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Research paper

Teacher Attitudes and Students' Interest in Mathematics: A Phenomenological Study of Eighth Graders in Mathematics

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ABSTRACT

Middle school marks a period in which students' academic interests and self-beliefs begin to consolidate, and mathematics is one of the subjects in which those beliefs matter most for later coursework and postsecondary access. This phenomenological study examined how eighth-grade students enrolled in accelerated mathematics courses perceived their teachers' attitudes and how those perceptions related to their interest in mathematics. Six students were recruited through snowball sampling and participated in semistructured, one-on-one interviews conducted online during the spring 2020 COVID-19 school closures. Interviews were transcribed and analyzed using first-cycle in vivo, emotion, and evaluation coding, followed by second-cycle pattern coding supported by network and matrix displays. Three themes emerged: the quality of the student–teacher relationship, the classroom environment, and the range of instructional strategies used to engage students. Participants who described supportive relationships with their mathematics teachers reported greater enjoyment, greater willingness to seek help, and clearer postsecondary goals, whereas participants who described distant or intimidating teachers reported reliance on peers, disengagement, and uncertainty about their futures. The findings are interpreted through Bandura's self-efficacy theory and Martin's motivation and engagement wheel, and participants described teacher attitudes, classroom climate, and instructional variety as bearing together on their enjoyment, confidence, and effort in mathematics. As a six-participant interview study, the findings are offered as a detailed account of these students' experience rather than as a basis for generalization.

Keywords: student–teacher relationships, mathematics motivation, self-efficacy, middle school, phenomenology

Middle school is the time that educational and occupational interests begin to take shape for young people. During early adolescence, middle school students experience more rapid and profound personal changes than any other period of their lives (National Middle School Association, 1995). The perceptions of children during middle school can have a profound effect on their future achievement in school.

One area where perception is critical is mathematics. Mathematics was the focus of this study for several reasons. First, there have been numerous calls for augmenting the mathematical abilities of students and decreasing the achievement gap in mathematics over the past 20 years (Ball, 2003). Second, a National Center for Education Statistics (2009) report indicates that, while there have been some improvements since 1995, students in the United States continue to score lower than students in comparison countries.

The National Science Board (2010) also reports a strong correlation between students who take advanced science and mathematics courses in high school and their enrollment and success in four-year college institutions. Likewise, high school students who do not take advanced courses typically do not enroll in four-year college institutions, and those who do often need remedial support courses. Results on the Programme for International Student Assessment and the Trends in International Mathematics and Science Study have also shown that American youth fall behind other developed countries in their abilities in science and mathematics (Russell et al., 2007). Based on these reports, international comparisons, and findings, the present study focused on eighth-grade mathematics classrooms to show how important a role teachers play in their students' mathematics achievement and academic success.

During this period of learning, understanding the material is very important because students must apply that knowledge to other areas. The development of understanding takes time and requires effort by both teachers and students. Given that the relationship between teacher and student is critical, the perception of one by the other, and vice versa, can have profound implications.

The question that arises and becomes especially important is how teachers motivate and engage middle-grade students in mathematics. Even though motivation and engagement are often used interchangeably, Gettinger and Walter (2012) defined these two terms separately, using *motivation* to refer to a student's intention or willingness to act and *engagement* to refer to the student's actual involvement.

This study used qualitative methodology to investigate the relationship between students' perceptions of their teachers' attitudes and students' interest in mathematics. The following research questions informed this area of study and investigation:

1. How do eighth-grade students in advanced mathematics courses perceive their teachers' attitudes, and how do those perceptions relate to their interest in mathematics?
2. In what ways do students describe their teachers' attitudes as shaping their mathematics learning?

Examining how students describe their teachers' attitudes, and how those descriptions sit alongside their own accounts of confidence and interest, offers one route into understanding what makes an accelerated mathematics classroom feel workable to the students inside it. The aim is not to establish what raises achievement but to render these students' experience in enough detail that teachers and researchers can recognize it.

LITERATURE REVIEW

Many investigations have been conducted in this area, and they indicate that there is a connection between the quality of the student–teacher relationship and students' academic motivation and attitudes toward school. Ernest (1989) noted that there is a powerful link between teacher support and students' emotional, motivational, and academic behaviors starting at very early stages of schooling. A number of researchers have found that teacher support plays a substantial role in adolescents' social and motivational development and achievement.

According to Eccles et al. (1993), students' need for higher quality interactions with adults and their sense of belonging increase in early adolescence. Becker and Luthar (2002) also found that social support and the lack of threat and anxiety in learning environments result in positive attitudes toward school, greater engagement in classroom activities, and higher achievement.

A lack of enjoyment can also cause students to become bored, which is typically accompanied by disengagement from activities in the learning environment. Moreover, a lack of positive connections between students and teachers is associated with risky behaviors such as stealing, aggression, gang membership, smoking, and drinking alcohol in early adolescence, especially in low socioeconomic groups

(Rudasill et al., 2010). Stipek et al. (2001) found that affective teacher characteristics such as respect, fair treatment, recognition, and listening significantly influenced young adolescents' motivation.

Recent work has extended these findings and located them specifically within mathematics. Analyzing PISA data across EU countries, Desmet et al. (2023) found that positive student–teacher relationships were associated with higher mathematics motivation, and that this association held across achievement levels rather than benefiting only high or low achievers. Umarji et al. (2021) followed culturally and linguistically diverse adolescents and reported that students' perceptions of teacher caring predicted the development of their mathematics motivation over time. Shin et al. (2025) found that teachers' influence on student motivation varied by subject, school level, gender, and achievement level, which suggests that the effects documented in earlier general studies are not uniform across classrooms. Working from a person-centered perspective, Zhou et al. (2025) identified distinct profiles of perceived teacher support among secondary students and found that these profiles differed significantly in behavioral, cognitive, and emotional mathematics engagement, with students' attitudes toward mathematics mediating the link between perceived support and engagement.

Contemporary research on academic emotions has refined this account. In a systematic review and meta-analysis of emotions in mathematics learning, Schoenherr et al. (2025) documented consistent relations between students' emotional experience and their mathematics outcomes. Sakaki et al. (2024) traced developmental trajectories of achievement emotions in mathematics across adolescence and found that enjoyment declines while negative emotions become more pronounced during precisely the years the present study examines. Schwartze et al. (2024) further showed that mathematics boredom arises from being both under-challenged and over-challenged, which indicates that boredom is not simply a marker of low ability or insufficient effort.

Young people also begin to question themselves and go through a complex and ongoing identity process. The American Association of University Women (AAUW, 1992) found that the middle school years can be the most damaging time in the lives of young girls because there is a large gap in self-esteem between boys and girls. In middle school, the literacy textbooks that students encounter are mostly written by male authors, and girls have fewer opportunities to see role models when they explore their own identity. Sadker and Sadker (1994) found that girls feel their presence is less important than that of others because they do not see themselves represented in the texts. According to the AAUW survey, there is a significant decline in the number of girls who believe in their ability to do things between elementary and middle school and between middle school and high school. Boys' beliefs in their competence, on the other hand, were higher and were directly linked to their higher self-esteem, mainly because of their athletic ability.

Female students also tend to have less confidence in their mathematics performance than their male classmates (Catsambis, 1994). Beginning in middle school, girls show less interest in mathematics and science and hold more negative attitudes toward these fields. They report relatively high levels of performance anxiety and little confidence in their personal abilities, and they attribute their success to luck rather than to their own efforts and abilities (Cross, 1988).

This body of work bears directly on the present study. If the confidence gap described in the literature is already operating by eighth grade, it should be audible in how students talk about their own competence, and it should be audible whether or not they are performing well. The interviews reported below were not designed to test for gender differences, and the sample is too small and too unbalanced to support such a test. They do, however, offer an occasion to notice whether the pattern surfaces in students' own self-appraisals, and a reading of that kind is presented alongside the three main themes.

More recent scholarship has both confirmed and complicated this picture. Using PISA 2022 data from five countries, Jeong et al. (2025) found that gender, mindset, and perceived teacher support jointly predicted students' mathematics motivation profiles, with girls less likely than boys to belong to the most adaptive profile even at comparable achievement levels. Master and Meltzoff (2020) argued that cultural stereotypes operate on girls' STEM motivation largely through sense of belonging rather than through perceived ability, and Master et al. (2026) drew on students' own accounts of K–12 STEM classrooms to show how belonging develops differently by gender. Nicolai et al. (2023) additionally reviewed how differential feedback practices shape middle school students' motivational experience, a reminder that what students hear from teachers is not distributed evenly across a classroom.

One further body of recent work bears on the interpretation of this study, because the interviews were conducted during the spring 2020 school closures. In a meta-analysis of 42 studies across 15 countries, Betthäuser et al. (2023) found a substantial learning deficit associated with the pandemic that emerged early, persisted over time, and was larger in mathematics than in reading. The students interviewed here were describing their mathematics classrooms at the moment that disruption began. Their accounts are therefore neither a record of ordinary schooling nor a record of pandemic instruction; they capture how students characterized a year of in-person mathematics teaching at the point when it was interrupted.

Theoretical framework

A key feature of this investigation is the use of Martin's (2007) motivation and engagement wheel (see Appendix A). The wheel operationalizes the combination of six key theories: *attribution theory* (Weiner, 1985), *expectancy–value theory* (Wigfield & Eccles, 2000), *goal theory* (Elliot & McGregor, 2001), *self-determination theory* (Ryan & Deci, 2000), *self-efficacy theory* (Bandura, 1997), and *self-worth motivation theory* (Covington, 1992).

The 11 factors of the motivation and engagement wheel also align with Fredricks et al.'s (2004) three components of engagement: behavioral, cognitive, and emotional. According to Fredricks et al., behavioral engagement pertains to physical participation in a task, cognitive engagement involves the thought-driven willingness to put forth effort in order to understand or apply the information presented, and emotional engagement is defined by the learner's activation of positive and negative feelings in class, which can lead to liking or disliking a given academic subject.

The instructional landscape has changed considerably since these interviews were conducted, and recent work indicates that the question participants raised has not been settled. Rutherford et al. (2025) examined teachers' use of generative artificial intelligence to develop motivationally supportive mathematics lessons, an option unavailable to the teachers these students described. What participants were asking for, however, was not technology as such. Yusuf wanted discussion, Brittany wanted to learn rather than memorize, and Ian valued a teacher who appeared invested in whether they understood. Those requests concern the design of instruction rather than its delivery medium.

In the motivation and engagement wheel, behavioral engagement is defined through positive factors including planning, task management, and persistence, and through negative factors including disengagement and self-handicapping behaviors. Cognitive motivational factors are identified in the wheel as positively influencing engagement, including self-efficacy, mastery orientation, and valuing, or as negatively influencing engagement, including uncertain control, failure or performance avoidance, and anxiety. Overall, the factors of the motivation and engagement wheel represent a diverse, theory-driven framework for research aimed at explaining motivation and engagement.

This study draws primarily on Bandura's (1997) self-efficacy theory, which holds that individuals form their self-efficacy beliefs by interpreting information from four sources: mastery experience, vicarious experience, social persuasion, and physiological or affective states. As a fundamental part of his social cognitive theory, Bandura (1986) posited that unless people believe they can produce desired outcomes, they have little incentive to act. For a frustrated student in the classroom, perceived uncertainty or anxiety over a subject such as mathematics can lead to academic disengagement.

Social cognitive theory accords a central role to cognitive, vicarious, self-reflective, and self-regulatory processes. The capacity to exercise control over one's own thought processes, motivation, and action is a distinctively human characteristic. Because judgments and actions are partly self-determined, people can effect change in themselves and their situations through their own efforts. The present study examines the mechanisms of human agency through which such changes are realized.

Social cognitive theory subscribes to a model of emergent interactive agency (Bandura, 1986). People are neither autonomous agents nor simply mechanical conveyors of animating environmental influences.

Rather, they make causal contributions to their own motivation and action within a system of triadic reciprocal causation.

Self-efficacy beliefs usually affect cognitive functioning through the joint influence of motivational and information-processing operations. This dual influence is illustrated in studies of different sources of variation in memory performance. The stronger people's beliefs in their memory capacities, the more effort they devote to cognitive processing of memory tasks, which in turn enhances their memory performance (Berry, 1987).

Through motivational processes, people's self-efficacy beliefs determine their level of enthusiasm, as reflected in how much effort they exert in an endeavor and how long they persevere in the face of obstacles. The stronger the belief in their capabilities, the greater and more persistent are a person's efforts (Bandura, 1989). Strong perseverance usually pays off in performance accomplishments.

METHOD

Research design

Qualitative research methods were used for this study because it was important to explore why participants answered as they did and how they felt about the topic. Every individual is unique, and generalizing would undermine the importance of their presence. As Merriam and Tisdell (2016) explained, qualitative researchers are interested in understanding the meaning people have constructed, and the data are words. This stands in contrast to quantitative research, which uses numbers as data and analyzes them using various statistical techniques.

Eighth graders enrolled in advanced mathematics courses were targeted for this study for an important reason. In the K–12 curriculum, sequential mathematics courses are offered from first through seventh grade, and in eighth grade students are placed in either a grade-level mathematics class or an accelerated course such as Integrated Math 1, Algebra 1, or an equivalent enhanced or advanced section, depending on prior performance and teacher recommendation. Placement in the accelerated track functions as a gatekeeper: the concepts taught there are foundational for later coursework, and the placement gives students the opportunity to take advanced courses such as geometry, precalculus, statistics, and calculus, including Advanced Placement calculus, before graduating. Course titles for the accelerated track vary across districts, so this study defined the population by placement level rather than by course name.

This study explored a phenomenon concerning the relationship between teachers and students; for that reason, a phenomenological design was used. Merriam and Tisdell (2016) defined a *phenomenological study* as a study of people's conscious experience of their life-world, that is, their everyday life and social action (Schram, 2003). Van Manen (2014) similarly explained that phenomenology is the way of access to the world as we experience it prereflectively, and that prereflective experience is the ordinary experience that we live in and live through for most, if not all, of our day-to-day existence.

In this study, a combination of methods was used, including conducting interviews, reading documents, and relying on participants' perspectives to provide insights. A questionnaire was also used as a measurement instrument. Exploratory interview questions were asked of each participant. One advantage of using interviews is that open-ended questions give participants the opportunity to respond in their own words rather than forcing them to choose from fixed responses. These responses were valuable, meaningful to the participants, unanticipated by the researcher, and rich in nature.

The interviews were conducted online because all school districts were closed nationwide in the United States during spring 2020 as a result of the COVID-19 pandemic. The researcher used inclusion requirements specifying that participants be in eighth grade and enrolled in an advanced-level mathematics course. Because school districts were closed and there was no opportunity to meet with participants in person, participants were recruited through snowball sampling, the most common form of purposeful sampling. Snowball sampling involves identifying a few participants who meet the criteria of the research and asking them, once interviewed, to refer other participants (Merriam & Tisdell, 2016). Patton (2015) described snowball sampling as a process in which asking a number of people whom else to talk with makes the snowball grow larger as the researcher accumulates new information-rich cases. In this study, an eighth-grade student enrolled in an accelerated mathematics course was interviewed first and was asked to suggest a few friends who might be interested in taking part in the research.

Ethical Considerations

This study was reviewed and approved under expedited review by the Institutional Review Board at the first author's institution (protocol 3718). Because all participants were minors, a parent or legal guardian provided informed permission before any contact was scheduled, and each student provided assent at the start of the interview. Participants were told that participation was voluntary, that they could decline to answer any question, and that they could withdraw at any point without consequence. Pseudonyms were assigned to all participants and identifying references to schools and teachers were removed from the transcripts. Recordings and transcripts were stored on a password-protected device accessible only to the researcher.

Researcher positionality

The researcher was conscious of her own biases, values, and experiences and of how they would affect her study as a White, non-American, young woman. She is also a middle and high school mathematics teacher, so during the interviews it was not easy to keep her facial expressions and body language neutral. The researcher did not want her participants to see her as an outsider, because participants were asked to talk about their mathematics teachers, or to have an effect on their responses; however, participants did not appear to be concerned about this during their interviews.

Another aspect that affected the researcher's positionality was her experience as an international student in the United States. Four of the participants were born in the United States; one of the male students had moved to the United States two years earlier. While he was talking about his challenges with English as a second language, rather than with mathematics, the researcher also found it difficult not to nod her head and display expressions that confirmed the participant's responses.

Data collection

In this study, the primary source of data was interviews: one-on-one conversations with semistructured questions that were asked purposefully. The interview questions did not match the theoretical framework perfectly because they allowed participants to answer freely in whatever direction they wished and gave the researcher a chance to gather information related to other factors associated with students' achievement in mathematics. This format allowed the researcher to respond to new situations in the moment and to new ideas on the topic (Merriam, 1998).

The questions on the protocol were organized into four categories: introduction, students' interest in mathematics, their current mathematics teacher, and the future impacts of eighth-grade mathematics (see Appendix B). Changes were made during the conversations to keep the dialogue flowing smoothly.

In this phenomenological study, a total of six participants were interviewed via Zoom. The background of each participant and the mathematics class each attended during eighth grade are shown in Table 1.

Table 1
Research Participants and the Mathematics Classes Attended in Eighth Grade

Participant pseudonym	Gender	Name of mathematics class
Yusuf	Male	Algebra 1
Brittany	Female	Advanced Math
Ashley	Female	Enhanced Math 1
Harrison	Male	Advanced Math

Participant pseudonym	Gender	Name of mathematics class
Ethan	Male	Advanced Math
Ian	Male	Enhanced Math 1

Note. All names are pseudonyms.

Each participant was contacted by telephone for an initial meeting. During these calls, the purpose of the research was explained, and participants were told that only one interview would take place and that it was expected to last 30 to 40 minutes. It was also confirmed that all possible participants were currently in eighth grade and were taking an accelerated mathematics course (Algebra 1, Advanced Math, or Enhanced Math 1). After parental permission and student assent were obtained, a virtual meeting time and date were arranged with each participant. Zoom was used for each interview, the Otter application was used to transcribe the conversations, and an iPad served as a backup audio recorder.

After each interview, the researcher took time to write notes and impressions while the interview was fresh in her mind. The only challenge the researcher faced was that the transcription application could not distinguish between the voices of the researcher and the participant, because the participant's voice came through the computer. The researcher therefore reviewed each audio recording and corrected the transcriptions.

Data analysis and coding

The audio recordings were transcribed and listened to twice to ensure accuracy. The researcher then began to organize and code the data according to suggested methods for qualitative research (Miles et al., 2020). Each transcript was read through twice, and significant sentences and quotations were highlighted. As Miles et al. (2020) stated, coding is analysis (p. 63); he also described the coding process in two major stages: first-cycle coding, in which codes are initially assigned to units of data, and second-cycle coding, in which similar codes are clustered together to create a smaller number of categories or themes. During first-cycle coding, in vivo coding was used, in which words or short phrases from the participants' own language in the data serve as codes (Miles et al., 2020). For example, Brittany noted the following:

Brittany: "…the teacher explains the things like not in a way that I understand."

Interviewer: "Do you feel like you are learning in the class?"

Brittany: "Yeah, [stopped for a moment], but like what I learned something I like ended up forgetting it so it's like I never learned anything."

Interviewer: "How confident do you feel about math?"

Brittany: "I feel kind of confident like I am not failing math, and … so like I am a little above average, but like I am not that good."

Emotion coding was also used to explore intrapersonal and interpersonal participant experiences and actions (Miles et al., 2020). For instance, Ashley spoke about her mathematics teacher from the previous year:

Ashley: "Um, my last year's math teacher, she was a girl and she like really like made me feel like comfortable and math and she would make jokes and stuff like I would sometimes see her after school to like study and stuff. And I think because of age, … people are older, they have like less patience, which makes it harder for teaching math … so I think, like, age differs in math, or like any teacher like, as you grow older your temper and your patience is going to go."

Care was taken to separate emotion coding from in vivo coding in passages where participants described how they actually felt about the questions. For the final part of the questionnaire, which asked about participants' future plans, evaluation coding was primarily used (see Table 2). After the first coding cycle was complete, the researcher returned to the transcripts to ensure that no significant data had been overlooked.

Table 2
Evaluation Coding of Participants' Postsecondary and Career Intentions

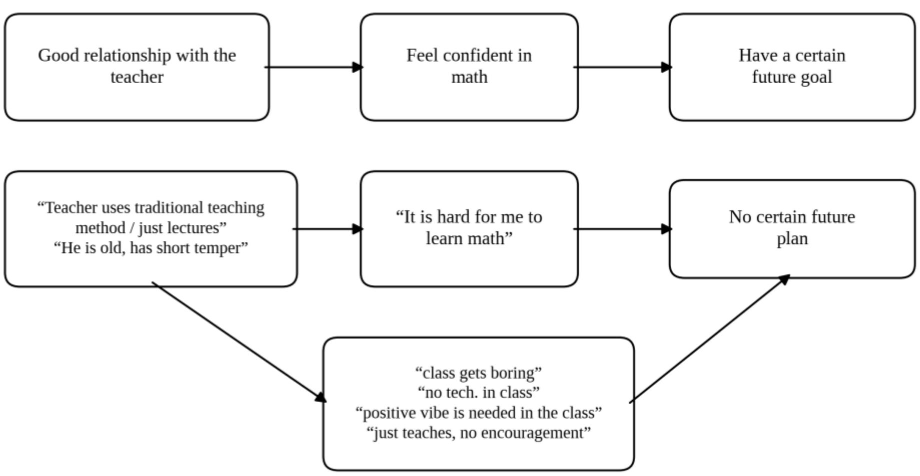
Participant	Wants to attend college	Intended future occupation
Yusuf	Yes	Media engineer, technician, or industrial designer
Brittany	Yes	Animator (not certain)
Ashley	Yes	Doctor (very sure)
Harrison	Yes	Undecided; believes almost any job requires mathematics
Ethan	Yes	Computer engineer or game developer
Ian	Yes	Engineer (very sure)

Note. Responses were obtained during the final section of the interview protocol (see Appendix B).

Second-cycle coding was used to consolidate material from first-cycle coding into more meaningful units of analysis, which were summarized into a smaller number of categories and themes. A network display (see Figure 1) and a matrix display were used during the final stage of coding.

The analysis followed a hybrid sequence. During data collection and first-cycle coding, the researcher bracketed the theoretical framework so that codes would stay in the participants' own language and the phenomenological commitment to prereflective experience would be preserved (Van Manen, 2014). The framework was reintroduced at the second cycle: once the inductive categories had stabilized, each was examined against the 11 factors of Martin's (2007) motivation and engagement wheel and against Fredricks et al.'s (2004) behavioral, cognitive, and emotional components of engagement. This sequence allowed the themes to arise from the interviews while still situating them within an established motivational vocabulary. The resulting alignment is presented in Table 3 and is carried through the presentation of each theme below.

Figure 1
Network Display of Themes After the Second Cycle of Coding



Note. The display links the three themes identified in second-cycle coding to participants' reported interest in mathematics. Arrows represent patterns of co-occurrence described by participants during the interviews; they do not denote tested causal relations.

At the end of this process the themes were checked against each transcript in turn to confirm that every theme was grounded in more than one participant's account and that no account contradicted the pattern being reported.

Trustworthiness

Several procedures were built into the study to support the credibility of the account, following the criteria set out by Lincoln and Guba (1985) and applied to qualitative educational research by Merriam and Tisdell (2016). Each recording was transcribed and then listened to twice against the transcript, a step that proved necessary because the transcription application could not reliably separate the researcher's voice from the participant's. Every transcript was read in full twice before any code was assigned. Once the themes had been developed, each transcript was revisited to confirm that every theme was grounded in more than one participant's account and that no account contradicted the pattern being reported. Participants' words are presented at length in the findings, including the excerpts that sit awkwardly with the themes, so that readers can assess the interpretation against the evidence it rests on.

Confirmability was addressed through reflexivity and through a separate record of the researcher's own responses. The positionality statement above sets out the commitments the researcher brought to the interviews, including her position as a mathematics teacher and the difficulty of keeping her reactions neutral while participants discussed their teachers. Observation notes were written immediately after each interview, while the conversation was still fresh, and were kept apart from the transcripts; these notes recorded nonverbal detail that the recordings did not capture, such as Brittany's pause and shrug before answering a question about seeking help. Keeping the two records separate made it possible to distinguish what participants said from what the researcher inferred.

An audit trail documents the analytic decisions. The interview protocol is reproduced in Appendix B, the coding methods used at each cycle are named and illustrated with the data that prompted them, and the second-cycle displays are reported in Figure 1 and Table 2. Table 3 records how the inductive categories were subsequently aligned with the theoretical framework, so that a reader can see which elements of the interpretation came from the participants and which came from the theory. Participant backgrounds and course placements are given in Table 1 to support judgments about transferability to other settings.

Three procedures commonly used to strengthen qualitative claims were not available in this study. Coding was carried out by a single researcher, so no intercoder agreement was established. Participants were not asked to review the transcripts or the emerging themes, so the findings have not been member checked. Each student was interviewed once, and no classroom observation or teacher interview was conducted, so the account was not triangulated across sources. These constraints are taken up again in the limitations section, and they bound the claims made here accordingly.

FINDINGS

After analyzing and coding the data, three main themes emerged as findings of this study: the *quality of the student–teacher relationship*, a *positive classroom environment*, and the *use of varied teaching methods* that engage students during instruction. Together, these themes describe conditions that participants associated with their own interest and effort in mathematics.

Each theme is presented below in two parts: what participants described in their own words, and how that description maps onto the motivational factors set out in the theoretical framework. Table 3 summarizes the alignment across all three themes.

Table 3
Alignment of themes with the motivation and engagement wheel and components of engagement

Theme	Motivation and engagement wheel factors	Engagement component and self-efficacy source
Quality of the student–teacher relationship	Self-efficacy, valuing, uncertain control	Emotional engagement; social persuasion
Classroom environment	Anxiety, uncertain control, disengagement	Emotional engagement; physiological and affective states

Theme	Motivation and engagement wheel factors	Engagement component and self-efficacy source
Use of varied teaching methods	Task management, persistence, mastery orientation, self-handicapping	Behavioral and cognitive engagement; mastery experience

Note. Wheel factors are drawn from Martin (2007); engagement components from Fredricks et al. (2004); self-efficacy sources from Bandura (1997).

Quality of the student–teacher relationship

As Noddings (2005) stated, a relationship that involves caring is a connection between two people. In education, the relationship between teacher and students affects both parties. Because caring is a mutual interaction, students respond to their teachers' attitudes when they receive help socially, physically, academically, and emotionally. Previous research indicates that teacher–student relationships are an essential element of middle school education (Ryan et al., 2013).

In the current study, when the researcher asked participants whether they liked their current mathematics teacher, two responses were as follows:

Ashley: "I mean, like, I like math in general but I don't like the teacher this year … he is too old and he has short temper, so, like he gets angry very quickly, I don't know, I like math in general but not the teacher and his teaching. When I have good relationship with the teacher, [I] also do good in that class … My math teacher is okay but he, like, makes jokes that are not funny … He is a good person … he gets scary sometimes, people do not want to ask him a lot of question."

Brittany: "If I don't understand something I ask my friends, it is a lot easier than asking the teacher for me."

The researcher's observation notes recorded that Brittany also made a facial expression, shrugged her shoulders, and stayed silent for a few seconds before answering. Both participants described turning away from the teacher as a source of help, Brittany explicitly and Ashley by way of classmates who preferred not to ask questions. Whether this reduced what they learned cannot be determined from interviews alone, but it is what the students themselves reported doing. Daniels and Arapostathis (2005) stated that the relationship between teachers and students can raise intrinsic motivation and increase effort in academic subjects. Gardiner and Kosmitzki (2008) similarly defined high-quality teacher–student interactions as stable, consistent, respectful, and fair interactions that help students trust their teacher; when students trust their teacher, they are more likely to seek help, which is correlated with academic achievement.

Read through the framework, these accounts describe the operation of *social persuasion*, the third of Bandura's (1997) four sources of self-efficacy. Ashley contrasted a teacher who made her feel comfortable with one whose short temper made classmates reluctant to ask questions, and Brittany redirected her help-seeking to peers entirely. In both cases the teacher is functioning as the source of appraisal information that students use to judge their own capability, and when that source is experienced as unsafe, the appraisal channel closes. In the terms of Martin's (2007) wheel, this theme touches three factors at once: it supports or undermines *self-efficacy*, it shapes *valuing* of the subject, and it contributes to *uncertain control*, since students who cannot predict a teacher's reaction lose a sense of what produces success in the class. Because the mechanism runs through how students feel about approaching the teacher, the theme corresponds most closely to Fredricks et al.'s (2004) *emotional engagement.*

These accounts align with what recent quantitative work has found at scale. Desmet et al. (2023) reported that perceived relationship quality predicted mathematics motivation independent of achievement level, which fits Ashley's insistence that she liked mathematics while disliking the teacher, and Umarji et al. (2021) found that adolescents' perceptions of teacher caring predicted their subsequent mathematics motivation. Zhou et al. (2025) found that students reporting low perceived teacher support differed from their peers most sharply in emotional engagement rather than in effort, which corresponds to what Brittany and Ashley described: neither reported working less, but both described a changed relationship to asking for help.

Classroom environment

Another common theme that emerged from the data is that the classroom environment affects students' learning and motivation. Wentzel (2002) suggested that when teachers create a calm, autonomy-supportive classroom environment, they provide a climate that nurtures students' motivation and directly affects students' achievement and persistence.

Brittany: "I like learning math, like, I like solving problems and stuff, but she [the teacher] doesn't make class fun … she doesn't really encourages us, just teaches … she needs more positive vibes … in the class nobody talks or anything, like, it's really like a workplace which is good but like, when there is some talking it still could be productive, too … I don't like the environment; she is so strict."

Harrison: "Math is not creative, there are equations that you follow … the class gets boring over time … we play games at the end of the class like heads up which I really like."

In classroom environments, a lack of enjoyment leads students to experience boredom, which is accompanied by disengagement from activities (Hamilton, 1983).

The framework locates this theme among the negative cognitive factors of the wheel. Brittany's description of a room where nobody talks and Harrison's account of a class that gets boring over time both point to *anxiety* and *uncertain control* rather than to any judgment about their own mathematical ability; neither student said the work was beyond them. What they described instead were the *physiological and affective states* that Bandura (1997) identified as the fourth source of self-efficacy information, in which the felt experience of the room becomes evidence about whether one belongs in it. Harrison's remark that the class gets boring is an instance of what Martin (2007) termed *disengagement*, the withdrawal of investment that follows when a setting offers no affective reason to remain involved. This theme therefore also operates through emotional engagement, but by a different route than the first: the environment, rather than the teacher's appraisal, supplies the affective signal.

Harrison's boredom merits particular attention in light of recent evidence. Schwartze et al. (2024) demonstrated that mathematics boredom arises both from being under-challenged and from being over-challenged, and that the two are behaviorally similar but motivationally distinct. Harrison was enrolled in an accelerated course and described the content as procedural rather than difficult, which points toward the under-challenged profile. Schoenherr et al.'s (2025) meta-analysis of emotions in mathematics learning and Sakaki et al.'s (2024) finding that mathematics enjoyment declines across adolescence both indicate that the affective climate these participants described is not incidental to their learning.

Use of varied teaching methods

The final key finding of this study concerns the importance of student engagement in the classroom. Previous research shows that when students are fully engaged in learning, they achieve better academic outcomes (Finn & Rock, 1997). Participants offered the following responses about their classroom environments:

Yusuf: "… all we do is worksheets from the textbook … it would be nice if we had discussion session."

Brittany: "… during the class, she gives us examples, we take notes and then we do a worksheet, just kind of like, all I am [doing] is just memorizing things instead of actually learning it."

Ashley: "… he doesn't really teach us; he just provides worksheets."

Ethan: "… she does, like, she gives us packets and stuff and so much homework … she gives us ninth grade optional work online, but I don't like doing them."

Unlike the others, Ian responded differently and described how he enjoys his mathematics class and learns with pleasure:

Ian: "I like having fun in the class. I like my teacher; like, he's more devoted to his work than some of my other teachers. He, like, really values our learning. Like, he really wants us to learn, instead of wanting to go in there, teach, and then come out. So, that's good. Sometimes he gives us fun worksheets; they are really enjoyable, and another thing that he does in the class, which is so cool, is Kahoot … I just like math … because there is so much interconnectedness in math; that's so cool."

As previous research shows, technology has been used as an alternative means of engaging students (Soares et al., 2009), and increasing the authenticity of an assessment is expected to have a positive influence on student learning (Oliver & Herrington, 2003).

This theme differs from the first two in that it maps onto the behavioral rather than the emotional side of the framework. The repeated references to worksheets and packets describe classrooms in which students exercise little *task management* or *planning*, two of the positive behavioral factors in Martin's (2007) wheel, and Brittany's statement that she was memorizing rather than learning describes the absence of *mastery orientation*. Ethan's account of declining the optional online work is closer to *self-handicapping*, a negative behavioral factor in which students withhold effort in advance. Ian's contrasting account is instructive: the fun worksheets and Kahoot activities he described are occasions for *mastery experience*, which Bandura (1997) identified as the strongest of the four sources of self-efficacy, and Ian was also the participant who spoke most readily about the interconnectedness of mathematics. The theme thus corresponds to Fredricks et al.'s (2004) *behavioral* and *cognitive* components of engagement.

Gender and self-appraisal: An exploratory reading

Because the literature on early adolescent mathematics identifies a confidence gap that emerges in the middle grades, the transcripts were also read with attention to how participants appraised their own competence. Four participants were male and two were female. This distribution cannot support any claim about gender differences, and what follows is offered as an observation about six specific accounts rather than as a finding.

One pattern was audible. Brittany, asked how confident she felt about mathematics, answered that she was not failing and was a little above average, and then withdrew the appraisal by adding that she was not that good. She described liking mathematics and liking to solve problems, and she reported no difficulty with the content itself; what she qualified was her standing. None of the four male participants qualified their competence in this way. Ian said simply that he liked mathematics and spoke about its interconnectedness, and Ethan and Yusuf described future occupations in engineering and design without reference to whether they were good enough for them. This asymmetry is consistent with what Catsambis (1994) and the AAUW (1992) reported about girls' confidence in mathematics relative to their performance, and it remains consistent with more recent evidence: Jeong et al. (2025) found that girls were less likely than boys to belong to the most adaptive mathematics motivation profile even at comparable achievement levels, and Master and Meltzoff (2020) argued that such gaps operate through belonging rather than through perceived ability.

Ashley complicates the pattern rather than confirming it. She said she liked mathematics in general, located her dissatisfaction in the teacher rather than in herself, and was the participant most certain about her intended occupation. Her account also contains the only unprompted reference to a teacher's gender in the six interviews: she recalled that her previous year's teacher was a girl who made her feel comfortable in mathematics and whom she would sometimes see after school to study. Notably, she raised teacher gender in connection with approachability and comfort rather than with competence, and she went on to attribute her current teacher's short temper to age rather than to gender.

Two cautions apply. With two female participants, the difference between Brittany and Ashley is at least as large as any difference between the female and male participants, and nothing in these data separates gender from individual disposition, from which teacher a student happened to be assigned, or from the particular classroom each described. More fundamentally, all six students had already been placed in the accelerated track. If the confidence gap has its sharpest consequences at the point of placement, by shaping who enrolls in advanced mathematics at all, then a sample drawn entirely from students who cleared that threshold is the least likely place to observe it. The absence of a stronger pattern here should not be read as evidence that the pattern does not exist.

Across the three themes, participants who described supportive relationships and engaging instruction also spoke about definite future goals, whereas those who described distant teachers and worksheet-driven classes were unsure about the field they would pursue (see Figure 1). This pattern is what *valuing* in

Martin's (2007) wheel, and *expectancy–value theory* more broadly (Wigfield & Eccles, 2000), would anticipate: students who attach utility value to a subject project themselves into futures that require it, whereas students for whom the subject holds little value do not. Karamarkovich et al. (2024) showed that mathematics expectancies and values do not change uniformly across students, which suggests that the divergence visible among these six participants is itself an ordinary feature of how mathematics motivation develops. The interviews cannot establish the direction of this association, but the co-occurrence was consistent across all six cases. Wang and Goldschmidt (2003) similarly noted that the relation between academic effort and academic achievement is especially important in middle schools, because research shows that mathematics achievement during this period significantly predicts mathematics achievement in high school, which eventually affects students' chances of entering postsecondary education.

DISCUSSION

These findings point to the importance of students' perceptions of their teachers' attitudes for students' interest in mathematics in accelerated eighth-grade mathematics courses. Across these six accounts, the quality of the relationship with the teacher, the felt climate of the room, and the variety of instruction were the conditions participants themselves returned to when explaining their own interest and effort.

Read against the framework, the three themes are not independent influences but three different routes into the same construct. Bandura (1997) identified four sources of self-efficacy information, and the participants' accounts supplied three of them. The student–teacher relationship theme corresponds to social persuasion, the classroom environment theme to physiological and affective states, and the varied teaching methods theme to mastery experience. Only vicarious experience went largely unmentioned, which is consistent with interviews conducted while schools were closed and peer observation was limited. This convergence offers a more parsimonious account than a list of three separate classroom conditions: what participants described were the channels through which they gathered evidence about their own mathematical capability.

This reading also aligns with how contemporary research frames teacher effects on mathematics motivation. Zhou et al. (2025) found that perceived teacher support related to mathematics engagement indirectly, through students' attitudes toward the subject, rather than directly, and Lee et al. (2024) documented that the longitudinal relationship between self-efficacy and interest differs across domains and student characteristics. Both findings imply that teacher attitudes reach engagement through what students come to believe about themselves and the subject, which is what the participants in this study described.

The distribution across Martin's (2007) wheel is also uneven in an informative way. Participants spoke readily about the cognitive and emotional factors, including self-efficacy, valuing, anxiety, and uncertain control, and about the negative behavioral factors of disengagement and self-handicapping. They said much less about the positive behavioral factors of planning, task management, and persistence. One reading is that the accelerated placement had already selected for students who manage their work, so those factors did not surface as concerns. Another is that worksheet-driven instruction gives students few occasions to plan or manage tasks, so the factors had little to describe. The present data cannot distinguish between these accounts, and doing so would be a useful aim for further research.

These readings are consistent with Skaalvik et al. (2015), who found that mathematics self-efficacy strongly predicted intrinsic motivation, effort, and help-seeking behavior, and with Bandura's (1989) argument that the stronger students perceived self-efficacy, the higher the goals they set and the firmer their commitment to them. Brittany's redirection of help-seeking away from her teacher and toward her friends is a small but concrete instance of that relation operating in a single classroom.

More recent evidence points the same way. Jeong et al. (2025) found perceived teacher support to be among the strongest predictors of adaptive mathematics motivation profiles across five countries, and Desmet et al. (2023) reported that this association held across achievement levels.

A final consideration concerns timing. These interviews were conducted during the spring 2020 school closures, and Betthäuser et al. (2023) subsequently established that pandemic-related learning deficits were larger in mathematics than in reading and persisted over time. The students in this study were describing conditions that immediately preceded a widely documented disruption in mathematics learning. Read in that light, their accounts of what made a mathematics classroom workable, a teacher who could be approached, a room that felt tolerable, and instruction that offered something to do besides worksheets, describe resources that the subsequent years made scarcer rather than more plentiful.

Limitations

Several limitations bound what can be claimed here. The study rests on six participants recruited by snowball sampling from a single referral chain, so the sample is neither representative of eighth graders in accelerated mathematics nor demographically balanced, with four male and two female participants. The design is cross-sectional and interview-based: it records what students said about their teachers and themselves at one moment, and it cannot establish that teacher attitudes produced the confidence, interest, or career intentions the students reported. The associations displayed in Figure 1 are patterns of co-occurrence in participants' accounts, not tested causal pathways. Teachers were never observed or interviewed, so the classrooms are known only through student description.

Two further constraints follow from the conditions of data collection. The interviews were conducted online during school closures, which limited the researcher's ability to observe body language, facial expression, and eye contact. Coding and theme development were carried out by a single researcher; no second coder or member-checking procedure was used, so the interpretive decisions reported here have not been independently corroborated. What the study offers is a close account of how six students described their experience, which may prove recognizable to readers working in similar settings.

Implications for future research

The exploratory reading of gender reported above suggests a design rather than a conclusion. A study recruiting a gender-balanced sample, and sampling from grade-level as well as accelerated sections, would be positioned to observe whether the qualified self-appraisal Brittany offered is characteristic and whether it is more pronounced among students who were not placed in the advanced track. Pairing student interviews with classroom observation would also allow the teacher behaviors that students describe, the short temper, the worksheets, the Kahoot games, to be examined directly rather than only through student report. Ethnicity, culture, and family circumstances are further factors that shape how students experience mathematics classrooms and that this study did not address.

CONCLUSION

Researchers have documented that students often experience a decline in academic motivation and self-efficacy during important school transitions (Wigfield et al., 1991). This study did not aim to measure teachers' knowledge or teaching styles. What these interviews show is that the relationship with the teacher was, for these students, among the first things they mentioned when asked about their mathematics class at all. As researchers and educators, it is important to recognize how teachers might help young students reach their higher potential for learning. The need for professionals in the fields of science, technology, engineering, and mathematics continues to grow at a comparable rate to meet the demands of a high-technology global economy. This study contributes to the literature on how teachers' support and attitudes are experienced by eighth graders in accelerated mathematics courses. The participants described their enjoyment, their confidence, and their willingness to put in effort as bound up with their teachers' attitudes, the climate of the classroom, and the range of instruction they encountered. Establishing whether those conditions produce the outcomes students associate with them would require a different design.

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Ethical statement

This study underwent expedited review and was approved by the Institutional Review Board of Claremont Graduate University (protocol 3718, approved February 19, 2020). Because all participants were minors, a parent or legal guardian provided informed permission before participation, and each student provided assent at the start of the interview. Participation was voluntary, and participants could decline any question or withdraw at any time without consequence. Pseudonyms were assigned to all participants, references to schools and teachers were removed from the transcripts, and recordings and transcripts were stored on a password-protected device accessible only to the researcher.

Competing interests

The author declares no competing interests.

Author contributions

EBA: conceptualization, methodology, investigation, data curation, formal analysis, writing — original draft, project administration. MG: methodology, validation, writing — review and editing. Both authors have read and approved the final manuscript.

Data availability

The data consist of interview transcripts collected from minor participants under conditions of confidentiality and are therefore not publicly available. The interview protocol is reproduced in Appendix B. De-identified excerpts beyond those reported in the manuscript may be available from the author on reasonable request, subject to the terms of the approved IRB protocol.

AI disclosure

During preparation of this manuscript, the authors used Claude (Anthropic) to assist with APA 7th edition formatting. Generative AI was not used to collect, generate, alter, or analyze the underlying interview data.

Biographical sketch

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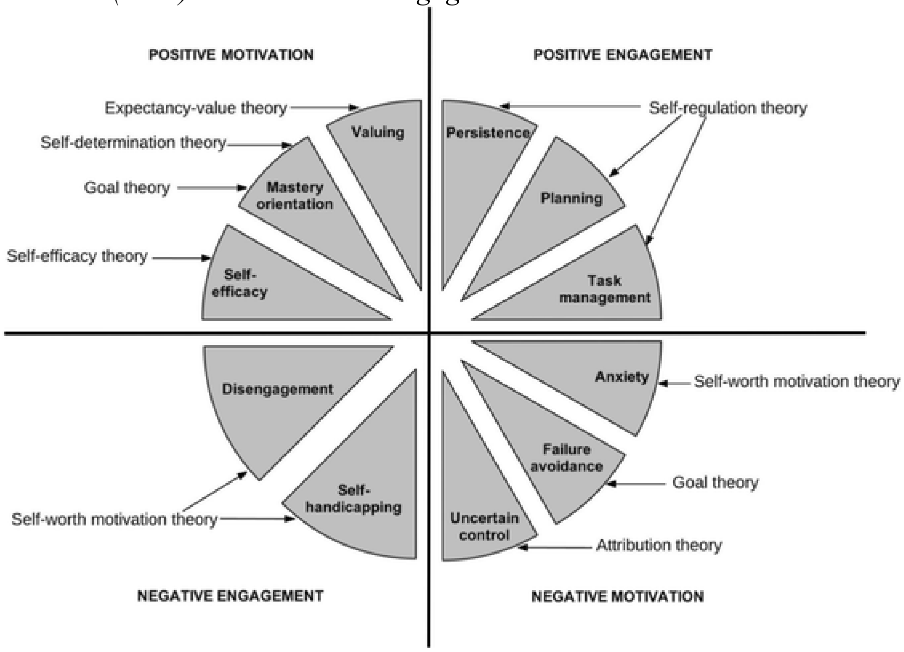
Appendix A

Martin's (2007) Motivation and Engagement Wheel



Note. Adapted from Martin (2007).

Appendix B

Exploratory Interview Protocol

Introduction Questions

1. What type of student would you describe yourself as? (Why good, why bad?)
2. What is your favorite subject at school? (Why is this your favorite subject?)

Questions About Students' Interest in Mathematics

3. How do you feel about mathematics overall?
4. How do you like your current mathematics class? Do you feel like you are learning in the class?
5. How confident do you feel about mathematics?
6. Do you get good grades in mathematics?
7. How do you study for your mathematics class? (Do you prefer to study individually or in a group?)

Questions About Their Current Mathematics Teacher

8. How would you describe your current mathematics teacher?
9. Do you feel that your current teacher is effective at teaching mathematics? (Why?)
10. Does your current teacher make you want to learn mathematics? What does she or he do?
11. Does your current teacher encourage you to do mathematics? What kinds of things?
12. What else can your current teacher do to help you more in your class?

Future Impacts of Eighth-Grade Mathematics

13. What do you like or dislike about mathematics?
14. How do you think you can do better in mathematics?
15. How important do you think mathematics will be in your high school experience?
16. What do you want to be when you grow up? Do you think mathematics will be important for this job?
17. Do you want to go to college? How important do you think mathematics will be for college?

