors have been identified in explaining academic achievement. Among the many variables studied, demographic status, intelligence [10], behavioral characteristics, and psychological factors namely, attitudes [11], psychosocial [11], self-esteem [12], [13], self-efficacy [14] and concepts self [15]. Sternberg et al. (2008) suggested that learning styles are modified to affect mathematics achievement. Thus, being aware of learning styles and their role in academic achievement is very important for educational psychologists, teachers and researchers. Cognitive style is thus an important cognitive characteristic of learners that has been known to influence complex problem solving [17]. Therefore, continuous investigation of the role of cognitive style on student performance during complex problem solving with computer tools is important. Obviously, research efforts that address which components of problem solving and tasks affect the solving of complex problems, and nevertheless, will be useful in terms of advancing theory of complex problem solving. Mathematical problem-solving skills are also very much needed by students in solving math problems, for example in trigonometry material.

Trigonometry is one of the subjects in mathematics where students experience many difficulties in learning [18], [19] and are not liked by students [20]. Trigonometry is a field of mathematics that students believe is very difficult and abstract compared to other mathematics subjects [20]. Trigonometry is a subject that is considered important in domains outside of mathematics, especially in science, technology, and engineering [21]. Various professions such as physics, astronomy, computer graphics, optics, and many branches of engineering require an understanding of trigonometric functions and their applications. In addition, the concepts and principles of trigonometry can be applied in the work of carpenters, surveyors, architects, and navigators [22]. Despite its very wide relevance, trigonometry is a subject matter that many students strive for [23].

Trigonometry is a unique mathematical subject. On the one hand, trigonometry is studied in terms of triangles, where angles are usually measured in degrees and trigonometric functions are defined as the ratios of the sides of a right triangle. On the other hand, trigonometry is studied in terms of circles, where angles are usually measured in radians and trigonometric functions are expressed in the coordinates of a point on a unit circle centered at the origin. High school trigonometry material consists of several basic competencies that students must learn [24]. One of these basic competencies is that students are expected to be able to solve everyday problems. These problems can be solved by stages of problem solving starting from understanding the problem, designing a settlement plan, implementing the plan, to reviewing the results of the completion as planned [25]. So that students are able to improve their skills in solving problems, especially trigonometric problems that are not routine. Gur [20] said that there are three misconceptions in trigonometry, namely: 1) misconceptions related to concepts that produce mathematical objects and symbols. Example: sine is a concept and symbol of trigonometric functions, 2) misconceptions related to the process of using operations. For example: representing the calculation result of $\sin 300$ and the value of $\sin 300$, and 3) misconceptions related to the procept, namely, the ability to understand mathematical operations and objects (procept includes concepts and processes). For example: $\sin x$ is a function and a value.

According to Frensch and Funke, complex problem solving is seen as an interaction between problem solvers and complex tasks in a particular environmental context [17]. Variables related to problem solving were distinguished between general and domain knowledge, information processing (cognitive style, strategy, monitoring, and evaluation), and non-cognitive variables (motivation and personality). Students assume that non-routine questions are often difficult to understand [26], [27]. Because students are accustomed to solving problems with routine solving steps according to the formulas they get. These difficulties can be seen from the various kinds of errors that students make in solving problems, for example, misunderstanding the questions, not being careful in calculating, and incorrectly applying formulas. These difficulties arise because students do not understand the concepts that have been studied.

In addition, in the process of learning mathematics, of course the teacher will be faced with students who have various characteristics. Each student has a different way of receiving subject matter and processing the information that has been given by the teacher. The difference in the way students obtain, process, and process the information obtained is known as cognitive style [28]–[30]. These differences will affect the ability of students to construct knowledge, so that students are able to understand and process the information obtained for later use in solving mathematical problems. Cognitive style is the preferred way or tendency and individual habits to solve problems, think, understand, and remember information [31]. Cognitive style reflects the mental information processing that students use to understand their world [32]. In this regard, there are three key elements: a) influencing or feeling, b) behavior or actions, and c) cognition or knowing, which form the basic framework of the individual's personal psychology [33]. These three key psychological elements are moderated by the individual's cognitive style and manifest themselves in the way people construct their own general approaches to learning and problem solving. Jonassen and Grabowski [34] categorize cognitive style constructs into two classes, namely cognitive control and

cognitive style. Jonassen and Grabowski [34] distinguish cognitive control from cognitive style by noting that cognitive style only defines the nature of the learner whereas cognitive control acts as an intervening variable that regulates the organization of behavior, perception, memory, and other cognitive functions of an individual as the individual interacts with the environment. Riding and Cheema [31] and Rayner and Riding [35] categorize cognitive styles into two groups, namely the Wholist-Analytic style dimension, which reflects how a person mentally processes information and has been noted by the authors as equivalent to a field-dependent/independent construct. The second group was labeled the Image-Verbal style dimension, which relates to the way individuals mentally represent information.

According to Witkin [36] and Witkin, et. al., [37], cognitive styles are categorized into two types, namely field independent (FI) and field dependent (FD) cognitive styles. Jonassen and Grabowski [34], defined field dependent (FD)/field independent (FI) as the extent to which the surrounding perceptual or contextual fields in the student's environment affect students' perceptions or understanding of information. Similarly, Riding and Rayner (1997) describe FD and FI as the extent to which an individual relies on a perceptual field when analyzing an object that is part of that field. Field-independent cognitive style is a person's cognitive style with a high level of independence in observing a stimulus without dependence on the teacher. Meanwhile, field-dependent cognitive style is a person's cognitive style tends to depend on the source of information from the teacher. Witkin et al., [37] refer to FI students as individuals who rely on the internal vestibular frame of reference when placing the uprights of the surrounding tilt frame in space and individuals who rely on planes as dependent on external and visual frames of reference. Furthermore, someone with the FI cognitive style also has strong analytical abilities, prioritizes information processing and is selective in receiving information. Therefore, students with FI cognitive style have a better ability to understand problems when compared to students with FD cognitive style [30], [31], [38].

Meanwhile, a person with FD cognitive style tends to be impersonal, likes to work in groups, and is easily influenced by outsiders so that they are not selective in receiving information. Therefore, students with FD cognitive style are not better than students with FI cognitive style in solving problems [30], [31]. Meanwhile, Daniels [39] summarizes the general tendency of students to be field dependent and field independent. Field dependent students tend to: 1) rely on the surrounding perceptual field, 2) have difficulty observing, extracting, and using non-obtrusive cues, 3) having difficulty structuring ambiguous information, 4) having difficulty rearranging new information and making connections. relationship with prior knowledge, 5) have difficulty retrieving information from long-term memory. Meanwhile, field independent students have a tendency to: 1) perceive objects as separate from the field, 2) be able to separate relevant items from irrelevant items in the field, 3) present structures if they are not embedded in the information presented, 4) rearrange information to provide context. for prior knowledge, 5) tend to be more efficient in retrieving items from memory.

While Yang et al. [40] found that FD students in learning had a tendency: requiring a simpler interface, less information presented at the same time, simply providing frequently used functions and links to information related to current learning content. Whereas FI students tend to be: able to understand more complex interfaces, can accept more information presented at the same time, and provide links to show the full function of the system and schematic of all learning content. Altun & Cakan [41] found that field independent students outperformed students who were field dependent on several test areas. Angeli [17] suggested that FI students are consistently better than FD students and well-designed instructional materials do not result in effective teaching and successful performance for all students. This shows that there is a relationship between each type of cognitive style on problem solving abilities. So that the difference between the two cognitive styles is seen to result in different problem solving abilities, especially in learning mathematics.

Each individual is different in their learning style and that there is no single delivery system that is optimal for all students and current learning and assessment techniques only support certain learning styles [9]. Cognitive styles have been studied in many countries, such as in the United States, Spain, the Philippines, Hong Kong, China, and more recently in Korea, Norway, and Malaysia. However, studies on learning styles and solving abilities in Indonesia are rare. As already pointed out, it is important for educational psychologists to know how learning styles affect student academic achievement in different countries, and from there to design possible means of intervention to promote effective learning and academic achievement.

Field dependent and field independent cognitive styles play an important role in solving mathematical problems. Cognitive style reflects the mental information processing that students use to make sense of their world. In this regard, there are three key elements: a) influencing or feeling, b) behavior or actions, and c) cognition or knowing, which form the basic framework of the individual's personal psychology. These three key psychological elements are moderated by the individual's cognitive style and manifest themselves in the way people construct their own general approaches to learning and solving math problems. One of the most important and complex high school mathematics materials is trigonometry. In addition, cognitive style is still not considered in the learning process. Therefore, this

study aims to explore the process of solving mathematics problems for high school students in terms of field-dependent and field-independent cognitive styles. Based on the information that has been explained, the problem in this study is how is the process of solving trigonometry problems in high school viewed from the cognitive style-field dependent and field independent?

RESEARCH METHOD

This research is a qualitative descriptive research. Creswell [42] describes the characteristics of a qualitative research approach whose research process will always develop dynamically and describe all facts, phenomena, and symptoms without manipulation [43], [44]. Subject selection technique is purposive sampling. This study describes the classification of students' cognitive styles in solving trigonometric problems. Sources of data in this study were students of class X SCIENCE MAN 2 Yogyakarta as many as 37 students with 16 male students and 21 female students. Based on the results of the GEFT test and the problem-solving ability test, the researchers selected one student each with a field dependent and field independent style for further interviews to explore the differences between each cognitive style in the process of solving trigonometric problems.

The data collection instrument in this study was a cognitive style classification test (GEFT/Group Embedded Figure Test), a problem-solving ability test, and interviews. The GEFT test was developed by adapting the GEFT test developed by Witkin. The GEFT test consists of 25 items in the form of commands to find simple pictures in complex forms and are used to obtain information on the classification of students' cognitive styles. The problem solving ability test is used to determine the students' ability in solving trigonometric material problems. The problem-solving ability test is in the form of a description of 5 items. Meanwhile, interviews were used to explore the results of the problem-solving ability test so that a picture of the differences in problem-solving abilities was obtained in terms of students' cognitive styles.

Data Analysis

1. GEFT test: GEFT test results were analyzed with the guide: the final score obtained by students on the GEFT test was 0 – 9: field dependent cognitive style and the final score obtained by students on the GEFT test was 10 – 18: field independent cognitive style [45]
2. The results of the problem-solving ability test were analyzed using scoring guidelines and making criteria for achieving problem-solving abilities.
3. The results of the interviews were analyzed using the Miles and Huberman analysis model. Miles and Huberman in [42] suggest that activities in qualitative data analysis are carried out interactively and continue continuously until complete, so that the data is saturated. The data analysis techniques are data reduction, data presentation, and drawing conclusions.

RESULT AND DISCUSSION

STUDENTS WITH FIELD INDEPENDENT COGNITIVE STYLE

Students with Field Independent cognitive style

The results of solving trigonometric problems and interviews representing FI students are as follows.

1. At the stage of understanding the problem, the FI subject is able to identify the elements that are known, what is being asked, and the adequacy of the elements needed.
2. At the planning stage, the subject of FI is able to formulate problems and determine the strategies used to solve the problem, but it is not complete. During the interview, the subject of FI suggested that the idea related to the result of the distance between people and the top of the tree used the Pythagorean theorem. However, he did not show the process in the answer sheet. According to him, these results can be obtained without the need to describe and calculate first. Because the numbers presented in the problem for him are still fairly simple. So, with the knowledge he already has, he can immediately guess the value of the hypotenuse.
3. At the stage of implementing the plan, based on the results of tests and interviews, the FI subjects carried out their ideas correctly.
4. At the review stage, the FI subject tries to re-examine the answers he has written and provide conclusions from the solutions obtained. He also said that there are other ways that can be used to solve the problem. According to him, in this problem, the angle value can also be found using the Sin and Tan formula. Here are the results of the work of FI students.

Interviews on students with field independent cognitive style were conducted on subject I18. Subject I18 was chosen because it was considered capable of representing students with the FI type, and able to demonstrate mastery of all (four) problem-solving indicators on all numbers. Here is the answer to subject I18 on question number 3.

Fig. 1. FI I18 Student Work Results

At the stage of making plans, subject I18 was able to formulate problems and determine the strategy used to solve the problem, but it was not complete. During the interview, subject I18 suggested that the idea related to the distance between people and the treetops used the Pythagoras theorem. However, he did not show the process in the answer sheet. According to him, these results can be obtained without the need to describe and calculate first. Because the numbers presented in the problem for him are still fairly simple. So, with the knowledge he already has, I18 can immediately state the value of the hypotenuse. Here is a transcript of the interview.

- P : Where did you get the number 10 as the distance between the top of the tree and the child?
- I18 : Use the Pythagorean theorem. But it doesn't count. Because the numbers are still small. You just need to make multiples of the special triangles which are 3, 4, 5.

In the review stage, subject I18 tries to re-examine the answers he has written and provide conclusions from the solutions obtained. He also said that there are other ways that can be used to solve the problem. According to him, in this problem, the angle value can also be found using the Sin and Tan formula. Thus, subject I18 has mastered the material of trigonometric comparisons of right triangles. Here is a transcript of the interview.

- P : Why do you use Cosine?
- I18 : Actually, you can also look for it using Tangent, using Sine as well. But what is known in the problem is that there are only Cosine and Sine and I chose to use Cosine.

Based on the description, it is known that the FI subject is able to master the four problem solving indicators. In addition, this FI subject also represents a subject with an FI cognitive style. This can be seen from the answers of FI subjects who tend to choose a more practical way of writing calculations and do not write down completely how to solve them. In solving problems, these FI subjects also tend to be able to improvise and have good creativity.

STUDENTS WITH FIELD DEPENDENT COGNITIVE STYLE (FD)

Meanwhile, the results of solving trigonometric problems and interviews representing FD students are as follows.

1. At the stage of understanding the problem, the subject of FD is able to identify the elements that are known, what is being asked, and the adequacy of the elements needed.
2. At the stage of making a plan, the subject of FD is able to formulate problems and determine the strategy used to solve the problem completely. At the time of the interview, the subject of FD stated that the idea related to the results of the distance between people and the top of the tree used the Pythagorean theorem. According to him, he needs to do calculations to find the hypotenuse of the triangle in the illustration.

3. At the stage of implementing the plan, based on the results of tests and interviews, the subject of FD implements his idea correctly. However, when asked to re-explain, he still seems unsure about the results of his work.
4. At the stage of reviewing, the subject of FD tries to re-examine the results of the calculations that he has written and provide conclusions from the solutions obtained. He also said that there might be other ways to solve the problem. According to him, in this problem, the angle value can also be found using the sine formula. The following are the results of interviews with FD subjects. Here are the results of the work of FD students.

Interviews were conducted on students with FD cognitive style represented by subject D7. The D7 subject was chosen because it was considered capable of representing students with the FD type and able to show the four problem-solving indicators on all numbers. The answers to subject D7 in question number 3 are as follows:

Fig. 2. FD Student Work Results

At the stage of making plans, D7 subjects are able to formulate problems and determine the strategies used to solve problems completely. At the time of the interview, subject D7 stated that the idea related to the result of the distance between people and the top of the tree used the Pythagorean theorem. According to him, he needs to do calculations to find the hypotenuse of the triangle in the illustration. In addition, he is also able to determine the value of angles using the Cosine formula. Here is a transcript of the interview.

P : How to find the hypotenuse?

D7 : Calculated using the ordinary Pythagorean formula.

At the stage of implementing the plan, based on the results of tests and interviews, subject D7 carried out his ideas correctly in determining the angle value. However, when asked to re-explain, he still seems unsure about the results of his work.

In the review stage, subject D7 tries to re-examine the results of the calculations that he has written and provide conclusions from the solutions obtained. He also said that there might be other ways to solve the problem. According to him, in this problem, the angle value can also be found using the Sin formula. Here are the results of the interview with subject D7 in question number 3.

P	:	Why use the Cosine formula?
D7	:	Because the ones in the question are Sine and Cosine.
P	:	Is there any other way?
D7	:	None. Seems like it can only use the Sine and Cosine rules.

From this description, it is known that the subject of FD is able to master all (four) problem solving indicators. But often hesitate in carrying out the plan on the given problem. In addition, this FD subject also represents a subject with an FD cognitive style. This can be seen from the answers of FD subjects who tend to choose a more detailed way of writing calculations and writing in full how to solve them. In solving problems, this FD subject also tends to be less able to improvise.

In investigating several factors, both subjects with field dependent and field independent cognitive styles have their own way of identifying what is known and what is asked in the given question. FI subjects who tend to choose a more practical way of writing calculations and do not write down completely how to solve them. In solving problems, these FI subjects also tend to be able to improvise and have good creativity. Their different cognitive styles also lead them into different mental actions. FD subjects are able to master the four problem solving indicators. But often hesitate in carrying out the plan on the given problem. In addition, this FD subject also represents a subject with an FD cognitive style. This can be seen from the answers of FD subjects who tend to choose a more detailed way of writing calculations and writing in full how to solve them. In solving problems, this FD subject also tends to be less able to improvise. Consistent with the findings of Onyekuru [46] that FI students have higher average achievements in science and mathematics than FD students and the opinion of Tinajero & Páramo [47] that cognitive style can affect the acquisition and application of efficient learning strategies and the characteristics shown by FI and FD subjects differed greatly in their use of learning strategies to complete intellectual tasks.

The results of the analysis of the results of tests and interviews that were followed by FI and FD students, obtained data that FI and FD students who mastered the first indicator had the following characteristics. At the stage of understanding the problem, both FI and FD students were able to express what was known and what was asked in the question. At this stage, FI students are able to illustrate problems on the questions, but sometimes they are incomplete. In addition, FI students tend to be more independent in solving problems. So that FI students feel more efficient when working with their own ideas. In line with Pashler et al. [48] which suggests that students with Field Independent (FI) cognitive style tend to use internal factors as directions in processing information. Witkin, et. al [37] also stated that students with Field Independent (FI) cognitive style tend to use an intermediate structure to learn the material, namely analyzing organized material or making their own material structure in their own way if the material is less organized.

FI and FD students who are able to master the four problem solving indicators (level 4) have the following characteristics. At the stage of understanding the problem, both FI and FD students are able to express what is known and what was asked in the question correctly and completely. However, FI students tend to be able to process information from questions in their own language. This is in line with Yang et al. [40] which states that individual FIs are capable of implementing their own structures. Then at the stage of making and implementing plans, FI and FD students are able to show strategic plans and interpret their plans to solve problems. They are also able to illustrate the problem in the problem correctly. However, FD students are less able to explain the plan and the results of the interpretation of the plan made to solve the problem. This is because students do not understand the concept of trigonometric comparisons of right triangles.

Meanwhile, FI students with level 4 have a better ability to explain plans and interpretation results used to solve problems. As Desmita [50], Angeli [17], and Altun & Cakan [41] state that students with field independent cognitive style are more likely to be able to solve problems well and fluently. Because basically independent students are able to decipher complex problems into simpler ones so that they are easy to solve.

Furthermore, at the stage of reviewing, FI students were able to re-examine the results of their answers. This can be seen from the explanation he gave related to what he had written. His conclusions are clear and appropriate. FI students are also able to plan more than one idea to solve a problem. Not only that, he was even able to provide explanations regarding other ideas he gave. Meanwhile, FD students are less able to re-examine the results of their answers. This can be seen from the inability of students to provide explanations related to the solutions they wrote. In addition, the conclusions he wrote were incomplete. FD students also begin to be able to plan more than one idea to solve a problem [11].

Based on the results of the discussion that has been described, the results show that there are differences in the characteristics of students in each type of cognitive style in solving problems. At the stage of understanding the problem, students with field independent (FI) cognitive style are able to identify problems with their own language, while field dependent (FD) students express the results of problem identification in accordance with what is written on the problem. At the planning stage, FI students tend to be more independent than FD students who still depend on information from the teacher. At the stage of implementing the plan, FI students tend to choose a more practical method, while FD students write down the completion and calculation stages in detail. At the stage of reviewing, FD students find it easy to re-explain the completion process that has been carried out. In addition, he has a pretty good creativity. Meanwhile, FD students are less able to explain the completion process that has been carried out and are

unable to provide other alternative solutions to a problem. In essence, the results from both experiments show that FI learners consistently do better than FD and FM learners and that well-designed instructional materials do not result in effective teaching and successful performance for all learners. Nonetheless, research reports on simply examining system performance are insufficient, as they cannot establish principles about how technology capabilities work with learners, and how one should improve system performance [17].

CONCLUSION AND RECOMENDATIONS

Based on the results of the discussion that has been described, the results show that there are differences in the characteristics of students in each type of cognitive style in solving problems. At the stage of understanding the problem, students with field independent (FI) cognitive style are able to identify problems with their own language, while field dependent (FD) students express the results of problem identification in accordance with what is written on the problem. At the planning stage, FI students tend to be more independent than FD students who still depend on information from the teacher. At the stage of implementing the plan, FI students tend to choose a more practical method, while FD students write down the completion and calculation stages in detail. At the stage of reviewing, FD students find it easy to re-explain the completion process that has been carried out. In addition, he has a pretty good creativity. Meanwhile, FD students are less able to explain the completion process that has been carried out and are unable to provide other alternative solutions to a problem.

The results of this study provide an overview of the differences in the mathematical solving abilities of senior high school students with field independent cognitive styles and field dependent cognitive styles and can be used as a basis for designing mathematics learning models, student worksheets, teaching materials, and or learning media to improve mathematical problem-solving skills that are able to facilitate both field independent cognitive style and field dependent cognitive style.

Based on the results of the research and discussion, the researcher recommends the following suggestions:

1. Teachers should choose learning strategies that can be accepted by students with field independent and field dependent cognitive styles. Alternative learning that can be done by the teacher is that the teacher provides variations of questions and exercises on the topics discussed so that students are accustomed to solving non-routine problems. Then, the teacher needs to guide students in analyzing information, planning investigations and reporting tasks from the problems given.
2. To improve the problem-solving ability of field independent students, teachers can help them by providing non-routine problem-based practice questions. So that students can develop problem solving skills in various forms of questions.
3. To improve the problem-solving ability of field dependent students, teachers can help by providing problem-based practice questions and guiding students when analyzing information and making problem-solving plans.
4. It is necessary to consider further research to analyze students' problem-solving abilities in terms of field independent and field dependent cognitive styles on the same subject, by adding other variables if possible. In addition, future researchers can also use other cognitive styles.

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