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Bransford & Stein Theory: Mathematical thinking Process of Prospective Mathematics Teacher Students in Solving Statistical Problems Based on Cognitive Learning Style

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ABSTRACT

A good mathematical thinking process for prospective students, mathematics teachers is a necessity that needs to be had. The purpose of this study is to describe the profile of the mathematical thinking process of prospective mathematics teacher students based on Field Dependent and Field Independent learning styles in solving mathematical problems. The method of research is descriptive-qualitative research. The research subjects taken were 3 mathematics education students for Field Dependent type learning styles and 3 people for Field Independent types. Data collection techniques, namely: tests of mathematical thinking skills on statistical material, and interviews. Data analysis uses stages, namely: (1) data reduction; (2) present data based on Bransford & Stein Theory; (3) make conclusions. The results showed that the mathematical thinking process of prospective mathematics teacher students is 1) The field of independent learning style is more systematic in reading story problems, able to identify important information and classify it into mathematical models / variables. While field-dependent students tend to read questions globally and focus less on details; 2) in understanding the problem, FI students more quickly map the problem into relevant mathematical representations. FD students think deductively and need concrete examples to understand problems; 3) FI students are more creative and flexible in developing problem-solving strategies using various mathematical concepts and procedures. FD students more often use the standard strategies that have been taught. 4) FI students are meticulous and detailed in interpreting solutions back to the context of the original problem. FD students tend to focus on the end result without relating to the meaning of the problem.

Keywords: bransford & stein theory ; cognitive learning style; field dependent; field independent; mathematical thinking process

INTRODUCTION

The ability to think mathematically is important in learning mathematics. Students' success in learning one of them is influenced by the ability to think. Problems related to everyday life and things experienced by students can slowly cultivate the habit of thinking and imagining well (Muhtadi et al., 2019). Individuals with critical thinking skills view the world from an open-minded and tolerant perspective and can think analytically and systematically in the face of events and problems. Individuals with the ability to think mathematically are more successful in analyzing the events they encounter and achieve solutions systematically in the correct and shortest way (Er, 2023). Mathematical thinking is a complex activity, so it is important to equip students with this ability from the basic level of Education (Rahmawati et al., 2024). Mathematical thinking as a mental process that comes into play when applying mathematics to solve problems (Danoebroto et al., 2024). Mathematical thinking includes the ability, namely: abstract, representation, and verification to find solutions to mathematical problems (Sa'adah et al., 2023). According To Haji (2019), mathematical thinking includes understanding mathematical concepts, using mathematical reasoning, and solving and interpreting solutions to mathematical problems. Teachers need

to understand the profile of students ' mathematical thinking processes to design effective learning.

Mathematical thinking ability is one of the essential competencies that must be possessed by prospective mathematics teachers. This becomes even more crucial considering their future role as facilitators of mathematics learning. However, various studies show that there is still a gap in the ability of prospective mathematics teacher students to solve statistical problems, which is an integral part of the mathematics curriculum.

Statistics are needed to read and understand the information encountered in everyday life (Guven et al., 2021). Statistics as a branch of mathematics has an important role in training students' abilities in presenting data, processing data, analyzing data, and concluding data (Listiani, 2023). Statistics itself is a branch of mathematics that has unique characteristics, where problem solving requires not only conceptual understanding but also the ability to interpret and analyze data. Andriatna et al. (2021) the results of the analysis of the statistical literacy skills of prospective mathematics teacher students showed still less than optimal on the indicators of reasoning on the basic concepts of statistics that have an impact on less than optimal data interpretation capabilities. This indicates the need for a more systematic approach to developing students' mathematical thinking skills, especially in the context of statistics.

In Indonesia, this problem is becoming more urgent considering the results of the TIMSS and PISA studies which show that the mathematical abilities of Indonesian students are still below the international average. This is inseparable from the quality of mathematics teaching, which begins with the readiness of prospective mathematics teachers. Data from the Ministry of Education shows that only 45% of mathematics teachers have adequate competence in teaching statistics.

Bransford & Stein's theory offers a systematic IDEAL (Identify, Define, Explore, Act, Look) framework in problem solving (Bransford & Stein, 1993). This approach has not been widely explored in the context of statistics learning, especially when associated with cognitive learning styles. Williams' (2023) research shows that cognitive style has a significant influence on how students process and solve mathematical problems.

Many factors influence student performance during the learning process, including each person's talents. However, because each student has a different way of understanding the subject matter taught by their teacher, not all students have the same learning ability. The difference in how students obtain, process, and process the information they obtain is called cognitive style (Ansyah et al., 2021). Cognitive styles indicate patterns of performance and cognitive preferences favored by students in perceiving and organizing surrounding stimuli (Alabdulaziz et al., 2022). Cognitive style is the trait that a person has for thinking, remembering and solving problems in an orderly and sustained way (Sutama et al., 2021). Cognitive styles have more to do with the way individuals think in depth and find two classifications of cognitive styles: field-independent styles (FI) and field-dependent styles (FD) (Sianturi et al., 2022). As one of the characteristics of students, the position of cognitive style in the learning process is very important to be considered by teachers or learning planners because the learning plan is designed and prepared with attention to cognitive style factors means providing learning instructions by the characteristics and potential of students. With this kind of planning, learning conditions will be created much better because this type

of learning does not interfere with the rights of students. In addition, learning is adapted to the student's cognitive processes and development (Prayekti, 2018).

On the other hand, field-independent (FI) and field-dependent (FD) cognitive learning styles are thought to influence students ' thinking processes. According to research (Witkin et al., 1977), FI students tend to be analytical, independent, and not easily affected by external stimuli in learning. While FD are more environmentally impressionable, tend to see problems globally and favor group learning.

Related to that, Chasanah et al. (2020) students of FI cognitive style have better skills than those with FD cognitive style. Teenagers who have independent cognitive styles can accomplish more tasks than those with dependent cognitive styles. Research Sutama et al. (2021) also shows that students who have a field-independent cognitive style show high self-confidence and the ability to solve problems correctly. They are also able to carry out planning steps, make important decisions for themselves, and solve problems appropriately. Students with a field-independent cognitive style respond well to math problems even if they have never experienced them before. When solving problems, students with a field-independent cognitive style can outline the components of the problem, use various strategies, and connect between mathematical concepts (Setiyani et al., 2024), including: Witkin et al. (1977) found that students with field-independent styles showed better analytical skills than field-dependent in solving problems.

However, there are not many studies that specifically analyze the profile of students ' mathematical thinking processes based on FI and FD cognitive styles. Most of the research only compared his eventual abilities, not his thought process. Novelty this study will describe the profile of the mathematical thought process of FI and FD students in depth at each stage. The results are expected to enrich the theory of Mathematical Thinking profile of students in terms of aspects of cognitive style. However, research on the profile of students ' mathematical thinking processes based on learning styles is still very limited. Therefore, it is necessary to research to describe the profile of the mathematical thinking process of FI and FD students to develop adaptive mathematics learning.

This gap raises important research questions about how the mathematical thinking process of pre-service mathematics teachers solves statistical problems, especially when viewed from the perspective of Bransford & Stein's theory and related to their cognitive learning styles. A deeper understanding of this can make a significant contribution to the development of more effective learning methods to prepare pre-service mathematics teachers.

Research gap in this research is most studies on Bransford & Stein's theory focus on general problem-solving rather than domain-specific applications in statistics and there has not been much research that integrates aspects of cognitive style with mathematical thinking processes in the context of statistical problem solving. In addition, novelty this research, there has been no research that specifically integrates all components of Bransford & Stein's theory with statistical problem solving and cognitive learning styles. Based on the description above, this study focuses on assessing, analyzing, and describing the mathematical thinking process of students in solving statistical problems with Bransford & Stein's theory.

The importance of this study is because it provides a deep understanding of students' mathematical thinking processes in the context of statistics, explores the effectiveness of Bransford & Stein's theory in learning statistics, identifies the relationship between cognitive style and statistical problem-solving abilities, provides a foundation for developing more adaptive and effective learning strategies. Through this research, it is hoped that a more comprehensive understanding of how prospective mathematics teacher students think and solve statistical problems can be obtained, which can ultimately contribute to improving the quality of mathematics education in Indonesia.

RESEARCH METHODS

This study uses a qualitative approach. A case study was conducted on the mathematical thinking profile of prospective mathematics teacher students based on their cognitive style. The subjects of this study were 3 students of mathematics teacher candidates in the Mathematics Education Study program who have field-independent cognitive style and 3 students of mathematics teacher candidates with field-dependent style. The main instrument is the researcher himself. The Data were collected through mathematical thinking process test instruments on Educational Statistics materials and interviews. Meanwhile, the GEFT (Group Embedded Figure Test) was given to gather information about students' cognitive styles (Sianturi et al., 2022).

Analysis of students' thinking processes in solving statistics problems using the IDEAL problem-solving steps. Explanation of IDEAL problem solving is described as follows:

1. *Identify Problems and opportunities*

The first component of the IDEAL approach is to identify potential problems and treat them as opportunities/opportunities to do something creative. A person who can identify important problems and treat them as opportunities/opportunities is often the most successful in his field. So, the ability to identify problems is an important characteristic to solve problems. Ability in identifying problems, allowing to be able to choose the right strategy in solving the problem.

2. *Define goals*

The second component in the IDEAL is goal setting. Setting/defining goals is different from identifying problems. Differences in goals often lead to differences in reflecting or determining strategies for understanding the problem. By knowing the purpose of a problem, a person will be able to determine the appropriate strategy for solving the problem.

3. *Explore possible strategies*

The third component of the IDEAL is to explore possible appropriate strategies for solving the problem. Exploring alternative problem-solving strategies, can involve reanalyzing goals by considering possible options or strategies for achieving those goals.

4. *Anticipated outcome and act*

The previous three components emphasized the importance of identifying problems and opportunities to be creative, define goals, and explore plans or strategies for finding solutions. Once a strategy is chosen, it is important to anticipate possible outcomes and then act based on that strategy. Anticipating possible outcomes can save a person from actions that may not be appropriate in problem solving.

5. *Look back and learn*

The last component of the IDEAL component is to see the true impact of your strategy and learn from experience. To learn from experience, one needs to re-examine their performance in more detail.

Furthermore, to determine the students 'thinking process, it is necessary to analyze the students' mathematical thinking process based on the answers they wrote. Zuhri stated that the analysis of thought processes can be grouped into categories of thought processes (Yanti & Syazali, 2016). Zuhri (Yanti & Syazali, 2016) revealed that the indicators of the thought process as follows:

1. Conceptual thinking process.
   The process of conceptual thinking is the ability to reveal the known in the problem, to reveal the Asked, to use the concepts that have been learned in answering the question, and to explain the elements of the concept solved.
2. Semiconceptual thinking process
   The semiconceptual thinking process is less able to express the known in the problem, less able to express the Asked, less able to use the concepts that have been learned in answering the question, and less able to explain the elements of the concept solved.
3. Computational thinking process
   The computational thinking process is not able to express the known in the problem, not able to express the asked, in answering the question is often separated from the concepts that have been taught/learned, not able to explain the steps used in solving the problem.

Data collection using Mathematical Thinking Process Written Test, Interview. The collected Data is then analyzed through Miles and Huberman models including data reduction, data presentation, and conclusion.

Data on statistical test results on sub-material sampling techniques were analyzed based on indicators of thought processes that meet the conceptual thinking process, semiconseptual, and computational Zuhri (Yanti & Syazali, 2016) and problem-solving steps by Bransford and Stein. Description of thought process indicators adapted from Zuhri which is described as a mathematical thought process presented in Table 1.

Table 1. Mathematical Thought Process Indicators

Conceptual thinking process	Semiconceptual thinking process	Computational thinking process
1. Students can identify a given problem by formulating what is known from the problem with their language or mathematical sentences	1. Students are less able to identify a given problem by formulating what is known from the problem with their language or mathematical sentences	1. Students are unable to identify a given problem by formulating what is known from the problem with their language or mathematical sentences
2. Students can formulate what is asked from the problem with their language or mathematical sentences	2. Students are less able to formulate what is asked from the problem with their language or mathematical sentences	2. Students are not able to formulate what is asked of the problem with their language or mathematical sentences

3. Students can choose the right strategy to solve a given problem	3. Students are less able to choose the right strategy to solve a given problem	3. Students are not able to choose the right strategy to solve a given problem
4. Students can use the concepts learned appropriately	4. Students are less able to use the concepts learned appropriately	4. Students are not able to use the concepts learned properly
5. Students can re-examine the answers that have been done	5. Students are less able to re-examine the answers that have been done	6. Students are not able to re-examine the answers that have been done

RESULTS AND DISCUSSION

Profile description mathematical thinking process of prospective teacher students reviewed cognitive learning style took six students analyzed. Students of mathematics teacher candidates consist of three people with Field field-independent learning styles and three with Field Dependent learning styles. Each group consists of high, medium, and low academic ability. It is assessed from the results of the student's answer to examine the mathematical thinking process by looking at the steps of solving the problem based on Bransford and Stein (Bransford & Stein, 1993).

The problem used to analyze the mathematical thinking process of prospective students of mathematics teachers is a matter of Educational Statistics. The problem is presented as follows:

Terdapat 1000 orang calon mahasiswa baru pendidikan matematika di suatu perguruan tinggi yang terdiri dari 560 perempuan dan 440 laki-laki. Kemudian dari hasil tes diketahui rata-rata hitung nilai masuk perguruan tinggi pada kelompok perempuan adalah 78 dan deviasi standarnya yaitu 3,5, sedangkan rata-rata nilai masuk perguruan tinggi pada kelompok laki-laki adalah 80 dan deviasi standarnya yaitu 11,5. Calon mahasiswa yang diterima di perguruan tinggi tersebut hanya untuk nilai lebih dari atau sama dengan 85. Periksalah apakah tepat bahwa mahasiswa yang banyak diterima adalah mahasiswa laki-laki? Buktikan manakah calon mahasiswa yang lebih banyak masuk perguruan tinggi?

Mathematical thinking process of students with field Dependent cognitive learning style

Mathematical thinking process of prospective mathematics teachers with field-dependent cognitive learning style Taken 3 people. On the other hand, it is also analyzed from the academic ability of students. The results of the recapitulation of the student's mathematical thinking process are presented in the following Table 2.

Table 2. Data results of Mathematical Thinking process with Bransford and Stein stages

Categories Of Cognitive Learning Styles	Category Subject Ability	Subject Number	Bransford and Stein stages	Performing Mathematical Thought Process	Conclusion Mathematical Thought Process
	High	S-1	1	conceptual	
			2	conceptual	
			3	conceptual	conceptual
			4	semiconceptual	

Categories Of Cognitive Learning Styles	Category Subject Ability	Subject Number	Bransford and Stein stages	Performing Mathematical Thought Process	Conclusion Mathematical Thought Process
			5	computational	
	Medium	S-2	1	semiconceptual	
			2	computational	
Field Dependent			3	semiconceptual	semiconceptual
			4	semiconceptual	
			5	computational	
	Low	S-3	1	computational	
			2	computational	
			3	computational	computational
			4	computational	
			5	computational	

The answers of FD group Students in answering the questions given are described based on high, medium, and low academic ability. The following are the answers of FD high category students:

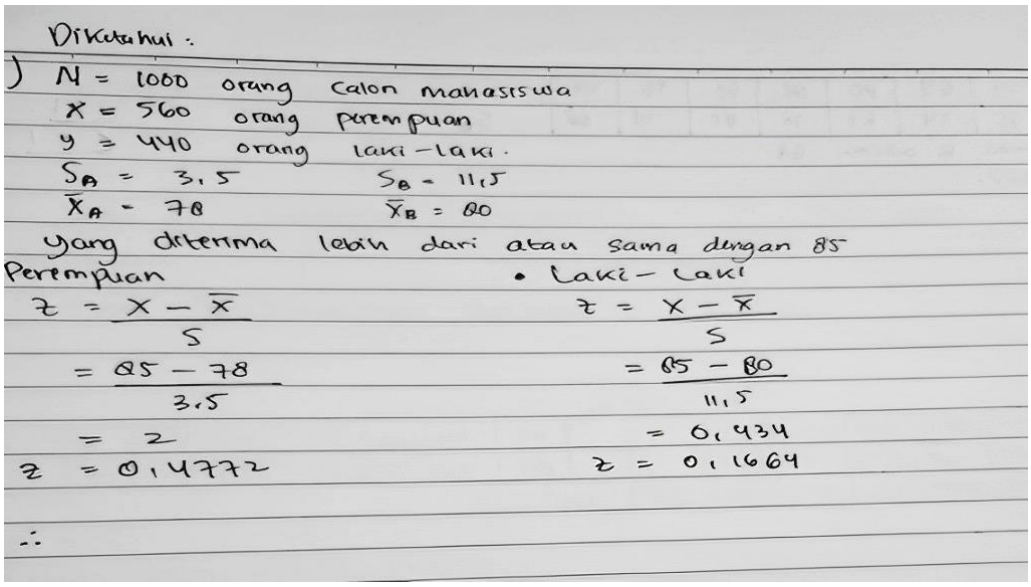

Figure 1. FD Cognitive Learning Style Students with High Academic Ability

Students in the FD cognitive learning style with high academic ability, it is seen that students can identify problems, formulate problems that are presented even though they are not described correctly, can choose the right strategy, but have not been able to apply the concept correctly, and the student does not check back on the answers he has done. For students in the FD group with a high category, the thought process is still dominant conceptual. Furthermore, for students with FD learning style in the category of medium academic ability, the answers in solving the given problems are presented in the following figure:

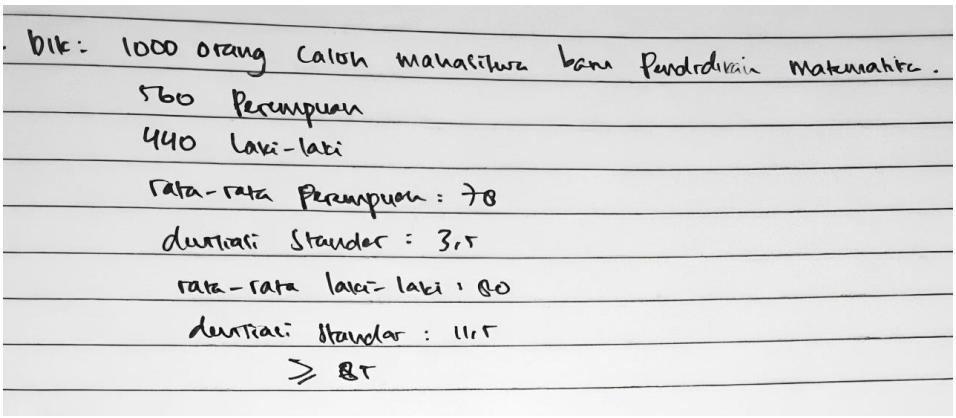

Figure 2. FD Cognitive Learning Style Students with Medium Academic Ability

In the group of students who FD cognitive learning style with moderate academic ability. The thought process can identify problems, less able to formulate a given problem, and does not show the ability to choose the right strategy and use the strategy appropriately. So as not to check the answer. In this student, the process of mathematical thinking tends to be semiconceptual. For the answers of FD group Students with low ability, the answers can be seen in Figure 3.

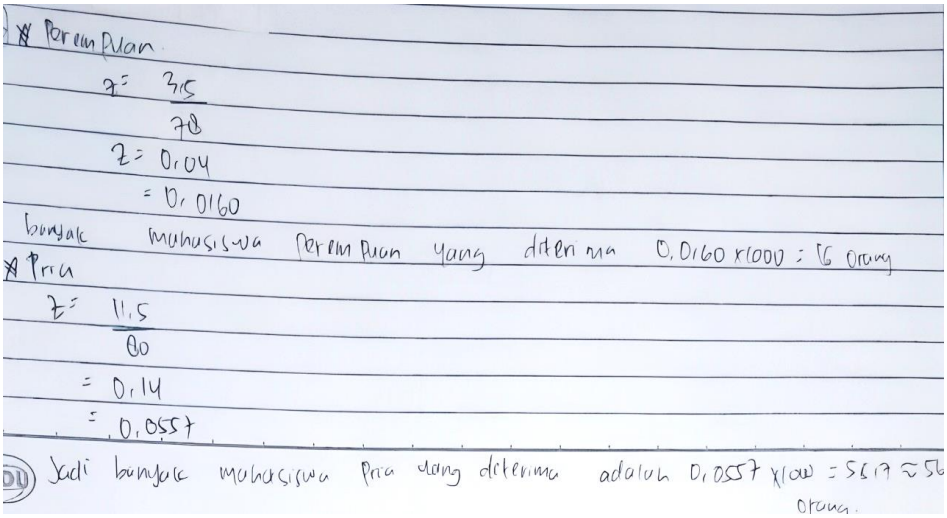

Figure 3. FD Cognitive Learning Style Students with Low Academic Ability

In Figure 3, students who FD cognitive learning style with low academic ability see that the answer does not show the ability to identify the problem given, unable to formulate what is asked in the problem, so that students are not appropriate in determining the strategy used and not appropriate in using the concepts learned. Students in the FD group with low academic ability also did not double-check the answers they did. The thought process of students in this category is included in the category of computational.

Mathematical thinking process of students with field-independent cognitive learning style

Mathematical thinking process of prospective mathematics teachers with cognitive learning style field independently taken 3 people. On the other hand, it is also analyzed from

the academic ability of students. The results of the recapitulation of the student's mathematical thinking process are presented in the following Table 3.

Table 3. Data results of Mathematical Thinking process with Bransford and Stein stages

Categories Of Cognitive Learning Styles	Category Subject Ability	Subject Number	Bransford and Stein stages	Performing Mathematical Thought Process	Conclusion Mathematical Thought Process
Field Independent	High	S-1	1	Conceptual	Conceptual
			2	Conceptual	
			3	Conceptual	
			4	Conceptual	
			5	Conceptual	
	Medium	S-2	1	Conceptual	Conceptual
			2	Conceptual	
			3	Conceptual	
			4	Conceptual	
			5	Semiconceptual	
	Low	S-3	1	Computational	Computational
			2	Computational	
			3	Computational	
			4	Computational	
			5	Computational	

Results of student problem solving in solving problems in Field Independent students in high, medium and low groups.

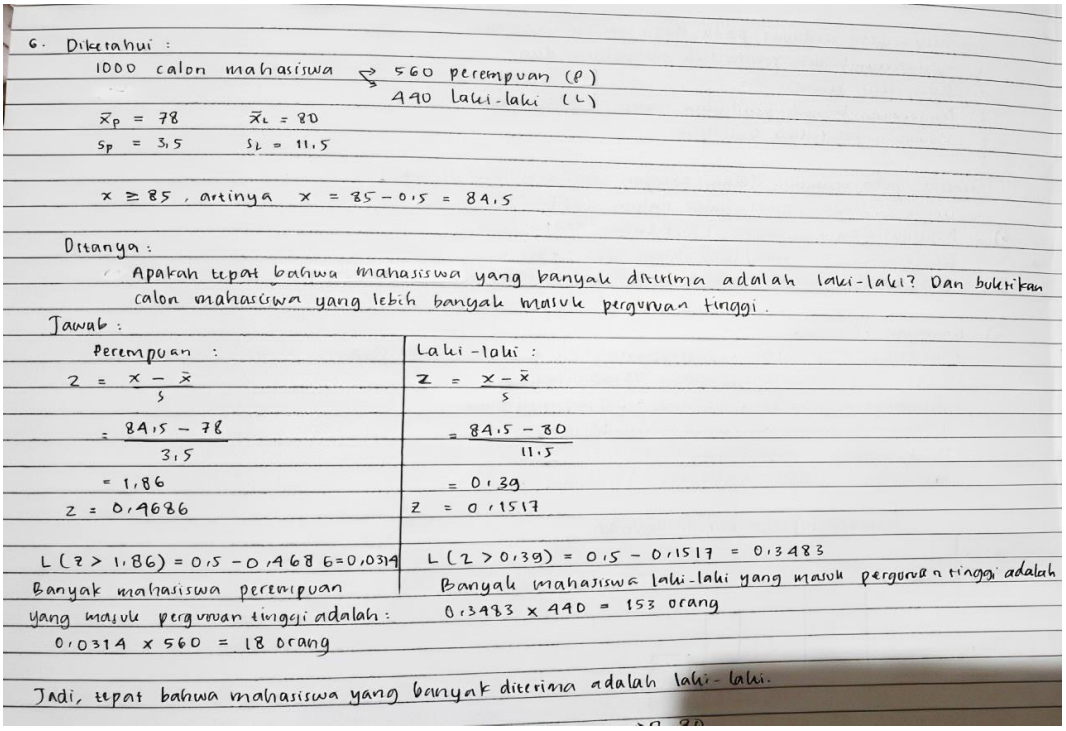

Figure 4. Answer FI Students with High Academic Ability

In Figure 4, FI students can identify the problem, formulate what is asked, choose the right method to solve the given problem, and double-check the answers that have been given. Based on the student's answer, it can be seen that his thought process is included in the conceptual group. Furthermore, FI students with moderate academic ability answers to their work can be seen in Figure 5.

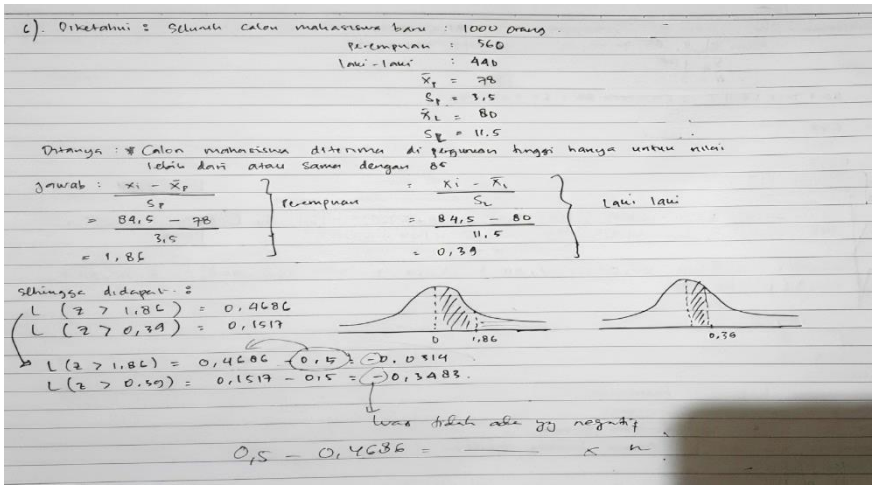

Figure 5. FI Student Answer's Medium Academic Ability

In Figure 5, students who are FI on ability are able to identify the problem, formulate what is asked, and choose the right method to solve a given problem, but are less able to recheck the answers that have been done. FI students with moderate academic ability, the thought process is still dominant conceptual. Furthermore, for FI students in the low category, the answers to the results of their work can be seen in Figure 6.

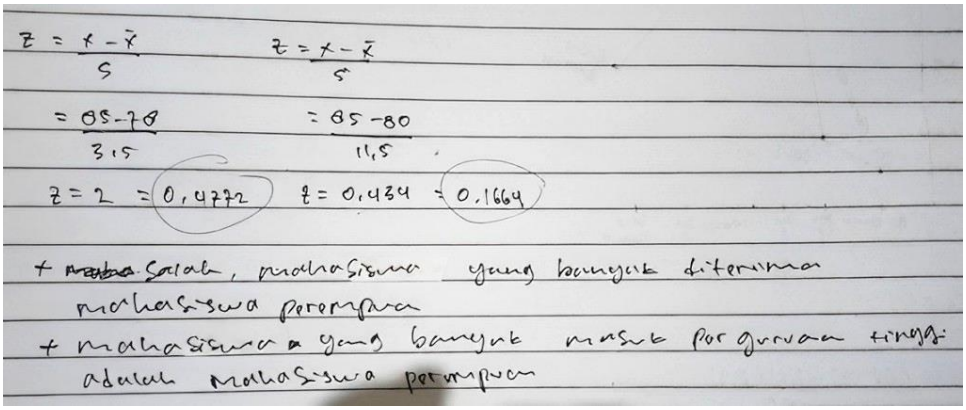

Figure 6. Students with Low Academic Ability

In Figure 6, FI students with low abilities are not able to identify problems and formulate what is asked, but they are able to determine the right problem-solving strategies to use. However, students have not been able to use the strategy properly and did not check the answers they did.

The results obtained from evaluating the cognitive processes of college students in the context of solving statistical questions show differences. The differences in cognitive strategies used by college students can be attributed to the analysis of their responses, which depend on their understanding or knowledge base. In solving statistical problems, students demonstrate the ability to identify the right problem-solving. However, their confidence

seems to be lacking, resulting in the re-application of various strategies when engaging with problems. This phenomenon shows a lack of understanding of the basic concepts in understanding the concept of Statistics.

Cognitive learning styles, field-dependent always work on a problem based on the context being studied, while field-independent is usually independent of the context being studied. This greatly affects the way students understand and solve math problems. Students with a field-independent style tend to be better at analyzing and solving complex problems because they can separate key information from context. In contrast, students with field-dependent styles rely more on context and relationships between elements in solving mathematical tasks. This can be seen from the answers of students in solving statistical problems given. So, cognitive style also affects students in their thinking process. Other findings, FI students' thinking processes showed higher awareness of their thinking processes, while FD students needed scaffolding to develop metacognitive awareness. The results of a review of the IDEAL steps (Bransford & Stein, 1993) in solving mathematical problems show different mathematical thinking processes between field-dependent and field-independent mathematics teacher candidates.

The results of this investigation showed that students with high cognitive abilities showed conceptual thinking processes, while those with medium abilities showed semi conceptual thinking processes, and students classified as low abilities were mainly involved in computational thinking processes. Students involved in conceptual and semi conceptual thought processes are adept at addressing and solving the problems presented. In contrast, students in the computing category require a solid understanding of the underlying concepts before problem-solving. A significant limitation of the study is the absence of comprehensive interviews with study participants. For future researchers investigating similar issues, it is advisable to include interviews to ensure student thought processes are aligned with the Brandford and Stein stages.

The mathematical thinking process that is expected to exist in today's learners based on curriculum guidance is a high-level thinking process (high-order thinking), while prospective teachers, especially prospective mathematics teachers, students need to have the ability to not only understand concepts in depth but also be able to convey material to students with different learning styles. This article highlights the importance of a prospective teacher's awareness of their learning style and that it can affect their teaching methods. For example, a prospective teacher with a field-independent learning style needs to notice that students with a field-dependent learning style may need a more contextual and visual approach.

Statistics teachers should provide opportunities for students to develop static thinking habits and Problem Solvers, such as reasoning, explanation, modeling, looking at Structure, and generalization. The results of this study can contribute to designing mathematical learning strategies that support a variety of cognitive learning styles. It is important for educators and curriculum developers to be aware of the cognitive styles that students have and to design learning environments and materials taking into account the characteristics of students with different cognitive styles (Sahin & Sasmaz Oren, 2022). Teaching Model and cognitive style of students is very important to note in learning so that students are able to solve mathematical problems. Therefore, it is advisable for teachers to use appropriate

learning models in order to accommodate student learning styles so as to build student problem-solving abilities (Son et al., 2020). Teachers should develop student leadership styles when developing instruction and learning assessments. Understanding the character and needs of different students can help teachers understand the appropriate lessons (Sianturi et al., 2022).

Limitations of this study in the form of the size of the study subjects are small enough to allow bias in identifying learning styles. In addition, the focus of the material is limited to statistical material and the results of this study also cannot be generalized due to qualitative research. Further research directions may include the influence of other factors, such as learning motivation, teaching experience, or educational curriculum on mathematical thinking processes.

CONCLUSION

Conclusion the difference in the Mathematical Thinking process between students with field-independent and field-dependent learning styles:

1. Field-independent students are more systematic in reading story Questions, and able to identify important information and classify it into mathematical models/variables. Meanwhile, field-dependent students tend to read questions globally and focus less on details.
2. In understanding the problem, FI students more quickly map the problem into a relevant mathematical representation. FD students think deductively and need concrete examples to understand issues.
3. FI students are more creative and flexible in developing problem-solving strategies using a variety of mathematical concepts and procedures. FD students more often use standard methods that have been taught.
4. FI students are meticulous and detailed in interpreting solutions back to the context of the original problem. FD students tend to focus on the result without associating it with the meaning of the problem.

REFERENCES

Alabdulaziz, M. S., Hassan, H. F., & Soliman, M. W. (2022). The effect of the interaction between crowdsourced style and cognitive style on developing research and scientific thinking skills. *Eurasia Journal of Mathematics, Science and Technology Education*, *18*(10), 1–19. https://doi.org/10.29333/ejmste/12428.

Andriatna, R., Kurniawati, I., & Wulandari, A. N. (2021). Profil Kemampuan Literasi Statistik Mahasiswa Calon Guru Matematika. *FIBONACCI: Jurnal Pendidikan Matematika dan Matematika*, *7*(1), 19–28. https://doi.org/10.24853/fbc.7.1.19-28.

Ansyah, E., Wachidi, W., & Riyanto, R. (2021). The Effect of Learning Methods and Cognitive Style on Student Learning Achievement. *Education Quarterly Reviews*, *4*(4), 79–85. https://doi.org/10.31014/aior.1993.04.04.372.

Bransford, J. D., & Stein, B. S. (1993). *The Ideal Prblem Solver (2nd ed.)*. W. H. Freeman and Company.

Chasanah, C., Riyadi, & Usodo, B. (2020). The effectiveness of learning models on written mathematical communication skills viewed from students' cognitive styles. *European Journal of Educational Research*, *9*(3), 979–994. https://doi.org/10.12973/EU-

JER.9.3.979.

Danoebroto, S. W., Suyata, & Jailani. (2024). Teachers' Efforts to Promote Students' Mathematical Thinking Using Ethnomathematics Approach. *Mathematics Teaching-Research Journal*, *16*(2), 207–231.

Er, Z. (2023). Examination of the relationship between mathematical and critical thinking skills and academic achievement. *Pedagogical Research*, *9*(1), 1–9. https://doi.org/10.29333/pr/14028.

Guven, B., Baki, A., Uzun, N., Ozmen, Z. M., & Arslan, Z. (2021). Evaluating the Statistics Courses in Terms of the Statistical Literacy: Didactic Pathways of Pre-Service Mathematics Teachers. *International Electronic Journal of Mathematics Education*, *16*(2), 1–15. https://doi.org/10.29333/iejme/9769.

Haji, S. (2019). Analisis Kemampuan Berpikir Matematis Mahasiswa melalui Model Pembelajaran Auditory Intellectually Repetition. *Jurnal Elemen*, *5*(2), 213–226. https://doi.org/https://doi.org/10.29408/jel.v5i2.

Listiani, T. (2023). Students' Mathematics Problem Solving Skills between Full-Online Learning and Hybrid Learning in Statistics Course. *International Conference on Research in Education and Science*, 1277–1287. https://doi.org/https://orcid.org/0000-0003-2170-3680.

Muhtadi, D., Supratman, & Hermanto, R. (2019). The students' mathematical critical thinking process reviewed from the cognitive style. *Journal of Physics: Conference Series*, *1188*, 1–7. https://doi.org/10.1088/1742-6596/1188/1/012082.

Prayekti. (2018). The Influence of Cognitive Learning Style and Learning Independence on the Students' Learning Outcomes. *Higher Education Studies*, *8*(2), 37–46. https://doi.org/10.5539/hes.v8n2p37.

Rahmawati, R. D., Sugiman, Wangid, M. N., & Purnomo, Y. W. (2024). Designing Model of Mathematics Instruction Based on Computational Thinking and Mathematical Thinking for Elementary School Student. *Mathematics Teaching-Research Journal*, *16*(1), 143–166.

Sa'adah, N., Faizah, S., Sa'dijah, C., Khabibah, S., & Kurniati, D. (2023). Students' Mathematical Thinking Process in Algebraic Verification Based on Crystalline Concept. *Mathematics Teaching-Research Journal*, *15*(1), 90–107.

Sahin, F., & Sasmaz Oren, F. (2022). Laboratory as an Instrument in Improving the Scientific Reasoning Skills of Pre-Service Science Teachers with Different Cognitive Styles. *Science Insights Education Frontiers*, *13*(2), 1875–1897. https://doi.org/10.15354/sief.22.or072.

Setiyani, Waluya, S. B., Sukestiyarno, Y. L., & Cahyono, A. N. (2024). Construction of reflective thinking : A field independent student in numerical problems. *Journal on Mathematics Education*, *15*(1), 151–172. https://doi.org/http://doi.org/10.22342/jme.v15i1.pp151-172.

Sianturi, M., Suliantin, R., & Fitrianti, H. (2022). Relationships Between Cognitive Styles and Indigenous Students' Mathematics Academic Outcomes. *Journal of Learning for Development*, *9*(3), 528–544. https://doi.org/10.56059/jl4d.v9i3.684.

Son, A. L., Darhim, & Fatimah, S. (2020). Students' mathematical problem-solving ability based on teaching models intervention and cognitive style. *Journal on Mathematics Education*, *11*(2), 209–222. https://doi.org/10.22342/jme.11.2.10744.209-222.

Sutama, S., Anif, S., Prayitno, H. J., Narimo, S., Fuadi, D., Sari, D. P., & Adnan, M. (2021). Metacognition of Junior High School Students in Mathematics Problem Solving Based on Cognitive Style. *Asian Journal of University Education*, *17*(1), 134–144. https://doi.org/10.24191/ajue.v17i1.12604.

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependent and

field-independent cognitive styles and their educational implications. *Review of Educational Research*, *47*(1), 1–64. https://doi.org/https://doi.org/10.3102/0034654.

Yanti, A. P., & Syazali, M. (2016). Analisis Proses Berpikir Siswa dalam Memecahkan Masalah Matematika berdasarkan Langkah-Langkah Bransford dan Stein ditinjau dari Adversity Quotient. *Al-Jabar: Jurnal Pendidikan Matematika*, *7*(1), 63–74. https://doi.org/10.24042/ajpm.v7i1.132.