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# MATHEMATICS PROBLEM SOLVING BASED ON COGNITIVE STYLE TO DETERMINE OF STUDENT REASONING ABILITIES IN THE COVID-19 PANDEMIC ERA

**Maswar Maswar[1*], Mohammad Tohir[2], Diyah Ayu Rizki Pradita[3], Dian Noer Asyari[4], Wahyu Sardjono[5], Erna Selviyanti[6]**
[1,2,3,4]Universitas Ibrahimy, Situbondo, Indonesia
[5]Bina Nusantara University, Indonesia
[6]Politeknik Negeri Jember, Indonesia
[1*]maswar@ibrahimy.ac.id, [2]matematohir@ibrahimy.ac.id,
[3]diyahpradita@ibrahimy.ac.id, [4]dianasyari@ibrahimy.ac.id, [5]wahyu.s@binus.ac.id,
[6]ernaselviyanti@polije.ac.id,

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**Abstract:**
Mathematical problem solving has become an important issue that was often discussed in school classes including in the covid-19 pandemic era. This research aimed to describe the level of reasoning ability of students in solving mathematical problems based on the cognitive style of field-dependent and field-independent cognitive styles. The research approach used a was mixed-method of quantitative and qualitative. The subject of this study were students of Ibrahimy 1 Junior High School of Situbondo. The data collection techniques used were the form of tests and interviews. The data of the written test and interview results were tested for validity by triangulation. This research indicated that:(1) there were differences in student's mathematical reasoning abilities between-FD and FI subjects; (2) the FI subject was able to re-examined, evaluated, and drew valid conclusions, but not for FD subject; (3) the FI subject has fulfilled all four mathematics reasoning indicators and classified as a very capable category; (4) the FD subject has fulfilled all three indicators and classified as capable enough category; and (5) generally, the level of mathematical reasoning ability of FI subjects group was very capable category as many as 21,43% and 14,29 % for FD subjects group.

**Keywords:** Problem Solving, Cognitive Style, Student Reasoning Abilities, Algebra, Pandemic Era

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## INTRODUCTION

Mathematics is one of the sciences that has an important role in the development of science and technology, whether as a tool in the implication of other fields on science or in the development of mathematics itself. Mastering the material of mathematics is an obligation for society and it cannot be negotiated in today's era on global competition. Mathematics is not knowledge that is used for

its own sake, but it is useful knowledge for humans and other knowledge. In other words, mathematics has a very important role in other knowledge, the main ones are science and technology (Siagian, 2016).

Desoete says that it is difficult to not emphasize mathematics literacy in society. We need time to pay bills, follow the directions or use the maps, see the train schedules or understand the announcements and expiration dates in our daily life situations (Suprihatiningsih, 2015). The difficulty of getting a decent job is also due to the lack of mathematical literacy. Mathematics is the basic foundation of every order of knowledge (Thalhah, Tohir, Nguyen, Shankar, & Rahim, 2019); (Maswar, 2019). Thus, mathematics has an important role in advancing the State of Indonesia and improving the welfare of the people through the development of Science and Technology which cannot be separated from mathematics.

But in this pandemic era, we know that almost all mathematics learning at all levels of education does not run as normal. The Indonesian government is currently intensifying social distancing activities. Where residents are asked to always maintain a distance of 1-2 meters when interacting with the surrounding community to avoid the spread of the Covid-19 virus. The virus attacks the respiratory system (Yezli & Khan, 2020), and has affected more than 100 countries in a matter of weeks (Selviyanti et al., 2021). The initial transmission of the Corona Virus disease outbreak in Indonesia was first discovered in March 2020 (Sardjono, Selviyanti, Tohir, & Azizah, 2021). Covid-19 transmission can occur through direct physical contact, so preventive measures are taken through social distancing (Sardjono, Selviyanti, Mukhlis, & Tohir, 2021). As a result, schools, universities, and agencies that are still under the auspices of the government are closed with operational activities and replaced with activities at home or the new term is work from home (Selviyanti et al., 2021). This certainly greatly affects student learning outcomes, especially in the field of mathematics. Nevertheless, mathematics learning activities still have to be improved in various ways and media. One of them is to identify students' cognitive styles before teaching them algebra.

At almost all levels of education, both Elementary, Junior High School, and Senior High School, mathematics is taught to students and especially algebra. Algebra is basic and important subject in mathematics. The students must be able to master algebra as a basis for further learning. Algebra has a complex level of difficulty in each problem. Algebra is a study of numbers systems and characteristically general. The letters or symbols are used to express the quantities and the signs in expressing both of them. Algebra is the development of knowledge from arithmetic. For example, if every two numbers add, it can be said that a + b, in replacement of every special thing like 3 + 4, 2 + 8, and so on, Holland (Erviana, 2019b).

The result of the study of Erviana showed that the difficulties of students in solving the algebraic problems are very diverse, such as the difficulty of calculating and the difficulty of connecting a problem to be solved in both textual and contextual (Erviana, 2019a). It can interpret mathematical solutions contextually both those obtained in the steps of solving the problem, as well as the final solution that is asked of the questions, double-checking the mathematical solutions obtained by believing that the solutions obtained are correct and can double-check

the solutions work backward and reexamine the problem-solving process, explaining why mathematical solutions make sense (Taufik & Zainab, 2021).

In teaching mathematics in class which is inappropriate with the characteristics or cognitive style of students tends to give improper knowledge for students, so that it makes a student reasoning weaker and their learning outcome are not optimal. The term of "cognitive style" was used by Allport in 1937, and it describes a person's characteristics or habits in solving the problems, thinking, discussing, remembering, understanding and representing information (Al Jabbar, Hadi, Wangguway, & Sulistiyono, 2020). Kogan states that one of the individual differences in cognitive style is in terms of field dependence and field-independent (Erviana, 2019a). According to Keefe dependent or independent fields is to measure how far an individual Analyze which opposes to general/common way of the experience in its environment (Erviana, 2019b).

The variety and techniques in completing algebra material become very important further study, so that, they will know and understand. Furthermore, especially relates to the students' cognitive styles. Then, it will look for the alternative of mathematics learning strategies that are appropriate to students' mathematical abilities and cognitive styles. The result of the research by Nugraha & Awalliyah shows that students' cognitive style greatly influences students' mastering concepts (Nugraha & Awalliyah, 2016). Therefore, the purpose of this study is to describe mathematical problem solving issues based on field-dependent and field-independent to determine the level of student's reasoning abilities in the covid-19 pandemic era.

## RESEARCH METHODS

This research used a mixed-method. This means that this research used qualitative and quantitative data. The analysis of qualitative data described produces a clear and detailed picture of junior high school students' mathematical perception in solving algebraic problems in terms of dependent and independent fields. The main sources in this qualitative research were words and action. Thus, the qualitative data in this study were the results of the student's answers to algebra test questions and the results of interviews conducted by researchers. Then, quantitative data were used to classify students' cognitive styles and groups. All the results had been analyzed so that they can be described in detail about the level of students' reasoning abilities.

The subject of this research was the students of Ibrahimy 1 Junior High School of Situbondo. It was determined by using purposive sampling which consisted of two subjects independent field subjects and dependent field subjects. The subjects of this research were chosen by using the cognitive style test in the form of the Group Embedded Figures Test (GEFT). It was adapted from the list of questions that were made by Withkin and has been validated by the expert before using it. Moreover, the determination of the subject is also based on their mathematical abilities. The researchers did not look at specific mathematics abilities in taking the subject of this study, but rather focused on subjects with moderate mathematical abilities and had different cognitive learning styles namely cognitive fields dependent (FD) and fields independent (FI).

The indicators used to learn about students' mathematics reasoning abilities in solving algebra problems are presented in the following Table 1:

**Table 1.** The Description of Mathematics Reasoning Indicators

| The steps of reasoning | Mathematical Reasoning Indicators | Description |
|---|---|---|
| *Step one: a problematic situation is met* (finding the problem) | 1. Investigate the problem (Investigating)<br>2. Finding the problem | a. Finding what is asked in the questions<br>b. Finding any data that is known in the question<br>c. Finding the methods or technics of problem-solving<br>d. Finding the connection between a problem with the methods or technics of solving the problem |
| *Step two: strategy choise* (choosing the strategy to solve the problem) | 1. Representing<br>2. Conjecturing | a. Deciding the methods or technic of problem-solving<br>b. Make a plan for the problem solving |
| *Step three: strategy implementation* (Conducting the strategy chosen) | 1. Making the illustration of problem-solving based on the strategy chosen (drawing)<br>2. constructing an argument or giving the explanation | a. Writing down the mathematical equation (patterns, symbols, pictures, etc.)<br>b. Writing down the stages of solving systematically or logically |
| *Step four: conclusions* | 1. Justifying<br>2. (validating logic conclusion) | a. Concluding the result<br>b. Re-checking the result<br>c. Validating the last conclusions as a solution |

Adapted from the *four-step structure of the solver's actual reasoning by* John Lither (Erviana, 2019a)

Meanwhile, the researchers did a recapitulation of each number of questions about mathematics reasoning ability tests to determine students' reasoning abilities. The scoring criteria for mathematics reasoning level test questions in this study can be presented in Table 2 below:

**Table 2**. The Criteria of Students' Mathematical Reasoning Ability Levels

| Category | Criteria |
|---|---|
| level 4: very capable | All the indicators of student mathematics reasoning are very clearly or completely fulfilled based on the four categories of mathematics reasoning |
| Level 3: capable | All the indicators of student mathematics reasoning are clearly or completely fulfilled based on the four categories of mathematics reasoning |
| Level 2: capable enough | All the indicators of the students' mathematics reasoning are quite clearly or completely fulfilled based on the category of mathematics reasoning |
| Level 1: less capable | All the indicators of students' mathematics reasoning are less clearly or incompletely fulfilled based on the four categories of mathematics reasoning |
| Level 0: not capable | All the indicators of students' mathematics reasoning are not clearly or incompletely fulfilled based on the four categories of mathematics reasoning |

Quoted from Mohammad Tohir (Mohammad Tohir, 2017)

**RESULTS AND DISCUSSION**

The results of this research taken from the description of the level of the students' mathematics reasoning ability in solving the problem based on the cognitive of the independent field that can be described as follow:

**Tests of Normality and Homogenity For FD Subject**

The normality and homogeneity test of research data can be seen in the following Table 3:

**Table 3.** Case Processing Summary

| Class | | Cases | | | | | |
|---|---|---|---|---|---|---|---|
| | | Valid | | Missing | | Total | |
| | | N | Percent | N | Percent | N | Percent |
| **All Subject** | **Pree Test** | 50 | 100% | 0 | 0.0% | 50 | 100% |
| | **Post Test** | 50 | 100% | 0 | 0.0% | 50 | 100% |

Table 3 above provides information about several sample analyses with the SPSS program and no data is blank or unfilled in data filling, so the data amount is 100%. The research analysis used was Kolmogorov-Smirnov to test the normality of the data and Levene statistic to test the homogeneity of variance. Normality and homogeneity decision are taken if the significance value is greater than 0.05.

**Table 4.** Test of Normality

| Class | | Kolmogorov-Sminov[a] | | | Dhapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| **All Subject** | **Pree Test** | 0.119 | 50 | 0.77 | 0.960 | 50 | 0.092 |
| | **Post Test** | 0.123 | 50 | 0.77 | 0.964 | 50 | 0.136 |

a. Lilliefors Significance Correction

Table 4 above provides information about the results of the normality test of pre-test and post-test data for all subjects. Because the test results show the significant value of Kolmogorov-Smirnov is greater than 0.5, then the data is normally distributed.

**Table 5.** Test of Homogenity

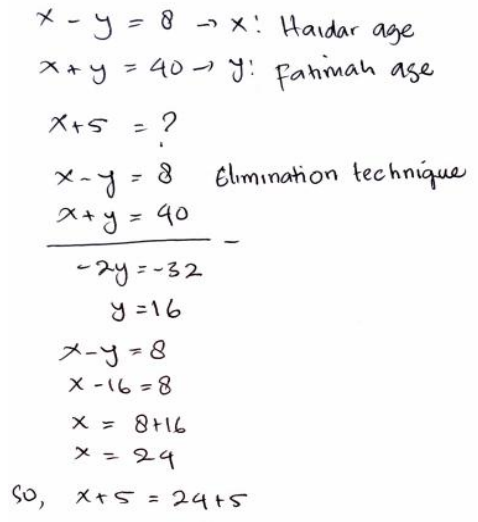
| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| **All Subject** | **Based on Mean** | 0.229 | 1 | 98 | 0.633 |
| | **Based on Median** | 0.232 | 1 | 98 | 0.631 |
| | **Based on Median and with adjusted df** | 0.232 | 1 | 95.736 | 0.631 |
| | **Based on trimmed mean** | 0.218 | 1 | 98 | 0.641 |

Table 5 above provides information about the results of the homogeneity test of pre-test and post-test data for all subjects. The test results showed that if the significance value of the Levene statistic is greater than 0.5, then the data is homogeneous.

Based on the two tables and the analysis, it can be concluded that the pre-test and post-test data for all subjects are normally distributed and homogeneous.

**Algebra Problem Solving Task (APST) for Field- Dependent (FD) Subject**

It is known that Haidar's age is 8 years older than Fatimah's age now. If both of them have a total age in 40 years, how old is Haidar 5 years letter?




Based on the result of the field-dependent subject, it is known that FD can investigate questions in detail so that they can understand the questions given properly. The FD wrote the data that were known directly in the form of equations illustrated with examples X and Y. The subject planned a solving strategy by eliminating, without considering which step is more efficient and then applying it to obtain the value of X through the substitution of the value of Y. Furthermore, the FI subject substituted the value of X = 24 to the question, namely X + 5, obtained a value of 29. The FD tended to solve

problems well and handled them with a combination of methods without analysis indeed way which is one of the methods that is quite easy to find efficient solutions

**Figure 1**. The Answered of Field-Dependent Subject

The following part is the Interview excerpts of students' cognitive style of the field-dependent in planning algebra problem solving based on APST:

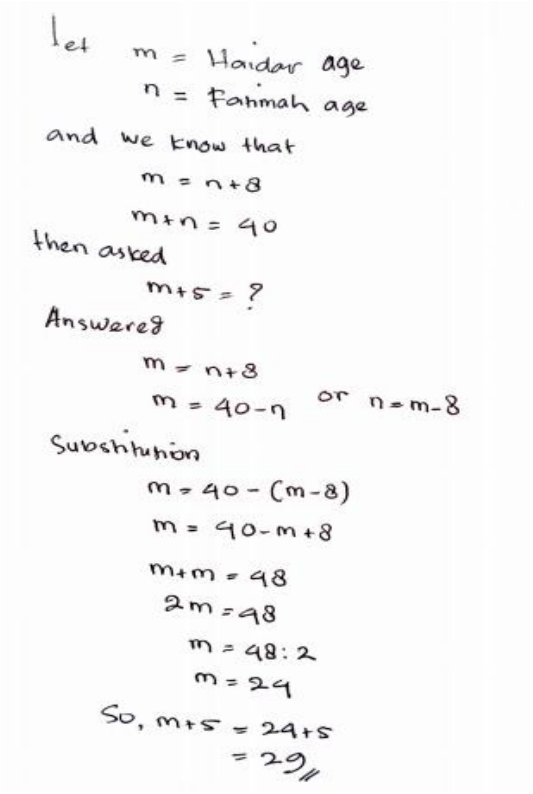
| | |
|---|---|
| Researcher : | Can you solve this algebra question? |
| FD Subject : | Yes, sir |
| Researcher : | Are you sure? |
| FD Subject : | Yes, I'm sure |
| Researcher : | Well, what do you know about the question? |
| FD Subject : | It is known that Haidar's age minus Fatimah's age is equal to 8. Then, Haidar's age plus Fatimah's age is equal to 40 and the question was, how old is Haidar in 5 years later? |
| Researcher : | So, how is your settlement strategy planning? |
| FD Subject : | Well, Haidar's age is x and Fatimah's age is y, then the total of their age is x-y=8 and x+y=40, then x+5=? |
| Researcher : | Then, what is the next stage that you need to do? |
| FD Subject : | I eliminate the value of x, so I find the value of y, then I substitute it to the equation and obtain the value x+5 |
| Researcher : | Go ahead!<br>How? Do you find the answer? |
| FD Subject : | Yes, sir. I obtain the value of y is 16 by eliminating process. Then I substitute it to the initial equation and obtained x = 24. Then, substituted again to $x$ + 5 obtained 29. |
| Researcher : | Hm, by the way, why don't you eliminate the value of y to obtain the value of x? |
| FD Subject : | Because the result will be the same, sir |
| Researcher : | Ah, I see. Do you think that your work is correct? Do you want to re-check it? |
| FD Subject : | I think that was correct, sir. I don't need to re-check it. |
| Researcher : | Well, do you have another way to solve it? |
| FD Subject : | Yes, sir. Both the substitution or elimination way can be used and the result will be the same as well |
| Researcher : | Thank you |
| FD Subject : | You're welcome, sir |

Based on the Interview above, what the FD did can be explained including: (1) FD analyzed the question very quickly, then FD was sure that can solve the problem. This means that the FD has investigated the problem by understanding the problem to find information about the data, what was asked in the problem, and how the problem-solving strategy can be used; (2) FD presented the statement in the question by using the symbol of algebraic equations, considering the name of the age of Haidar with x, and the age of Fatimah with y. Then, assume the gap in the age of Haidar and Fatimah in 8 years, also the number of their present age by

assuming with x + y = 40; (3) FD arranged problem-solving in the form of equations and solved them using elimination and substitution methods. FD chose the problem-solving strategy without detail analyzing the answers to the questions. Therefore, FD still searched for the y value even though what was needed is the x value in compiling the equation, but they eliminated x than substituted it; and (4) FD concluded by determining the result from what they obtained, namely the Haidar's age of 5 years later with 29. FD immediately felt confident with the answer, he did not double-check nor consider by asking the researcher's opinion about the correctness of the answer.

**Algebra Problem Solving Task (APST) for Field-Independent (FI) Subject**

The following part is the Interview of students' cognitive style of the dependent field in planning algebra problem solving based on APST:




Based on the result of the field-independent subject, it is known that FI can investigate the question in detail. The FI used for an example before writing in detail data and what is in the question. Then, the subject planned the strategy of substitution solving and solved the problem based on the planed until they got the right solution. The subject made a clear decision based on the result of re-checking the work. The subject tended to master the concept of algebra and they have a strong analytical ability.

**Figure 2.** The Answered of Field-Independent Subject

The following part is the Interview excerpts of students' cognitive style of the field-independent subject in planning algebra problem solving based on APST:

| | | |
|---|---|---|
| Researcher | : | Can you solve this algebra question? |
| FI Subject | : | I don't know, Sir. I try to understand first the question |
| Researcher | : | Well, can you? |
| FI Subject | : | Yes, sir. I can |
| Researcher | : | what do you know about the question? |
| FI Subject | : | It is known that Haidar's age is 8 years older than Fatimah's age. Then, their total age is 40 years, and it is questioned the Haidar's age in 5 years later, sir |

| | |
|---|---|
| Researcher : | So, how is your settlement strategy planning? |
| FI Subject : | Look, sir. I suppose that Haidar's age is now m, and Fatimah's age is n, then their total age is now $m + n$, then ... Fatimah's age is added to 8, then what will come is $n + 8$ |
| Researcher : | Then, what is the next stage that you need to do?? |
| FI Subject : | I need to use the substitution way to look for the value of n, it is accordance with m+n = 40, then the Haidar's old is m= Fatimah's old + 8, and it is made ¬m= 40-n Then the same thing is put together namely $n = m - 8$ and $m = 40 - n$. |
| Researcher : | Sure! Can you find the result? |
| FI Subject : | Wait, sir. I am still re-checking the result of it. (a few minutes later) Done, sir. The result is m= 24 and n=16 by using substitution. So, Haidar's age is 24 years old, sir. Isn't it? |
| Researcher : | Yes, you're right. By the way, why do you arrange that equation in such an away, how come it wasn't made $n = m + 5$ and $n = 40 - m$? |
| FI Subject : | Yes, it is true. Because what is asked is the age of Haidar sir, I just need to use the equation so that the value of m can be directly known, because m is the value of Haidar sir. After finding the value of n = 24, I add 5 so that it becomes 29 years. |
| Researcher : | Why do you still need to add 5? |
| FI Subject : | Because m is only for the age of Haidar now, while the question is the age of Haidar 5 years later. So, it must be added by 5. |
| Researcher : | Do you have another way to solve it? |
| FI Subject : | Yes, I do. We can use the elimination but actually, the result will be the same |
| Researcher : | I see, thank you! |
| FI Subject : | You're welcome, sir |

Based on the Interview above, what FI did can be explained including: (1) FI analyzed the problem first before deciding whether or not the problem can be solved. In this field, the independent subject must investigate the question by finding data about what is known, what is asked about the problem, and what problem-solving strategies can be used; (2) FI presented the statement of the symbol on algebraic equations, namely by considering Haidar's age now as m, and Fatimah's age as n. Then, let's say the number of their age now is in the form of m + n. If Haidar's age is added 5 years, that will be presented in the form of algebra m + 5 and then they look for the connections with each other; (3) FI arranged a problem-solving plan in the form of an equation and solved it using a substitution method. FI subject chooses a solution strategy by analyzing the answers that lead to questions. So, FI directly looked for the value of m, not the value of n in compiling the equation; and (4) FI determined that the results that were the age Haidar of 5 years later is 29 years old. In other words, they considered re-checking the answers by asking another researcher to obtained the correctness of the answers.

Based on the result of documentation and interview data to FD and FI above, then knew that independent subjects tend to master the concept well and have a mature/sharp analysis related to the data, what was asked about the problem, and

the selection of an appropriate and efficient solving strategies to obtain the correct solution of the problem/problem encountered. Furthermore, the field-independent subject was not hasty in making a final decision to obtain the answers. The subject takes time to think for a while, check the results of his performance, and try to show that other strategies can be used. Then, the subject decides directly what they got as a result. This was confirmed by Tohir et.al that students need to apply a certain strategy to other problems or try new strategies that are more simple or easier because the student learning processes will always be developed and used, so it increases the high order thinking level which is also getting higher too (Munawwarah, Laili, & Tohir, 2020). Furthermore Tohir et.al, said that the thought on what has thought of this case which related to students' awareness of their ability to develop various ways that might be taken in solving mathematics problems (Tohir, Susanto, Hobri, Suharto, & Dafik, 2018).

Meanwhile, the subject of field-dependent tends to make a less sharp analysis. Thus, the solving strategy adopted is inefficient because it does not directly to what is asked. Besides, the subject tends to have strong beliefs without checking the performance results. However, both of them have something in common that is capable of investigating questions, preparing plans and implementing plans that have been made. This is in line with the results of research conducted by Annur, Sujadi, & Subanti that the students in the independent field cognitive style category appear to be more fluent, faster in execution and come up with answers that he already believes as the correctness (Annur, Sujadi, & Subanti, 2016). A similar opinion was conveyed by Ngilawajan that students with independent fields are not too difficult in separating essential information from their context and are more selective in absorbing the information they already received (Ngilawajan, 2013). Furthermore, they say that students with an independent field cognitive style tend to be more analytical in seeing a problem compared to a field-dependent cognitive style student.

The results of the analysis of the achievement in understanding the algebraic concept of field independent and field-dependent subjects group are as follows:

**Table 6.** The Increasing Test of the Algebra Concept Understanding

| TEST | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| **PREE_TEST_FD** | 28 | 58 | 78 | 70.54 | 4.811 |
| **POST_TEST_FD** | 28 | 68 | 90 | 80.75 | 5.118 |
| **PREE_TEST_FI** | 22 | 60 | 82 | 69.36 | 6.036 |
| **POST_TEST_FI** | 22 | 65 | 95 | 81.50 | 7.002 |

Based on Table 6 above, it can be seen that the mean of FD pretest value is 70.54 and the posttest is 80.75. From that data, it can be explained that it increases in the value from pretest to posttest by 10.21 in the FI subject group. Meanwhile, in the mean of FI subject group found that the pretest value is 69.36 and the posttest value is 81.50. So that, it increases in 12.14 from pretest to posttest for the FI subject group. The mean value differences of pretest for the FD group is higher in 1.18 than compared to the mean value of the pretest in the FI group. While the comparison of the mean post-test scores, the FI subject group is 0.75 higher than

the average of the FD group. The total number of subjects is 50, students for each FD is 28 people and FI is 22 people in group

**Tabel 7.** The Differences in N-Gain Score Between FD and FI Group

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| **NGAIN_SCORE FD** | 28 | 0.07 | 0.30 | 0.147 | 0.058 |
| **NGAIN_SCORE FI** | 22 | -0.17 | 0.46 | 0.182 | 0.130 |

Based on Table 7 above, it can be seen that the average N-Gain value in the FD group is 0.147 and the FI group is 0.182. Take a look at the interpretation table of the gain value, it can be said that the increase in the average pretest/posttest value for the FD and FI group can be categorized low or as ineffective. Meanwhile, Overall, the average increase in pretest to posttest scores, FI subject group was better than the FD group, the percentage of the mean Gain is on 14.70% (FD) and 18.20% (FI). Overall the difference in average and angain in the FD and FI group can be seen in Figure 3 below:

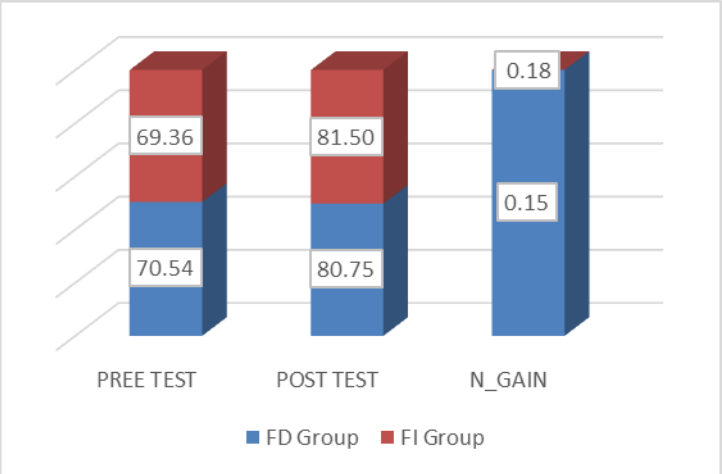



**Figure 3.** The Differences mean and N-Gain Score Between FD and FI Group

The following table is the result of the achievement analysis of the cognitive style level of independent and dependent fields in solving algebraic problems based on the categories of mathematical reasoning indicators in general:

**Table 8.** The Levels of Student Mathematics Reasoning

| The average percentage of FD | Category | The average percentage of FI |
|---|---|---|
| 14,29% | Level 4 (Very capable) | 14% |
| 17,86% | Level 3 (capable) | 10% |
| 28,57% | Level 2 (capable enough) | 38% |
| 32,14% | Level 1 (less capable) | 30% |
| 7,14% | Level 0 (not capable) | 8% |

Based on the data presented in table 8, the level of students mathematics reasoning ability in the FD group are 2 students (7,14%) in not capable category (level 0), 9 students (32,14%) are in the less capable category (level 1), 8 students (28,57%) are in the capable enough category (level 2), 5 students (17,86%) are in the capable category, and 4 students (14,29%) are in the very capable category. This is following the opinion of Tohir et al that the thinking ability in identifying and constructing formulas in mathematics is needed to foster students' understanding to the material and produce meaningful learning (Tohir & Muhasshanah, 2021; Tohir et al., 2021; Tohir, Maswar, Atikurrahman, Saiful, & Rizki Pradita, 2020; Tohir, Abidin, Dafik, & Hobri, 2018). The result of this study has strengthened the result of the research conducted by Mirlanda & Pujiastuti that by knowing the different types of students 'cognitive styles and their characteristics, mathematics learning activities must be designed in such a way to foster and develop student's mathematics reasoning ability (Mirlanda & Pujiastuti, 2018). Meanwhile, the level of students mathematics reasoning ability in the FI subject group are 1 student (3,57%) in not capable category, 4 students (14,29%) are in the less capable category, 10 students (35,71% ) are in the capble enough category, 7 students (25,00%) are in the capable category, and 6 students (21,43%) are in the very capable category. Therefore, students with independent field cognitive styles do not always have the same mathematics reasoning ability. In line with the result of research obtained by Khoiriyah shows that the categories of subjects with the same cognitive style do not always have the same level of thinking (Khoiriyah, 2013).

## CONCLUSION

The conclusions of this research about mathematical problem-solving issues based on field-dependent and field-independent to determine the level of students reasoning abilities in the covid-19 pandemic era are as follows: (1) There were differences in student's mathematical reasoning abilities between FD and FI; (2) The FI was able to re-examined, evaluated and drew valid conclusions, but not for FD; (3) The FI has fulfilled all four mathematics reasoning indicators and classified

as having a high category level of mathematical reasoning; (4) The FD has fulfilled all three indicators of mathematics reasoning and classified as having capable enough category or level 2 of mathematical reasoning; and (5) The mean of FD pretest value is 70.54 and the posttest is 80.75. From that data, it can be explained that it increases in the value from pretest to posttest by 10.21 in the FI group. Meanwhile, in the mean of FI group found that the pretest value is 69.36 and the posttest value is 81.50. So that, it increases in 12.14 from pretest to posttest for the FI subject group. The mean value differences of pretest for the FD group is higher in 1.18 than compared to the mean value of the pretest in the FI group. While the comparison of the mean post-test scores, the FI group is 0.75 higher than the average of the FD subject group. The percentage of the mean Gain of two group is on 14.70% (FD) and 18.20% (FI), and (6) Generally, the results of this research showed that FI subject group was better than the FD group. Then the level of mathematical reasoning ability of FI subjects group was very capable category as many as 21,43% and 14,29 % for FD group.

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