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# Creative Thinking Process of Prospective Elementary Education Teacher Students Based on Field Independent Cognitive Styles and Self-Efficacy in Solving Contextual Problems

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***Abstract***

This study aims to describe the creative thinking process of prospective elementary school teachers based on independent field cognitive style and self-efficacy in solving contextual problems. This qualitative-exploratory study involved two prospective elementary school teachers who had independent field cognitive style and self-efficacy. Data collection was conducted through task-based interviews and analysis using interactive methods consisting of data condensation, data presentation, data interpretation and verification. The results showed that prospective elementary school teachers with independent field cognitive style and high self-efficacy had better creative thinking processes than prospective elementary school teachers with independent field cognitive style and low self-efficacy. Prospective elementary school teachers with independent field cognitive style and high self-efficacy in synthesizing ideas understood information well, and met the criteria for creative thinking in terms of fluency, flexibility and novelty. Meanwhile, prospective elementary school teachers with independent field cognitive style and low self-efficacy did not see the provisions in the questions given well, and only met the fluency criteria aspect.
**Keywords:** field independent cognitive style, creative thinking process, mathematics contextual, self-efficacy

**Abstrak**

Penelitian ini bertujuan untuk mendeskripsikan proses berpikir kreatif siswa calon guru pendidikan dasar berdasarkan gaya kognitif field independen dan self-eficacy dalam memecahkan masalah kontekstual. Penelitian kualitatif-eksploratif ini melibatkan dua orang siswa calon guru sekolah dasar yang memiliki gaya kognitif *field independent* dan *self-eficacy*. Pengumpulan data dilakukan dengan wawancara berbasis tugas dan analisis menggunakan metode interaktif yang terdiri dari kondensasi data, pemaparan data, interpretasi data dan verifikasi. Hasil penelitian menunjukkan bahwa siswa calon guru sekolah dasar dengan gaya kognitif *field independent* dan *self-efficacy* tinggi mempunyai proses berpikir kreatif yang lebih baik dibandingkan calon siswa guru sekolah dasar dengan gaya kognitif *field independent* dan *self-efficacy* rendah. Siswa calon guru sekolah dasar dengan gaya kognitif kognitif *field independent* dan *self-efficacy* yang tinggi dalam mensintesis gagasan memahami informasi dengan baik, dan memenuhi kriteria berpikir kreatif dalam hal kelancaran, fleksibilitas dan kebaruan. Sedangkan siswa calon guru dengan gaya kognitif *field independent* dan *self-efficacy* rendah kurang melihat dengan baik ketentuan dalam soal yang diberikan, dan hanya memenuhi aspek kriteria kelancaran.
**Kata kunci:** gaya kognitif *field independent*, masalah kontekstual, proses berpikir kreatif, *self-efficacy*

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## Introduction

When an individual carries out thinking activities to solve a problem, that is when the individual's thinking process occurs. Thinking is a mental activity that occurs in students' minds to process the information received and can be observed in visible behavior (Isroil, Budayasa & Masriyah, 2017). The thinking process is a stage of mental activity that occurs naturally, either through systematic planning or not through planning in the hope that there will be changes to the object being thought about. The thinking carried out by someone who combines previous knowledge to produce new ideas in solving

problems is called creative thinking (Wang in Fathoni & Siswono, 2023). Creative thinking is one of the skills that a person must have in the 21st century, apart from media technology skills and life and career skills (Trilling & Fadel, 2009). Creative thinking is an ability that must be developed in 21st century learning to produce new findings in solving increasingly complex problems. It is very important to integrate creative thinking in learning to generate original ideas from students into the knowledge they have acquired. A series of steps and mental activities carried out to produce new ideas, innovative solutions, or unconventional approaches to facing problems or challenges is called the creative thinking process.

According to Marpaung (1986), the creative thinking process is a process of thinking that begins with the process of receiving information from outside or within the student, processing, storing and recalling the information from the student's memory. Siswono (2007) states that the stages/process of creative thinking are synthesizing ideas, building ideas, planning the implementation of ideas, and implementing ideas to produce new products. The idea in the definition here is a stage of creative thinking that produces a product, the product in question is a product that meets the aspects of fluency, flexibility and novelty.The thinking process will be carried out by a person when that person carries out a problem solving process for the problems they face (Pupitasari & Sulaiman, 2019). This is because problems stimulate the brain to carry out thinking activities and process information. On the other hand, it turns out that problem solving is related to creative thinking. This is in line with research Briggs (2007) which states that problem solving can improve a person's creative thinking abilities. Thus, teachers can use problem solving instruments to improve their students' creative thinking abilities. On the other hand, creative thinking is also really needed in solving everyday problems that are new non-routine, including in mathematics (Rizki, 2018). One type of problem in mathematics that requires creative thinking is contextual problems.

Contextual problems given to students must provide information that can be arranged mathematically and provide opportunities for students to solve the problem using the knowledge and experience they have gained (Van den Heuvel-Panhuizen, 2005). When students solve contextual problems, students connect the problem situation with their experiences in everyday life. The results of observations and interviews with lecturers who teach mathematics courses for prospective elementary school teachers show that the mathematics achievements of elementary school teacher education graduates have not been encouraging based on the results of the minimum competency assessment obtained by elementary school students at their teaching places. Apart from that, based on experience in teaching elementary school mathematics education courses, it shows that they are still weak in solving questions related to contextual problems. This is because prospective elementary school teachers assume that mathematics is a difficult subject to learn and understand. They have difficulty relating mathematical concepts to the problems given, so far they have placed more emphasis on memorizing formulas or theories in the material being taught. Apart from difficult mathematics problems, prospective elementary school teacher students are also influenced by those whose lecture process does not focus only on mathematics subjects but there are still several disciplines that must be mastered. The difficulty and lack of focus of prospective elementary school teacher students in solving contextual mathematics problems is greatly influenced by the students' self-confidence in achieving the targets or goals they want to achieve. Confidence in being able to solve problems in order to achieve the expected goals is greatly influenced by self-efficacy. According to Hamdi and Abadi (2014) research results, self-efficacy influences the mathematics learning achievement of elementary school teacher education students. Self-efficacy has a positive impact on various aspects of a person's life, especially in learning, as stated by Zimmerman, Sebastian, & Robert (1996).

A person's self-confidence in their abilities and success in solving problems from a psychological perspective is called self-efficacy. Self-efficacy has an important role in influencing behavior that determines a person's goals and aspirations. Bandura (1994) explains that self-efficacy is defined as a

person's belief about his ability to produce a specified level of performance that influences events and one's life. Another opinion explains that self-efficacy is the belief that oneself is able to achieve desired results, such as mastering a new skill or achieving a certain goal (Wade & Travis, 2007). These opinions show that self-efficacy has a quite important role in achieving one's goals. The abilities of students are different so the way students express creative ideas is also different. Therefore, each student's mathematical problem solving strategy has a different way of thinking and thinking style. Students' problem solving strategies are influenced by the way they process, store and respond using information obtained from the problem. These different ways and styles of thinking in the world of education are called cognitive styles. Witkin (1977) explains that cognitive style is an individual characteristic that is expressed through perceptual and intellectual activities in a pervasive and very consistent manner. Each individual has a different way of recognizing, seeing and organizing information in processing information as a response to receiving environmental stimuli.

Based on the background description above, researchers are interested in researching the creative thinking process considering prospective elementary school teachers in solving contextual mathematics problems, because prospective elementary school teachers will have an important role in developing the creative thinking abilities of students who will later be educated. The difficulties faced certainly require the support of high self-confidence, namely self-efficacy, students with high self-efficacy are more likely to organize learning activities, check their progress, and manipulate their environment to support their learning. Apart from the self-efficacy factor, students' abilities vary so that the way students express creative ideas also varies. This research is part of the results of dissertation research with the title that creative thinking process of prospective elementary school teacher students based on cognitive style and self-efficacy in solving contextual problems. So the results of the seminar paper are presented by looking at student elementary school teacher candidates with a field independent cognitive style based on self-efficacy. Considering that individuals with the field independent cognitive style have the characteristics of individuals who are able to analyze and separate elements and their context analytically. Students who have the field independent cognitive style solve problems using their own perception and analytically, using strategies and processes that vary systematically.

Thus, it is necessary to study and carefully that how is the creative thinking process of prospective elementary school teacher students based on field independent (FI) cognitive style and self-efficacy in solving contextual problems.

## Method

The research method used in this research is an exploratory qualitative method. Exploratory qualitative research is an approach to exploring and understanding the meaning of individuals or groups in dealing with social or human problems Creswell (2017). The type of qualitative research in this research is a case study. A case study is a research design that can be carried out in various fields where the researcher analyzes a case in depth, collects complete information using various data collection procedures based on a predetermined time. This qualitative research method with case studies was chosen because it is in accordance with the research objective of exploring or describing the thinking processes of prospective elementary school teacher students based on field independent cognitive styles and high and low levels of self-efficacy.

The subject selection technique uses a purposive sampling method, namely a data collection technique with certain considerations Sugiyono (2008). The selection of subjects was based on field independent cognitive style and high and low levels of self-efficacy, each criterion was determined by one subject. Data collection uses task-based test and interview methods.

The instruments in this research consist of primary instruments and secondary instruments. The primary instrument is the researcher as an interviewer to explore data in depth and at the same time control interview activities in depth in an effort to obtain complete data according to the needs in answering the research. Meanwhile, secondary instruments consist of the GEFT Test (Group Embedded

Figures Test), Self-Efficacy Questionnaire, Contextual Problem Solving Creative Thinking Test and interview guidelines. Data analysis uses the Milles and Huberman interactive model which has three components, namely data reduction, data presentation and conclusion drawing/verification (Miles, 2014). Data credibility was carried out by more diligent observation (Persistent Observation) and the researcher was in the classroom and observed the subject's activities for sufficient time. In this research, the author uses time triangulation, through think aloud activities, written subject data in the form of completing contextual mathematics problem solving tasks and verbal data in the form of subject expressions related to completing contextual mathematics problem solving tasks by collecting data at different times.

## Result and Discussion

Based on the test results, the research subjects were determined to be 1 student with a field independent cognitive style with high self-efficacy, 1 student with a field independent cognitive style with low self-efficacy. The subject selection in this research was students with the same gender and relatively the same mathematical abilities with the aim of avoiding bias due to these two factors**.** The following table 1 shows the results of selected research subjects

**Tabel 1. The Results of Selected Research Subjects**

| No | Subject Name Initials | Gender | GPA | Cognitive Style Categories | *Self-Efficacy* Categories | Subject Code |
|---|---|---|---|---|---|---|
| 1 | DA | L | 3,93 | *Field Independent* | High | FI-HSE |
| 2 | AF | P | 3,87 | *Field Independent* | Low | FI-LSE |

After finding the selected subjects, the researcher then carried out tests and interviews with the selected subjects. The following are the results of the answers from FI-HSE subjects and FI-LSE subjects in solving contextual mathematics problems given during the interview:

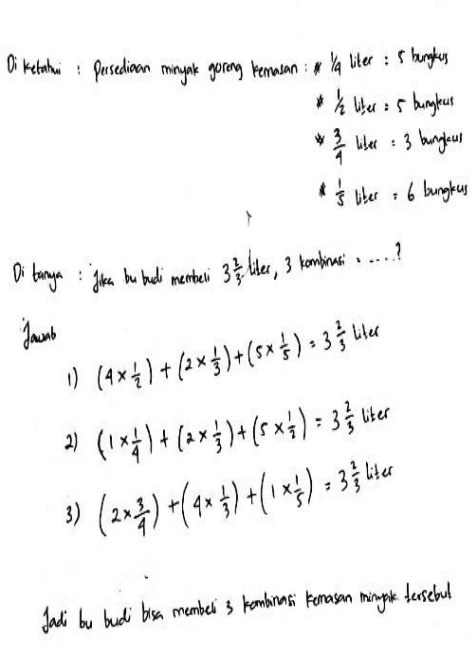


Figure 1: FI-LSE Subject Answer Results

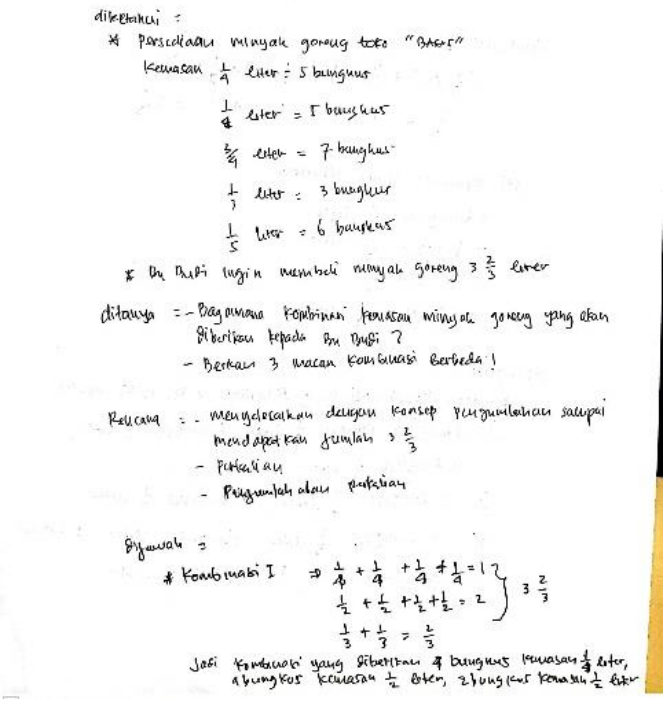


Figure 2: Results of FI-HSE Subject Answers

The results of research data analysis show that the comparison of the creative thinking processes of FI-HSE subjects and FI-LSE subjects can be discussed as follows:

**Synthesize Ideas**

Synthesizing ideas, means intertwining or combining ideas that you have which can be sourced from classroom learning and daily experiences Siswono (2008). Furthermore, in synthesizing ideas, individuals already understand the problem given and have the knowledge tool to solve it which can come from classroom learning and daily experiences. FI-HSE subjects understand the contextual problems given well, explain and write in detail the information obtained. This agrees with Aldarmono (2012) who states that students with a field independent cognitive style tend to be more independent by prioritizing analytical and systematic thinking skills in receiving information from their environment. Furthermore, the subject seemed confident in linking information obtained from contextual problems with mathematical concepts, namely the concept of fractions. This is in line with the opinion of Alwisol (2014) which states that people who have high self-efficacy (believe that they can work according to the demands of the situation) and realistic expectations of results (estimate the results according to their own abilities), that person will work hard and persist in doing the work. task to completion. FI-LSE subjects in developing ideas explained their understanding in detail but not comprehensively, FI-LSE subjects also seemed hesitant in explaining the relationship between information from the contextual problems given and mathematical concepts even though the subjects were able to explain that the problems given were related to concepts.

**Building Ideas**

According to Siswono (2008) that building ideas means generating ideas related to a given problem as a result of the previous idea synthesis process. FI-HSE subjects, in building ideas, are able to relate information to a given contextual problem by generating more than one idea. Mursidik et al (2015) explained that aspects of fluency are related to the way students construct ideas. Fluency in creative thinking refers to the variety of correct answers given to students. In this aspect, different answers are not necessarily considered diverse. Because FI-HSE subjects develop plans or ideas/strategies for solving things that are different from before. Meanwhile, FI-LSE subjects build ideas that require a long process and explain how to solve contextual problems given by using the same method to get different combinations. FI-LSE subjects explain briefly and want to immediately try to complete their work on the answer sheet. The subject generally meets the criteria for creative thinking in the fluency aspect.

Prospective teacher students with a field independent cognitive style and low self-efficacy, in going through the stages of the creative thinking process have efforts to think analytically at the stages of synthesizing ideas and building ideas, but because the subject has low self-efficacy the subject is unable to plan the application of ideas and the application of ideas. well. In the opinion of Alwisol (2014) states that people who have high self-efficacy (believe that they can do the work according to the demands of the situation) and realistic expectations of the results (estimate the results according to their own abilities), that person will work hard and persist in doing the task until it is completed. . So low self-efficacy affects the creative thinking process in solving contextual problems given to prospective teacher students with a field independent cognitive style and low self-efficacy.

**Plan the Implementation of the Idea**

FI-HSE subjects planned to implement the idea three times with different and correct approaches. This is in line with the opinion of Siswono (2008) that planning implementation means that an individual has chosen one of several ideas that have been previously raised to be used in solving a

problem, and implementing an idea means that an individual has used a previously selected idea in solving a problem. Apart from that, according to the opinion of Mursidik et al (2015), the aspect of flexibility/flexibility in creative thinking leads to students' ability to solve problems with a variety of different ways of solving them. Using this different method begins with looking at the problem given from a different perspective. This is different from the FI-LSE subject, the subject produces answers to three different combinations in the same way, but the second and third answers are not correct or do not match the problem given. The subject did not pay attention to the number of cooking oil packages available so the subject did not pay attention. In terms of creative thinking criteria, the subject does not meet the flexible criteria.

Research by Amini et al (2023) shows that students with the FI cognitive style have high creative thinking abilities. Where students are able to analyze questions well, provide more than one idea and answer, find the right solution in solving the problem, obtain correct information from the problem and write it back in detail as a step in solving the problem. However, because the subject had low self-efficacy, the FI-LSE subject seemed hesitant and needed time to answer the researcher's questions by repeating reading the TMK questions before answering the researcher's questions. This is in line with the opinion of Schöber et al. (2018) that low self-efficacy is correlated with low learning achievement, this often prevents students from achieving success and makes them less likely to do difficult tasks.

**Implementation of Ideas**

In general, FI-HSE subjects succeeded in implementing their three idea plans by producing correct answers from three different strategies. First, the subject applies the first method using addition, then the FI-HSE subject solves it by combining multiplication and addition. According to Siswono (2008), applying an idea means that an individual has used a previously selected idea in solving a problem. In the opinion of Mursidik et al (2015), the criterion for novelty is the authenticity of the answer or solution method related to how many students provide the answer or solution method. The less often students give the same answer or the same way of solving it, the higher the level of authenticity of the answer. However, this aspect also requires considering the suitability and usefulness of the answer. Based on the results of applying the idea of the FI-HSE subject, it produces three different answers from the previous one and has the correct value so that the FI-HSE subject meets the criteria for creative thinking of novelty or novelty. This is in contrast to the FI-LSE subject, the FI-LSE subject implements the idea according to the plan for implementing the previous idea by producing the correct answer with the chosen idea or strategy. The subject completed the multiplication and addition operations to produce three answers, the first combination of answers was correct and the second and third answers from the results of applying the idea were still not correct because the subject did not pay attention to the provisions of the contextual problem given.

FI-HSE subjects are able to solve contextual problems correctly, can apply different methods and produce more than one different answer. This is in accordance with Bandura's (1986) opinion that self-efficacy plays a role in mathematics learning, influencing the way students act, the effort they exert, their persistence, thought patterns and emotional responses. Self-efficacy will increase students' interest in mathematics and enable them to achieve maximum learning outcomes. In essence, a student's level of success in learning mathematics also depends on the student's level of self-confidence.

**Conclusion**

Based on the results of research, analysis and discussion, it can be concluded that the creative thinking process of prospective elementary school teacher students based on field independent cognitive style and self-efficacy shows: the creative thinking process of prospective elementary school teacher students based on field independent cognitive style and high self-efficacy tries to think analytically and

can go through the four stages of the creative thinking process, namely the stages of synthesizing ideas, building ideas, planning the implementation of ideas, and implementing ideas. Primary school teacher candidates based on field independent cognitive style and high self-efficacy are able to solve contextual problems correctly, can apply different methods and produce more than one different answer, meet the criteria for fluency, flexibility and novelty aspects. Meanwhile, the creative thinking process of prospective teacher students with field independent cognitive style and low self-efficacy, in going through the stages of the creative thinking process, has an effort to think analytically at the stage of synthesizing ideas and building ideas, but because the subject has low self-efficacy the subject cannot plan the implementation. ideas and implementing ideas well. Student teachers with field independent cognitive style and low self-efficacy can produce the correct answer in the first step but in the next step produce an incorrect solution. This means that prospective teacher students with a field independent cognitive style and low self-efficacy can meet the flexible aspect, but the subject cannot meet the criteria for the flexible aspect and the novelty aspect. According to the following explanation of the stages of creative thinking.

The results of the research show that prospective elementary school teacher students with a field independent cognitive style and low self-efficacy are less careful in computing because they lack confidence in synthesizing ideas so that in building ideas, planning the implementation of ideas and implementing the chosen ideas or strategies so that they do not produce solutions. right. Thus, it is necessary to pay attention to learning by providing regular contextual problem solving exercises so that students become accustomed to solving problems. Relevant researchers can use the results of this research as a basic reference in looking at students' creative thinking processes based on field independent cognitive style and self-efficacy.

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