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Profile of High School Students' Mathematical Beliefs in the "Quitter" Category of the Adversity Quotient

Komang Tri Ananda Kusuma*, Pathuddin, Mubarik, I Nyoman Murdiana
Mathematics Education, Faculty of Teacher Training and Education, Tadulako University, Palu, 94118, Indonesia

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** Corresponding author:*

E-mail: komangtri1928@gmail.com

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A B S T R A C T

This study aimed to describe students' mathematical beliefs, particularly in the aspect of mathematical social norms, among students categorized as quitter based on the Adversity Quotient. This study employed a qualitative descriptive approach. The subject was one eleventh grade student categorized as a quitter selected through the Adversity Response Profile (ARP) questionnaire, mathematics teacher recommendations, and willingness to participate in the study. Data were collected through classroom observations and semi structured interviews. The findings showed that the quitter student demonstrated positive mathematical beliefs regarding mathematical social norms during mathematics learning. The student was able to accept differing opinions, participate in collaborative discussions, ask and answer questions to understand mathematical concepts, communicate ideas systematically and politely, and apply mathematical symbols and principles consistently during problem solving. These findings highlight that student categorized as quitter may still demonstrate positive mathematical social norms despite having low Adversity Quotient characteristics. However, these findings are limited to the quitter category involved in this study and cannot be generalized to students with different Adversity Quotient characteristics.

1. Introduction

Mathematics is one of the disciplines that plays a crucial role in education. Mathematics is a science with objective truths and plays a vital role in developing critical thinking skills and problem-solving abilities (Safari & Nurhida, 2024). However, many students still view mathematics as a difficult and intimidating subject. The perception that mathematics is a difficult subject is not only caused by the complexity of the material but is also influenced by external factors such as parenting styles, teaching approaches, and peer influence. Additionally, internal factors such as a fixed mindset, previous experiences of failure, and a loss of motivation following failure further reinforce students' negative beliefs about

mathematics (Purbaningrum et al., 2023). These conditions cause some students to feel less confident and to give up easily when facing mathematical problems.

Effective mathematics learning not only imparts knowledge but also shapes students' perspectives and beliefs about mathematics, which are expected to foster their cognitive and affective abilities. One such affective ability that can be developed in mathematics instruction is a belief in mathematics itself (Komara et al., 2024). Beliefs regarding how mathematics is learned and taught are known as mathematical beliefs (Beeli-Zimmermann, 2019). Mathematical beliefs develop through learning experiences and students' interactions with the learning environment, which shape their perspectives on mathematics (Muhtarom et al., 2023).

Students with positive mathematical beliefs tend to be more open to the learning process, more confident in solving problems, and less likely to give up when facing difficulties. Conversely, students with negative mathematical beliefs tend to feel afraid, doubt their own abilities, and view mathematics as a difficult subject (Purbaningrum et al., 2023; Nurhidayah et al., 2026). Additionally, Asare et al. (2025) explain that mathematical beliefs are related to an individual's confidence in their ability to understand mathematical concepts and solve challenging mathematical tasks. Mathematical belief also influences students' ability to understand and solve mathematical problems (Zahratunnisa et al., 2026).

Mathematical beliefs develop through an individual's interaction with prior learning experiences that shape patterns of thinking and perceptions of mathematics (Muhtarom et al., 2023). However, mathematical beliefs do not stem solely from individual experiences but are also influenced by social interactions that occur in the learning environment. Students' self-confidence in mathematics learning can develop through effective communication during the learning process (Kurniawan et al., 2018).

Peer interactions through group discussions are highly effective in enhancing mathematical understanding (Abdul Rahman & Lee Abdullah, 2024). Through ongoing interactions in the classroom, students and teachers indirectly build a shared understanding of how mathematical ideas are presented, justified, and evaluated, thereby forming unwritten values and rules that govern student participation and argumentation. These rules and values are known as mathematical social norms, which influence how students interpret mathematical activities and determine the quality of mathematical discussions in the classroom (Yackel & Cobb, 1996).

Mathematical social norms play a positive role in enhancing students' learning resilience and mathematical representation skills (Maarif & Akbari, 2024). In this context, the adversity quotient becomes a crucial aspect that complements mathematical social norms, as it reflects students' ability to persevere, adapt, and bounce back from challenges during the mathematics learning process. The adversity quotient (AQ) is a key indicator of how well an individual can confront,

overcome, and transform difficulties into opportunities for success (Stoltz, 2000). Adversity Quotient relates to students' ability to face difficulties and maintain engagement throughout the learning process (Suci et al., 2025). Students with high AQ levels demonstrate better self-control, take responsibility for their learning outcomes, and are able to view difficulties as opportunities for growth compared to students with low AQ (Gradini & Noviani, 2025).

Research on mathematical beliefs has been extensively conducted in various educational contexts. For example, a study by Sari & Afriansyah (2022) found that students' beliefs about mathematics significantly influence how they think and behave during the learning process. Students with positive beliefs tend to be more motivated and resilient compared to those with negative beliefs. However, studies on mathematical beliefs that specifically address mathematical social norms in relation to the Adversity Quotient remain limited. Based on the above description, this study aims to profile students' mathematical beliefs at a private high school in Palu, specifically examining students categorized as quitter based on their AQ. The results of this study are expected to contribute to the development of learning strategies that are not only oriented toward cognitive outcomes but also strengthen students' mathematical beliefs and mental resilience in facing learning challenges.

2. Methodology

This study employs a qualitative descriptive approach to describe students' mathematical beliefs regarding the mathematical social norms as viewed through the Adversity Quotient. The research was conducted at a private high school in Palu during the 2025/2026 academic year, with one 11th-grade student as the subject specifically, a student in the low AQ category (Quitter). The selection of the subject was based on the results of the Adversity Response Profile questionnaire developed by Kusumawardani (2018) as well as the mathematics teacher's assessment. The research instruments consisted of the primary instrument the researcher and supporting instruments, including the Adversity Response Profile (ARP) questionnaire, an observation sheet, and an interview guide. Data collection techniques were conducted through a questionnaire to determine students' AQ levels, observation to examine students' mathematical social norms during learning, and semi structured interviews to deepen the information from the subjects.

The collected data were analyzed using Miles (2014), namely data condensation, data presentation, and drawing conclusions or verification. In the data condensation stage, the researcher selected, simplified, and categorized observation and interview data based on the indicators of mathematical social norms. Furthermore, the data were presented in the form of descriptive narratives and indicator-based classifications to facilitate the data interpretation process. The conclusion drawing stage was conducted by identifying patterns of mathematical beliefs in the aspect of mathematical social norms among quitter students. Data credibility was strengthened through technique triangulation by comparing the results of observations and interviews. In addition, data validity was also ensured through

member checking by reconfirming several interview results with the subject to avoid misinterpretation of the data.

The data collection process was conducted in four stages. In the initial stage, students were identified based on their Adversity Quotient (AQ) scores from the ARP questionnaire. Next, students participated in their regular lessons taught by their teachers, while the researchers conducted observations to assess mathematical social norms among the selected subjects. After the observations were conducted, semi structured interviews were carried out to further investigate students' beliefs regarding mathematical social norms in the classroom. All observation and interview activities were then documented through field notes and audio recordings. The observation sheet was designed based on the dimensions of belief in a social context, specifically regarding students' beliefs about mathematical social norms in the classroom. The indicators of mathematical social norms used in this study were adapted from the research by Anggraeni (2018). The indicators used are listed in the following Table 1.

Table 1. Indicators of Mathematical Social Norms

No	Indicator
1.	Students are able to accept the diverse levels of thinking within the group without feeling superior or inferior to other members of the group
2.	Students agree on writing down solutions to problems using mathematical symbols/terms
3.	Students are able to express their ideas/opinions to reach an agreement using mathematical evidence based on the problem
4.	Students are able to work together (collaborate) to solve problems
5.	Students are able to verbally present solutions to problems 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 consistently based on mathematical principles
9.	Students ask each other questions with an emphasis on understanding the material
10.	Students draw conclusions using polite language

3. Results and Discussion

Based on the results of the questionnaire ARP administered to 11th grade students, three categories AQ were identified. A total of 3 students were in the low category (quitter), 14 students were in the moderate category (camper), and 2 students were in the high category (climber). Based on the results of the ARP questionnaire, one representative subject was selected from the quitter category based on the highest score, recommendations from the mathematics teacher, and the student's willingness to participate in the study. Data were then collected through observations during the learning process and interviews to describe the students' mathematical beliefs, particularly regarding the mathematical social norms among the quitter category.

Profile of Quitter Students' Mathematical Beliefs Regarding Mathematical Social Norms

Based on the analysis of observational data and interviews, subject in the quitter category exhibited various characteristics of mathematical beliefs reflected through mathematical social norms during the learning process. To facilitate the interpretation of the research results, the ten indicators of mathematical social norms used in this study were grouped into three discussion sections, namely: (1) Social interactions of quitter students in mathematics learning, (2) Mathematical communication skills of quitter students, and (3) Use of mathematical rules by quitter students.

Social Interactions of Quitter Students in Mathematics Learning

The social interaction component in mathematics learning includes the indicators "Students are able to accept the diverse levels of thinking within the group without feeling superior or inferior to other members of the group," "Students are able to work together (collaboratively) to solve problems," and "Students ask each other questions with a focus on understanding the material." The results of observations and interviews regarding the social interaction component in mathematics learning are described based on each of the following indicators. The supporting interview excerpts for each indicator can be seen in Table 2.

Table 2. Social Interactions of Quitter Students in Mathematics Learning

Indicator	Interview Results
Students are able to accept the diverse levels of thinking within the group without feeling superior or inferior to other members of the group	NFS-012 : During a discussion, there are bound to be differing opinions, and that's perfectly normal. NFS-014 : Usually, we handle that through discussion, sis. So, if someone has a different opinion, we discuss why they think that way. Then we explore why there's a difference from our own views.
Students are able to work together (collaborate) to solve problems	NFS-040 : Yes, I joined the discussion. So, before working on the problems, we first discussed which ones were difficult and which ones were easy, so that afterward we could divide up the tasks for each problem, and I worked on problem number 1.
Students ask each other questions, focusing on understanding the material	NFS-052 : For example, they're still confused about whether to draw the wave from the bottom or the top. Well, we can tell that from the equation in the problem. If the initial term of the equation is positive, that means the wave starts from the top. If the equation starts with a negative value, that means the wave starts from the bottom. NFS-056 : My question yesterday was about division. Since we weren't allowed to use calculators yesterday, we had to do the calculations by hand. Well, to find the values of these sine and cosine functions, we've been taught how to do it using quadrants 1 through 4. There are many ways to do it. Since I was still confused about the specific quadrants involved, I asked my friend. My friend explained it very well, so clearly that I understood

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

Based on the observations, the NFS subject demonstrated the ability to accept the diversity of thinking styles among group members without displaying an attitude of feeling superior or inferior to other members. This was evident in the subject's attitude of consistently giving other members the opportunity to express their opinions and respecting differing answers throughout the discussion process. Based on the interview results, the NFS subject stated that differing opinions are normal in group discussions and can be resolved through collective discussion. This statement indicates that the subject views differences in thinking as part of the process of understanding mathematical concepts.

The NFS subject demonstrated the ability to accept differences in the ways group members think while still giving all members the opportunity to express their opinions and respecting different answers, indicating an understanding that diversity of thought is an important part of the mathematics learning process. This finding is consistent with Muzakki et al. (2026), who reported that collaborative and student-centered learning environments encourage students to exchange ideas, respect different perspectives, and participate actively in classroom discussions. Such interactions support meaningful learning experiences and foster positive social participation among students.

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

Based on the observations, the NFS subject demonstrated engagement in the group collaboration process during mathematics lessons. This was evident in the subject's participation in discussions, task allocation, and involvement in solving problems together with other group members. Based on the interview results, the NFS subject explained that the group first discussed the difficulty level of the problems before assigning tasks to each group member. The subject also took part in solving the problems that had been assigned. This statement indicates a sense of responsibility and cooperation in completing group tasks.

Based on the research findings, the NFS subject demonstrated active engagement in group collaboration during mathematics lessons, as evidenced by their participation in discussions, task division, and direct involvement in solving problems together with other members as well as the sense of responsibility they demonstrated when completing group tasks. This aligns with the findings of Agustin & Udin (2022) which states that students' collaborative abilities in learning encompass interactions among students in completing tasks, critical thinking, discussing with peers, sharing tasks, and helping one another to achieve optimal results, indicating that collaboration positively contributes to the group learning process.

c. Students asked each other questions, focusing on understanding the material

Based on the observation results, the NFS subject demonstrated the ability to engage in two-way interaction through asking and answering questions during the discussion process. The questions and answers provided by the subject tended to focus on the process of solving and understanding mathematical concepts. Based

on the interview results, the NFS subject explained that he had answered a classmate's question regarding the direction of waves in trigonometric equations and had asked a question about the concept of quadrants that he did not yet understand. His classmates' responses helped the subject understand the material better.

The NFS subject demonstrated the ability to engage in two-way interaction during discussions by actively asking and answering questions focused on the process of understanding mathematical concepts, such as clarifying the direction of waves and quadrants in trigonometric equations, thereby gaining a deeper understanding through peers' responses. This finding is consistent with Nazipurahman et al. (2025), who reported that learning activities emphasizing discussion, active participation, and collaborative problem-solving encourage students to become more involved in classroom interaction. Through these activities, students are provided with opportunities to ask questions, exchange ideas, and clarify their understanding of mathematical concepts, which supports meaningful participation during mathematics learning.

The findings of this study differ from Maarif & Fitriani (2023), who found that mathematical resilience has a positive influence on mathematical social norms and students with strong resilience skills tend to demonstrate better social interaction and participation during mathematics learning. In contrast, the quitter student in this study, who was categorized as having low Adversity Quotient characteristics, was still able to demonstrate positive mathematical social norms through collaborative interaction, respect for differing opinions, and active participation during group discussions.

Although quitter students are generally characterized by low persistence and a tendency to avoid academic difficulties (Stoltz, 2000), the subject in this study remained actively involved in social interaction during mathematics learning. This finding indicates that positive mathematical social norms are not solely determined by students' adversity levels, but may also develop through supportive classroom interaction and collaborative learning environments. The classroom environment provided opportunities for the student to participate in discussions, exchange ideas, and receive support from peers during the learning process. Through these interactions, the student remained engaged in mathematical activities despite having quitter characteristics. These findings indicate that positive mathematical beliefs related to mathematical social norms can develop through collaborative learning and meaningful classroom interaction. Therefore, this study provides additional insight that students categorized as quitter can still develop positive mathematical beliefs in the aspect of mathematical social norms when meaningful social interaction is consistently facilitated during mathematics learning.

Mathematical Communication Skills of Quitter Students

The mathematical communication component of learning includes the indicators "Students are able to express their ideas/opinions to reach a consensus using mathematical evidence based on the problem," "Students are able to express their

ideas/opinions systematically using understandable language," "Students are able to express their ideas/opinions systematically using polite language," and "Students draw conclusions using polite language." The results of observations and interviews regarding the mathematical communication component in learning are described based on each of the following indicators. The supporting interview excerpts for each indicator are presented in Table 3.

Table 3. Mathematical Communication Skills of Quitter Students

Indicator	Interview Results	
Students are able to express their ideas and opinions to reach a consensus using mathematical evidence based on the problem	NFS-034 :	In that assignment, for question number one, the instruction is to plot the graph of the function $y = 3 \sin 2x$ for $0° \leq x \leq 360°$. From this function, we can begin to find the x-coordinates and y-coordinates to plot the graph. To find these points, I'll start by substituting simple x-values, such as, which yield special angles like 0° and 30°. If $x = 0°$, then $2x = 0°$. Since sin 0° is 0, then $y = 3 \times 0 = 0$. So the first point is (0°, 0). To get sin 30°, 2x must be 30°. So x = 15°. Since sin 30° is 1/2, then $y = 3 \times 1/2 = 3/2$. So we get the point (15°, 3/2), and so on until 360°. Now, all we have to do is plot these points on the function's graph, resulting in a function graph like the one we drew, where the graph has two waves.
Students are able to express their ideas and opinions systematically using polite language	NFS-044 :	If I were explaining this to a friend, I'd probably start by explaining the purpose of the problem what we're supposed to find. Since the problem asks us to plot a graph using a given formula, I'd first explain how to find the points we'll use on that graph. Since the problem involves 2x, one wave is only 180°, so there are two waves from 0° to 360°. To find several points on the graph, I explain that we can use special angles. For example, let's use sin 30°. We know that sin 30° is 1/2. This can be remembered from the special 30°, 60°, 90° triangle, where the side opposite the 30° angle is half the hypotenuse, so its value is 1/2. Since the function contains 2x, to get sin 30°, it means 2x = 30°, so x = 15°. Therefore, the value of y = 3 × 1/2 = 3/2. From points like that, simply continue the pattern until two full waves are formed.
Students are able to express their ideas and opinions systematically using polite language	NFS-014 :	We usually handle that through discussion, sir. So if our opinions differ, we discuss why their opinion is like that. Then we discuss why there is a difference from our own opinion.
	NFS-040 :	Yes, I join in the discussion. So, before working on the problems, we first discuss which ones are difficult and which are easy, so that afterward we can divide up the tasks for each problem, and I work on problem number 1.
Students draw conclusions using polite language	NFS-058 :	So, the conclusion I've drawn from this trigonometry material is that the graph actually spans four quadrants, not just one section. In each quadrant, the signs of sin, cos, and tan are different. In Quadrant I, all values are positive. In Quadrant II, only sin is positive. In the third quadrant, only tan is positive. And in the fourth quadrant, only cos is positive. To draw the graphs of sin

	and cos, you first find a few key points, then connect them to form a wave shape because the pattern repeats. As for tan, the graph is different because there are values that cannot be determined when cos equals zero. So the graph seems to jump up or down without limits. So, in my opinion, understanding the signs in each quadrant is important so that we can more easily draw and understand the shapes of trigonometric graphs.

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

Based on the observation results, the NFS subject demonstrated the ability to express ideas or opinions using mathematical evidence based on the given problems. This was evident in the way the subject explained the step-by-step solution process using mathematical calculations consistent with trigonometric concepts. Based on the interview results, the NFS subject explained the process of determining points on the graph of a trigonometric function by utilizing special angle values and sine calculations. This explanation indicates that the subject used mathematical evidence to support the opinion presented.

The NFS subject demonstrated the ability to express ideas and opinions coherently by using mathematical evidence to solve trigonometry problems, such as utilizing calculations of special angles to determine points on the graph of a function; this facilitated reaching consensus in group discussions because their arguments were supported by numerical evidence and logical steps. Recent research published by Lubis et al. (2024) confirms that students' mathematical reasoning skills include the ability to state claims, present evidence/data, and connect that evidence to strong reasoning, which helps students explain their solution processes and defend their positions scientifically in class discussions.

b. Students are able to express their ideas and opinions systematically using polite language

Based on the observation results, the NFS subject demonstrated the ability to express ideas or opinions systematically using understandable language. This was evident in the way the subject explained the solution steps in a coherent sequence, starting from the objective of the problem to the process of determining points on the graph. Based on the interview results, the NFS subject also uses simple and easy to understand language when explaining the concepts used in solving the problem. Additionally, the explanations provided by the subject follow a clear sequence, making them easy for others to understand.

Subject NFS demonstrated strong mathematical communication skills by conveying ideas and opinions in a coherent manner using clear and easily understandable language, as evidenced by the sequence of explanations for the solution steps from the problem's objective to the graphical solution of the trigonometric function thereby making it easier for other group members to follow his line of reasoning. This finding is consistent with the research by Na'im & Mukhlis (2024) which states that mathematical communication skills encompass students' ability to express ideas and problem solving strategies systematically and

coherently through verbal and written expressions that align with the mathematical concepts discussed in class discussions.

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

Based on the observation results, the NFS subject demonstrated the ability to express ideas or opinions systematically using polite language. This was evident in the way the subject provided a coherent explanation while consistently using polite language throughout the communication process. Based on the interview results, the NFS subject also used polite expressions when explaining how to resolve differences of opinion within a group through group discussion. Additionally, the subject continued to respect others' opinions without using offensive language.

Subject NFS demonstrated the ability to convey ideas and opinions systematically using polite and respectful language during group discussions, as evidenced by their coherent manner of speaking and their respect for others' opinions in order to reach a mutual understanding without causing offense. This finding aligns with the research results of Munandar (2023) which state that students' mathematical communication skills include the ability to convey mathematical information orally and in writing using appropriate and clear language, as well as demonstrating good communication ethics when interacting with peers to solve mathematical problems, thereby making group interactions more positive and constructive.

d. Students draw conclusions using polite language

Based on the observation results, the NFS subject demonstrated the ability to draw conclusions using polite and clear language. This was evident in the way the subject presented a summary of the material without imposing their opinion and while continuing to use language that was easy to understand. Based on the interview results, the NFS subject was able to summarize trigonometry material coherently by explaining the signs of trigonometric functions in each quadrant as well as the general steps for graphing trigonometric functions. The language used by the subject was also relatively simple and communicative.

The NFS subject demonstrated the ability to draw conclusions in a polite and communicative manner by presenting a coherent summary of trigonometry material for example, explaining the signs of functions in each quadrant and the general steps for graphing functions using simple, easy to understand language, without imposing personal opinions. This aligns with the findings of Andika et al. (2025) who state that students' mathematical communication skills include their ability to summarize learning outcomes clearly and in a structured manner through the use of appropriate mathematical representations, which help students convey ideas logically and in a way that is acceptable to others in the learning process.

The findings of this study differ from Siregar & Khusna (2023), who found that students with low reflective thinking abilities tend to demonstrate low mathematical social norms. In contrast, the quitter student in this study was still able to communicate mathematical ideas systematically, participate in discussions, and express opinions respectfully during mathematics learning. This finding indicates

that students with low Adversity Quotient levels do not always demonstrate weak mathematical communication during classroom interaction.

Although quitter students are generally associated with low persistence when facing academic difficulties (Stoltz, 2000), the subject in this study remained actively involved in explaining mathematical ideas, responding to peers' questions, and participating in collaborative discussions. This condition indicates that positive mathematical communication as part of mathematical social norms can develop when classroom communication is supportive and encourages active participation. The discussion activities provided opportunities for the student to express ideas, ask questions, and receive feedback from peers. These interactions supported the development of positive mathematical beliefs regarding mathematical communication, allowing the student to communicate ideas confidently and participate actively in classroom discussions. Therefore, the findings of this study strengthen the view that mathematical beliefs related to mathematical social norms can still develop positively among quitter students through meaningful classroom communication and collaborative interaction.

Use of Mathematical Principles by Quitter Students

The section on the use of mathematical principles in problem solving includes the indicators "Students agree to write down solutions to problems using mathematical symbols/terms," "Students are able to express solutions to problems orally using mathematical principles," and "Students are able to express their ideas/opinions based on mathematical principles consistently." The results of observations and interviews regarding the use of mathematical principles in problem-solving are described based on each of the following indicators. The supporting interview excerpts for each indicator are presented in Table 4.

Table 4. Use of Mathematical Principles by Quitter Students

Indicator		Interview Results
Students agree to use mathematical symbols and terms when writing down solutions to problems	NFS-030 :	In solving these problems, we agreed to use the symbols sin, cos, tan, alpha, and others.
	NFS-032 :	Yes, so we discussed everything from the method of solving to the notation and we all agreed on it
Students are able to verbally express solutions to problems using mathematical principles	NFS-034 :	In that assignment, for question number one, the instruction is to plot the graph of the function $y = 3\sin 2x$ for $0^o \leq x \leq 360^o$. From that function, we can start finding the x-coordinates and y-coordinates to plot the graph of the function. To find the points, I tried and entered simple x-values first, such as those that result in special angles like 0^o and 30^o . If $x = 0^o$, then $2x = 0^o$. Since sin 0^o is 0, then $y = 3 \times 0 = 0$. So the first point is (0^o, 0). Then, to get $\sin 30^o$, 2x must be 30^o. So x = 15^o. Since $\sin 30^o$ is $\frac{1}{2}$, then $y = 3 \times \frac{1}{2} = \frac{3}{2}$. So we get the point ($15^o$,$\frac{3}{2}$), and so on until 360^o. Now, all we have to do is plot these points on the function's graph to form a function graph like the one we drew, where the graph has two waves

	NFS-042 :	So we use the formula for graphing trigonometric functions, which is $f(x) = y = \sin x$. Why do we use that formula? Because the problem asks us to graph the function. To graph this function, we must first find the sine values. So we use that formula to find the sine values or the coordinates of the points
Students are able to express their ideas/opinions based on mathematical principles consistently	NFS-048 :	In the next problem, we are asked to graph the function $y = 2\cos x$ for $0^o \leq x \leq 360^o$. From this function, just as before, we can start by finding the x- coordinates and y-coordinates to plot the graph. To find these points, I'll start by plugging in simple x- values, such as those that yield special angles like 0^o and 30^o. For $x = 0^o$, since $\cos 0^o = 1$, we have $y = 2 \times 1 = 2$. So the first point is $(0^o, 2)$. Then, for $x = 30^o$, we know that cos 30^o is $\sqrt{\frac{3}{2}}$. Therefore, $y = 2 \times \sqrt{\frac{3}{2}} = \sqrt{3}$. Thus, we obtain the point $(30^o, \sqrt{3})$, and so on until 360^o. Once that's done, we simply plot these points on the function's graph, resulting in the graph we've illustrated, where the graph forms a full wave from $0^o$to 360^o.

a. Students agree to use mathematical symbols and terms when writing down solutions to problems

Based on the observations, the NFS subject demonstrated the ability to agree on the use of mathematical symbols and terms during the problem-solving process. This was evident in the use of mathematical symbols in writing out the correct solutions; however, in some parts of the solutions, there were still symbols that were not written out in full. Based on the interview results, the NFS subject used mathematical symbols and terms such as sine, cosine, coordinate points, and special angles to explain the problem-solving process. The use of these symbols and terms indicates that the subject understands the mathematical notation used in problem-solving.

The NFS subject demonstrated the ability to agree upon and correctly apply mathematical symbols and terms in the problem-solving process, incorporating terms such as sine, cosine, coordinate points, and special angles in their written solution steps, which reflects an understanding of mathematical notation even though some symbols were not fully written out. This finding aligns with the studies by Pratamaningtyas & Hakim (2021) which indicate that symbolic representation in problem-solving, including the precise use of mathematical symbols, plays a crucial role in helping students formulate solutions that are clear, consistent, and understandable to others, as symbols serve as tools for expressing mathematical ideas accurately and effectively in mathematical communication.

b. Students are able to verbally explain solutions to problems using mathematical principles

Based on the observation results, the NFS subject demonstrated the ability to verbally explain solutions to problems using mathematical principles. This was evident in the way the subject explained the steps to solve the problem in a logical sequence according to the trigonometric concepts used. Based on the interview

results, the NFS subject explained the process of determining coordinate points on the graph of the cosine function by using the rules for special angles and correct mathematical operations. The explanation provided also followed a logical and easy-to-understand line of reasoning.

Subject NFS demonstrated the ability to verbally present solutions to problems by following proper mathematical principles, as evidenced by the way the subject explained the steps for solving trigonometric problems in a coherent and logical manner, including determining coordinate points on the graph of the cosine function using special angles and valid mathematical operations, this is consistent with the findings of Lubis & Rahayu (2023) which state that students' mathematical communication skills include the accurate and clear oral presentation of mathematical ideas and reasoning, thereby enabling students to convey their thought processes using appropriate language and strengthening conceptual understanding during class discussions.

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

Based on the observations, the NFS subject demonstrated the ability to consistently express ideas or opinions based on mathematical principles. This was evident in the presentation of solution steps that consistently followed the same mathematical patterns and concepts from start to finish. Based on the interview results, the NFS subject used a similar solution method for both sine and cosine problems, namely by determining the values of special angles, finding the values of trigonometric functions, and then determining the points on the graph. This explanation indicates consistency in the application of mathematical principles throughout the problem-solving process.

The NFS subject demonstrated the ability to consistently express ideas or opinions based on mathematical principles, as evidenced by the sequence of solution steps that followed mathematical patterns and concepts from start to finish, including the use of special angle values and the determination of points on the graphs of trigonometric functions; this finding aligns with the findings of Tavşan & Pusmaz (2023) which indicate that students' mathematical reasoning processes during problem-solving involve the ability to maintain arguments, logical structure, and consistency in the use of relevant formulas and concepts, supporting effective conceptual understanding and mathematical communication.

The findings of this study differ from Azzahro et al. (2026), who found that students with low mathematical social norms tended to show fragmented understanding, ineffective planning, and low confidence in solving mathematical problems. In contrast, the quitter student in this study was still able to use mathematical symbols, principles, and procedures appropriately during mathematics learning activities. This finding indicates that student categorized as quitter do not always demonstrate negative mathematical behavior, particularly in applying mathematical rules and procedures within classroom interaction.

Although quitter students are generally characterized by low persistence when facing difficulties (Stoltz, 2000), the subject in this study consistently demonstrated the use of mathematical principles during collaborative learning activities. The collaborative learning process required the student to explain solutions, use mathematical symbols, and justify answers based on mathematical principles during discussions. Through these learning experiences, the student remained actively involved in applying mathematical rules and procedures despite having quitter characteristics. These findings indicate that positive mathematical beliefs related to the use of mathematical principles can develop through classroom activities that encourage mathematical participation and interaction. Therefore, the findings of this study provide additional insight that mathematical beliefs in the aspect of mathematical social norms may still develop positively among quitter students despite their low Adversity Quotient characteristics.

4. Conclusion

The results of this study indicate that student categorized as quitter in the Adversity Quotient were still able to demonstrate positive mathematical beliefs in the aspect of mathematical social norms during mathematics learning. Based on the indicators used in this study, the quitter student was able to show positive attitudes in accepting differing opinions, participating in collaborative discussions, asking and answering questions related to mathematical concepts, communicating ideas systematically, and applying mathematical rules and procedures appropriately during learning activities. These findings indicate that students with low Adversity Quotient levels do not always demonstrate negative mathematical beliefs, particularly in the aspect of mathematical social norms.

The findings of this study imply that mathematics teachers need to create supportive and collaborative learning environments that provide opportunities for quitter students to actively participate in discussions, communicate mathematical ideas, and interact positively with peers during mathematics learning. Through collaborative learning activities and meaningful classroom interaction, quitter students may develop positive mathematical beliefs related to participation, cooperation, and respect for others' mathematical opinions. This study contributes to the literature by showing that student categorized as quitter can still develop positive mathematical beliefs regarding mathematical social norms despite having low Adversity Quotient characteristics.

However, this study has limitations because it only involved one student categorized as quitter, so the findings cannot be generalized broadly to all students with low Adversity Quotient levels. Therefore, further studies are recommended to involve more participants and more diverse Adversity Quotient categories in order to obtain a broader understanding of mathematical beliefs in the aspect of mathematical social norms.

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References

Abdul Rahman, N. A. A., & Lee Abdullah, M. F. N. (2024). The Effects of Peer Interaction towards Mathematical Understanding during Learning Activities among Elementary Students. *Journal of Science and Mathematics Letters*, *12*(1), 53–57. https://doi.org/10.37134/jsml.vol12.1.7.2024

Agustin, R., & Udin, T. (2022). Analisis Profil Kemampuan Kerja Sama Siswa Dalam Pembelajaran IPA di SD/MI. *UNIEDU: Universal Journal of Educational Research*, *3*(3), 262–278. https://doi.org/doi.org/10.1234/uniedu.v3i3.105

Andika, R., Rani, M. M., Syam, S. S., & Firdaus, A. (2025). Dampak Pemanfaatan Handphone Atau Gawai Terhadap Minat Membaca Murid SMAS Bhaktyarsa. *Journal of Practice Learning and Educational Development*, *5*(1), 247–257. https://doi.org/doi.org/10.58737/jpled.v5i1.402

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

Azzahro, S., Wahyuni, M., & Astuti, A. (2026). Analysis of Students' Mathematical Problem-Solving Ability in Statistics Viewed from Sociomathematical Norms. *AL-ISHLAH: Jurnal Pendidikan*, *18*(1), 252–261. https://doi.org/doi.org/10.35445/alishlah.v18i1.8750

Beeli-Zimmermann, S. (2019). Extending belief research to adult basic education: an exploration of some adult educators' beliefs about numeracy and its teaching. *Zeitschrift für Weiterbildungsforschung*, *42*(3), 357–377. https://doi.org/10.1007/s40955-019-00149-9

Gradini, E., & Noviani, J. (2025). Students Profile of Adversity Quotient in Mathematics Learning: Control, Origin and Ownership, Reach, and Endurance. *American Journal of STEM Education: Issues and Perspectives*, *3*, 84–104. https://doi.org/doi.org/10.32674/2y5p9359

Komara, Lestari, P., & Supratman. (2024). Analysis of Mathematical Beliefs of Madrasah Tsanawiyah Students After Using the Geometry Transformation Digibook. *Mathematics Education Journal*, *8*(2), 185–193. https://doi.org/10.22219/mej.v8i2.32611

Kurniawan, D., Yuwono, I., Irawan, E. B., & Susanto, H. (2018). Communication

of Prospective Teachers with Students in Mathematics Learning at Senior High School (SMA). *arXiv preprint arXiv:1804.11197*. https://doi.org/doi.org/10.48550/arXiv.1804.11197

Kusumawardani, L. (2018). Proses berpikir siswa dalam menyelesaikan masalah open-ended model PISA konten space and shape berdasarkan adversity quotient (aq). *Universitas Jember*.

Lubis, M. S., & Lubis, N. A. (2024). Analisis kemampuan argumentasi matematis siswa pada materi bangun ruang sisi datar ditinjau dari kemampuan awal matematika. *Jurnal Pengembangan Pembelajaran Matematika*, *6*(1), 63–78. https://doi.org/doi.org/10.14421/jppm.2024.61.63-78

Lubis, R. N., & Rahayu, W. (2023). Kemampuan komunikasi matematis siswa pada pembelajaran Matematika. *Jurnal Riset Pembelajaran Matematika Sekolah*, *7*(2), 23–34. https://doi.org/doi.org/10.21009/jrpms.072.03

Maarif, S., & Akbari, H. A. (2024). Sociomathematical Norm, Mathematical Resilience and Mathematical Representation Ability in Mathematics Learning. *Jurnal Penelitian dan Pengembangan Pendidikan*, *8*(3). https://doi.org/doi.org/10.23887/jppp.v8i3.65238

Maarif, S., & Fitriani, N. (2023). Mathematical resilience, habits of mind, and sociomathematical norms by senior high school students in learning mathematics: A structured equation model. *Infinity Journal*, *12*(1), 117–132. https://doi.org/doi.org/10.22460/infinity.v12i1.p117-132

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook* (3 ed.). Thousand Oaks, California: SAGE Publications.

Muhtarom, M., Nizaruddin, N., Sutrisno, S., Murtianto, Y. H., & Baldemor, M. (2023). Mathematical beliefs: What topics appear, and how has this changed over time? *Al-Jabar : Jurnal Pendidikan Matematika*, *14*(2), 413–433. https://doi.org/10.24042/ajpm.v14i2.18177

Munandar, D. R. (2023). Kemampuan komunikasi matematis siswa dalam pembelajaran matematika. *Jurnal Educatio Fkip Unma*, *9*(2), 1100–1107. https://doi.org/doi.org/10.31949/educatio.v9i2.5049

Muzakki, K., Sutomo, M., & Wahyuni, I. (2026). The Implementation of Flashcard Media in Early-Grade Learning: A Case Study on Strengthening Students' Understanding of Fundamental Mathematical Concepts at MI Al Magfiroh. *Journal of Educational Sciences*, *10*(2), 3332–3345. https://doi.org/doi.org/10.31258/jes.10.2.p.3332-3345

Na'im, Z. N., & Mukhlis, M. (2024). Exploration of Students' Mathematical Communication Abilities. *Jurnal Riset Pendidikan Matematika*, *11*(1), 41–52. https://doi.org/doi.org/10.21831/jrpm.v11i1.66639

Nazipurahman, M., Syaiful, S., & Maizon, M. (2025). The Effect of Implementing PBL, DL And DI on Critical Thinking Ability Mathematics Reviewed from Motivation to Learn. *Journal of Educational Sciences*, *9*(3), 1754–1768. https://doi.org/doi.org/10.31258/jes.9.3.p.1754-1768

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/doi.org/10.31258/jes.10.4.p.650-665

Pratamaningtyas, Z., & Hakim, D. L. (2021). Student's Mathematic Representation Ability in Mathematics Problem Solving on Triangle Materials: Kemampuan Representasi Matematis Siswa dalam Pemecahan Masalah Matematika pada Pokok Bahasan Segitiga. *Mathline: Jurnal Matematika dan Pendidikan Matematika*, *6*(2), 175–190.

Purbaningrum, M., Ramadhan, S., & Thauzahra, R. (2023). Why is Math Difficult? : Beliefs That Affecting Students' Mathematics Skills. *Jurnal Paedagogy*, *10*(4), 1000. https://doi.org/10.33394/jp.v10i4.8652

Safari, Y., & Nurhida, P. (2024). Pentingnya Pemahaman Konsep Dasar Matematika dalam Pembelajaran Matematika. *Karimah Tauhid*, *3*(9), 9817–9824. https://doi.org/10.30997/karimahtauhid.v3i9.14625

Sari, R. F., & Afriansyah, E. A. (2022). Kemampuan berpikir kreatif matematis dan belief siswa pada materi persamaan dan pertidaksamaan linear. *Plusminus: Jurnal Pendidikan Matematika*, *2*(2). https://doi.org/10.31980/plusminus.v2i2.1755

Siregar, D. S. E. P., & Khusna, H. (2023). Analysis of sociomathematical norms aspect based on mathematical reflective thinking ability. *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, *11*(3), 766–775. https://doi.org/doi.org/10.33394/j-ps.v11i3.8053

Stoltz, P. G. (2000). *Adversity Quotient at Work: Make Everyday Challenges the Key to Your Success*. New York, NY: William Morrow.

Suci, A., Kamid, K., & Yantoro, Y. (2025). The Effect of PBL Model on Students' Critical Thinking Ability in View of Adversity Quotient (AQ). *Journal of Educational Sciences*, *9*(4). https://doi.org/doi.org/10.31258/jes.9.4.p.2639-2646

Tavşan, S., & Pusmaz, A. (2023). Examination of 7th-grade students' mathematical reasoning and argumentation process during problem-solving. *International journal of mathematical education in science and technology*, *54*(10), 1966–1993. https://doi.org/doi.org/10.1080/0020739X.2021.2005168

Yackel, E., & Cobb, P. (1996). Sociomathematical norms, argumentation, and autonomy in mathematics. *Journal for Research in Mathematics Education*, *27*(4), 458–477. https://doi.org/10.2307/749877

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/doi.org/10.31258/jes.10.4.p.666-681

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