

MISCONCEPTIONS AND SCAFFOLDING STUDENTS IN SOLVING ALGEBRAIC OPERATION PROBLEMS IN TERMS OF COGNITIVE STYLE

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Abstrak

Penelitian ini bertujuan untuk mendeskripsikan jenis dan penyebab terjadinya miskonsepsi siswa dengan gaya kognitif *field dependent* dan *field independent*. Serta pemberian *scaffolding* yang digunakan untuk mengurangi miskonsepsi siswa dalam menyelesaikan soal operasi aljabar. Penelitian ini merupakan penelitian kualitatif dan dilakukan dengan memilih 2 siswa UPT SMPN 33 Gresik yang mengalami miskonsepsi dengan gaya kognitif *field dependent* dan *field independent*. Instrumen yang digunakan adalah tes diagnostik miskonsepsi pertama dan kedua yang dilengkapi dengan CRI, pedoman wawancara serta pedoman *scaffolding*. Hasil penelitian menunjukkan bahwa siswa dengan gaya kognitif *field dependent* dan *field independent* mengalami miskonsepsi klasifikasional, teoritikal dan korelasional. Penyebab dari miskonsepsi itu adalah kondisi siswa, kemampuan siswa dan buku. Setelah diberikan *scaffolding*, siswa dengan gaya kognitif *field dependent* dapat menyelesaikan soal yang diberikan dan miskonsepsi yang terjadi berkurang. Serta miskonsepsi pada siswa dengan gaya kognitif *field independent* dapat berkurang dan pengerjaannya lebih sistematis. Dapat dikatakan bahwa pemberian *scaffolding* dapat mengurangi miskonsepsi siswa dalam menyelesaikan soal operasi aljabar pada siswa dengan gaya kognitif *field dependent* dan *field independent*.

Kata Kunci: Miskonsepsi; *Scaffolding*; Gaya kognitif; Aljabar.

Abstract

Purpose of the research was to describe the types and causes of student misconceptions with field dependent and field independent cognitive styles. As well as providing scaffolding which was used to reduce student misconceptions in solving algebraic operation problems. This research was a qualitative research and was conducted by selecting 2 students of UPT SMPN 33 Gresik who experienced misconceptions with field dependent and field independent cognitive styles. The instruments used were the first and second misconception diagnostic tests which were equipped with CRI, interview guidelines and scaffolding guidelines. The results showed that students with field dependent and field independent cognitive styles experienced classificational, theoretical and correlational misconceptions. The cause of the misconception was the condition of students, students' abilities and books. After being given scaffolding, students with a field dependent cognitive style can solve the questions given and the misconceptions that occur are reduced. As well as misconceptions in students with an independent field cognitive style can be reduced and the process was more systematic. It can be said that giving scaffolding can reduce students' misconceptions in solving algebraic operation problems in students with field dependent and field independent cognitive styles.

Keywords: Misconception; Scaffolding; Cognitive style; Algebra.

Introduction

Concepts are events, objects, situations, or something that has a characteristic which is represented by the same sign or symbol in each culture (Ausubel, 2000). Concepts in mathematics are usually arranged sequentially so that previously owned concepts can be used again to learn the concepts that will be given next (Tiro, 2011). Conception is a form of one's interpretation of an observed object that arises before learning activities (Cahyani, 2018). Suparno (2013) defines the ability to understand concepts obtained from formal education or concepts obtained from interactions with the environment as conceptions. Based on this explanation, it can be interpreted that the conception is an interpretation of a person on a concept or a knowledge obtained from formal education and when there is an interaction with the environment.

Meanwhile, the misconception itself comes from the word mis and conception. The word mis mean error and the word conception mean understanding. Etymologically, a misconception is a misunderstanding of a concept or science that is caused because someone's initial understanding is incorrect, it can also be due to learning that someone has previously received. In terminology, misconception is a misunderstanding. Van Den Berg in (Liliawati, 2009) defines a misconception as the incompatibility or contradiction of one's concept to the concepts used by experts. Misconceptions in a person can occur at all levels of age and education (Ausubel, 2000). Misconceptions can come from various sources, for example from students themselves who do not understand the previous concept, from teachers who are wrong in conveying a concept, it can also be from the teaching methods used by the teacher that are not right. According to (Suparno, 2013) the causes of misconceptions include teachers, student conditions, teaching methods, context and books.

Moh. Amien in (Salirawati, 2013) stated that misconceptions are divided into three types, the first is classification misconception, the second is theoretical misconception, and the last one is correlational misconception. (1) Misconception based on the misclassification of a fact that exists in an orderly chart is called a classification misconception. (2) Misconceptions based on mistakes in studying a fact or event in an orderly system are called theoretical misconceptions. (3) Misconceptions based on errors related to specific events that are related to each other, or an observation consisting of conjectures, especially in the form of principle formulations commonly referred to as correlational misconceptions.

There are several ways to determine the occurrence of misconceptions in students, including using *Certainty of Response Index*. This method can determine a person's level of

confidence in the answers given. In this misconception research, the CRI method with a scale of six made by (Hasan et al., 1999) was used, as in the following table:

Table 1. The Scale of Certainty of Response Index

Scale	Criteria
0	When someone answers a question with a 100% guessed percentage (<i>Totally Guessed Answer</i>)
1	When someone answers a question with a guess that has a percentage between 75%-99% (<i>Almost Guess</i>)
2	When someone answers a question with a guess that has a percentage between 50%-74% (<i>Not Sure</i>)
3	When someone answers a question with a guess that has a percentage between 25%-49% (<i>Sure</i>)
4	When someone answers a question with a guess that has a percentage between 1%-24% (<i>Almost Certain</i>)
5	When someone answers a question without an element of guesswork (0%) (<i>Certain</i>)

The scale is used in giving a value of the level of confidence of students in providing answers to a question. When students are asked questions and asked to give CRI to the answers given, students indirectly give an assessment to themselves regarding their beliefs in choosing concepts, principles and rules that they already have so that students can provide answers to a question.

According to (Tayubi, 2005), there are several provisions in categorizing students with misconceptions, knowing concepts or not knowing concepts. Ways to find out whether students have misconceptions can be seen in table 2 below:

Table 2. CRI provisions in categorizing misconceptions, knowing concepts or not knowing concepts with individual responses

Student answers	Low Certainty of Response Index ($< 2, 5$)	High Certainty of Response Index ($> 2, 5$)
Correct	Students do not know the concept: students answer correctly and the CRI of students' answers is low (lucky guess)	Students understand the concept: students answer correctly and the CRI of students' answers is high
Incorrect	Students do not know the concept: students answer incorrectly and the CRI of students' answers is low	Students experience misconceptions: students answer incorrectly and the CRI of students' answers is high

Table 2 explains that there will be several possibilities that can occur from the student's answer, namely, if the student's answer is correct but the CRI that has been filled in is low (<2.5) it means that the student does not know the concept, when the student's answer is correct and the CRI that has been filled in is high (>2.5) means that the student has understood the concept well, when the student's answer is wrong and the CRI that has been filled in is low (<2.5) it means that the student does not know the concept, but when the student gives the wrong answer but the CRI is high (>2.5) means that the student has experienced misconceptions. The table is an indicator in determining whether students experience misconceptions in working on algebraic operation problems.

Scaffolding is the provision of learning help for a student, this help will be reduced and removed slowly so that students can take over responsibility and develop their own understanding (Anghileri, 2006). This means that when students are given the support needed when learning something new, students will have a better chance of using the student's knowledge independently. Vygotsky in (Arends, 2008), believes that someone's intellectual will increase and develop when someone has new and confusing experiences and when someone tries to solve problems caused by these experiences.

Anghileri (2006) categorizes scaffolding into three levels, as follows. The first level is environmental provision, the second level is explaining, reviewing, and restructuring. At the reviewing stage there are several stages consisting of (a) looking, touching and verbalizing (b) prompting and probing (c) interpreting student's actions and talk, (d) parallel modeling and (e) explaining and justifying students. At the restructuring stage, there are several stages consisting of (a) identifying meaningful context (b) simplifying the problem (c) re-phrasing student's talk (d) negotiating meaning. The third level is developing conceptual thinking, which consists of developing representational tools and making connections (Anghileri, 2006).

Everyone's cognitive style is different. Everyone has differences in how to process information and organize activities. This difference has an influence on the quality and quantity of the results of the activities that have been carried out, one of them is student learning activities (Darmono, 2012). Woolfolk in (Darmono, 2012) stated that, cognitive style is a way for someone who has differences in knowing, seeing, and organizing information. A person can choose an appropriate and desirable way of processing information as a response to environmental influences. Each person has a different speed in responding to information, some people are slow to respond to information and some are fast. When students have different

cognitive styles, the ways to solve the problems they face are also different. So that in finding a solution to a mathematical problem, the cognitive style of students is very influential on the answers given.

Students who have a field dependent cognitive style are usually more easily influenced by other people's criticism and have a comprehensive way of thinking. Students with this cognitive style prefer learning social science, and very dependent on the environment. Students with independent field cognitive style are students whose behavior is mostly not influenced by the surrounding environment (Risnawati, 2012). Environmental elements have a great influence on students' thinking and decision making by students according to Wooldridge in (Darmono, 2012). Students with field independent cognitive style have high effectiveness in learning gradually, starting from analyzing existing facts, processing information, to getting what they are looking for. Thomas in (Darmono, 2012) argues that students who have a field independent cognitive style usually prefer to learn individually, more independent and can respond well to learning.

New knowledge acquired by a person must be in accordance with the cognitive structure of students, cognitive structure is a system that has a link between theories, ideas, concepts, and others (Suparno, 2013). Misconceptions can be seen as a cognitive structure that students have and do not fit the conceptions that have been described by experts. Therefore, students' cognitive styles and misconceptions in students are related. Based on the above statement, one of the factors that can cause a misconception in students is cognitive style, this is because the cognitive structure of students when obtaining information, remembering, and looking for a solution to existing problems will differ according to their cognitive style.

Algebra is a very important component of mathematics (Star et al., 2015). We can find the use of algebra in everyday life in various fields such as finance, technology, and so on (Mulungye et al., 2016). So that in learning at school, students very often use algebra in learning mathematics. The report on the results of the National Examination from BSNP PUSPENDIK (Badan Standar Nasional Pendidikan, 2020) on the percentage of mastery of the material in the 2018/2019 academic year National Examination in algebra material is 51.24%, while in 2017/2018 it was 41.88%, and in 2016/2017 it was 48.60%. From these data it shows that there are still students who do not understand the concept of algebra well. In the current education curriculum, namely the 2013 curriculum, students are expected to meet the competency standards that exist in learning algebra. Students are required to be able to explain algebraic

forms and perform operations on algebraic forms in accordance with the basic competencies of mathematical knowledge (Badan Standar Nasional Pendidikan, 2020).

Many researchers have conducted research on misconceptions in algebraic material. Like research conducted by Natalia et al. (Natalia et al., 2016) which examined the misconceptions of 8th graders in solving algebraic problems. Then Dina & Rosyidi (Dina & Rosyidi, 2019) research which examines the misconceptions of high school students on trigonometry material. However, there is still relatively little research conducted to analyze student misconceptions in completing algebraic operations and ways to reduce misconceptions in students by being given scaffolding in accordance with students' cognitive styles.

Based on this description, the researcher has the following research questions. (1) How are the causes and types of student misconceptions in solving algebraic operation questions in terms of the students' Field Dependent and Field Independent cognitive styles? (2) What are the students' misconceptions after being given scaffolding in solving algebraic operation questions in terms of the students' Field Dependent and Field Independent cognitive styles? Therefore, researchers are interested in conducting a study about misconceptions and giving scaffolding to students with the title "Misconceptions and Scaffolding Students in Solving Algebraic Operation Problems in terms of Cognitive Style."

Research Method

This research is a qualitative descriptive research. The results of this study are a description of the types of misconceptions, factors causing misconceptions and changes in misconceptions after being given scaffolding experienced by students who have a field dependent cognitive style and students who have a field independent cognitive style in junior high school on algebraic operation material. The research subjects were students of class VII UPT SMPN 33 Gresik with field dependent and field independent cognitive styles and had received algebraic operation material. Subjects in the study were selected using the Group Embedded Figure Test (GEFT). This test is conducted to determine students with field dependent cognitive style and students with field independent cognitive style. Students who can determine 12 or more simple pictures are categorized as having an independent field cognitive style. Students who can only determine less than 12 pictures are categorized as having a field dependent cognitive style.

Furthermore, the researcher gave a misconception test 1 consisting of 10 questions along with the Certainty of Responses Index to determine the level of student confidence in the answers the students gave, then to determine whether the students had misconceptions or not

in the algebraic operation material. The results of the first test were analyzed in order to find out the misconceptions that occurred in each student based on the type of misconception defined by Amien in (Salirawati, 2013) by paying attention to the diagnostics of each type of misconception and CRI assistance raised by Hasan and friends (1999). Based on the results of the first misconception test, the researcher took 2 research subjects, namely a student with a field dependent cognitive style and a student with a field independent cognitive style who experienced a misconception. Then given interviews to 2 research subjects that aim to complete the data from the previous test.

Then given scaffolding to the research subject. The provision of scaffolding is adjusted to the type of misconception experienced by the subject and is adjusted to the scaffolding theory according to Anghileri (2006). After being given scaffolding, the research subject was given a second misconception test which consisted of 10 questions along with the Certainty of Responses Index (questions equivalent to the first misconception test) to determine the level of student confidence in the answers he gave. The purpose of this test is to find out whether there are still misconceptions in students. The data analysis technique used in this research is descriptive qualitative analysis used in order to get a general and comprehensive picture of the situation that has been studied. The data obtained from this study are the results of the field dependent-field independent (GEFT) cognitive style test, the results of the algebraic operation misconceptions, and the results of the subject interviews. In this study, the instruments used were validated by experts. There are two experts who are lecturers of mathematics at Universitas Negeri Surabaya.

Results and Discussions

This research begins with giving the GEFT test given to 10 students, from the test results found 6 students who have a field dependent cognitive style and 4 students who have a field independent cognitive style. Then from all students, the first misconception diagnostic test is given which contains 10 questions about algebraic operations and is accompanied by the Certainty of Responses Index. After being given a misconception diagnostic test, almost all students experienced a misconception. Below is a table of many misconceptions experienced by students.

Table 3. The Number of Student Misconceptions

No.	Concept	Number of Student Misconceptions			
		M1	M2	M3	Total
1.	Simplifying algebraic forms	5	0	0	5
2.	Simplify the algebraic form with the highest power is 2	5	1	0	6
3.	Determine the true / false value of a sum of two algebraic forms	3	3	0	6
4.	Determines the true / false value of a subtraction of two algebraic forms	4	3	0	7
5.	Determine the quotient of two algebraic forms	3	3	0	6
6.	Determine a coefficient of the algebraic equation	0	2	4	6
7.	Determine the simple form of an algebraic fraction	0	4	3	7
8.	Determine the true / false value of an algebraic form operation based on contextual problems	0	1	5	6
9.	Determine the form of algebraic operations based on contextual problems	0	0	2	2
10.	Determine the result of algebraic operations based on contextual problems	0	2	5	7

Explanation:

M1 = Classificational misconception

M2 = Theoretical misconception

M3 = Correlational misconception

After obtaining the results of the first misconception diagnostic test and being analyzed, the researchers selected the two study subjects with the most misconceptions. One student who has a field dependent cognitive style and is given the initials S1 and one student who has an independent field cognitive style and is given the initials S2. Then given interviews with the two subjects to find out the causes of the misconception experienced and to make it easier for researchers to provide scaffolding according to the type of misconception experienced by the subject. The following are the types of misconceptions experienced by each subject.

Table 4. The types of misconceptions experienced by research subject

Subject	Number of Question									
	1	2	3	4	5	6	7	8	9	10
S1	M1	M1	M1	M2	-	M2	M2	M3	M3	M3
S2	M1	M1	-	-	M2	M2	M2	M3	-	M3

Based on the results of the first misconception diagnostic test, the first subject was the field dependent cognitive style student. There are three misconceptions of classification (M1), namely in the first problem, he only classifies similar variables in an algebraic form but does not include constants. S1 cannot classify all the variables in the second problem correctly and incorrectly in classifying the variables before performing algebraic operations in the third problem. In addition, S1 also experiences 3 theoretical misconceptions (M2). In the fourth problem, S1 did the wrong algebraic subtraction operation. In the sixth question, S1 cannot operate the algebraic form with the highest power of two. S1 operates all of its variables in one.

In the seventh problem, S1 can determine the denominator correctly, but cannot determine the numerator correctly. Then there are three correlational misconceptions (M3), namely in the eighth question, S1 does not do the calculation first. In the ninth question, S1 is not careful in reading the questions so that it states an algebraic form with a different variable than what is being asked. Then in the last problem, the subject uses the concept of a square but does not associate it with the algebraic form of the problem to determine the area in question. S1 does not experience a misconception in the fifth question, which is to determine the quotient of algebraic operations, he can determine the result correctly.

Based on the results of the first misconception diagnostic test, the second subject was students with the independent field cognitive style. There are two classification misconceptions (M1), namely in the first and second questions, the subject cannot classify similar variables in an algebraic form. In addition, the subject also experienced 3 theoretical misconceptions (M2). In the fifth question S2 only operates the variable with the highest power of one and its constants. For the sixth problem, the subject was wrong in determining the coefficient of the algebraic equation. And in the seventh problem, S2 was wrong in determining the denominator to determine the simple form of the algebraic operation.

Then there are two correlational misconceptions (M3), namely in the eighth question, the subject does not do the calculations first but only uses the thought that the statement given is true without using the concepts he already has. In the tenth problem, the subject cannot determine the result of the algebraic operation associated with the material area of the square. S2 does not experience misconceptions in the third and fourth questions, namely determining whether the algebraic addition and subtraction is true or false, it can determine the result correctly. Then for the ninth problem, S2 can determine the form of the algebra operation correctly.

Classification misconceptions occur in students in solving problems determining the simple form of an algebraic form and algebraic operations. Students cannot classify the variables that are in an algebraic form correctly. The following is an excerpt from the classification misconception experienced by S1 question number 1.

1. Sederhanakan bentuk aljabar berikut $4x + 6y - 3z + 8x - 10y + 3$

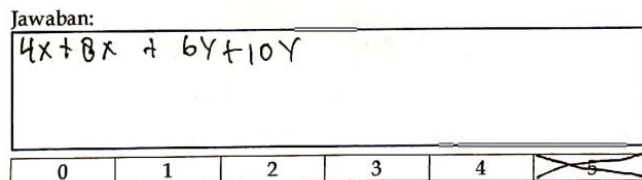


Figure 1. Quote misconceptions class S1 question number 1

In Figure 1, it can be seen that S1 experiences a classification misconception because S1 only groups the x and y variables, does not include other variables or existing constants. Following are the reasons given by S1 during the interview.

P : “Simplify the algebraic form in number 1. Why are you grouping only the x and y variables?”

S1 : “Because I usually do algebra problems with only x and y variables.”

P : “So if there are other variables it doesn't matter right?”

S1 : “Yes.”

P : “Why do you do it like that?”

S : “Usually I do it like that”

From the results of the interview, S1 can be categorized as experiencing a classification misconception because it only groups a few variables, and does not care about other variables. In addition, the cause of the misconception in S1 is the student's condition, namely the experience of students, where S1 is used to working on questions given by the teacher with the x and y coefficients.

Theoretical misconceptions can occur when students learn wrong symbols, definitions, determine formulas, and have errors in learning facts on algebraic operation material. In the misconception test, students experience theoretical misconceptions in solving questions to determine the operations of an algebraic form of both addition, subtraction, multiplication and division operations as well as in the problem of simplifying the form of algebraic fractions. The following is a quote from the theoretical misconception experienced by S1 question number 7.

7. Tentukan bentuk sederhana dari $\frac{y}{2} + \frac{x-3}{3y}$.

Jawaban:

$$\frac{y}{2} + \frac{x-3}{3y} = \frac{y}{6} + \frac{x-3}{6y}$$

Figure 2. Quote of the theoretical misconceptions S1 question number 7

In Figure 2 it can be seen that the students were wrong in determining the denominator to simplify the algebraic fraction operation and did not change the numerator first. So it can be said that S1 experiences a theoretical misconception in solving algebraic fraction operations. Following are the results of interviews with S1 related to the answers given.

P : “Determine the simple form in question number 2. Why is the denominator the first fraction 6 and other fractions is 6y?”

S1: “Because in the problem, the first fraction has no y, while the second has y. So, I differentiate.”

P : “Then why does the numerator stay the same?”

S1: “Because it's like that in books.”

P : “So in the book how to do it like that? Take a look at the book.”

S1: “Yes, as I remember in my elementary school books, that's how to do it.”

Based on the interview, S1 experienced a misconception in determining the correct denominator and numerator. S1 assumes that the denominator is adjusted to the variables in the problem. Though the concept of simplifying fractions is not like that. In addition, S1 also revealed that the method used in solving these questions was correct according to the elementary school book he used first. This is one of the causes of misconceptions experienced by students.

Correlational misconceptions occur in students in determining the form and results of algebraic operations based on contextual problems. Students cannot relate the knowledge they have and it is related to solving the problem. The following is a quote from the correlational misconception experienced by S2 in question number 10.

10. Pak Putra memiliki sebidang tanah berbentuk persegi dengan sisi-sisinya $(10 - x)$ m. Di tanah tersebut ia akan membuat kolam ikan berbentuk persegi dengan sisi-sisinya $(8 - x)$ m. Tentukan luas tanah Pak Putra yang sebenarnya jika sisa tanah itu seluas 28 m^2 .

Jawaban:

$$(10 - x) - (8 - x) = 2 - x$$

Figure 3. Quote S2 correlational misconceptions question number 10

In Figure 3, S2 only subtracts the two known pieces of information in the problem. But unable to determine the actual land area. From working with S2, it can be seen that S2 understands the point of the problem, by subtracting the side of the large square from the side of the small square. But S2 couldn't operate it using the square area concept properly. The following is an interview with S2 related to the answers given.

P : "In question number 10. Why did you only subtract both sides?"

S2: "Because in my opinion, if you know the rest of the land, you can find out by subtracting the large side of the square from the small side of the square."

P : "Then why not continue working on it?"

S2: "I am confused about the x ."

P : "What about the rest of the land, is it just like that?"

S2: "No, It shouldn't be, but I don't know what else to answer."

Based on the interview with S2, it can be concluded that S2 experiences a correlational misconception because S2 knows the initial steps to solve the problem, but cannot relate to the concept of square area it already has. The cause of the misconceptions experienced by S2 is the student's condition, namely the student's experience where the student is not able to relate the concepts he has. From the results of the interview, S2, namely students with an independent field cognitive style, knew how to do it. A person with this cognitive style can analyze and be more systematic in receiving information. This means that the cognitive style affects the misconceptions experienced by students.

From the results of the first misconception diagnostic test and the results of interviews that have been conducted. The researcher gave scaffolding to the two research subjects according to the type of misconception and adjusted based on the student's cognitive style. The provision of scaffolding which is used to reduce misconceptions in students is the two levels

of scaffolding proposed by Anghileri (2006). The first is scaffolding level two which consists of explaining, reviewing, and restructuring then scaffolding level three, namely developing conceptual thinking.

Researchers provide scaffolding to students with field dependent cognitive style by asking students to read algebraic form operation questions more carefully (reviewing), then examining student work by looking at the student's work, asking questions and collecting student work (looking, touching and verbalizing), For this type of classification misconception, students are asked to explain why different variables cannot be operated (prompting and probing), ask questions related to students' work in solving algebraic operation problems (interpreting students actions and talk), make similar examples about simplifying algebraic forms (parallel modeling), students are asked to provide an explanation and justify the answer that has been done (student explaining and justifying), then for the theoretical misconceptions, the researcher asks questions about simplifying the algebraic form related to students (identify meaningful context), researcher simplifies the problem (simplifying the problem), and conducts discussions after rebuilding students' understanding (re-phrasing student talk), and negotiates the meaning of the mathematical symbols on the problem (negotiating meanings). For this type of correlational misconception, the researcher provides developing conceptual thinking, that is, giving directions to students to make connections with the mathematical concepts that have been obtained and reminding students of what concepts are needed in solving these problems.

For students with the independent field cognitive style, the researcher provided scaffolding by asking students to read the algebraic form operation questions more carefully (reviewing), then examining the student's work by looking at the student's work, asking questions and collecting student work (looking, touching and verbalizing), For this type of classification misconception, students are asked to explain why different variables cannot be operated (prompting and probing), ask questions related to students' work in solving algebraic operation problems (interpreting students actions and talk), provide similar examples of simpler algebra operations (parallel modeling), students are asked to provide an explanation and justify the answers that have been done (student explaining and justifying). For this type of theoretical misconception, questions are given about the operation of two algebraic forms related to students (identify meaningful context), the researcher simplifies the questions given systematically (simplifying the problem), conducts discussions after rebuilding understanding (re-phrasing student talk), and negotiating the meaning of mathematical symbols on the

problem (negotiating meanings). For this type of correlational misconception, the researcher provides developing conceptual thinking, which is giving directions to students to make connections between the questions given and the knowledge that students have previously acquired.

After being given scaffolding to each research subject according to the type of misconception that occurred and their cognitive style, a second misconception diagnostic test was given. This test is given to find out how students' misconceptions after being given scaffolding in solving algebraic operation problems. Following are the results of the second misconception diagnostic test.

Table 5. The result of the second misconception diagnostic test

Subject	Number of Questions									
	1	2	3	4	5	6	7	8	9	10
S1	-	-	-	-	-	-	-	-	-	M3
S2	-	-	-	-	M2	-	-	-	-	-

From the results of the second misconception diagnostic test, S1 experiences a correlational misconception (M3), which is unable to connect the concept of square area with algebraic form operations. This can be due to students' lack of strong preconceptions. Meanwhile, S2 still experiences a theoretical misconception (M2), which is unable to perform algebraic division operations. S2 still has difficulty in determining the result of algebra quotient with the highest power 2. Following are the misconceptions of S1 before and after being given scaffolding.

Table 6. Misconceptions of S1 before and after being given Scaffolding

Test	Number of Questions									
	1	2	3	4	5	6	7	8	9	10
First	M1	M1	M1	M2	-	M2	M2	M3	M3	M3
Second	-	-	-	-	-	-	-	-	-	M3

Students with a field dependent cognitive style prioritize the influence of the environment around them. In the process of thinking, students are more thorough, this makes it easier for students to follow and does not require systematic and analytical thinking. Therefore, students who have a field dependent cognitive style prefer to get a lot of criticism and advice from teachers and friends. In solving problems, students who have a field dependent cognitive style will find it difficult to find a solution to their own problem. So that to overcome this, it takes motivation and help from teachers and friends. Like S1, students can complete

algebraic operation questions after being given scaffolding, so that the misconceptions that occur on the first misconception diagnostic test can be reduced on the second test. This means that the student's cognitive style affects misconceptions and scaffolding can help S1 to reduce misconceptions that occur.

Following are misconceptions of S2 before and after being given scaffolding.

Table 7. Misconception of S2 before and after being given Scaffolding

Test	Number of Questions									
	1	2	3	4	5	6	7	8	9	10
First	M1	M1	-	-	M2	M2	M2	M3	-	M3
Second	-	-	-	-	M2	-	-	-	-	-

Students with field independent cognitive style have a tendency to be able to analyze and be more systematic when receiving new information. Students are not easily influenced by the environment around them. However, it is possible that students who have a field independent cognitive style can experience misconceptions such as S2. After being given scaffolding, students who have an independent field cognitive style are able to receive information more easily and the process is also more systematic compared to S1.

From tables 6 and 7, it can be seen that the misconceptions of S1 and S2 were reduced after being given scaffolding. This is in accordance with previous research related to misconceptions or scaffolding including Intan & Masriyah (Intan & Masriyah, 2020) research, which examines the provision of scaffolding to student misconceptions, from this study it is concluded that scaffolding can reduce student misconceptions in solving set material questions.

Cognitive style also affects the occurrence of misconceptions in students. This is in accordance with Savitri et al. (Savitri et al., 2016) research who examined students 'misconceptions on algebraic fraction material in terms of students' cognitive styles. From this study, it was concluded that misconceptions could be experienced by every student, both students who had a field dependent cognitive style, namely students who had a low way of thinking in solving a mathematical problem, or students who had a field independent cognitive style, namely students who have a high way of thinking in solving a math problem.

Conclusion and Suggestion

Based on the results of the research that has been done, students who have a field dependent cognitive style experience three types of misconceptions, namely classifying, theoretical and correlational misconceptions. Classification misconceptions occur in determining the simple form of an algebraic form and algebraic operations. Students cannot

classify the variables that are in an algebraic form correctly. Theoretical misconceptions occur in solving problems determining the operations of an algebraic form of both addition, subtraction, and multiplication operations. In addition, it is also in the problem of simplifying algebraic fractions. Correlational misconceptions occur in students in determining the form and results of algebraic operations based on contextual problems. Students cannot relate the knowledge they have and it is related to solving the problem. The factor causing misconceptions in students with a field dependent cognitive style is the condition of the student, namely the student's experience in working on the questions given by the teacher and the book. Students who have an independent field cognitive style experience three types of misconceptions, namely classificational, theoretical and correlational misconceptions. Classification misconceptions occur in determining the simple form of an algebraic form and algebraic operations. Students cannot classify the variables that are in an algebraic form correctly. Theoretical misconceptions occur in solving problems determining the operation of an algebraic form of multiplication and division operations. In addition, it is also in the problem of simplifying the algebraic fraction form. Correlational misconceptions occur in students in determining the form and results of algebraic operations based on contextual problems. Students cannot relate the knowledge they have and it is related to solving the problem. The factor that causes misconceptions experienced by students with the independent field cognitive style is the condition of the student, namely the student's ability to relate the concepts they have.

The scaffolding given by researchers to each subject according to the type of misconception is scaffolding proposed by Anghileri (2006), namely scaffolding level two, namely explaining reviewing, and restructuring and level three, namely developing conceptual thinking. After being given scaffolding, the misconceptions experienced by the research subjects decreased. Based on the results of the research, after being given assistance or scaffolding, students who have a field dependent cognitive style can solve the questions given and student misconceptions are reduced. Meanwhile, students who have field independent cognitive style, after being given scaffolding, the misconceptions that occur are reduced and can receive the information provided more easily and the process is more systematic than students with field dependent cognitive style. It can be said that the provision of scaffolding can reduce student misconceptions in solving algebraic operation problems, both students with field dependent cognitive styles and students with field independent cognitive styles.

For teachers, it is better to make learning that has been adjusted to field dependent - filed independent students' cognitive styles, such as being more systematic and checking students' understanding of the material provided so that students do not experience misconceptions and making scaffolding for students who experience misconceptions. In addition, it is better for teachers to check the material to be delivered first so it doesn't cause misconceptions to students, and to further strengthen students' understanding of concepts before proceeding to more complicated material. For researchers who will carry out similar research, it is better to develop the research that has been carried out by researchers by analyzing student misconceptions with other observations and with other materials. We recommend that you do further research on the causes of student misconceptions and use references for similar research.

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