Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Mathematical Belief Profile of Junior High School Students with Field Dependent Cognitive Style

Nurul Apriliani Balango*, Pathuddin, Mubarik, I Nyoman Murdiana
Mathematics Education, Faculty of Teacher Training and Education, Tadulako University, Palu, 94118, Indonesia

ARTICLE INFO

Article history:

Received: 22 May 2026
Accepted: 27 May 2026
Available Online: 05 June 2026

Keywords:

Field Dependent,
Cognitive Style,
Mathematical Belief,
Mathematical Social Norms,
Mathematics Learning

* *Corresponding author:*

E-mail: nurulapriliani397@gmail.com

Article Doi:

https://doi.org/10.31258/jes.10.6.p.660-678

This is an open access article under the CC BY-SA license.

A B S T R A C T

This study is motivated by the importance of students' mathematical belief toward mathematical social norms in mathematics learning. Although research on mathematical belief and social norms has been widely conducted, studies specifically examining the mathematical belief of field dependent students remain limited. The purpose of this study is to describe the profile of mathematical belief of junior high school students with a field dependent cognitive style in the aspect of mathematical social norms. A descriptive qualitative approach was employed, with one student selected based on the Group Embedded Figures Test (GEFT) and the recommendation of a mathematics teacher. Data were collected through observation and semi- structured interviews, then analyzed using the Miles and Huberman model, which includes data condensation, data display, and conclusion drawing. The findings show that the subject has a positive mathematical belief toward mathematical social norms, reflected in the ability to accept diverse levels of thinking, cooperate, actively ask questions, use symbols and rules accurately and consistently, and express ideas politely and systematically. These findings highlight the role of social interaction, collaboration, and mathematical communication in shaping the mathematical belief of field dependent students. Thus, their mathematical belief develops through active involvement in social interaction.

1. Introduction

Mathematics learning does not only emphasize mastery of concepts and problem solving skills but also involves processes of communication, argumentation, and social interaction throughout learning activities. NCTM (2000) emphasizes that mathematics learning should develop students' abilities in communication, reasoning, problem solving, connections, and mathematical representation. Therefore, the success of mathematics learning is influenced not only by students' cognitive abilities but also by affective aspects related to their beliefs about mathematics and the learning process (Ernest, 1989; Hidayatullah & Csíkos, 2024).

Mathematical belief is one of the affective aspects related to students' beliefs about mathematics, the process of learning mathematics, and their own ability to engage in mathematical activities. Such beliefs influence the way students understand problems, express ideas, respond to peers' opinions, and participate in mathematics learning. Students with positive mathematical beliefs tend to be more confident, active, and persistent in learning mathematics, whereas students with negative mathematical beliefs tend to feel doubtful, passive, and less confident in expressing their mathematical ideas (Widiani & Pardi, 2024). This is consistent with the study by Nurhidayah et al. (2026), which showed that students with positive beliefs about their mathematical abilities are more confident in using problem solving strategies and verifying the answers obtained. Ernest (1989), as cited in Muhtarom et al. (2024), explains that mathematical belief encompasses beliefs about mathematics education, beliefs about oneself, and beliefs about the social context. Among these three aspects, beliefs about the social context are particularly important to examine because they are directly related to students' interactions during the mathematics learning process in the classroom (Yackel & Cobb, 1996).

Interaction in mathematics learning gives rise to various norms that develop throughout the learning activities. One important norm in mathematics learning is mathematical social norms. Yackel & Cobb (1996) explain that mathematical social norms are norms formed through interactions between teachers and students regarding what is considered mathematically acceptable in classroom discussions. These norms include how students present ideas, provide mathematical reasoning, respond to peers' opinions, and determine solutions that are considered mathematically valid. With the presence of mathematical social norms, students not only learn to solve problems but also learn to build mathematical understanding through communication and social interaction.

Mathematical social norms play an important role in creating active and meaningful mathematics learning. Recent studies show that mathematical social norms can encourage students to be more engaged in discussions and mathematical argumentation during the learning process (Asare et al., 2025). Students who are accustomed to discussing, providing mathematical arguments, and respecting peers' opinions tend to have better mathematical communication and reasoning skills. McClain & Cobb (2001) state that mathematical social norms can support the development of students' mathematical argumentation, conceptual understanding, and a sense of responsibility for their own learning process. Thus, students' beliefs about mathematical social norms are important to understand, as they can influence students' engagement during mathematics learning.

However, each student has a different way of interpreting and responding to mathematical social norms according to their individual characteristics. One factor that may influence these differences is cognitive style. Cognitive style refers to individual characteristics in receiving, processing, and organizing information (Woolfolk, 2015). According to Witkin et al. (1977), cognitive styles are classified into two types: field independent and field dependent. Students with field independent and field dependent cognitive styles demonstrate different characteristics in understanding and solving mathematical problems (Pathuddin et

al., 2019). Students with a field dependent cognitive style tend to adapt more easily to social environments, prefer collaboration, and build understanding through communication and discussion with peers during the learning process (Simanjuntak et al., 2022). Thus, the mathematical beliefs of field dependent students regarding mathematical social norms are important to examine, as they can provide insights into how students interpret social interaction in mathematics learning.

Several previous studies have discussed mathematical beliefs and mathematical social norms. Anggraeni (2018) found that mathematical social norms can develop through collaborative learning that encourages students to actively engage in discussions and provide mathematical arguments. Dianita (2022) stated in her study that mathematical beliefs influence the way students perceive and solve mathematical problems. In addition, positive mathematical beliefs are also known to support students' confidence and participation in mathematical activities (Asare et al., 2025). These findings are supported by the studies of Nurhidayah et al. (2026) and Zahratunnisa et al. (2026), which showed that differences in student characteristics affect mathematical beliefs in solving mathematical problems.

Although many studies on mathematical beliefs have been conducted, research that specifically examines mathematical beliefs in the aspect of beliefs about the social context remains limited. In particular, studies on beliefs about mathematical social norms from the perspective of field dependent cognitive styles are still rarely carried out. Most previous studies discussed mathematical beliefs in a general context or focused on problem solving abilities. These studies have not extensively addressed how students develop beliefs about social interaction in mathematics learning. Furthermore, research exploring field dependent students in relation to mathematical social norms is also limited. Therefore, this study focuses on students with a field dependent cognitive style to gain a deeper understanding of their mathematical beliefs, particularly their beliefs about mathematical social norms in classroom mathematics learning. Based on this description, the purpose of this study is to describe the profile of mathematical beliefs of students with a field dependent cognitive style, especially in the aspect of mathematical social norms.

2. Methodology

This study employed a descriptive qualitative approach to describe students' mathematical beliefs with a field dependent cognitive style, particularly in the aspect of beliefs about mathematical social norms. The research was conducted at a public junior high school in Palu City during the even semester of the 2025/2026 academic year. The subject of the study was one student with a field dependent cognitive style, selected based on the results of the Group Embedded Figures Test (GEFT) developed by Witkin et al. (1971) and recommendations from the mathematics teacher. This study used a single research subject because the main objective was to gain an in-depth understanding of the profile of field dependent students' mathematical belief. In qualitative research, the depth of data is prioritized over the number of participants (Creswell, 2013). The subject was selected

purposively because the characteristics relevant to the focus of the study, thus considered sufficient to represent the phenomenon being investigated.

The main instrument in this study was the researcher, while the supporting instruments included the GEFT questionnaire, observation sheets, and semi-structured interview guidelines. The GEFT questionnaire was used to identify students' cognitive styles based on the classification by Witkin et al. (1977), in which scores ranging from $0-9$ are categorized as field dependent. The observation sheet was used to observe students' activities during mathematics learning, while the semi-structured interview was employed to explore students' mathematical beliefs, particularly their beliefs about mathematical social norms, in greater depth. The research indicators referred to the indicators of mathematical social norms developed by Anggraeni (2018), as shown in Table 1 below.

Table 1. Indicators of Mathematical Social Norms

	Indicators
1.	Students are able to accept various levels of group thinking without feeling superior or inferior to other members of the group.
2.	Students agree on writing problem solving solutions using mathematical symbols/terms.
3.	Students are able to express their ideas/opinions to reach agreement using mathematical evidence based on the problem.
4.	Students are able to collaborate (work together) in solving problems.
5.	Students are able to express problem solving solutions orally using mathematical principles.
6.	Students are able to express their ideas/opinions systematically using understandable language.
7.	Students are able to express their ideas/opinions systematically using polite language.
8.	Students are able to express their ideas/opinions based on mathematical principles consistently.
9.	Students ask each other questions emphasizing understanding of the material.
10.	Students draw conclusions using polite language.

The data collection techniques in this study were carried out through the GEFT test, observation, and semi-structured interviews. The GEFT test was used to determine students' cognitive styles, after which one student with a field dependent cognitive style was selected as the research subject based on the test results and recommendations from the mathematics teacher. Subsequently, observations were conducted during the mathematics learning process to obtain data regarding student activities related to mathematical social norms, and during the observation process, the subject's activities were recorded on video to support data analysis. Furthermore, semi-structured interviews were conducted to obtain more in-depth information about students' mathematical beliefs concerning mathematical social norms. All interview sessions were recorded using an audio recorder to facilitate the data analysis process.

The data analysis technique in this study refers to the data analysis model by Miles et al. (2014), which includes data condensation, data display, and conclusion drawing/verification. Data condensation was carried out by selecting and focusing on observation and interview data related to students' mathematical beliefs, particularly their beliefs about mathematical social norms based on the research

indicators. Subsequently, the data were presented in the form of narrative descriptions by connecting the results of observations and interviews to obtain a comprehensive picture of the research subject. Conclusion drawing was conducted through data interpretation.

The validity of the research data was carried out through credibility and dependability tests. According to Sugiyono (2013), data credibility can be enhanced through triangulation, peer discussion, and member check. The triangulation used in this study was technique triangulation. Technique triangulation was conducted by using observation and interviews to obtain and confirm data regarding students' mathematical belief. Peer discussion was carried out to obtain input on the process of data analysis and interpretation, while member check was conducted by confirming the findings to the research subjects to ensure the suitability of the researcher's interpretation with the subjects' experiences. As for dependability, it was carried out through an audit by the supervisor on the entire research process.

3. Results and Discussion

Based on the results of the Group Embedded Figures Test (GEFT) administered to 30 eight-grade students, 3 students were identified with a field independent cognitive style and 27 students with a field dependent cognitive style. One subject from the field dependent category was then selected based on the GEFT results and recommendations from the mathematics teacher. Data were subsequently collected through classroom observations during the learning process and interviews to describe the student's mathematical beliefs, particularly their beliefs about mathematical social norms, within the context of a field dependent cognitive style.

Profile of the Mathematical Beliefs of the SFD Subject Regarding Beliefs about Mathematical Social Norms in the Classroom

Based on the analysis of observation and interview data, the SFD subject demonstrated various characteristics of mathematical beliefs that were evident through mathematical social norms during the mathematics learning process. To facilitate the interpretation of the research findings, the ten indicators of mathematical social norms identified in this study were classified into several parts. These parts consisted of (1) social interaction in mathematics learning, (2) mathematical communication skills, and (3) the use of mathematical rules in problem solving.

1. Profile of the Mathematical Beliefs of the SFD Subject in Terms of Social Interaction in Mathematics Learning

Social interaction in mathematics learning includes several indicators. These indicators include: (1) students are able to accept various levels of group thinking without feeling superior or inferior to other group members, (2) students are able to collaborate in solving problems, and (3) students ask each other questions to

enhance their understanding of the material. The interview results of the SFD subject for each indicator are presented in Table 2.

Table 2. Interview Results of Subject SFD in the Social Interaction Section of Mathematics Learning

Indicators	Interview Dialogue
Students are able to accept various levels of group thinking without feeling superior or inferior to other members of the group	PN-005 : Here are some questions. During yesterday's lesson, were there any differences of opinion between you and your friends? SFD-006 : Yes. PN-007 : How did you respond to a friend's opinion that differed from yours? SFD-008 : I discussed it with my friends. If there was a difference of opinion, we looked for a solution to find out which opinion was correct, and that opinion would be used. Yesterday the difference was in the method of solving. PN-009 : What did you do if a group member was smarter than you during the discussion? SFD-010 : I still helped each other. It's called group work, we must cooperate and help each other to lighten the task. PN-011 : So you accepted it without objection? SFD-012 : Yes, no objection. PN-013 : What did you do if a group member was less smart than you during the discussion? SFD-014 : I taught them until they understood, starting from the steps, where the answer came from, and all the procedures. PN-015 : So you accepted it if your friend was less smart? SFD-016 : Yes. PN-017 : How did you adjust yourself to work with all group members? SFD-018 : My way of adjusting was, if someone didn't understand, I taught them. If someone already understood, we still helped each other so the task would be lighter. The key is communication.
Students are able to collaborate (work together) in solving problems	PN-035 : Were you able to work together with your group in solving problems? SFD-036 : Yes. PN-037 : What contribution did you make during yesterday's lesson? SFD-038 : I contributed by solving the problems, starting from explaining the method, the steps, and giving the results of addition and multiplication. Yesterday I also went to the front as the group representative to explain the answer.
Students ask each other questions emphasizing understanding of the material	PN-049 : During yesterday's lesson, did your friends ever get confused with your explanation? SFD-050 : There isn't any. PN-051 : During the lesson/discussion, did your friends ask questions? SFD-052 : Yes. PN-053 : What questions did they ask? SFD-054 : Maybe about the results of addition. For example, why is the result like this?

	How did you respond?
PN-055 :	I explained again in detail, starting from the initial steps,
SFD-056 :	the addition, until the final result.
	During the lesson/discussion, did you ask questions to
PN-057 :	your teacher/friends?
	Yes.
SFD-058 :	What questions did you ask?
PN-059 :	To my friends, I asked, what do you think, is this
SFD-060 :	correct? Then to the teacher, I asked, is this solution correct or not?
	How did your teacher/friends respond?
PN-061 :	Their response was good, answered well.
SFD-062 :	

a. Students are able to accept various levels of group thinking without feeling superior or inferior to other members of the group

The observation results show that the SFD subject remained actively engaged during group discussions. The subject was observed listening to the opinions of other group members, responding to the answers presented, and continuing to follow the discussion process when different solution methods emerged. In addition, the subject also assisted peers who had difficulty understanding the material by re-explaining the steps used in solving the problems. The interview results indicate that the SFD subject preferred to discuss with group members when differences of opinion arose in order to determine the most appropriate solution. The SFD subject also stated that he did not mind having peers who were more capable and was willing to help classmates who struggled to understand the material.

This attitude shows that the SFD subject is able to accept the diversity of group members' levels of thinking without displaying arrogance or inferiority. The subject views mathematics learning as a collaborative process that emphasizes cooperation and mutual respect for opinions within the group. The attitude of respecting the opinions of other group members also demonstrates the subject's openness to various ways of solving mathematical problems. These findings reflect a positive mathematical belief toward mathematical social norms, particularly in accepting differences in levels of thinking during mathematics learning. This is in line with Ningsih (2022), who stated that mathematical social norms in mathematics learning involve efforts to understand others' explanations, respond to opinions, and build interactions that support mathematical discussions.

b. Students are able to collaborate (work together) in solving problems

The observation results show that the SFD subject was able to collaborate with group members in solving mathematical problems. This was evident from the subject's active involvement during group discussions, such as discussing problem solving strategies, assisting other group members, and participating in presenting the results of the discussion. Based on the interview results, the SFD subject also stated that he contributed by explaining the steps of problem solving and assisting with calculations throughout the discussion process. In addition, the subject was involved not only in discussing solution strategies but also in assisting peers and

presenting the group's work. This shows that the subject actively participated in various stages of the group discussion process.

These findings indicate that the SFD subject views collaboration as an important part of mathematics learning in order to achieve shared understanding and problem solving. This reflects a positive mathematical belief toward mathematical social norms, particularly in building cooperation during the learning process. These findings are consistent with the study of Yulia et al. (2025), which stated that mathematical social norms can encourage cooperation and collaboration among students in mathematics learning. This condition is also in line with the characteristics of students with a field dependent cognitive style, who tend to prefer social interaction, cooperation, and learning through communication with others during the learning process (Witkin et al., 1977; Simanjuntak et al., 2022;).

c. Students ask each other questions emphasizing understanding of the material

The observation results show that the SFD subject and his group members were actively involved in question and answer activities during group discussions. The SFD subject was observed asking questions when experiencing difficulties in understanding the material. In addition, the SFD subject also provided explanations to other group members regarding the steps for solving problems and responded to questions raised during the discussion. The interview results show that the SFD subject asked questions to both peers and the teacher to ensure the accuracy of the solutions obtained, as well as re-explained the solution steps in detail when there were peers who had not yet understood the material.

This attitude shows that the SFD subject views question and answer activities as an important part of understanding mathematical concepts during the learning process. The subject not only asked questions to obtain answers but also used the discussion process to confirm the correctness of solutions and deepen understanding of the material being studied. Likewise, when responding to questions from peers, the subject attempted to provide detailed explanations so that the concepts discussed could be understood more clearly. These findings reflect a positive mathematical belief toward mathematical social norms, particularly in building comprehension of the material through interaction and group discussion. This is consistent with the study of Gülburnu & Gürbüz (2023), which stated that mathematical social norms in mathematics learning develop through dialogue, negotiation of solutions, and student interaction during the discussion process. This finding is also supported by Baharuddin (2025) and Maulidina et al. (2026), who emphasized that communication skills play an important role in explaining ideas and supporting students' understanding during mathematics learning.

Overall, the findings on the aspect of social interaction show that the subject with a field dependent cognitive style views social interaction and cooperation as an important part of mathematics learning. The subject not only accepts the diversity of group members' thinking levels, but also actively collaborates and builds understanding through question and answer activities. These findings are consistent with the characteristics of field dependent students who tend to be oriented toward

the social environment (Simanjuntak et al., 2022). Conceptually, this condition is different from field independent students who, according to Witkin et al. (1977), tend to work independently and focus on individual analysis. Thus, the novelty of this study lies in the in-depth description of how mathematical social norms are understood by field dependent students through collaboration, which emphasizes the role of social interaction as the foundation for the formation of mathematical belief.

2. Profile of the Mathematical Beliefs of the SFD Subject in Terms of Mathematical Communication

The mathematical communication aspect in learning includes several indicators. These indicators include: (1) students are able to express their ideas/opinions to reach agreement using mathematical evidence based on the problem, (2) students are able to express their ideas/opinions systematically using understandable language, (3) students are able to express their ideas/opinions systematically using polite language, and (4) students draw conclusions using polite language. The interview results of the SFD subject for each of these indicators are presented in Table 3 below.

Table 3. Interview Results of Subject SFD in the Mathematical Communication Section

Indicators	Interview Dialogue
Students are able to express their ideas/opinions to reach agreement using mathematical evidence based on the problem	PN-027 : Explain your idea/opinion about how to solve this test! SFD-028: This problem asked to find the formula for the n-th term of the given sequence. So I used the formula for the n-th term of a geometric sequence. PN-029 : When expressing your opinion, did you provide mathematical evidence in solving the problem? SFD-030: Yes. PN-031 : What mathematical evidence? SFD-032 : The formula used was the n-th term of a geometric sequence, $U_n = U_1.r^{n-1}$ PN-033 : Why use that formula? What's the proof? SFD-034 : From the ratio, which was constant. First, the ratio of each term was found, and since the ratio was constant, the geometric formula was used. If the ratio was not constant, then it was not a geometric sequence. For example, in problem 1, the sequence was 2, 4, 8, 16, and so on. To find the ratio, the formula $r = \frac{Un}{U_{n-1}}$ was used. So, $\frac{4}{2} = 2, \frac{8}{4} = 2, \frac{16}{8} = 2$. The ratio was constant, 2. Therefore, the sequence was indeed geometric.
Students are able to express their ideas/opinions systematically using understandable language	PN-043 : Explain how to solve the problem from beginning to end! SFD-044 : Number 1. The formula for the n-th term of the sequence 2, 4, 8, 16, … is… Steps: Given U_1, namely the first number in the sequence, namely 2. Next, r is not yet known, so we find the ratio

		first. Formula: $r = \frac{Un}{U_{n-1}} = \frac{U_2}{U_1} = \frac{4}{2} = 2$. Then it is asked, what is U_n? Next, solution: $U_n = U_1.r^{n-1}$ $U_n = 2.2^{n-1}$ $U_n = 2^{1+n-1}$ $U_n = 2^n$ So, the formula for the n-th term of the sequence 2, 4, 8, 16, … is $U_n = 2^n$
Students are able to express their ideas/opinions systematically using polite language	PN-007	: How did you respond to a friend's opinion that differed from yours?
	SFD-008	: I discussed it with my friends. If there was a difference of opinion, we looked for a solution to find out which opinion was correct, and that opinion would be used. Yesterday the difference was in the method of solving.
	PN-017	: How did you adjust yourself to work with all group members?
	SFD-018	: My way of adjusting was, if someone didn't understand, I taught them. If someone already understood, we still helped each other so the task would be lighter. The key is communication.
Students draw conclusions using polite language	PN-063	: During yesterday's lesson, were you able to make a conclusion?
	SFD-064	: Yes.
	PN-065	: What conclusion did you get?
	SFD-066	: The conclusion from yesterday's lesson was that we learned about geometric sequences, especially how to determine the formula for the n-th term. The formula is $U_n = U_1.r^{n-1}$.

a. Students are able to express their ideas/opinions to reach agreement using mathematical evidence based on the problem

Based on the observation results, the SFD subject was seen to be able to express his ideas or opinions during group discussions. The subject was able to explain the solution method used. In addition, the subject was also involved in the discussion process to reach agreement by providing reasons that supported the opinions expressed. The interview results show that the SFD subject was able to express ideas and opinions using mathematical evidence in solving the given problems. The subject explained that the use of the formula for the n-th term of a geometric sequence was based on the constant ratio of the sequence. Furthermore, the subject also demonstrated the process of determining the ratio of each term in the number sequence until the same ratio was obtained, then concluded that the sequence was a geometric sequence and thus could be solved using the formula for the n-th term of a geometric sequence. This explanation shows that the SFD subject not only used formulas in solving problems, but was also able to provide mathematical evidence supporting the use of those formulas.

These findings show that the SFD subject holds a positive mathematical belief regarding the importance of using mathematical evidence when expressing opinions and determining solutions to mathematical problems. The subject views that a mathematical solution must be supported by logical reasoning and proof in order to be well-accepted in mathematical discussions. This aligns with Lessing &

Ogbonnaya (2025) and Putri et al. (2025), who emphasized that mathematical proof and reasoning play an important role in helping students develop justification, explain solutions, and support mathematical arguments based on concepts and principles.

b. Students are able to express their ideas/opinions systematically using understandable language

Based on the observation results, the SFD subject appeared capable of expressing ideas or opinions systematically using comprehensible language. This was evident when the subject explained the problem solving steps sequentially from beginning to end with clear and easily understood language. In addition, during the question and answer session in group discussions, the subject was also able to provide detailed explanations again to help clarify the understanding of other group members. The interview results show that the SFD subject was able to express ideas and opinions systematically using comprehensible language. The subject explained the problem solving steps in a structured manner, starting from determining the first term, finding the ratio, and finally obtaining the formula for the n-th term. Moreover, the subject used appropriate mathematical terminology and explained the solving process with simple and easy-to-understand language. The explanation given demonstrates that the subject was able to communicate mathematical ideas sequentially so that they could be well understood by others.

These findings show that the SFD subject has a positive mathematical belief about the importance of expressing ideas and opinions clearly and systematically in mathematics learning. The subject views that mathematical solutions need to be explained in a structured way so that both the process and the results can be well understood. This is consistent with the statement of the NCTM (2000), which emphasizes that mathematical communication must be able to explain the thought process so that it can be understood by others. This finding is also supported by Sari et al. (2026), who stated that mathematical representation, both verbal and symbolic, plays an important role in helping students communicate mathematical ideas and construct understanding during mathematics learning.

c. Students are able to express their ideas/opinions systematically using polite language

The observation results show that the SFD subject remained actively engaged throughout the group discussion. The subject was seen listening to the opinions of other group members and responding to differences of opinion with polite language and respectful behavior. In addition, the subject maintained communication and valued the perspectives of peers during the discussion process. The interview results indicate that when differences of opinion occurred, the subject chose to discuss with group members to determine the most appropriate solution. Furthermore, the way the subject expressed opinions during the interview also reflected the use of courteous and respectful language.

These findings show that the SFD subject has a positive mathematical belief regarding the importance of using polite language when expressing ideas and opinions in mathematics learning. The subject views that differences of opinion in

discussions should be conveyed in a respectful and courteous manner so that comfortable and mutually appreciative communication can be established. This is consistent with Haryadi et al. (2021), who stated that politeness in language during the learning process is important to apply when asking questions, engaging in discussions, and expressing opinions in order to create good communication and mutual respect.

d. Students draw conclusions using polite language

The observation results show that the SFD subject was able to present the conclusions of group discussions using polite and structured language, without showing any attitude that offended or diminished the conclusions of other group members. The interview results also indicate that the subject was able to summarize the learning material. When asked to restate the conclusion during the interview process, the subject conveyed it briefly, sequentially, and using polite language. In addition, the conclusion delivered by the subject reflected the main concepts discussed during the lesson and was expressed in a way that could be easily understood by others. This indicates that the subject was able to communicate the essential ideas of the learning material while maintaining respectful communication during the discussion process.

These findings show that the SFD subject has a positive mathematical belief about the importance of delivering conclusions with polite language in mathematics learning. The subject views that conclusions from learning activities need to be conveyed in a proper and structured manner so that they can be understood while still respecting others' opinions. This is consistent with Napitupulu et al. (2016), who stated that mathematical communication and politeness in expressing ideas are crucial for building understanding and fostering positive attitudes toward mathematics.

The findings on the aspect of mathematical communication show that the field dependent subject more often expresses ideas orally, uses polite language, and strives to reach agreement through mathematical evidence. These findings emphasize that communication becomes the main means for field dependent students in building beliefs about mathematical social norms. Conceptually, this is different from field independent students who place more emphasis on symbolic representation and logical analysis without relying much on group discussion (Witkin et al., 1977). Thus, this study provides a new contribution in the form of an in-depth description of how mathematical communication plays a role in strengthening the mathematical belief of field dependent students.

3. Profile of the Mathematical Beliefs of the SFD Subject in Terms of the Use of Mathematical Rules

The use of mathematical rules in learning includes several indicators. These indicators include: (1) students agree on writing problem solving solutions using mathematical symbols/terms, (2) students are able to express problem solving solutions orally using mathematical principles, (3) students are able to express their

ideas/opinions based on mathematical principles consistently. The interview results of the SFD subject for each of these indicators are presented in Table 4 below.

Table 4. Interview Results of Subject SFD in the Use of Mathematical Rules Section

Indicators	Interview Dialogue
Students agree on writing problem solving solutions using mathematical symbols/terms	PN-019 : Did you agree on the solution written on the answer sheet? (While showing the worksheet already completed by the student). SFD-020 : Yes, agreed. PN-021 : Did you use mathematical symbols/terms in the solution? SFD-022 : Yes. PN-023 : What symbols did you use? SFD-024 : $U_n, U_1,$ ratio or r, and n. That's all. PN-025 : When your group wrote the answer, did you first discuss how to write and use the symbols/terms? SFD-026 : Yes, we discussed.
Students are able to express problem solving solutions orally using mathematical principles	PN-043 : Explain how to solve the problem from beginning to end! SFD-046 : Number 2. The formula for the n-th term of the sequence 9, 3, 1, $\frac{1}{3}$, … is… Steps: Given: $U_1 = 9$. Furthermore, r is unknown, so we need to find the ratio of the sequence. The formula for finding the ratio is: $r = \frac{Un}{U_{n-1}} = \frac{U_2}{U_1} = \frac{3}{9} = \frac{1}{3}$. Then it is asked, what is U_n? Next, solution: $U_n = U_1.r^{n-1}$ $U_n = 9.\frac{1}{3}^{n-1}$ $U_n = 3^2.\frac{1}{3}^{n-1}$ $U_n = 3^2.3^{-1(n-1)}$ $U_n = 3^2.3^{-n+1}$ $U_n = 3^{2+(-n)+1}$ $U_n = 3^{3-n}$ So, the formula for the n-th term of the sequence 9, 3, 1, $\frac{1}{3}$, … is $U_n = 3^{3-n}$
Students are able to express their ideas/opinions based on mathematical principles consistently	PN-043 : Explain how to solve the problem from beginning to end! SFD-048 : Number 3. The formula for the n-th term of the sequence 27, 9, 3, 1, … is … Steps: Given: $U_1 = 27$. The formula for finding the ratio is: $r = \frac{Un}{U_{n-1}} = \frac{U_2}{U_1} = \frac{9}{27} = \frac{1}{3}$. Then it is asked, what is U_n? Next, solution: $U_n = U_1.r^{n-1}$ $U_n = 27.\frac{1}{3}^{n-1}$ $U_n = 3^3.\frac{1}{3}^{n-1}$ $U_n = 3^3.3^{-1(n-1)}$ $U_n = 3^3.3^{-n+1}$ $U_n = 3^{3+(-n)+1}$ $U_n = 3^{4-n}$

	So, the formula for the n-th term of the sequence 27, 9, 3, 1, … is $U_n = 3^{4-n}$

a. Students agree on writing problem solving solutions using mathematical symbols/terms

Based on the observation results, the SFD subject was seen using appropriate mathematical symbols and terminology during group discussions. The subject also participated in discussions related to writing solution steps and the use of mathematical symbols in problem solving. The interview results show that the subject and group members used mathematical symbols such as U_n, U_1, the ratio (r), and n in solving the given problems. In addition, the subject stated that the group first discussed before agreeing on the use of symbols and the way of writing solutions to be included in their answers.

These findings show that the SFD subject has a positive mathematical belief about the importance of using mathematical symbols and terminology accurately and in mutual agreement during mathematics learning. The subject views that the proper use of mathematical symbols can help clarify both the process and the results of solving mathematical problems. In addition, the subject's involvement in discussing and agreeing on the use of symbols indicates a belief that mathematical ideas should be communicated in a way that can be understood and accepted by all group members. This reflects a positive mathematical belief toward mathematical social norms, particularly in establishing shared agreements regarding the use of mathematical representations during problem solving. Such findings are also consistent with the characteristics of students with a field dependent cognitive style, who tend to build understanding through interaction and discussion with others (Simanjuntak et al., 2022). This is consistent with the NCTM (2020), which stated that mathematical representations and symbols are used to help students communicate and understand mathematical ideas more clearly.

b. Students are able to express problem solving solutions orally using mathematical principles

Based on the observation results, the SFD subject was able to orally present problem solutions using mathematical rules during the learning process. This was evident when the subject explained the problem solving steps sequentially in accordance with the mathematical concepts and procedures applied. The interview results show that the subject explained the process of determining the ratio, applying the formula for the n-th term of a geometric sequence, and arriving at the final solution using appropriate mathematical steps. In addition, the subject was able to explain the transformation of exponential forms in sequence using proper mathematical symbols and operations. These explanations demonstrate that the subject was capable of orally communicating problem solutions while consistently adhering to the mathematical rules required in problem solving.

These findings show that the SFD subject has a positive mathematical belief about the importance of applying mathematical rules when explaining problem solutions orally. The subject views that mathematical solutions need to be explained according to concepts and procedures so that the solving process can be well

understood. This is consistent with Yulia et al. (2025), who stated that mathematical social norms in mathematics learning encourage students to explain solutions and communicate mathematical problem solving using appropriate representations and mathematical rules during the discussion process.

c. Students are able to express their ideas/opinions based on mathematical principles consistently

Based on the observation results, the SFD subject demonstrated the ability to consistently express ideas and opinions according to mathematical rules throughout the learning process. This was evident from the use of solution steps that adhered to the concept of geometric sequences from the beginning to the end of problem solving. In addition, the subject consistently used mathematical symbols and terminology at each step presented during group discussions. The interview results show that the subject consistently determined the ratio first before applying the formula for the n-th term of a geometric sequence in solving the given problems. The subject also continued to use appropriate mathematical forms and operations until arriving at the final solution.

These findings show that the SFD subject has a positive mathematical belief about the importance of consistently applying mathematical rules when expressing ideas and solving mathematical problems. The subject views that the consistent use of concepts, symbols, and procedures in mathematics can help achieve accurate and easily understood solutions. This aligns with Hodiyanto (2017), who stated that communication skills in mathematics involve the precise and consistent use of mathematical symbols, terminology, and procedures in explaining the solutions to mathematical problems.

In the aspect of the use of mathematical rules, the findings of the study show that although students with a field dependent cognitive style are known to have a strong social orientation and tend to build understanding through interaction with their surrounding environment Witkin et al. (1977), the subject still pays attention to the use of symbols, terms, and mathematical procedures accurately and consistently. This shows that the subject's involvement in social interaction does not reduce his attention to mathematical accuracy in solving problems. On the contrary, the correct use of mathematical rules becomes an important part of building and maintaining agreement during group discussions. These findings show that the subject's mathematical belief in mathematical social norms is not only reflected through social interaction, but also through the belief that mathematical solutions must be based on rules and mathematical reasoning that can be mutually accepted in classroom discussions (Hodiyanto, 2017). Thus, this study provides a contribution in the form of an in-depth description of how the social orientation of field dependent students is combined with a commitment to the use of mathematical rules. Conceptually, these findings complement the understanding of the characteristics of field independent students who in several studies are more prominent in processing information independently and using individual strategies (Pathuddin et al., 2019).

4. Conclusion

Based on the research findings, the subject with a field dependent cognitive style demonstrated positive mathematical beliefs in the aspect of mathematical social norms, particularly beliefs about social norms within the classroom. This was evident through the subject's ability to accept diverse levels of group thinking, collaborate in problem solving, and actively ask questions emphasizing understanding of the material. The subject was also able to agree on the use of mathematical symbols and terminology, express solutions orally using mathematical principles, and provide mathematical evidence when presenting opinions. In addition, the subject could communicate ideas systematically using clear and polite language, draw conclusions courteously, and consistently apply mathematical rules in problem solving. The findings indicate that social interaction plays an important role in shaping students' beliefs toward mathematics learning activities, especially among students with a field dependent cognitive style. Therefore, this study describes the profile of mathematical beliefs of junior high school students with a field dependent cognitive style, particularly in the aspect of mathematical social norms. These findings indicate the importance for teachers to create a learning environment that encourages interaction, discussion, and mathematical collaboration in order to support the development of students' mathematical belief. In addition, this study contributes to enriching the study of mathematical belief and mathematical social norms by showing that the formation of mathematical beliefs of field dependent students develops through active involvement in social interaction during mathematics learning. Future research may involve more subjects and different cognitive styles to obtain a broader understanding of students' mathematical beliefs in mathematics learning.

Acknowledgement

The author would like to express sincere gratitude to Tadulako University, particularly the Faculty of Teacher Training and Education and the Mathematics Education Study Program, for their academic support and the facilities provided. Appreciation is also extended to the supervising lecturers and instrument validators for their valuable guidance and feedback throughout this study. The author further thanks the school and mathematics teachers for granting permission and assisting in the data collection process. Special thanks are given to all parties who have contributed and supported the completion of this article.

References

Anggraeni, B. (2018). *Analisis Norma Sosiomatematik dalam Model Pembelajaran Kolaboratif Pokok Bahasan Statistika*.

Asare, B., Dissou Arthur, Y., & Adu Obeng, B. (2025). Mathematics self-belief and mathematical creativity of university students: the role of problem-solving skills. *Cogent Education*, *12*(1). https://doi.org/10.1080/2331186X.2025.2456438

Baharuddin. (2025). Kemampuan Komunikasi Matematis Siswa dalam Lingkup Sekolah Menengah Pertama. *Jurnal Citra Pendidikan*, *5*(2), 174–183. https://doi.org/10.38048/jcp.v5i2.5411

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, California: Sage publications.

Dianita, N. K. (2022). Mathematical Belief Profile of Seventh-Grade Students in Sleman Regency, Yogyakarta City. *Proceedings of International Conference on Science, Education, and Technology*, *8*, 788–796.

Ernest, P. (1989). The impact of beliefs on the teaching of mathematics. In *Mathematics teaching: The state of the art*. London: Falmer Press.

Gülburnu, M., & Gürbüz, R. (2023). An investigation of sociomathematical norms perceived by students regarding the legitimacy of solutions. *South African Journal of Education*, *43*(3), 1–13. https://doi.org/10.15700/saje.v43n3a2215

Haryadi, Listini, Gunawan, Supriatini, & Yati. (2021). *Kesantunan Berbahasa dalam Percakapan Guru dan Siswa dalam Proses Belajar Mengajar*. https://doi.org/10.32502/jbs.v5i1.3348

Hidayatullah, A., & Csíkos, C. (2024). The role of students' beliefs, parents' educational level, and the mediating role of attitude and motivation in students' mathematics achievement. *The Asia-Pacific Education Researcher*, *33*(2), 253–262. https://doi.org/10.1007/s40299-023-00724-2

Hodiyanto, H. (2017). Kemampuan komunikasi matematis dalam pembelajaran matematika. *AdMathEdu*, *7*(1), 9–18. https://doi.org/10.12928/admathedu.v7i1.7397

Lessing, M.-J., & Ogbonnaya, U. I. (2025). Reasoning and proof in mathematics education: a systematic literature review. *Discover Education*. https://doi.org/10.1007/s44217-025-01016-1

Maulidina, N., Idris, M., Hasbi, M., & Nurhayadi, N. (2026). Analysis of Mathematical Connection and Communication Skills in Flat-Sided Solid Geometry Material Based on the Mathematical Skills of Grade VIII Students at SMP Negeri 12 Palu. *Journal of Educational Sciences*, *10*(2), 2594–2610. https://doi.org/10.31258/jes.10.2.p.2594-2610

McClain, K., & Cobb, P. (2001). An Analysis of Development of Sociomathematical Norms in One First-Grade Classroom. *Journal for Research in Mathematics Education*, *32*(3), 236–266. https://doi.org/10.2307/749827

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook* (3rd ed.). Thousand Oaks, California: Sage Publications.

Muhtarom, M., Sutrisno, S., Nizaruddin, N., & Murtianto, Y. (2024). Research on mathematical beliefs: systematic literature review. *Int J Eval & Res Educ*, *13*(2), 693–704. https://doi.org/10.11591/ijere.v13i2.27339

Napitupulu, E. E., Suryadi, D., & Kusumah, Y. S. (2016). Cultivating upper secondary students' mathematical reasoning-ability and attitude towards mathematics through problem-based learning. *Journal on Mathematics Education*, *7*(2), 117–128. https://doi.org/10.22342/jme.7.2.3542.117-128

National Council of Teachers of Mathematics (NCTM). (2000). *Principles and Standards for School Mathematics*. National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics (NCTM). (2020). *Principles to Actions: Ensuring Mathematical Success for All*. National Council of Teachers of Mathematics.

Ningsih, E. F. (2022). Membangun empati di era eksponensial melalui norma sosiomatematika. *Jurnal Pembangunan Pendidikan: Fondasi Dan Aplikasi*, *10*(1), 62–74. https://doi.org/10.21831/jppfa.v10i1.29357

Nurhidayah, N., Pathuddin, P., Fajriani, F., & Mubarik, M. (2026). Profile of Students' Mathematical Beliefs at State Junior High School 1 Palu in Solving Algebra Problems Viewed from Learning Styles. *Journal of Educational Sciences*, *10*(4), 650–665. https://doi.org/10.31258/jes.10.4.p.650-665

Pathuddin, Ketut Budayasa, I., & Lukito, A. (2019). Metacognitive activity of male students: difference field independent-dependent cognitive style. *Journal of Physics: Conference Series*, *1218*(1), 012025. https://doi.org/10.1088/1742-6596/1218/1/012025

Putri, A. I., Maimunah, M., & Anggraini, R. D. (2025). Development of a Problem Based Learning Teaching Module on the Topic of Comparison to Facilitate Mathematical Reasoning Skills of Phase D Students. *Journal of Educational Sciences*, *9*(5), 4082–4091. https://doi.org/10.31258/jes.9.5.p.4082-4091

Sari, M. A. R., Rahmawati, D., & Andayani, S. (2026). Mathematical Representation Ability in Junior High School Students: Study Literature Review. *Journal of Educational Sciences*, *10*(3), 832–851. https://doi.org/10.31258/jes.10.3.p.832-851

Simanjuntak, M. V., Dewi, S., & Simamora, R. (2022). Proses Berpikir Siswa Field Independent (FI)-Field Dependent (FD) dalam Menyelesaikan Soal Matematika di Kelas XII MIPA SMA Negeri 3 Kota Jambi. *PHI: Jurnal Pendidikan Matematika*, *6*(2), 237–244. https://doi.org/10.33087/phi.v6i2.231

Sugiyono, P. (2013). Metodologi penelitian kuantitatif kualitatif dan R&D. *Bandung: Alfabeta*.

Widiani, S., & Pardi, M. H. H. (2024). Pengaruh Belief Dan Self Confidence Terhadap Kemampuan Pemecahan Masalah Matematika. *Alifbata: Jurnal Pendidikan Dasar*, *4*(1), 1–17. https://doi.org/10.51700/alifbata.v4i1.654

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/10.3102/00346543047001001

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. (1971). *A Manual for the Embedded Figures Tests*. Consulting Psychologists Press.

Woolfolk, A. (2015). *Educational Psychology, Global Edition, Thirteenth Edition* (13 ed.). Harlow, England: Pearson Education.

Yackel, E., & Cobb, P. (1996). Sociomathematical Norms, Argumentation, and Autonomy in Mathematics. In *Source: Journal for Research in Mathematics Education* (Vol. 27, Number 4). https://doi.org/10.2307/749877

Yulia, Y., Kustati, M., Nelmawarni, N., Perrodin, D. D., Afriadi, J., & Rahmadhani, M. K. (2025). Enhancing Cooperative Learning in Mathematics Education through Sociomathematical Norms in the Era of Society 5.0. *TEM Journal*, 3760. https://doi.org/10.18421/tem144-79

Zahratunnisa, Z., Pathuddin, P., Fajriani, F., & Mubarik, M. (2026). Profile of Mathematical Beliefs of State Junior High School 1 Palu Students in Solving Two-Variable Linear Equations: Viewed from Gender. *Journal of Educational Sciences*, *10*(4), 666–681. https://doi.org/10.31258/jes.10.4.p.666-681

How to cite this article:

Balango, N. A., Pathuddin., Mubarik., & Murdiana, I. N. (2026). Mathematical Belief Profile of Junior High School Students with Field Dependent Cognitive Style. *Journal of Educational Sciences*, *10(6)*, 660-678.