Received: 27 February 2024 | Accepted: 29 September 2024

DOI: 10.1111/jora.13030

JOURNAL OF Research on Adolescence SRA Society for Research on Adolescence www.s-r-a.org

EMPIRICAL ARTICLE

Adolescents' evaluations of peer and teacher unfair treatment in science, technology, engineering, and mathematics classes: Expected interventions

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Funding information
National Science Foundation

Abstract

This study explores adolescents' evaluations of unfair teacher and peer behavior in science, technology, engineering, and mathematics (STEM) classes. Participants included ninth and tenth grade students from five public schools in the Southeastern United States, ($N = 577$, 45.9% female, 49% male, 5% other/prefer not to say/unsure). Students were ethnically representative of their communities: 48% White/European American, 22.7% Black/African American, 14% Latino/a/e/x, and 15.3% multi-racial/other/prefer not to say. Measures assessed adolescents' responses to hypothetical scenarios of unfair treatment. The findings indicate that adolescents recognize both teacher and peer unfair behavior as wrong, with nuanced differences based on participants' gender and grade. Attribution analysis reveals varied expected reasons for unfair treatment. Responses to unfair behavior differ, with adolescents more likely to confront peers than teachers. Demographic factors, school climate, discrimination, belonging, and critical consciousness contribute to variations in judgments and responses. The study highlights the importance of addressing unfair treatment in STEM settings to foster inclusivity and support student persistence in STEM.

KEYWORDS
bystander, critical consciousness, school climate, STEM, teacher, unfair treatment

INTRODUCTION

Bystander intervention can help stop instances of peer bullying and aggression (Salmivalli et al., 2011), including bias-based bullying (Gönültaş & Mulvey, 2021). Less is known about interventions in response to teacher bullying or unfair treatment in comparison with peer bullying. However, studies range widely in terms of how much teacher unfair treatment students experience, with up to 90% of students reporting experiencing teacher bullying (Gusfre, Støen, & Fandrem, 2023). Experiencing teacher discrimination or unfair behavior is associated with a host of negative outcomes for students, with research supporting connections between teacher discrimination and well-being, substance use, achievement, and motivation (Civitillo et al., 2024). Moreover, a particular context where unfair treatment may occur is in science, technology, engineering, and mathematics (STEM) classes. While girls' achievement is similar to boys' achievement in STEM courses in K-12 education, and girls enroll in advanced STEM courses in high school at similar rates to boys, ethnically minoritized K-12 students are not enrolling in as many advanced courses and by college, both women and ethnic minoritized individuals are lagging behind their White male peers in taking STEM courses (National Girls Collaborative Project, 2016). Critically, research indicates that an important barrier to persistence in STEM fields for marginalized groups, including women and ethnically minoritized individuals, is a culture in many STEM organizations, including in schools, that fosters discrimination, harassment, and prejudicial treatment of those

from underrepresented groups (Beasley & Fischer, 2012; McGee, 2016; Reuben et al., 2014; Robnett, 2015; Shapiro & Williams, 2012). Therefore, the aim of this study was to examine adolescents' judgments about teacher and peer unfair treatment in STEM contexts and their expected reactions to this treatment to better understand how to create inclusive STEM contexts for adolescents where students feel welcomed and like they belong, regardless of their background.

Theoretical framework: Social reasoning developmental perspective

This study is framed using the social reasoning developmental perspective (Rutland et al., 2010; Rutland & Killen, 2015), which draws on social identity theory (Tajfel & Turner, 1976) and social domain theory (Turiel, 1983) to understand how individuals respond to intergroup situations involving social and moral decisions. Importantly, this theory argues that individuals will balance information about morality with their sense of loyalty to their social group, at times prioritizing the ingroup over moral principles, which can lead to exclusion, discrimination, and unfair treatment of outgroup members (Killen & Rutland, 2022).

In this study, we focus on evaluations of teacher and peer unfair behavior, namely exclusion from opportunities in STEM classes. Adolescents might prioritize moral principles and judge all unfair behavior as wrong. Alternatively, they may differentially respond and judge some types of unfair behavior as more acceptable than others, depending on the identity of the victim (e.g., gender) and to what they attribute the unfair treatment. Prior research demonstrates that adolescents may turn to information about group membership when evaluating unfair behavior, such as social exclusion, with adolescents often justifying social exclusion by referencing group functioning (Mulvey, 2016). Further, adolescents do not judge exclusion of individuals from different groups in the same way. For instance, they rate inter-wealth exclusion as more acceptable than inter-racial exclusion (Burkholder et al., 2019), and rely on information about group norms when making judgments about unfair behavior (Killen et al., 2017). Less is known about adolescents' evaluations of teacher unfair behavior, although some early research suggests that factors such as perceptions of teacher authority and legitimacy may shape these evaluations (Smith & LaPlante, 1980).

Unfair behavior in STEM contexts: a central issue

Unfair treatment in STEM contexts by teachers and peers has been linked to negative consequences. For instance, teacher unfair behavior in the form of discrimination is related to worse perceptions of school climate (Herry & Mulvey, 2024) and lower STEM engagement in school (Mulvey, Mathews, et al., 2022). Further, there have been recent calls in the literature for more research on teacher bias and unfair treatment of students, generally (Kaufman et al., 2024). Further, peer unfair behavior in STEM contexts in the form of social exclusion from STEM domains occurs frequently (Mulvey, Hoffman, & McGuire, 2022), although children often assert the importance of allowing their peers to pursue STEM careers, even if the STEM careers are counter-stereotypical such as a girl expressing interest in engineering (Mulvey & Irvin, 2018). Experiencing discrimination from teachers and peers is related to lower levels of academic persistence in school (Gale, 2020). Moreover, adolescents recognize unfair treatment in STEM contexts as problematic, although there is variation in terms of how much of an issue they perceive this to be (Robnett & John, 2020). Much of the work documenting unfair treatment in STEM has focused on emerging adulthood and adulthood (Allen-Ramdial & Campbell, 2014; Chang et al., 2014; Jones et al., 2000), with less research focused on adolescent experiences. For instance, reports note that exclusive STEM climates contribute to those historically excluded from STEM dropping out of STEM majors (Allen-Ramdial & Campbell, 2014; Chang et al., 2014; Jones et al., 2000). Further, discrimination and occupational segregation contribute to historically excluded individuals leaving the STEM workforce at high rates (Alonso-Villar et al., 2012; Reid, 2002). Previous research has established a number of factors that may manifest as unfair treatment in STEM contexts, including historical discrimination and non-inclusive or even hostile STEM environments, implicating both educators and other learners as playing a role in creating spaces where unfair treatment is perpetuated (Diele-Viegas et al., 2021).

Bystander intervention in response to unfair treatment in STEM contexts

Prior work has posited some potential solutions for creating more equitable STEM spaces, noting that "Dismantling the mechanisms that favour all kinds of racism and discrimination in science will require those currently operating the cogs of science to admit its flawed design and commit to change" (Diele-Viegas et al., 2021 p. 673). While attending to the role of authority figures (i.e., those operating the cogs of science) will likely play a key role in fostering more equitable STEM contexts, research also highlights the power of bystanders in shifting norms, behaviors, and actions when unfair treatment, such as bullying, occurs (Mulvey et al., 2021; Salmivalli et al., 2011). Indeed, research indicates that bullying behaviors stop almost immediately when bystanders engage in active responses to the bullying, such as speaking up to support the victim or challenging the bully (Nansel et al., 2001).

Therefore, the current study focuses on bystander responses to unfair treatment by peers and teachers in STEM classes. While research has certainly documented that unfair treatment often occurs in STEM contexts (Diele-Viegas et al., 2021; Mulvey, Hoffman, & McGuire, 2022), less is

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known about if adolescents recognize this unfair treatment as problematic and how they intend to respond to such treatment. Seminal research on bystander intervention highlights that the first step in responding to a situation is recognizing that there is a problem (Latane & Darley, 1970). Therefore, this study centers both on how students evaluate unfair treatment as well as their expected responses to that behavior.

Adolescents may make different judgments about unfair treatment by peers and teachers; one factor that may differ is what attributions they make regarding the reason behind the unfair treatment. As noted above, early work documented that students often justify teacher behavior by focusing on factors such as the teacher's authority and the expectation that the teacher is doing what is best for the class (Smith & LaPlante, 1980). More recent work, however, notes that students are often attuned to unfair and even discriminatory teacher behavior, with findings from qualitative work revealing that students may be more aware of biased treatment by teachers based on gender than on other social identities, such as race (Brown et al., 2011). Students who perceive more positive interracial interactions at school, including peer and teacher interactions, are more likely to express a sustained interest in STEM careers and to be more engaged in STEM (Cerda-Smith et al., 2023). Further, recent scholarship notes that students can play a role in shaping inclusive school environments, for instance, by challenging unfair treatment when they see peers or teachers enact such behavior (Killen & Rutland, 2022).

Factors that may shape evaluations and responses

One aim of this research is to identify factors that shape the recognition of unfair treatment as well as factors that encourage active bystander intervention to stop unfair treatment in STEM classes. Prior research on bystander intervention in response to bullying documents that school climate factors matter for adolescents, with adolescents more likely to engage in positive behaviors, such as talking to a teacher or other adult, or helping the victim, when they report more positive school climate, such as having more positive student–teacher relationships and reporting a more positive school social environment (Mulvey, Hoffman, Gönültaş, Hope, & Cooper, 2018). Further, experiences of discrimination may also shape responses: prior work on responses to bullying indicates that some students who report prior discrimination are motivated to prevent unfair treatment to others and do seek to intervene, while others disengage, perhaps in order to protect themselves from experiencing more discrimination if authority figures assume that they were involved in the initial bullying (Mulvey et al., 2020). Other research suggests that those who report teacher discrimination are significantly less likely to get involved when they observe bullying (Herry et al., 2021; Mulvey et al., 2018). Further, adolescents may feel less empowered to respond to teacher unfair behavior than to peer unfair behavior in part because teacher unfair behavior, by definition, involves a power imbalance as teachers are authority figures with power over students (Gusfre et al., 2023). Additionally, adolescents are frequently encouraged by school personnel to report and respond to peer bullying and schools often have explicit policies protecting students from retaliation if they report peer bullying (Hall, 2017), but similar policies are not in place to support intervention in response to teacher bullying (Zerillo & Osterman, 2011). Moreover, prior work on LGBTQIA+ youth suggests that there are often no consequences or repercussions for teachers who engage in bullying behaviors (Horn & Schriber, 2020). Thus, adolescents may perceive intervening when teachers engage in unfair behavior as ineffective.

It is important to note that much of this prior work has focused on bullying perpetuated by peers and has not focused on teacher *and* peer unfair treatment, or focused on behaviors enacted in STEM classes. While research has not previously explored adolescents' comparative judgments of teacher and peer unfair behavior, research with teachers reveals that they often judge teacher bullying to be more acceptable than youth bullying (Zerillo & Osterman, 2011). Little is known about the attributions adolescents perceive for unfair behavior by peers and teachers, but work with teachers suggests that teachers often believe harmful behaviors toward students are justified because they are ostensibly responses to student misbehavior (Zerillo & Osterman, 2011). Prior research documents that belonging may be an important factor that shapes bystander responses, with findings suggesting that feeling connected to school can promote bystander intervention, particularly for African American students (Knox et al., 2021).

An additional factor that may shape responses to unfair treatment is critical consciousness (i.e., one's awareness of and ability to analyze inequalities in the world; Diemer et al., 2015; Freire, 1973). Critical consciousness involves individuals' perceptions of social inequality (i.e., racism, sexism, and poverty), their egalitarian beliefs (i.e., the extent to which they think social groups should be equal), and their critical motivation (i.e., motivation to reduce social inequality; Diemer et al., 2015; Rapa et al., 2020). Thus, youth who are more critically conscious may be more likely to recognize and respond to unfair treatment from peers and teachers. Critical consciousness has been positively related to likelihood of responding when one observes potential sexual assault (Rojas-Ashe et al., 2019) and when one observes peer exclusion in STEM classes (Herry et al., 2023), although this research has focused on emerging adults, not adolescents. Further, much of the prior work on factors related to bystander intervention has not centered on intervention in STEM classes. The focus on STEM classes, in particular, is an important new direction for research as findings suggest that STEM class environments are spaces where unfair treatment commonly

occurs and that experiences of exclusion in STEM classes have long-term consequences for persistence and engagement in STEM (Diele-Viegas et al., 2021; Graham et al., 2013; Mulvey, Hoffman, & McGuire, 2022; Mulvey, Mathews, et al., 2022).

CURRENT STUDY

The current study aims to examine adolescents' evaluations of and responses to both teacher and peer unfair treatment in high school STEM classes. Research indicates that both teachers and peers may engage in unfair behaviors in STEM contexts, contributing to a hostile, chilly, and unwelcoming climate that many students who are historically excluded from STEM report (Diele-Viegas et al., 2021; Mulvey, Hoffman, & McGuire, 2022; Mulvey, Mathews, et al., 2022), which is why the current study focuses on teacher *and* peer behaviors. As students may experience unfair treatment for a range of different reasons, in the current study we did not indicate a reason (such as one's gender or ability), but instead asked participants to make attributions for why they believe the unfair treatment occurred. This study centers on adolescence, as this is a key developmental period for persistence in STEM (i.e., when student engagement in STEM often wanes; Joy et al., 2023; Moss-Racusin et al., 2018) and when students are making choices about which classes to take (Sadler et al., 2014) as well as what career paths they want to follow (Cerda-Smith et al., 2023; Watt et al., 2017). In particular, we focus on ninth and tenth graders. While close in age developmentally, tenth graders have had more experiences in high school and thus may have a more developed understanding of peer and teacher unfair behavior and how they might respond to such behavior. Further, as ninth grade is a transition year for students, they may be still evaluating how best to navigate their social and academic worlds at school. Thus, we were also interested in any developmental differences between participants in ninth and tenth grades.

Hypotheses

First, we expected that there may be differences in adolescents' attunement to teacher and peer unfair treatment in STEM classes (Hypothesis 1). Namely, we expected that adolescents might justify teacher unfair behavior as more acceptable than peer unfair behavior, citing factors such as teacher authority and teacher legitimacy (Smith & LaPlante, 1980). Further, we hypothesized that adolescents would vary in their attributions of teacher and peer unfair behavior, citing student characteristics, such as personality, as well as prejudice and bias (Hypothesis 2). We also expected that adolescents would be more likely to anticipate that they would respond to peer unfair treatment than to teacher unfair treatment and that they may be more likely to say something or seek out adult help for peer unfair behavior than teacher unfair behavior, given that schools often encourage adolescents to report peer, but not teacher bullying (Hypothesis 3; Hall, 2017). We expected that school and individual factors would shape evaluations of and responses to unfair treatment, with students who report greater critical consciousness, more positive school climate, lower levels of discrimination and greater feelings of belonging in their STEM classes more likely to indicate that they would intervene if they observed unfair teacher or peer behavior (Hypothesis 4). Finally, given prior research indicates that younger adolescents, and girls are more likely to engage in bystander intervention (Mulvey et al., 2018) and that ethnically minoritized adolescents are less likely to get involved when they observe bullying (Mulvey et al., 2020), we expected to find age, gender, and race/ethnicity differences in evaluations of unfair behavior and expected bystander responses (Hypothesis 5). We also tested for interactions, although we did not have specific hypotheses about interactions between demographic characteristics.

Methods

Participants

Participants included ninth- (55.3%) and tenth- (41.2%) grade students (3.5% reported they were another grade in high school, $N = 20$) from five public schools in the Southeastern United States ($N = 577$, 45.9% female, 49% male, 5% other/prefer not to say/unsure). Students were ethnically representative of their school communities: 48% White/European American, 22.7% Black/African American, 14% Latino/a/e/x, and 15.3% multi-racial, other, or prefer not to say. Although 898 students began the survey, the current analyses focus on students who have complete data for the measures included in this analysis ($N = 577$). Participants reported that they were currently enrolled in a range of STEM classes. While participants were given the full list of approved STEM classes for the state to select, we report only classes that at least 10% of participants were enrolled in. These include Math 1 (23%), Math 2 (20%), Math 3 (16%), Biology (23%), Earth/environmental science (15%), and Physical science (11%).

Procedure

Following Institutional Review Board approval from North Carolina State University, all students in ninth and tenth grades at the participating schools were invited to participate. Opt-out parental consent forms were sent to families 1 week before data collection. Participants with opt-out parental consent who assented to participate completed a 45- to 60-min online survey at school that was part of a larger study about adolescents' STEM experiences

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at school. All items were optional. Students who completed the survey received a $10 electronic gift card to thank them for their participation. Data were collected between January and April of 2022.

Measures

Unfair peer and teacher treatment

Participants read two hypothetical scenarios about repeated, unfair treatment of a classmate by peers and teachers in a STEM class. The scenarios were developed for this study, based on prior research on social exclusion and bullying (Mulvey et al., 2018, 2021). Specifically, the teacher scenario read: "Let's say that one of your classmates is treated differently by a teacher in one of your STEM classes. This teacher does not call on your classmate and does not include the student in class activities. Your classmate does not know what to do about it." The peer scenario read: "Let's say that one of your classmates is treated differently by some of the other students in your STEM classes. None of the students include this classmate in activities or group projects. Your classmate does not know what to do about it." It is important to note that we did not provide identity characteristics for the target, as we were interested in understanding attributions for unfair treatment.

Attribution for unfair treatment

Participants were asked to respond to an attribution question for the teacher and peer behavior ("Why do you think your classmate is treated unfairly by the [teacher/other students]?"). All items on the survey were optional, and some participants did not respond to this open-ended item, which was designed for this study to explore attributions for unfair behavior. Participant responses were coded using a coding system developed by the research team. 25% of responses were coded by two coders and Cohen's kappa = 0.89. Responses were coded as 1 if that was the only code used, as 0.5 if that code was used along with 1 other code and 0.33 if that code was used along with 2 other codes. However, it is important to note that most participants did not respond to these optional items or indicated that they did not know why the behavior occurred. Specifically, for the peer behavior 346 participants and for the teacher behavior 294 participants responded with a codable response. Codes used were Personality Traits or Characteristics, Work Ethic, Identity, Doesn't Happen, Prejudice, External/Situational, Friendship, and Undifferentiated Dislike (See Table 1 for codes and examples responses).

Acceptability of the act

Participants completed measures of acceptability of the treatment (1 = *really not okay* to 6 = *really okay*) by teachers and peers ("How okay or not okay is it that the [teacher/other students] acts this way?"), based on prior work (Mulvey et al., 2018, 2021).

TABLE 1 Attribution of unfair treatment in STEM classes (codes and examples).

Code	Example
Personality traits or characteristics	"because they are quiet and don't talk to anyone"
Work Ethic	"they chose not to participate"
Identity	Sexual orientation: "because she's gay"
	Race/ethnicity: "because of their race"
	Disability "maybe they have a disability
	Religion: "don't like his religion"
Doesn't happen	"the teacher wouldn't do that"
	"they don't treat people that way"
Prejudice	"because they are biased"
External/situational	"maybe they didn't see him"
Friendship	"they aren't friends with them"
Undifferentiated Dislike	"they just don't like her"

Note: Identity categories were coded separately, but collapsed due to low frequency for each sub-category.

Likelihood of responses

For both peer and teacher treatment, participants responded to 6 items assessing the likelihood that they would engage in different types of responses (e.g., say something to the aggressor, talk to an adult, talk to a friend, do nothing or talk to the victim; 1 = *not at all likely* to 6 = *really likely*), aligned with prior research (Mulvey et al., 2018, 2021).

School climate

Participants completed a measure of school climate that was validated for use with adolescents (Zullig et al., 2015). The following subscales (Likert-type: 1 = *strongly disagree* to 5 = *strongly agree*) were used for this study: positive student–teacher relationships (eight items; $\alpha = .93$), opportunities for student engagement (five items; $\alpha = .91$), school connectedness (four items; $\alpha = .84$), perceived exclusion (three items; $\alpha = .87$), and school social environment (two items; $\alpha = .88$). Scores were averaged for each subscale and higher scores reflected greater agreement.

STEM class belonging

To measure students' belonging in their STEM classes, we used a measure including eight items (Mulvey, Mathews, et al., 2022). An example item reads, "How much do you feel that you fit in within your STEM classes?" (1 = *definitely do not fit in* to 10 = *definitely fit in*). Scores were averaged and higher scores reflected greater belonging, $\alpha = .94$.

Teacher and peer discrimination

Participants completed a measure of perceived discrimination by their teachers and peers, which was modified from an existing measure of general racial discrimination by peers and teachers (Gutman et al., 2017). The modified teacher discrimination scale includes an average of five items evaluating students' experiences of discrimination due to one's identity in class settings (e.g., being disciplined more harshly, graded harder; 1 = *never* to 5 = *every day*; $\alpha = .91$). An example item is as follows: "At school, how often do you feel that teachers grade you harder than they grade other kids because of who you are?" The modified peer discrimination scale includes an average of three items regarding discrimination due to one's identity, in class settings (e.g., kids don't want to hang out with you; 1 = *never* to 5 = *more than 6 times*; $\alpha = .84$).

Critical consciousness

The critical reflection (perceived inequality and egalitarianism) and critical motivation dimensions of Critical Consciousness Short Scale were used (Rapa et al., 2020). This measure included three subscales each comprised of three items measured on a Likert-type scale from 1 = *strongly disagree* to 6 = *strongly agree*: perceived inequality $\alpha = .91$, egalitarianism, $\alpha = .85$; and critical motivation, $\alpha = .74$. Scores were averaged and higher scores reflected higher critical consciousness.

Data analytic plan

First, preliminary analyses were conducted to assess if multilevel modeling was needed to account for students nested in schools. Results revealed that all ICCs were small (< .05), thus multi-level modeling was not required. Next, correlations and descriptive statistics were computed (see Supplemental Materials for correlations—Table S1) and variance inflation factors (VIF) were assessed to ensure that regressions were appropriate. Then, the hypotheses were tested in SPSS 28 (IBM Corp, 2022) using repeated measures ANOVAs (to compare peer and teacher unfair treatment and to assess attributions of unfair behavior) and regressions (to explore predictors of responses to unfair teacher and peer behavior). For analyses, only participants who identified as male or female and those who indicated they were in ninth or tenth grade were included. For race/ethnicity, analyses used the following categories: Black, White, Latino/a/e/x, and Other (including all other participants). Attribution data were analyzed using a repeated measure ANOVA as the data include empty cells as participants could have indicated any of the attributions and many participants included more than one attribution (for instance, Identity and Work Ethic). These types of data are effectively analyzed using ANOVAs because ANOVAs are robust to the problem of empty cells (see Posada & Wainryb, 2008, for a fuller explanation and justification of this data analytic approach). Additionally, review of analytic approaches to coded data like ours indicated that linear models with repeated procedures (particularly ANOVA) are preferred compared to other approaches such as log-linear analysis (see Wainryb et al., 2001, footnote 4).

Hierarchical regression analyses were conducted to identify predictors of expected responses to peer and teacher unfair behavior. In the first step, grade, gender, and race/ethnicity (dummy-coded) were included in the model as controls. In the second step, dimensions of school climate (student–teacher relationships, student engagement opportunities, school connectedness, perceived exclusion, and school social environment) were added, as these are the most general school-based experiences. In the third step, belonging, peer discrimination, and teacher discrimination were added, as these are more specific school-based experiences. Finally, in the fourth step, critical consciousness (perceived inequality, egalitarianism, and critical motivation) was included. We included critical consciousness last as this is a developmental social cognitive lens that we expected might underlie participants' thinking about judgments and responses.

Power analyses conducted using G*Power (Faul et al., 2007) for the ANOVAs with power set at .80 and to detect small effect sizes indicated that a sample size of 400 was necessary for the repeated measures ANOVA comparing peer and teacher unfair behavior and a sample size of 208 for the repeated measures ANOVA on attributions and a sample size of 176 for the repeated measures ANOVA on types of responses. For the regressions, power analyses with power set at .80 and to detect small effect sizes with all predictors included indicated a sample size of 311. Thus, we were adequately powered for all analyses.

RESULTS

Correlations

For both peer and teacher unfair behavior, acceptability judgments were positively correlated with doing nothing and negatively correlated to all other intervention responses. School climate variables, except perceived exclusion, and belonging were moderately correlated with each other. Peer and teacher discrimination were positively correlated with perceived exclusion and generally negatively correlated with other school climate variables. All critical consciousness variables were correlated. See Table S1 for correlation matrix.

Evaluations of unfair behavior

Testing Hypothesis 1, a 2 (Grade: 9th, 10th) X 2 (Gender: Male, Female) X 4 (Race: White, Black, Latino/a/e/x, Other) X 2 (Condition: Teacher, Peer) ANOVA was conducted on Acceptability of the Unfair Treatment with repeated measures on the last factor. There were no main effects: participants rated peer ($M = 2.13$, $SD = 1.36$) and teacher ($M = 2.08$, $SD = 1.37$) unfair treatment to both be very wrong. However, there was a significant Condition X Gender X Grade interaction effect, F (1, 484) = 4.46,

$p = .035$, $\eta_p^2 = .01$. This revealed that younger (ninth grade) male and female participants differed in their acceptability judgments for both peer (ninth grade, $p = .015$, Female: $M = 2.05$, $SD = 1.34$, Male: $M = 2.36$, $SD = 1.47$) and teacher (ninth grade, $p < .001$; Female: $M = 1.80$, $SD = 1.87$, Male: $M = 2.46$, $SD = 1.624$) unfair behavior, and that older (tenth grade) male and female participants differed in their judgments of peer unfair behavior (tenth grade, $p = .039$, Female: $M = 1.86$, $SD = 1.16$, Male: $M = 2.30$, SD = 1.40). Moreover, ninth grade girls judged unfair teacher behavior ($M = 1.86$, $SD = 1.16$) to be less acceptable than unfair peer behavior ($M = 2.05$, $SD = 1.34$), $p = .05$. There were no differences between male and female tenth graders for teacher unfair behavior, with both recognizing the behavior as wrong (female: $M = 1.97$, $SD = 1.28$, male: $M = 2.14$, $SD = 1.30$).

Peer unfair treatment acceptability

Testing Hypothesis 4, we conducted regression analyses to understand factors related to judgments of the acceptability of peer unfair treatment. The final model fit the data best ($r^2 = .11$) and there were four significant predictors of judgments of the acceptability of peer unfair treatment. Ninth grade students ($b = -.23$) and male students ($b = .43$) rated unfair peer treatment as more acceptable than did tenth grade and female students. Additionally, the more students reported that they felt that they belonged in their STEM classes ($b = -.11$) and the more egalitarian attitudes they held ($b = -.17$), the less acceptable they judged the unfair treatment to be, see Table 2.

Teacher unfair treatment acceptability

Testing Hypothesis 4, we conducted a regression analysis to examine predictors of teacher unfair behavior judgments. The final model fit the data the best ($r^2 = .16$) and there were three significant predictors of judgments of the acceptability of teacher unfair treatment. Students who perceived greater exclusion within their school environment ($b = -.23$; e.g., the same students always getting selected for special activities) and the more egalitarian attitudes they held ($b = -.32$), the less acceptable they judged teacher unfair treatment to be. Interestingly, the more teacher discrimination the participants reported ($b = .31$), the more acceptable they judged the teacher unfair treatment to be, see Table 2.

Attributions for unfair behavior

Peer behavior

A 2 (Grade: 9th, 10th) X 2 (Gender: Male, Female) X 4 (Race: White, Black, Latino/a/e/x, Other) X 7 (Attribution: Personality Traits, Identity, Doesn't Happen, External, Prejudice, Friendship, General Dislike) ANOVA was conducted with repeated measures on peer attribution to test Hypothesis 2. First, an overall main effect for attribution was found, F (6, 1806) = 8.802, $p < .001$, $\eta_p^2 = .028$. Participants were more likely to attribute unfair peer behavior to personality traits than to any other reason, (all $ps < .05$, see Table 2). They were also less likely to attribute the peer unfair treatment to explicit prejudice than to victims' identities ($p < .001$), undifferentiated dislike ($p < .001$), or to friendship ($p = .014$). They were more likely to attribute the unfair treatment to victims' identities than to friendship ($p = .002$). There was also a Gender X Reasoning interaction effect, F (6, 1806) = 4.026, $p = .002$, $\eta_p^2 = .013$. Female participants ($M = .003$, $SD = .039$) referenced general dislike less than did male participants ($M = .08$, $SD = .26$).

Teacher behavior

Participants did not mention friendship for teacher attributions, so a 2 (Grade: 9th, 10th) X 2 (Gender: Male, Female) X 4 (Race: White, Black, Latino/a/e/x, Other) X 6 (Attribution: Personality Traits, Identity, Doesn't Happen, External, Prejudice, General Dislike) ANOVA was conducted on with repeated measures on teacher attribution to test Hypothesis 2. Findings reveal an overall effect of attribution, F (5, 1275) = 6.12, $p < .001$, $\eta_p^2 = .023$. Specifically, participants were more likely to attribute unfair teacher behavior to prejudice than to victims' identities, to external factors, or to general dislike ($ps < .05$). Additionally, they were more likely to attribute unfair teacher behavior to personality traits than to identities or to external factors, ($ps < .05$). They were less likely to indicate that unfair treatment does not happen than to attribute it to personality, prejudice or undifferentiated dislike ($ps < .05$), see Table 3.

Responses to unfair behavior

To test Hypothesis 3, a 5 (intervention: say something, talk to an adult, talk to a friend, do nothing, talk to victim) X 2 (Grade: 9th, 10th) X 2 (Gender: Male, Female) X 4 (Race: White, Black, Latino/a/e/x, Other) X 2 (condition: teacher, peer) ANOVA with repeated measures on the last factor was conducted on differences in what types of responses they expected to take for the unfair treatment. Findings revealed an interaction effect for Intervention X Condition, F (3, 476) = 10.694, $p < .001$, $\eta_p^2 = .002$. Specifically, participants were more likely to say something and less likely to talk to an adult or do nothing when a peer rather than a teacher was treating a classmate unfairly ($ps < .001$, Table 4).

Likelihood of responding: Say something

Peer

The regression to test Hypotheses 4 and 5 for peer likelihood of responding demonstrated that the final model fit the data best ($r^2 = .20$). There were five significant predictors of

TABLE 2 Regressions predicting acceptability judgments and likelihood of engaging in different interventions.

Step	Variables	Accept: Peer	Accept: Teacher	Say something: Peer	Say something: Teacher	Talk adult: Peer	Talk adult: Teacher	Talk friend: Peer	Talk friend: Teacher	Do nothing: Peer	Do nothing: Teacher	Talk victim: Peer	Talk victim: Teacher
1	Grade	−.23*	−.14	.11	.06	.08	−.001	.21	.03	.08	.29*	.03	−.02
	Gender	.43***	.51	−.31*	−.17	−.25	−.27	−.60***	−.54***	.18	.13	−.36**	−.41**
	White	.06	.10	−.16	−.20	.09	−.19	.16	.08	.18	.02	−.20	−.37
	Black	.25	−.12	.21	.34	.18	.06	.08	.13	.15	−.15	.26	.17
	Latino/a/x	.20	.02	−.47*	−.07	−.26	−.17	−.27	−.22	.19	.04	−.27	−.32
2	Student–teacher relationships	.19	.23	.31*	.24	.30*	.35	.10	.35*	.17	.19	.17	.01
	Student engagement opportunities	−.06	−.12	.03	−.09	−.02	−.06	.20	.001	.02	.12	.14	.08
	School connectedness	.06	.04	.02	.30**	.27**	.19*	−.03	−.04	−.07	−.15	−.15	.01
	Perceived exclusion	−.09	−.23**	.12	.18**	.14	.07	.05	.05	.13	.20*	.09	.17*
	School social environment	−.08	.01	.09	.12	−.06	.07	.17*	.11	.00	−.01	.23	.20*
3	Belonging	−.11**	−.07	.08*	–	.12**	–	.09**	.08	−.04	−.07	.11**	.15***
	Peer discrimination	.03	−.06	.08	–	.11	–	.04	.07	.10	.16	.17*	.12
	Teacher discrimination	.10	.31***	−.03	–	−.11	–	.02	−.01	.08	.11	−.15	−.18
4	Perceived inequality	−.03	−.01	−.08	–	.02	–	.005	.04	.06	–	−.03	−.03
	Egalitarianism	−.17*	−.32***	.13	–	.06	–	.13	.20*	.02	–	.10	.17*
	Critical motivation	.004	.15	.19*	–	.13	–	.06	.06	−.30***	–	.20*	.10

*$p < .05$. **$p < .01$. ***$p < .001$.

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TABLE 3 Means and standard deviations for attributions for peer and teacher unfair behavior.

Attribution	Peer *M* (*SD*)	Teacher *M* (*SD*)
Personality traits	.08 (.08)	.07 (.08)
Identities	.04 (.08)	.03 (.08)
Doesn't happen	.03 (.17)	.02 (.14)
External	.02 (.13)	.02 (.13)
Prejudice	.01 (.09)	.07 (.24)
Friendship	.01 (.10)	–
Undifferentiated dislike	.04 (.17)	.09 (.27)

Note: Not all participants indicated an attribution, thus means do not sum to 1.

TABLE 4 Mean differences in intervening in response to peer and teacher unfair treatment.

Intervention	Unfair treatment	*M* (*SD*)
Say something	Peer	3.75 (1.56)
	Teacher	3.44 (1.57)
Talk to an adult	Peer	3.59 (1.47)
	Teacher	3.81 (1.54)
Talk to a friend	Peer	4.19 (1.42)
	Teacher	4.19 (1.51)
Do nothing	Peer	2.95 (2.41)
	Teacher	3.13 (1.49)
Talk to the victim	Peer	4.04 (1.44)
	Teacher	4.06 (1.51)

participants expecting that they would speak up to challenge unfair peer behavior. Specifically, girls ($b = -.31$) and non-Latino/a/e/x students ($b = -.47$) were more likely to indicate that they would speak up. Additionally, participants with better student–teacher relationships ($b = .31$) and those who report greater school belonging ($b = .08$) were more likely to expect they would speak up, see Table 2.

Teacher

For the regression testing Hypotheses 4 and 5 for teacher likelihood of response, the second model fit the data best ($r^2 = .11$). There were two significant predictors for participants expecting that they would challenge teacher unfair behavior by speaking up. Students who felt more connected at school ($b = .30$) as well as, interestingly, those who perceived more exclusion at school ($b = .18$) were more likely to expect that they would speak up if they observed teacher unfair behavior, see Table 2.

Likelihood of responding: Talk to an adult

Peer

For the regression testing Hypotheses 4 and 5 for the likelihood of talking to an adult when you observe peer unfair treatment, the final model fit the data best ($r^2 = .19$). There were three significant predictors of participants expecting that they would talk to an adult if they saw unfair peer behavior. Specifically, participants with better student–teacher relationships ($b = .30$) and those who reported greater school connectedness ($b = .27$) and greater belonging ($b = .12$) were more likely to expect they would talk to an adult, see Table 2.

Teacher

For the regression testing Hypotheses 4 and 5 for the likelihood of talking to an adult after observing teacher unfair treatment, the second model fit the data best ($r^2 = .08$). The only significant predictor was positive student–teacher relationships: students who reported more positive student–teacher relationships ($b = .35$) were more likely to expect that they would talk to an adult if they observed teacher unfair behavior, see Table 2.

Likelihood of responding: Talk to a friend

Peer

For the regression testing Hypotheses 4 and 5 for the likelihood of talking to a friend when observing peer unfair treatment, the final model fit the data best ($r^2 = .19$). There were three significant predictors of participants expecting that they would talk to a friend if they observed unfair peer behavior. Specifically, girls ($b = -.60$) and participants who perceived a more positive school social environment ($b = .17$) and those who reported greater belonging ($b = .09$) were more likely to expect they would talk to a friend, see Table 2.

Teacher

The final model fit the data best ($r^2 = .18$) for the regression testing Hypotheses 4 and 5 for the likelihood of talking to a friend when observing teacher unfair treatment. There were three significant predictors of participants expecting that they would talk to a friend to challenge unfair teacher behavior. Specifically, girls ($b = -.54$) and participants who reported more positive student–teacher relationships ($b = .35$) and those who reported greater egalitarian attitudes ($b = .20$) were more likely to expect they would speak up, see Table 2.

Likelihood of responding: Talk to the victim

Peer

For the regression testing Hypotheses 4 and 5 for the likelihood of talking to the victim when observing peer unfair treatment, the final model fit the data best ($r^2 = .22$). There were four significant predictors of participants expecting that they would talk to the victim if they observed unfair peer behavior. Specifically, girls ($b = -.36$) and participants who reported greater belonging ($b = .11$), who reported more peer discrimination ($b = .17$), and who were more critically motivated ($b = .20$) were more likely to expect they would talk to the victim, see Table 2.

Teacher

For the regression testing Hypotheses 4 and 5 for the likelihood of talking to the victim when observing teacher unfair treatment, the final model fit the data best ($r^2 = .20$). There were five significant predictors of participants expecting that they would talk to the victim if they observed unfair teacher behavior. Specifically, girls ($b = -.41$) and participants who perceived more school exclusion ($b = .17$), a more positive school social environment ($b = .20$), greater belonging ($b = .15$) and those who reported greater egalitarian attitudes ($b = .17$) were more likely to expect they would talk to the victim, see Table 2.

Likelihood of not responding (do nothing)

Peer

The final model fit the data best ($r^2 = .09$) for the regression testing Hypotheses 4 and 5 for the likelihood of not responding when observing peer unfair treatment. There was only one significant predictor: participants who reported more critical motivation were less likely to indicate that they would do nothing ($b = -.30$), see Table 2.

Teacher

The third model fits the data best ($r^2 = .07$) for the regression testing Hypotheses 4 and 5 for the likelihood of not responding when observing teacher unfair treatment. There were two significant predictors of participants expecting that they would do nothing if they observed unfair teacher behavior. Specifically, tenth graders ($b = .29$) and participants who perceived more exclusion ($b = .20$) were more likely to report that they would do nothing, see Table 2.

DISCUSSION

The current study is the first to directly assess evaluations of unfair teacher and peer behavior in STEM classes. This is an important area for new research, given that disparities in who pursues STEM fields are pervasive (Pew Research Center, 2021) and interactions in high school STEM classes may contribute to these disparities. Thus, we focused on how ninth- and tenth-grade students evaluated both teacher and peer unfair behavior, finding that, overall, they judged both types of actions as similarly wrong. We also documented differences based on grade and gender with younger and female participants more likely to judge unfair behavior as especially wrong. Further, we explored adolescents' attributions for this unfair behavior, finding that they attributed peer unfair behavior to factors such as personality traits, whereas unfair teacher behavior was attributed to prejudice, personality traits, and undifferentiated dislike. Moreover, adolescents do not expect that they would respond in the same way to teacher and peer bullying and different factors predict responses to these types of unfair treatment.

Evaluations of unfair behavior

While much prior literature has focused on adolescents' evaluations of bullying or unfair treatment by peers (Kollerová et al., 2014; s; Pouwels et al., 2017), much less research has focused on how adolescents evaluate teacher unfair behavior, even though up to 90% of students experience teacher bullying (Gusfre, Støen, & Fandrem, 2023). Moreover, only limited research has centered on unfair treatment in STEM classes, although prior work highlights the importance of considering exclusion and unfair treatment in STEM as a key moral issue (Mulvey, Hoffman, & McGuire, 2022). Our findings suggest that adolescents are attuned to unfair behavior in STEM classes, recognizing both unfair teacher and peer behavior as very wrong. Interestingly, however, there were differences by gender and grade.

Female participants in ninth grade reported unfair teacher behavior to be less acceptable than unfair peer behavior, suggesting that they may hold higher expectations for teachers than peers to engage in fair treatment in STEM classes. Additionally, ninth-grade female participants judged both peer and teacher unfair behavior as more wrong than did their male counterparts. It may be that female adolescents are more attuned to the harmful nature of unfair treatment in STEM settings, given that they historically experience more exclusion in STEM than their male peers (Mulvey, Hoffman, & McGuire, 2022). The gender difference for tenth-grade students only emerged for peer behavior, and not teacher behavior, with female tenth graders judging peer unfair treatment as more wrong than did male tenth graders. However, it is important to note that the gap between the female and male means closed somewhat for teacher unfair behavior by tenth grade, suggesting that with age male adolescents may be more aligned with female adolescents in recognizing the harmful nature of unfair teacher behavior. Interestingly, there were no differences based on race/ethnicity, suggesting that students of all racial/ethnic backgrounds were aligned in their recognition of how harmful unfair behavior in STEM classes can be.

Attributions for unfair teacher and peer behavior

While it is important to note that the attributions items were optional, and thus some participants did not indicate an attribution for why they thought unfair teacher and peer behavior might occur in STEM classes, some notable patterns emerged. First, participants thought primarily of peer unfair behavior as being driven by personality characteristics of the victimized peers, whereas participants most commonly referenced prejudice when making attributions for teacher unfair behavior. While these preliminary results are intriguing, additional work must be done that continues to probe not only why adolescents think unfair behavior happens in

STEM classes, but also that more systematically documents prevalence and reasons behind unfair treatment in STEM classes.

While additional work will be needed to better understand the differences in adolescents' attributions for unfair teacher and peer behavior, it is notable that they consider a direct role for prejudice more often when evaluating teacher behavior than peer behavior. It may be that they observe prejudicial behavior more often from teachers or that they are better able to take the perspective of their peers and recognize a greater range of possible reasons why unfair behavior occurs on the part of peers than teachers. Research suggests that teachers do want to discuss prejudice and discrimination in class, although they vary in their beliefs about whether prejudice can change (Kaufman et al., 2024) and in their readiness to engage in culturally responsive teaching practices (Knox et al., 2023), and in doing so they may inadvertently communicate uncomfortableness with issues around inclusion, bias, and prejudice in the classroom. Prior research suggests that adolescents are primarily exposed to extremely stereotypic representations of scientists in STEM classes (with adolescents reporting that the vast majority of scientists they learn about are White and male), thus, adolescents may assume that teachers are invested in perpetuating the status quo in STEM (Mulvey et al., 2023). Future work is needed to clarify why adolescents make different attributions around unfair teacher and peer behavior as well as to explore how accurate adolescents are in making attribution judgments when they observe unfair treatment motivated by different reasons.

Responses to unfair behavior

A large body of research has documented the power of bystanders in helping to stop bullying and unfair treatment in school settings (Padgett & Notar, 2013; Palmer & Abbott, 2018; Salmivalli et al., 2011; Yüksel et al., 2022), although this work typically centers on responding to unfair treatment by peers. Less work has examined how individuals respond to observing unfair teacher behavior or unfair behavior in STEM classes. In the current study, we explored a range of different types of positive responses, including those that involve directly seeking help from others (i.e., friends or adults), confronting the aggressor, and talking with the victim about what is happening. We also asked about staying inactive or doing nothing when one observes unfair behavior. Our findings suggest somewhat different patterns for intentions to respond to teacher and peer unfair behavior.

Specifically, adolescents were more likely to report that they would directly address the situation by saying something and less likely to report that they would talk to an adult or do nothing when a peer was engaging in unfair behavior than when a teacher was treating a classmate unfairly. This suggests that adolescents may, generally, disengage more when they observe teacher unfair behavior as compared to peer unfair behavior—they may not do anything and refrain from speaking up in the moment. This may be due to respect for teachers, social norms around the appropriateness of challenging a teacher's behavior, or fear of repercussions if they do act (Macleod et al., 2012). This pattern is concerning as this may leave students exposed to unfair behavior by teachers without support from their peers. Exposure to both peer and teacher unfair behavior is associated with a host of negative outcomes (Civitillo et al., 2024; Mulvey, Hoffman, et al., 2018; Nansel et al., 2001; Olweus, 1994), thus understanding factors that motivate action in response to this unfair behavior is important. These findings also highlight the critical importance that peers can play in challenging unfair behavior (Salmivalli et al., 2011; Waasdorp et al., 2022), providing key insight for prevention and intervention efforts to maintain persistence in STEM. Specifically, new efforts might draw on the power of peer behavior to help ensure that students feel welcomed and included in their STEM classes and that peers feel capable and motivated to challenge unfair behavior they observe.

Demographic differences in responses to unfair behavior

In terms of possible bystander responses, we found few demographic differences. Notably, younger adolescents (ninth grade) and older adolescents (tenth grade) generally did not differ in their expected responses, although older adolescents reported that they would be less likely to challenge unfair teacher behavior than did younger adolescents. It may be that larger differences would be found if we examined a broader age range. However, it is important to note that this may suggest the systematic nature or normalization of exclusion or unfair treatment in STEM contexts. This is an important direction for future research as it is likely that students experience and observe unfair treatment in STEM classes from early in schooling.

We did document some gender differences: girls were more likely than boys to report that they would talk to friends and to the victim directly both in instances of teacher and peer unfair behavior. This may be as a result of socialization of gender norms that encourages girls to be more emotionally expressive (Chaplin & Aldao, 2013). Given girls' pervasive underrepresentation in STEM, and this finding that they may be more likely to reach out to talk to others (including the victims) about unfair treatment, it is important for STEM teachers to create inclusive, welcoming spaces (Mulvey, Mathews, et al., 2022) where girls feel comfortable speaking up and sharing when they observe unfair treatment. Although prior research has sometimes found that ethnic minoritized youth are less likely to respond if they are bystanders when unfair behavior or bullying occurs (Mulvey et al., 2018, 2020), and more likely to judge unfair behavior as acceptable (Herry et al., 2021), we only found one difference which reflected that Latino/a/e/x participants were less likely to say something when their peers experienced unfair behavior than were non-Latino/a/e/x participants.

School climate, discrimination, belonging, and responding to unfair behavior

In terms of school climate, discrimination, and belonging, we document that more positive experiences are associated with greater intentions to actively respond to both peer and teacher unfair behavior. The more positive student–teacher relationships participants reported, the more likely they were to expect that they would say something and talk to an adult when peers engaged in unfair treatment. However, when teachers engaged in unfair behavior, student–teacher relationships were only associated with talking to a friend. This suggests that there may still be work to do around student–teacher relationships. It may be that students were concerned with damaging the positive relationships that they have with teachers and, thus, not as likely to address unfair teacher behavior.

In terms of belonging, students who report that they feel like they belong more in their STEM classes were more likely to engage in a host of active responses, especially in response to peer unfair treatment: saying something, talking to an adult, talking to a friend or talking to the victim. For teacher unfair behavior, those who reported greater STEM class belonging also reported that they would be more likely to talk to the victim. In general, these findings reinforce the crucial role of belonging in STEM classes. While prior research has clarified that belonging in STEM is associated with better academic outcomes, namely, engagement (Cerda-Smith et al., 2023; Mulvey, Mathews, et al., 2022), these findings extend this work by documenting that belonging can also create an environment more optimal for positive bystander responses. Thus, teachers and schools might consider a strong focus on belonging in order to create STEM class environments that are welcoming and supportive for all students.

Students who reported greater school connectedness were more likely to believe they would say something or talk to an adult when a teacher engaged in unfair behavior, and to talk to an adult when a peer engaged in unfair behavior. This suggests that general school connectedness may promote positive bystander responses, especially in the face of unfair teacher behavior. Aligned with this finding, those who report more positive school social environments were more likely to intend to talk to a friend about peer unfair treatment and to the victim about teacher unfair treatment, suggesting that those with a positive sense of social relationships at school seek out opportunities to speak to others when they observe unfair behavior.

Interestingly, those who perceived greater exclusion at school (essentially, adolescents who felt that some students received preferential access to opportunities), were especially attuned to teacher behavior: they were more likely to say something and talk to the victim when teachers engaged in unfair behavior, but also reported that they would be more likely to do nothing. Additional person-centered analyses may clarify this pattern as it is possible that some students who perceive exclusion are motivated to challenge unacceptable teacher behavior in schools, while others have become disengaged as a result of this perception. Prior latent class analysis exploring bystander responses to bullying reveals that quite different classes of these sorts do emerge and that these classes predict likelihood of responding in positive ways to peer unfair treatment (Mulvey et al., 2020). Aligned with this, students who reported more peer discrimination were more likely to report that they would talk to victims of peer unfair behavior, likely because they share similar experiences of harmful peer behavior.

Critical consciousness and responding to unfair behavior

In the current study, we also examined if aspects of critical consciousness predicted adolescents' acceptability judgments and likelihood of responding to unfair peer and teacher behavior. Given that greater critical consciousness signifies more awareness of social inequalities (Freire, 1973), we were surprised to not find any differences in students' acceptability judgments or intended responses based on their perceptions of inequality. However, we did find that students with greater egalitarian beliefs are less likely to accept unfair peer and teacher treatment and are more likely to expect to talk to friends and the victim when they observe unfair teacher behavior. It may be that the perceptions of inequality measure, which captured adolescents' perceptions of broad societal inequalities, was not as relevant to their school-related experiences. In contrast, students who were more critically motivated were less likely to do nothing and more likely to talk to the victim when peers engaged in unfair behavior. This finding indicates that students who think it is important to confront and correct social inequalities and who feel responsible to improve society expect to be active bystanders when witnessing peer (but not teacher) unfair treatment in their STEM classes. Future research should examine the extent to which adolescents associate their own experience and observations within their school, including unfair interpersonal treatment in their STEM classes, to broader, systemic issues that perpetuate group-based exclusion and disparities in STEM domains (e.g., discrimination and stereotyping).

Limitations and future directions

Although the current study is notable in that it is one of the first to examine both teacher and peer unfair behavior in STEM classes, there are some limitations. First, the study only captures attitudes and intended behaviors, not actual responses in classroom settings. Future research is needed that allows for behavioral measures of bystander responses to unfair treatment in STEM classes, although this work will be challenging. Further, we were only able to provide a preliminary examination of attributions for unfair teacher and peer behavior, as these were optional items and many

participants declined to respond to these questions. We also did not explicitly provide participants with information about the identities of the victims nor the reason for the unfair treatment. Future research might more specifically test for different types of evaluations and responses to unfair treatment, for instance, based on gender, race/ethnicity, or disability. Additionally, more research is needed that clarifies the prevalence of unfair treatment in STEM classes and documents what factors protect against the emergence of this type of treatment. Finally, additional research is needed that attends to developmental changes in evaluations of and responses to unfair treatment by peers and teachers either with broader sampling across age groups or longitudinal work, especially given that prior work on bullying has documented age-related differences in evaluations when examining a larger age range of adolescents (Bennett et al., 2014; Mulvey, Gönültaş, et al., 2018; Thornberg et al., 2012; Waasdorp & Bradshaw, 2018). Future work might also aim to recruit samples with enough representation of youth who identify outside of the gender binary in order to carefully capture their experiences.

Conclusion

This study documents that adolescents are attuned to both unfair teacher and peer behavior in STEM classes and clarifies that, while adolescents judge both types of behaviors to be wrong, they may not always respond in similar ways to these behaviors. This work provides an important new understanding of an understudied factor that may account for the lack of persistence in STEM fields, especially for those who are historically excluded from STEM (Mulvey, Mathews, et al., 2022; Pew Research Center, 2021), and suggests that educators and policy-makers might focus on creating safe, welcoming, and inclusive STEM spaces where students are treated fairly and feel empowered to speak up on their peers' behalf if they observe unfair treatment of others.

ACKNOWLEDGMENTS

This research was funded by NSF-DRL-1941992, awarded to the first author. We thank the schools and students who participated in this study as well as the undergraduate research assistants who aided in coding this data. The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest

CONSENT

All participants assented to participation and parents provided opt-out informed parental consent.

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How to cite this article: Mulvey, K. L., Cerda-Smith, J., Herry, E., Joy, A., Marlow, C. S., Mathews, C. J., & Ozturk, E. (2024). Adolescents' evaluations of peer and teacher unfair treatment in science, technology, engineering, and mathematics classes: Expected interventions. *Journal of Research on Adolescence*, *00*, 1–15. https://doi.org/10.1111/jora.13030