Student Attributions about Interest-Value Shape Academic Decisions and Recommendations

[This is a preprint version of a manuscript in press at Motivation Science]

Jasmine B. Norman[1], Danielle M. Geerling[2], Dustin Thoman[3], Yun Tang[4], & Carol Sansone[4]

[1] Department of Psychology, University of North Carolina, Wilmington
[2] Department of Psychology, St. Norbert College
[3] Department of Psychology, San Diego State University
[4] Department of Psychology, University of Utah

Correspondence regarding this manuscript can be sent to:

Jasmine B. Norman
601 South College Road
Wilmington, NC 28403-5612
normanj@uncw.edu
ORCID: 0000-0002-3308-3987

Author Note: First authorship shared between DMG and JBN, with order determined by coin flip. All data and syntax for these studies are publicly available at https://osf.io/2tm5s/

Abstract

We examine how students reason about their own and others' problems of motivation, and with what consequences. Across four studies (N_{total} = 1,624), we present evidence for the relative importance of a novel attribution type—interest-value—that is distinct from attributions about effort and efficacy. We examine a proposed process by which students infer interest-value by relying on contextual cues about the academic domain and student characteristics, with these inferences relating to subsequent academic decisions and recommendations. Results show students weigh interest-value as an important consideration in academic contexts (Study 1) and use explanations of interest-value when making attributions about the causes of others' (Studies 2a-2b) and their own (Study 3) motivational struggles. In Studies 2a-2b, attributions about the problems of others to a lack of interest-value were sensitive to some features of the context, and could be attenuated through the provision of individualizing cues about a target's prior interest. Furthermore, students' perceptions of interest-value as the cause of motivational struggles related to both their recommendations for others' participation (Studies 2a-2b), and their own intentions to participate (Study 3), in a field. This occurred above and beyond effects of effort and efficacy attributions. Our findings contextualize beliefs about interest-value within the attribution process and demonstrate their utility for understanding students' educational paths.

Key words: attributions; meta-motivational beliefs; motivation; interest-value; STEM

Student Attributions about Interest-Value Shape Academic Decisions and Recommendations

Motivation is vital for academic engagement and achievement. Yet, even the most successful students encounter activities, assignments, or classes that they find more or less engaging, and most students struggle with motivation at some point in their educational career (Kaplan et al., 2012; Kaplan et al., 2018). Imagine such a student comes to you for advice, saying they are having trouble getting started on a class project or assignment. What might you view as the cause of this motivation problem? How do characteristics of the student and context play into your beliefs? And do your beliefs about the cause matter for whether you think the student should continue in related fields?

In the present paper, we examine how students reason about motivation problems, and with what consequences for navigating education-related decisions. We present evidence for the importance of beliefs about interest and value following motivational challenges, and their implications for academic decisions and recommendations related to participating in academic fields. We examine a process by which these attributions may be sensitive to contextual cues at the category level (e.g., academic domain and target student's gender) and target level (e.g., individual student's domain-specific activities). In the context of these questions, we focus on the structure and consequences of inferences made not only about students' own academic problems, but also about the problems of their peers, who are important drivers of students' academic paths (Kim & Schallert, 2014; Thoman et al., 2012; Thoman et al., 2019; Wentzel & Wigfield, 1998).

Attributions about Motivation Problems

People draw inferences about their own and others' behaviors to understand their social worlds (Heider, 1958; Kelley, 1973). In the context of education, the inferences and judgements people make about why someone struggles academically represent their attributions for academic challenges. Perceptions regarding the causes behind academic challenges depend in part on why someone thinks a challenge occurs—that is, the *type* of attribution that is made. We define types of attributions as different categories of explanations, which are focused on distinct types of causes about an academic problem.

An extensive body of work has examined qualitatively distinct types of attributions that teachers and parents make for students' performance outcomes (see Wang & Hall, 2018, for a review), with a focus on attributions to efficacy-related causes and effort-related causes (see Graham, 1991 for a review; Weiner, 1972). When a student performs poorly on an exam, people may attribute that failure to efficacy reasons (e.g., "She failed because she wasn't smart enough to succeed") or to effort reasons (e.g., "She failed because she didn't study hard enough"). The type of attribution people make has both intra- and inter-personal consequences: teachers, for example, feel more anger and are less likely to continue efforts to help when they attribute students' failures to effort over efficacy (Georgiou et al., 2002).

Previous research has also distinguished between attribution *levels*, or relative emphases within types of attributions. For example, when attributing a problem to ability, individuals could put greater weight on beliefs about the person's innate capacity than on beliefs about the person's mastery of skills needed for a specific task (Dweck et al., 1993; Nicholls, 1984). Moreover, effort attributions can be associated with different inferences about ability depending on the perceived reason the person did (or did not) exert effort. In this research (Miele, Browman, et al., 2020; Muenks & Miele, 2017) students inferred different levels of ability for a

peer when they believed effort levels were due to subjective task demands relative to when they believed effort was due to self-initiated motivation. Thus, while students were reasoning about the same type of attribution, effects diverged depending on whether the reason for the effort emphasized the specific task or characteristics of the person. Following from this body of work, beliefs about motivation problems may differ in not only explanations about the type of problem is happening, but also across multiple within-category distinctions (e.g., locus of causality as internal vs. external, intentional vs. unintentional, stable vs. unstable; see Kelley & Michela, 1980 for a review).

Despite an extensive research literature on how individuals interpret the causes of *performance* difficulties, less is known regarding how individuals interpret problems of *motivation*, and with what implications. In extant work, the construct of motivation has primarily been incorporated into attribution theories as either a perceived cause of poor performance or as an outcome that varies depending on the use of certain attributions to explain performance. For example, past work has examined students' subsequent motivation when attributing poor performance to efficacy or ability (Andrews & Debus, 1978; Weiner et al., 1987). Emerging research, however, demonstrates that students' beliefs about motivation—where motivation comes from, how to regulate it, and why it ebbs and flows—are important for how students manage motivational states and overcome their own motivational challenges (Scholer et al., 2018; Thoman et al., 2017; Wolters, 2003). Although attributions about motivational challenges may in some ways mirror attributions about performance-related challenges, we propose that beliefs about *interest* and *value* play an important, understudied role in the context of motivational challenges.

Attributions to Interest-Value

Theoretical models of motivation (Deci & Ryan, 2012; Sansone & Smith, 2000; Sansone & Thoman, 2005; Wigfield & Eccles, 2000) and evidence-based interventions targeting motivation (e.g., Asher, et al., 2023; Hulleman & Harackiewicz, 2009) suggest that feelings of interest and value are important factors associated with long-term motivation, re-engagement, and persistence in academic domains. Because interest and value have strong ties to academic motivation, it is reasonable to expect that students may attribute problems of motivation to be caused, at least in part, by a lack of interest and/or value. Further, as with efficacy and effort beliefs (e.g., Surber, 1984), people likely make inferences about *others'* interest and value.

We define interest-value attributions as explanations centered around whether a person is invested in, enjoys, and sees value in learning about a particular activity or an academic domain. Building off work situating efficacy and effort as perceived causes of academic challenges, we argue for the additional importance of beliefs about a lack of interest-value as a perceived cause of academic problems. We posit that interest-value attributions, and considerations about interest-value in general, are a fruitful area of exploration in understanding students' beliefs about motivation.

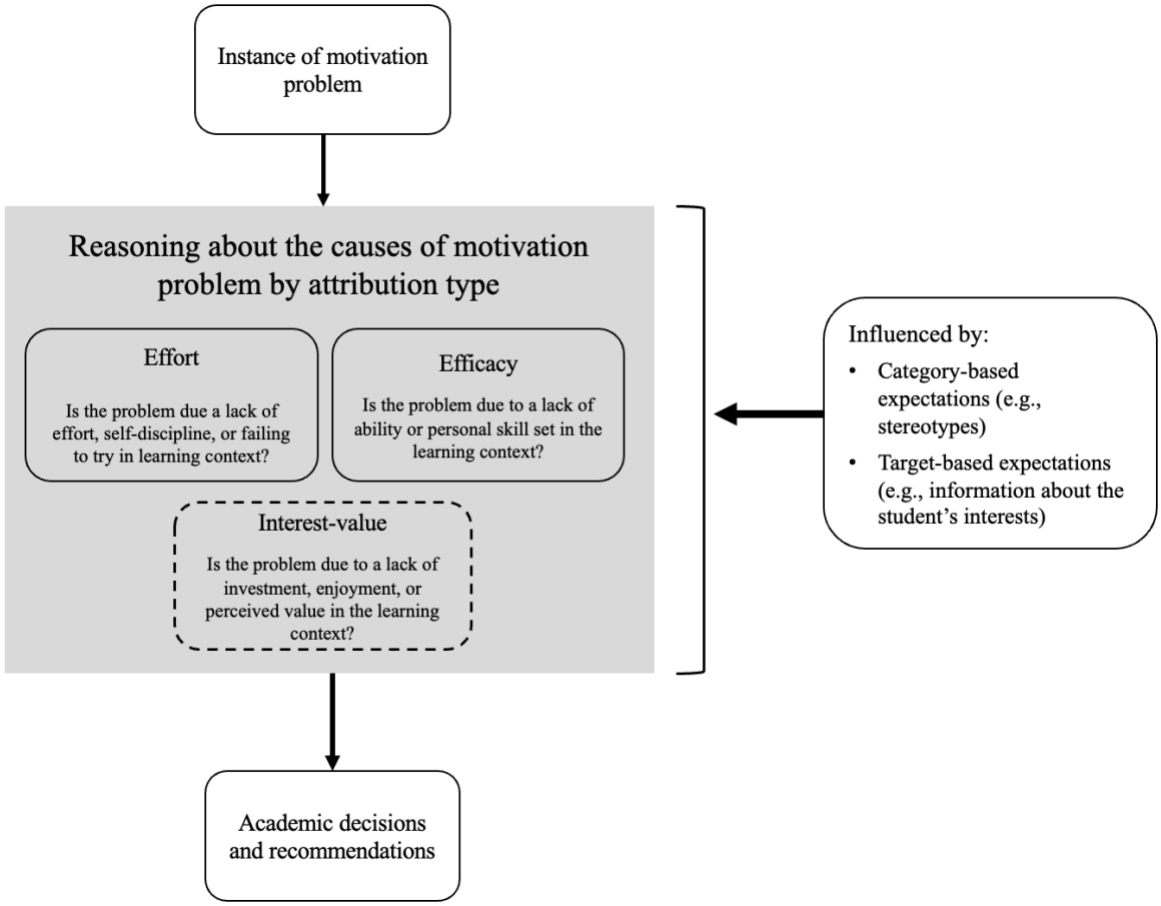
Even though interest and value can be separable in terms of explaining problems of motivation, we combine these constructs in the current research for several reasons. Across different literatures, interest and value are closely and often sequentially related (Renninger & Hidi, 2011; Sansone & Thoman, 2005). The experience of interest is variable, and even things that begin as interesting can become less so through satiation or competing bids for attention. Without value, therefore, experiencing interest may not be sufficient to sustain motivation over time. In contrast, when a task is highly valued, motivation can persist for a time even if interest is not present. In these circumstances, however, maintaining attention is more effortful, and

rewards are experienced more from achieved outcomes (if they are achieved), rather than from the experience of engaging with the task itself. Relatedly, Eccles and Wigfield (2002) define "intrinsic value" (the extent to which individuals find the task interesting) as one source of task value. Thus, in their framework, interest is subsumed in task value, along with attainment value and task usefulness. Therefore, although the variables of interest and value can be distinguished both conceptually and empirically, they are often highly intertwined when predicting or explaining motivation and persistence over time (Hidi & Renninger, 2006; Renninger & Hidi, 2015; Renninger, 2009). To explicitly acknowledge that this type of attribution includes both components in our research, we use the label "interest-value" rather than subsume one of the components under the other label.

In sum, the current work sought to examine understudied beliefs about interest-value relative to other commonly studied attributions, particularly their antecedents (i.e., whether students use of interest-value to explain others' motivational problems is sensitive to context; Aim 1) and consequences for academic decisions (i.e., how they factor into students' future intentions to participate in academic fields and recommendations to peers; Aim 2). This conceptual framework is outlined in Figure 1.

Figure 1

Conceptual framework outlining the tested antecedents and consequences of perceivers' attributions to interest-value for students' motivation problems



Aim 1: Are Attributions about Interest-Value Sensitive to Context?

We aimed to examine key social-psychological factors that may drive students' use of interest-value attributions in explaining motivational struggles. We expected that observers' expectations about interest can influence interest-value attributions; more specifically, that attributions to interest-value might align with category-based stereotypes or beliefs about who is interested in particular academic domains. Indeed, perceivers' attributions depend in part on expectations and prior knowledge (e.g., Gilbert, 1989; Jones & McGillis, 1976; Weiner, 2018). Teachers, for example, are likely to attribute students' performance as due to factors internal and stable to the student when the student's performance matches teachers' expectations (e.g., Burger et al., 1982). Consistent with this, perceivers' attributions for academic problems systematically

vary by academic domain (Bong, 2004) and student characteristics such as gender (Dweck et al., 1978), particularly in stereotype-relevant contexts (Kiefer & Shih, 2006).

Science, technology, engineering, and mathematics (STEM) fields have especially prevalent gendered stereotypes about interest (see Master & Meltzoff, 2020 for a review; Ceci & Williams, 2011; Dasgupta & Stout, 2014; Makarova et al., 2019; Su & Rounds, 2015). For example, stereotypes about girls being less interested than boys in STEM are present in children as young as six and persist across educational levels (Master et al., 2021). Given strong pre-existing expectations, STEM domains provide an ideal test of whether people attribute motivational challenges to problems of interest-value in ways that align with stereotypes about academic domains.

We predicted that categories used to evaluate whether a student is negatively stereotyped in a field (i.e., gender and academic domain) would be important context cues that affect the extent to which peers make attributions to interest-value about another student's motivation problem. Furthermore, if interest-value attributions are sensitive to contextual characteristics, they should be movable by introducing target-specific information (e.g., information about a student's interest in the field they are struggling in). We thus tested the impact of both category level cues (i.e., academic domain and gender) and a target level cue (i.e., information about prior interest) on the use of interest-value attributions (see right panel of Figure 1).

Aim 2: Does Interest-Value Play a Role in Academic Decisions and Recommendations?

We propose that, when considering which fields to continue or participate in following motivational struggles, students will see interest-value as an important factor above and beyond the efficacy- and effort-related factors commonly used to explain performance outcomes. That is, while attributions to efficacy and effort are likely to play a role in how people engage with

academic paths following motivation difficulties, just as they do in achievement motivation (Weiner, 1985), we focus on the novel role of interest-value attributions. Consider, for example, that a student believes their trouble getting started on a project originates from a problem of being uninterested in, or not caring about, the field or course-specific assignment (and is therefore attributing a motivation problem to interest-value). Students might generalize these explanations for single instances of motivational problems and be less likely to consider further coursework or opt out of the field because of these interest-value attributions.

We further identify how thoughts about interest-value factor into the recommendations students make to peers. Motivation is often conceptualized as an intra-individual process, but social experiences influence whether students maintain motivation in academic activities and domains over time. The way others react to students' interests, failures, and achievements in academic domains, and the recommendations they make, matter. Peers represent a particularly vital driver of students' attitudes and likelihood of engagement in different academic domains (Kim & Schallert, 2014; Thoman et al., 2012; Thoman et al., 2019; Wentzel & Wigfield, 1998). Thus, identifying whether interest-value attributions relate to both a student's own academic decisions as well as the peer recommendations students give to each other can shed light on why some students are driven to enter and participate in (vs. opt out of) a field.

As outlined in the left panel of Figure 1, we hypothesized that the extent to which people reason that an instance of a motivational challenge is due to a lack of interest-value would relate to academic decisions about opting out or exploring other domains (e.g., in peer contexts, not recommending the student take additional classes within that domain).

Does Level Matter for Interest-Value Attributions?

Assuming students use attributions to interest-value in the context of motivational challenges, and that these attributions have consequences for academic decisions and recommendations, an open question is whether the level at which these attributions are made matters within this process. One possibility is that if students generalize beyond a single motivational problem when attributing the source of difficulty, we may see greater impact on recommendations or plans to continue, as well as greater sensitivity to expectations based on general categories rather than knowledge of the individual. In the current work we explore attribution level as a potentially important distinction within attribution type.

We define the level of emphasis within different types of attributions as whether causes of academic problems are seen as more transient and situation-specific, or stable and generalizing beyond a specific situation (Abramson et al., 1978; Weiner, 1985). Situation-specific attributions, which we refer to as *situational* attributions, are rooted in causal beliefs about current demands or tasks. *Global* attributions, in contrast, are rooted in causal beliefs about a given event reflecting a broader, persisting characteristic of the person, demands, or tasks. For example, some motivational struggles may be thought of as temporary deficits due to interest-value specific to a task, time, or context (situational), while other challenges may be thought of as reflections about an enduring state or the student's interest-value in the domain more broadly (global). Globality thus taps into beliefs about the likelihood of the problem recurring over time or across different instances. When people make more global attributions for their own academic challenges, they tend to show poorer outcomes, such as reduced expectancy for future success in school (Houston, 2016; Mikulincer, 1986) and depressive mood (Metalsky et al., 1982). We therefore tested our aims both when collapsing across, and distinguishing between, global and situational interest-value attributions.

Overview of Current Research

Across four studies, we present evidence for a novel attribution type: interest-value. We test whether the use of interest-value attributions is sensitive to categorical cues—STEM vs. non-STEM domains and target gender—and individuating characteristics of the struggling student—participation in events that indicate interest (Aim 1). We further present evidence for the relative importance of interest-value beliefs in students' academic decisions and academic recommendations for others (Aim 2).

In Study 1, we conduct an initial test of whether students perceive that interest-value is an important consideration, above and beyond the traditionally studied efficacy and effort beliefs. We then turn to experimentally examining when, and with what implications, students use attributions to interest-value to explain a hypothetical student's motivational challenge (Studies 2a-2b). Study 3 extends to identifying whether students use interest-value attributions as explanations for their own motivational struggles in an actual class, including associations between attributions and their intentions to take future classes in the field. In Studies 2a-2b, we conduct supplementary analyses across attribution level to identify potential distinctions in situation-specific relative to global interest-value attributions; in Study 3, we expand on this distinction.

Data were collected in Spring 2016 (Study 2a), Spring 2019 (Study 2b), and Fall-Spring 2020 (Studies 1 & 3). All procedures were declared exempt by the institutional ethics committee.

Data and syntax for all studies have been made publicly available at the Open Science Framework (OSF) and can be accessed at: https://osf.io/2tm5s/. Materials necessary for replication of these studies are either reported in text or on OSF. Study 2b was pre-registered, and we note deviations from this pre-registration in text

(https://doi.org/10.17605/OSF.IO/JWR47). We report sample size determinations, all data exclusions, and relevant measures and materials in the main text or Supplementary Online Material (SOM). For all studies, missing data were handled on an analysis-by-analysis basis (i.e., participants who were missing data on one of the variables of interest for that analysis were excluded but may have been included in other analyses). In composite scores (e.g., for our attribution types of effort, efficacy, and interest-value), we calculated averages when a participant responded to at least one of the items in that composite. In instances where a construct was measured with one item, participants were excluded if they did not respond to that item. Additional missing data information is available in the SOM.

STUDY 1

In Study 1, we conducted an examination of college students' beliefs about the relative importance of interest-value, compared to efficacy- and effort-related factors. Our goal was to establish that students believe that interest-value is an important factor in academic decisions. We surveyed college student participants about the factors that they felt were important for students to consider when making decisions about enrolling in future coursework and declaring majors, regardless of academic domain. We did this by asking students to evaluate the importance of several factors when recommending that a hypothetical student take additional classes or major in a generic field or domain. These factors included interest-value as well as efficacy (e.g., grades) and demonstrated effort (e.g., works hard).

Methods

Participants

We recruited 274 undergraduate students from a psychology department participant pool. Four participants did not answer any study questions, resulting in a final sample size of 270. This

allowed for 80% power to detect a small effect size ($f \sim .10$) for the omnibus within-subjects comparison across the three measures of interest. Students were awarded course credit for their participation. One hundred and sixty-five participants (60.2%) identified as women, 95 (34.7%) as men, and 6 (2.2%) as non-binary or gender fluid, with 4 (1.5%) not reporting. The sample was predominantly White (72.6%), Hispanic/Latino (15.0%), and Asian (15.0%; 3.3% Black, 1.8% Pacific Islander, 1.8% American Indian/Alaska Native, 1.8% other, .7% not reporting). Approximately 83% of participants were in their first or second year of college (M_{age}=19.97, SD_{age}=3.56).

Procedures and Measures

The present study was included as part of a larger survey, in which participants were first asked to evaluate a student struggling in school (used for piloting realistic student profiles). Participants were subsequently asked to think about situations where students in general try to make decisions about *future coursework* (Think about a student trying to decide whether to continue taking courses on a topic they learned about in high school during college. How important do you think each of the following are for deciding whether to take similar classes in college?) and *majors* (Think about a student trying to decide whether to major in a certain field. How important do you think each of the following are important for deciding to major in a certain field?). They rated how important they thought each of several factors would be when making these two decisions, using a scale ranging from 1 (*Not at all important*) to 5 (*Extremely important*).

The factors for coursework decisions were: *interest-value* ("personal interest in the topic or field" and "relevance of the topic to their future career plan"), *efficacy* ("grade(s) in related high school course(s)" and "personal skill set or ability in the class material"), and *effort* ("goal-

oriented or driven"). For major decisions, the same items were used for effort and interest-value. For efficacy, one additional item was added ("grade(s) in related college course(s)"), and we asked about "personal skill set or ability in the field." One additional item ("involvement in related extracurricular activities") was included to explore how people might be thinking about extracurriculars as related to beliefs about interest-value vs. effort and efficacy but was not included in primary analyses.

We created an index of how important students believed each factor to be in general by taking the average of items regarding coursework decisions and major decisions for each attribution type (efficacy, effort, interest-value). The two-items assessing efficacy beliefs for coursework decisions were moderately correlated, $r(268) = .33$, $p < .001$, and the three-items assessing efficacy beliefs for major decisions showed adequate reliability (α=.62; ω=.68). For interest-value, the two items about coursework decisions were weakly but significant correlated, $r(266) = .22$, $p < .001$, and moderately significantly correlated for major decisions, $r(267) = .40$, $p < .001$. After beliefs about academic decisions, participants responded to a series of exploratory questions about career-related and hiring decisions (e.g., "how important is it to be interested/passionate about a job?"). Finally, participants completed demographic items and were thanked and compensated with course credit.

Results and Discussion

We conducted a repeated measures analysis of variance (ANOVA) across factor type (interest-value, efficacy, and effort). We used a Huynh-Feldt correction for sphericity violations. There was an overall effect of factor type, $F(1.90, 511.30)=199.87$, $p<.001$, $\eta_p^2=.43$, such that participants rated interest-value (M=4.33, SD=.56) as more important for academic decisions

than efficacy (M=3.55, SD=.65), p<.001, 95% CI M_{diff} [.71, .86], d=1.29, and as similarly important as effort (M=4.26, SD=.71), p=.082, 95% CI M_{diff} [-.01, .17], d=.11.

Thus, we found initial evidence that students believe interest-value is an important factor in academic contexts. Even in comparison to factors centered around effort and efficacy, interest-value considerations were rated as relatively important for students' decisions. In fact, students weighted interest-value as more important than demonstrations of academic performance (efficacy), and equal to sustained effort.

STUDY 2A

Study 1 found that students believe interest-value is a relatively important factor for making academic decisions, including what classes and majors to consider. In Study 2a, we examine the implications for academic decisions when judgements of interest-value are made about others, and in potentially stereotype-laden contexts (Siy, et al., 2023). Extending Study 1, we identify how interest-value attributions may or may not be impacted by context cues about the target student and academic domain (Aim 1), and if these attributions relate to academic recommendations in a hypothetical peer advising paradigm (Aim 2). We thus turned to examining students' use of interest-value attributions to reason about a single instance of a *peer's* motivation problem.

Using an experimental peer advising paradigm in which participants gave advice to an ostensible high school student, we first examined what impacts interest-value attributions, testing whether these judgments are sensitive to contextual cues. Specifically, we manipulated whether the target student's problem aligned with category-based stereotypes about interests (i.e., gender in STEM). Given gendered beliefs and expectations about who belongs in STEM fields, we examined these attributions across student gender (man vs. woman) and academic domain

(physics vs. history).[1] We expected that these characteristics would impact the endorsement of interest-value attributions. Specifically, when making attributions about students who are negatively stereotyped in a given domain (i.e., women in physics, a STEM domain), we expected perceivers would be more likely to attribute the motivation problem to lack of interest-value compared to a non-stereotyped context. When judging the cause of one instance of a peer's motivation problem, therefore, we expected that the gender-based stereotype could lead individuals to be more likely to differentially emphasize interest-value attributions as reasons for motivation problems. We further sought to test whether explaining another's problems of motivation as due to a lack of interest-value influences peer recommendations. We expected to find a link between interest-value attributions and recommendations for participating in the domain in which the target student was struggling.

Methods

Participants

We recruited 792 undergraduate students from two public universities, University of Utah and San Diego State University, allowing sampling from diverse college student populations. Across both universities, we used psychology department participant pools to recruit participants who were awarded course credit for their participation. We recruited participants who had

[1] We selected physics to represent our STEM domain because it is male-dominated (Cimpian et al., 2020; National Science Foundation, 2019) and there are strong stereotypes about who is interested in physics (Eaton et al., 2020). We chose history to represent our comparison, non-STEM domain for several reasons. History is part of core requirements in social studies for high school, and one for which student motivation is often cited as a problem (e.g., Stodolsky et al., 1991). But these motivation problems typically are not associated with gender stereotypes about ability or interests (Metzger & Harris, 2018), in contrast to STEM (e.g., Desy et al., 2011). As a result, using history as a comparison field allows us to better understand the role of gender stereotypes about fit compared to purely gender representation. This also represents a conservative test of these effects, relative to using a field where strong gender stereotypes exist, but in the opposite direction of physics. Of note, public perception of the field of history has substantially shifted in the last several years. What constitutes the proper focus of "history" has become more politically charged (e.g., Metzger & Harris, 2018), meaning students' baseline perceptions of history relative to physics may have shifted over time, although the relative relevance to gender-based stereotypes would likely not have changed.

recently entered college and were enrolled in an introductory psychology course for two primary reasons. First, we were interested in understanding college students' perceptions of motivational struggles and wanted to ensure participants would feel close in academic standing and simultaneously qualified to give advice to the hypothetical student (an advanced high schooler). Second, recruiting from introductory psychology courses allowed for greater diversity in the range of majors among our sample. The distribution of majors was approximately 37% undeclared; 33% STEM, 12% Social Sciences; 6% health (e.g., nursing). The remaining were scattered across Business, Fine Arts, and Education.

Our final sample was 577 participants (M_{age}=19.14, SD_{age}=2.45).[2] Prior to analyzing the data, we used Superpower (Lakens & Caldwell, 2021; v0.2.0) in R (v4.0.5) to determine our power to detect the smallest expected effect: for the three-way interaction within a mixed-model ANOVA, corresponding to the effect of experimental conditions on relative endorsement of situational and global interest-value attributions. We determined that our final sample size would achieve approximately 92% power to detect a significant three-way interaction at η_p^2=.02, assuming a balanced design for between-subjects factors (see OSF page for specifications to replicate power analysis).

Four-hundred and eleven participants (71.23%) identified as women, 162 (28.1%) identified as men, and 4 (0.7%) did not report their gender or responded "other". Participants reported their racial/ethnic background by checking one or more options. The sample was

[2] Participants were randomly assigned to view either a male or female student struggling with motivation in either a physics or history class. We initially included an additional baseline comparison condition, in which no information about student gender or domain was provided. However, a technical error in the survey resulted in the dependent variables only being measured for some participants in the baseline condition (more than half who were assigned to this condition (82 out of 159) did not receive the primary measures). Because the lack of measurement was nonrandom, and the baseline condition was not central to our research aims, we excluded all participants assigned to the baseline condition (n=159). Furthermore, 38 participants did not consent to participate or did not complete all study measures and ended the survey early, 4 participants indicated that they were under eighteen years of age, and 14 participants did not respond to the attribution items and were thus excluded from analyses.

predominantly White (63.3%), Hispanic/Latino (19.2%), and Asian (17.2%), 4.7% Black, 4.2% Pacific Islander, 1.2% American Indian/Alaska Native, and 2.9% other. Most participants (91.4%) were first-year or sophomore students who reported taking 3-4 history classes in high school and college (34.2% reported 3; 49.4% reported 4 or more), and 0 or 1 physics classes in high school and college by the time of the study (37.2% reported 0; 46.0% reported 1).

Procedures

Participants completed the study using a Qualtrics survey link, either in-person (n=309) or online (n=282). All procedures were identical across survey modalities and data collection sites. After providing informed consent, participants were exposed to a cover story that described the study as involving an online advice-giving platform. Participants were told that, as someone who had successfully made the transition to college, they would be asked to give advice and suggestions to a high school student who was struggling in school. The cover story described how college may be a time where there are fewer external influences on completing work (e.g., "you are expected to do what is required in a course without someone…telling you when and how to work on things") and that, with these considerations in mind, participants would be asked to give advice to students who are struggling with motivational challenges. Participants were told they would view one student's profile drawn from a number of profiles that varied in the type of problem, student backgrounds and experiences, and the amount of information about the problem.

After reading the cover story, participants were exposed to one of four student profiles of an advanced high school student (always named Jordan) who was struggling getting started on a class project. This study used a 2 (target gender: man or woman) x 2 (domain: physics or history)

between-subjects design.[3] To vary Jordan's gender, we selected images of two White men and two White women from the Chicago Face Database (Ma et al., 2015) that were similar in perceived age, attractiveness, and gender and racial categorization.[4] Below the photograph, participants were presented with a vignette detailing Jordan's problem. In the history condition, participants were told that Jordan was struggling with an end-of-year project in History of Western Civilizations. In the physics condition, participants were told that Jordan was struggling with an end-of-year project in Physics. The tasks required by the project were the same across both domain conditions (reading an article and evaluating the presented ideas and data), but we varied the descriptions of the content of the assignments (adapted from then-current Utah Common Core Standards for advanced high school history and physics, respectively). At the end of the vignette, all participants, regardless of condition, were told that Jordan tried to work on the project several times, but "ended up texting, browsing the Internet, or playing video games instead."

Immediately after reading the profile, participants were asked to fill out an "Advisor Checklist," which they were told would help them to summarize the facts of the student's problem(s) before providing advice to the student. This advisor checklist used a form style questionnaire and asked the participant to fill in boxes for basic information including the student name, gender (if known), race (if known), year in school (if known), and provide a summary of the student's problem in their own words. Next, participants were asked to fill out items assessing interest-value, efficacy, and effort attributions. Participants also completed a variety of measures regarding recommendations for how the student should overcome the problem, and

[3] In Studies 2a-2b, we held racial background of the target constant. Because STEM fields in the U.S. tend to be disproportionately White (Fry et al., 2021), we only examined White targets in the present research.

[4] Image type did not affect scores on our primary dependent measures, so our analyses report results averaging across both stimuli within each set.

whether the student should continue in the domain or not. Finally, participants completed demographic and individual difference items. Exact wording of the cover story, the four profiles, and a full list of materials are available on OSF.

Measures

Attributions

To examine the perceived reasons why Jordan was struggling to get motivated on the class project, we measured participants' endorsement of attributions related to interest-value and, for comparison purposes, effort and efficacy.[5] Within these attribution types, we sampled across the level at which these attributions were made (i.e., items ranged from attributions based on the nature of the assignment or course to more globalized reactions about the domain). We also included items assessing attributions to factors such as "not getting enough sleep" and the teacher not being "very good", which were not included in analyses. All ratings were on a scale from 1 (*Not at all*) to 7 (*Very much*).

Interest-value attributions. Five items measured interest-value attributions: The extent to which participants viewed the problem as stemming from the project being 1) irrelevant, 2) pointless, and 3) uninteresting, or viewed Jordan's problem as stemming from 4) Jordan not being a [history/physics] person, and 5) [history/physics] assignments being boring (α=.75, ω=.76).

Efficacy attributions. Two items measured efficacy attributions: The extent to which participants viewed the problem as stemming from the project being too difficult and viewed the problem as stemming from Jordan's lack of ability (r = .31).

[5]A principal components analysis was conducted using all primary attribution items for Studies 2a-3. These results, which provide some support for the distinction of effort, efficacy, and interest-value attributions, are presented in the SOM.

Effort attributions. Two items measured effort attributions: The extent to which participants viewed the problem as stemming from the target student, Jordan, not trying hard enough in the situation and as stemming from Jordan lacking self-discipline (r = .41).

Peers' Academic Recommendations

To measure academic recommendations, participants were asked to select yes/no for three items reflecting increasing levels of potential continuation in the domain: 1) "Jordan should continue to take classes in [history/physics] in high school," 2) "Jordan should continue to take classes in [history/physics] in college," and 3) "Jordan should consider majoring in [history/physics] in college." The responses to these three items were summed into a 0-3 scale, with zero representing a recommendation that Jordan not take any additional courses nor consider majoring in the domain, and three representing maximum recommendations such that Jordan should continue to take classes in the domain in high school and college, as well as consider majoring in the domain.[6]

Results and Discussion

Are interest-value attributions sensitive to target gender and domain?

Aim 1 focused on whether participants' use of attributions for motivation problems was sensitive to target gender and academic domain. Thus, we conducted a 2(domain: history vs. physics) x 2(target gender: man or woman) between-subjects ANOVA. We controlled for the number of courses participants took in history and physics. As mentioned in the Methods, we

[6] We chose to treat this as an interval scale although participants could have responded "no" to a lower-level recommendation (e.g., high school coursework), yet "yes" to an upper-level recommendation (e.g., majoring in the domain). This was a relatively rare occurrence. Of the 273 participants who said Jordan should consider taking additional classes in college, 29 said no to taking additional high school classes. This may reflect an understanding of less possibility for additional advanced coursework in high school settings, which is not true in college coursework. However, for the 77 participants who said Jordan should consider majoring in the domain, 7 said no to taking additional classes in high school, and 1 said no to taking additional classes in college.

sampled across the level at which attributions were made including both situational attributions based on the nature of the project to more globalized attributions about the domain or person. Because the items differentiating by level did not emerge as distinct factors in factor analyses (see SOM), for the main analyses we collapsed across attribution level. Follow-up analyses examined attributions taking level into account, and are reported in footnotes and SOM.

There were no significant main effects of target gender, $F(1, 568)=.004$, $p=.951$, $\eta_p^2<.001$, or domain, $F(1, 568)=.14$, $p=.705$, $\eta_p^2<.001$. There was no significant interaction between target gender and domain, $F(1, 568)=.13$, $p=.718$, $\eta_p^2<.001$. Thus, contrary to expectations, attributions to interest-value were not used more or less as a function of the contextual cues about student gender and domain in which the student was struggling in, at least when collapsing across level.[7] Participant gender also did not relate to the extent to which participants made attributions to interest-value (as a main effect or interactively), *p's* > .064.

Do interest-value attributions have consequences for peer recommendations?

To determine whether the pattern from Study 1—showing students' weighed interest-value as a factor in general academic decisions—was replicated, we examined whether, supporting Aim 2, attributions to a lack of interest-value were associated with peer recommendations about taking additional classes and majoring in the field. We conducted a hierarchical linear regression with two steps, with academic recommendations as our dependent

[7]When distinguishing between attribution level (global vs situational) as a within-subjects variable, there was a significant three-way interaction between target, domain, and attribution level indicating contextual effects on interest-value attributions. This effect is reported further in the SOM, and indicates that there was a larger discrepancy between global and situational interest-value attributions when the target student was a woman having a problem with a physics assignment, and a smaller but still significant difference for women in history, men in history, and men in physics. Thus, while people overall seemed to endorse global more than situational interest-value attributions, this difference was largest for attributions about a woman in Physics.

variable. Descriptive statistics and zero-order correlations for all primary variables are in Table 1.

Table 1

Descriptive statistics and correlations between all study variables in Study 2a (lower diagonal) and Study 2b (upper diagonal).

	S2a Mean *(SD)*	1.	2.	3.	4.	5.	6.	S2b Mean *(SD)*
1. Interest-value	3.44 (1.10)	—	.43***	.26***	-.04	-.03	-.50***	3.61 (1.16)
2. Efficacy	2.33 (1.13)	.37***	—	.11*	-.07	.03	-.12**	2.32 (0.85)
3. Effort	4.79 (1.34)	.11**	.11**	—	.02	-.005	-.17***	4.77 (1.28)
4. Num. history classes	4.32 (0.83)	-.05	-.02	-.04	—	.06	.13**	4.29 (0.88)
5. Num. physics classes	1.83 (0.85)	-.03	-.04	.05	-.02	—	.07	1.80 (.84)
6. Recommendations	1.34 (0.93)	-.23***	-.11**	-.10*	.05	.01	—	4.80 (3.83)

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

In the first step, we included the following predictors: interest-value attributions, efficacy attributions, and effort attributions. All attributions were mean-centered. We also controlled for participants' previous course experience in each domain by entering the number of physics and history courses participants reported having taken. As shown in Table 2, there was a significant, negative association between interest-value attributions and recommendations to continue in the

field, even when controlling for attributions to efficacy and effort. When participants more strongly attributed the motivation problem to issues of interest-value, they were less likely to recommend Jordan continue in the domain. When disaggregating by attribution level, this pattern was driven by global interest-value attributions (see SOM, Table S5).

We further tested whether our experimental manipulations explained additional variance in academic recommendations by adding our experimental conditions (target gender and domain) and the interactions between these two variables in step two. The addition of these variables did not explain significant additional variance in peer recommendations, ΔR^2=.01, $\Delta F(3, 565)$=2.11, p = .098. There was a significant effect of target domain, such that people tended to be more likely to recommend continuing in history domains relative to physics domains. There was no significant effect of target gender, nor an interactive effect between target gender and domain. Importantly, interest-value attributions remained a significant predictor of recommendations, controlling for experimental conditions.[8]

Table 2

Study 2a regressions testing the associations between attributions and academic recommendations

	Step 1			Step 2		
	b (SE)	ß	*p*	*b* (SE)	ß	*p*
History courses	.04 (.04)	.04	.370	.03 (.04)	.03	.452
Physics courses	.005 (.04)	.005	.904	-.001 (.04)	-.001	.983
Efficacy	-.02 (.04)	-.03	.520	-.01 (.04)	-.01	.735

[8]We also examined effects across the three education stages (high school, college, major) separately, and the main effect of interest-value attributions on peer recommendations held across all three stages. However, the significant main effect of domain (which held for the high school and college recommendations) reversed for the major as participants were more likely to recommend continuing in the major when the student was struggling in physics (compared to history); however, this effect was conditional upon a significant interaction between domain and gender. Overall, it was apparent that the association between interest-value attributions and peer recommendations holds across both immediate and distal academic recommendations.

Effort	-.05 (.03)	-.07	.088	-.05 (.03)	-.07	.107
Interest-value	-.07 (.04)	-.21	<.001	-.18 (.04)	-.21	< .001
Target gender				.02 (.04)	.02	.614
Domain				-.08 (.04)	-.09	.031
Target gender x Domain				-.05 (.04)	-.05	.224
Model Statistics	$F(8, 551) = 4.99$, $p < .001$, $R^2 = .07$			$F(11, 548) = 4.12$, $p < .001$, $R^2 = .08$		

Note. Target gender (-1=man; 1=woman) and domain (-1=history; 1=physics) were effect coded.

STUDY 2B

Collapsing across attribution level, Study 2a found no evidence that interest-value attributions were impacted by the category cues of academic domain and target gender (Aim 1). However, when attribution level was taken into consideration there was some evidence for category-based expectations on endorsement of global interest-value attributions relative to situational interest-value attributions. Supporting Aim 2, participants who attributed a target's motivational struggle to a lack of interest-value in Study 2a were less likely to recommend future participation in the field (e.g., taking additional classes or considering a major in that domain). Given the link between attributions to interest-value and peer recommendations, and the mixed findings regarding category cues, Study 2b expanded on these aims to further examine the role of target-based information and individualizing information in the patterns of attributions used to explain motivation problems.

In Study 2b, we examined attributions while holding constant both target gender (high school girl) and, to account for potential gender performance stereotypes, baseline performance (GPA). We manipulated prior interest-value by providing information about the student's ostensible participation in a domain-specific event geared toward women. We reasoned that

providing cues about a female student's prior interest (i.e., that the student participated in a gender-based Physics/History program) might signal she has pre-existing interest in the field, and thus decrease the extent to which people attribute her problems to interest-value.

The presence of initiatives and programs geared towards increasing women's participation, interest, and belonging in STEM has grown exponentially (e.g., science enrichment programs, Girls who Code; Olson & Riordan, 2012). These programs are particularly effective at increasing positive perceptions toward science for women and other underrepresented students (e.g., Markowitz, 2004; Tyler-Wood et al., 2012). Ostensibly, participation in these programs can signal to others that students are interested in and value specific fields. However, past research also demonstrates diversity initiatives and programs can be undermined by perceptions and reactions toward these programs, producing unintended consequences (Cundiff et al., 2018; Danbold & Huo, 2017). In the context of peer recommendations, it is equally plausible these programs could suggest to students not that their peer had pre-existing interest, but, instead, that women's interest in certain fields needs to be increased through specified programs (i.e., reinforcing category-based beliefs that women's interest-value was originally lacking in this domain). Thus, it was possible that such an individualizing cue could result in greater attributions to interest-value in domains related to interest stereotypes. Study 2b explored these competing possibilities, expanding on our understanding of the role of category cues and individualizing information in attributions.

Methods

Pre-Registration

We pre-registered Study 2b measures and analyses. The pre-registration outlines three primary measures: attributions, course and major recommendations, and recommendations for

self-regulatory strategies. In this study, we focus on research questions related to attributions and course and major recommendations (1-2b in the pre-registration). The additional research questions regarding recommendations for self-regulatory strategies (labeled 2c in the pre-registration) are beyond the scope of the current work.

There were three deviations from our initial pre-registration. First, we submitted a formal revision in the middle of data collection to increase our sample size goal for Study 2b from 400 to 525 participants. This change was implemented to achieve gender parity in our sample and in response to new information from a revised power analysis (see OSF for time stamped pre-registration update). Second, for interpretability, we combined recommendations across each educational level rather than analyzing them separately. The patterns were largely the same when disaggregating this variable, and deviations are reported in footnotes. Third, as mentioned previously, we combined our items assessing interest and value. We report results disaggregating interest and value in the SOM, but caution that this does not suggest participants distinguish these two factors in everyday reasoning about motivation. Indeed, whether or when people distinguish between interest and value in these attributional inferences remains an open empirical question. Relatedly, our pre-registered analytic plan also specified we would distinguish between a globality component of attributions when examining the impact of experimental condition (Aim 1). As noted for Study 2a, we collapsed across level for the primary analyses because some items were ambiguous and the PCAs did not indicate participants differentiated between attribution level. We report brief summaries broken down by level in the main text, with further explanation in the SOM.

Participants

We pre-registered that we would recruit 525 participants, approximately evenly distributed between men and women from two public state universities. As in Study 2a, we only included participants from introductory psychology courses for whom the peer advising paradigm was most relevant. Students were awarded course credit for their participation. Of the initially recruited 528 participants, 13 did not consent to have their data used and one participant was under the age of 18 and thus had their data excluded. Thirty-three participants did not complete the full study and were also excluded from analyses.

Four hundred and eighty-one participants comprised the final sample (294 women, 184 men, 2 non-binary, and 1 decline to answer). As in Study 2a, we re-calculated power for this final sample size using Superpower, focusing on the pre-registered three-way interaction in the mixed-model ANOVA comparing interest-cue, domain, and attribution level, which was our smallest effect size of interest. There was approximately 87% power to detect a three-way interaction effect of $\eta_p^2 = .02$.

Most students were in their first or second year of college (n = 457). Participants were asked to select their racial/ethnic background(s) and could select one or more options. The sample was predominately White (n = 326), Asian (n = 94), and Latinx (n = 88), with fewer participants who were Black (n = 28), American Indian/Alaska (n = 14), Pacific Islander/Native Hawaiian (n = 11), or other (n = 12). Five participants declined to report their race/ethnicity. Participants ranged in age from 18 to 43 (M_{age} = 19.25, SD_{age} = 2.42). Most participants had taken 1(n = 219) or 0 (n = 190) physics classes and 3 or more history classes (n = 395) in high school and college.

Procedures

We randomly assigned participants to one of four conditions in a 2 (domain: physics v. history) x 2 (interest cue: absent v. present) design. As in Study 2a, each condition included a student profile describing how Jordan, the target student, was having trouble getting started on the final project for a class and had tried to work on it but ended up getting distracted by other things such as texting and watching YouTube. However, we adjusted the Study 2a experimental materials in three ways. First, only female targets were used in the present study. Second, we used only one of the female photos from Study 2a, given that there were no differences by target photo in Study 2a. Third, we added additional background information about the target student, "Jordan," to disguise our focus on the interest cue. For all conditions, we added overall GPA that put Jordan at the average level of students who were admitted to the two universities used for recruitment (as reported by university webpages). This information was added to reduce ambiguity that the target would meet the standards to attend college, while not addressing performance in the particular domain. More importantly, we also added the category of "Extracurricular Activities" ostensibly reported by the target. In this list we embedded the manipulation of the cue about the target's prior interest and, for both conditions, listed Jordan as participating in soccer and being on the student newspaper. In the condition with the interest cue, we included a statement about the student participating in a "Women Becoming [Physicists/Historians] Summer Event" (see OSF page for example student profiles).

After viewing the student profile, participants completed the "Advisor Checklist", attribution measures, made recommendations to the student concerning academic decisions (e.g., coursework, majors), and completed several individual difference (e.g., beliefs about interest as malleable, personality measures, and academic motivation measures) and demographic measures.

Measures

Attributions

As mentioned in the pre-registration document, we were especially interested in examining attributions to interest-value, efficacy (labeled self-efficacy in the pre-registration), and effort (labeled self-control in the pre-registration). However, we also pre-registered and measured other attribution types (e.g., support, cost). Because these measures do not pertain to the present research questions and were pre-registered as exploratory comparisons, we do not report or discuss them further here. Like Study 2a, we also sampled across attribution levels (i.e., some attribution items were more global, while others were more situational).

Interest-value attributions. In Study 2b, we refined our measure of interest-value attributions to include additional items. Nine items measured interest-value attributions: The extent to which participants viewed Jordan's problem as stemming from 1) Jordan not finding the project fun, 2) the project not being interesting to Jordan, 3) the project being pointless, and 4) the project being irrelevant to real life, 5) Jordan not being a [history/physics] person, 6) Jordan not being interested in [history/physics], 7) [history/physics] assignments being boring, 8) Jordan not caring about [history/physics] classes, and 9) [history/physics] being too removed from everyday life (α = .87; ω=.87).

Efficacy attributions. Four items measured attributions to efficacy: The extent to which participants viewed the problem as stemming from 1) the project being too difficult, 2) the project being too easy, 3) Jordan lacking ability and 4) [History/Physics] assignments just being too hard (α = .61; ω=.66).

Effort attributions. Four items measured effort attributions: The extent to which participants viewed the problem as stemming from 1) Jordan not trying hard enough on the

project and 2) Jordan not putting in enough effort on the project, 3) Jordan lacking self-discipline and 4) Jordan lacking self-control (α = .81; ω=.78).

Peers' Academic Recommendations

As in Study 2a, we examined participants' recommendations for future academic decisions across three educational stages: taking classes in high school, taking classes in college, and majoring in the domain in college. In Study 2b, however, we revised our academic recommendation measure to capture a greater range of potential variation in these recommendations. For each educational stage, participants were asked whether they would recommend the target continue using a yes/no response scale (e.g., "Do you think Jordan should continue to take history classes in high school? [Y/N]"). If the participant selected no, this was coded as a "0" for recommendations at that level. If the participant selected yes, they were then asked about the strength of their recommendation (e.g., "How strongly would you recommend Jordan continue to take history classes in high school?") on a scale from 1 (*Slightly*) to 5 (*Very Strongly*).

Although we pre-registered examining these three stages separately, the patterns were the same with few exceptions (see Footnote 10). We thus combined these by summing the three academic recommendation items into one overall recommendation score. Overall recommendations ranged from 0 (*no recommendation to engage in the field in any context*) to 15 (*strongly recommended engagement in the field across all three contexts*).[9] The average recommendation was 4.80 out of 15 (*SD* = 3.84).

[9]Excluding participants who recommended that a student major in the domain, but not take any college courses and/or high school courses in the domain (*n* = 5), and who said they should continue in college coursework but not in high school (*n* = 22), did not change Study 2b results.

General major recommendations (i.e., extending beyond the specific domains of physics/history) were assessed by asking participants how strongly they recommend Jordan consider several majors from 1 (*Not at all strongly*) to 5 (*Very Strongly*). Options for majors were selected and adapted from the majors offered at data collection sites and mapped onto the careers in Diekman et al. (2010). Participant responses to each major were averaged to create three composites (with four items per composite): recommendations for STEM majors (engineering, computer sciences, sciences, mines & earth sciences; α = .86; ω = .86), male-stereotyped non-STEM majors (business, medicine, law, architecture and planning; α = .70; ω = .70), and female-stereotyped majors (education, health, social and behavioral sciences, humanities; α = .58; ω = .57).

Results and Discussion

Are interest-value attributions sensitive to cues about the domain and target's interest?

Our primary focus in Study 2b was to test whether attributions to interest-value differed with the provision of a cue about the target's prior interest in the domain. We tested the impact of the cue across both history and physics domains. We were especially interested in investigating whether the individuating information might counter category-based expectations about women's interest in physics. That is, we expanded on Aim 1 by investigating the role of individuating information in this attribution process, and testing whether we found the same pattern as in Study 2a: that interest-value attributions were not reliably impacted by domain.

We conducted a 2(domain: history vs. physics) x 2(interest cue: present vs. absent) x 2(participant gender: man or woman) between-subjects ANOVA. We also controlled for the effects of prior history coursework and prior physics coursework. There was a significant main effect of prior interest cue, $F(1, 466)=28.53$, $p<.001$, $\eta_p^2=.06$ such that, as expected, the cue

about prior interest lowered attributions to interest-value. Participants were less likely to attribute Jordan's problem to a lack of interest-value when the prior interest cue was present compared to absent, mean difference = .56, 95%CI_{Mdiff} [.36, .77], p<.001. The main effect of domain was also significant, $F(1, 466)=7.07$, p=.008, η_p^2=.01. Inconsistent with Study 2a, interest-value attributions were stronger for history relative to physics, mean difference = .28, 95%CI_{Mdiff} [.07, .49], p=.008. There was no significant main effect of participant gender, $F(1, 466)=0.47$, p=.494, η_p^2=.001. There were also no significant interactions between domain, event, nor participant gender.

When disaggregating across global vs. situational attribution levels (e.g., "Jordan is not interested in Physics" vs. "Jordan is not interested in this assignment")—we found evidence that participant gender, academic domain, and attribution level moderated the impact of the interest cue on endorsement of interest-value attributions. Specifically, for male participants, the interest cue was related to lower global interest-value attributions when Jordan was struggling in physics but did not impact situational attributions or attributions when Jordan was struggling in history. Female participants, in contrast, showed lower attributions to interest-value at both the situational and global levels when the cue was present vs. absent across both domains (see SOM Figure S3). This pattern of results suggests that domain may be differentially impactful on the use of interest-value attributions as a function of participant gender, but only when differentiating across level (i.e., for global attributions). These results may also indicate differential effects of interest cues when making recommendations to same-gender vs. opposite-gender peers, regardless of attribution level. However, these results should be interpreted with caution given the preliminary nature of this level distinction, and some mixed results between Study 2a and 2b.

In sum, when reasoning about the causes of others' motivational struggles, participants attended to information about prior interests when making attributions to interest-value. Participants also differentially made these attributions as a function of the domain in which the study was struggling in: endorsement of interest-value attributions was higher for history relative to physics. This pattern was inconsistent with Study 2a, which found no domain effect. However, the larger sample size in Study 2b and improvement on our interest-value measures could explain our ability to detect an effect in this study. Although we expected both domains to be seen as motivationally challenging due to interest-value, interest-value may be seen as even more relevant to motivation problems in history relative to physics (at least in terms of how they were operationalized in our study). However, more empirical evidence to fully understand domain differences is needed.

Do interest-value attributions have consequences for peer recommendations?

Domain-Specific Recommendations

We next examined support for Aim 2 in the context of academic recommendations related to the domain in which the student was struggling: that is, whether attributions to a lack of interest-value were related to recommendations in physics/history, and whether they emerged as a distinct factor relative to attributions to efficacy and effort. To examine the association between interest-value attributions and peer recommendations, we conducted a hierarchical linear regression with academic recommendations as our dependent variable. Consistent with Study 2a, we used a two-step approach.

In the first step we entered mean-centered efficacy, effort, and interest-value attributions. We additionally controlled for participants' past enrollment in physics and history courses. As shown in Table 3, we replicated the finding from Study 2a showing a significant, negative

association between interest-value attributions and recommendations to consider future classes or major in the field, which emerged even when controlling for attributions to effort, attributions to efficacy, and participants' past course experiences. When participants more strongly attributed Jordan's motivation problem to issues of interest-value, they were less likely to recommend she engage in that academic domain. When disaggregating by level, this pattern was driven by global interest-value attributions (see SOM Table S8).

In the second step, we entered our experimental conditions, participant gender, and interactions between experimental conditions and participant gender. This model explained significantly more variance in recommendations than the attributions only model, ΔR^2=.05, $\Delta F(7, 463)$=5.17, $p < .001$. But, importantly, the effect of interest-value attributions remained significant even after controlling for these factors. The prior interest cue impacted recommendations such that people tended to make higher recommendations to engage in that domain when an interest cue was present, relative to when it was absent. Furthermore, there was an effect of participant gender such that women tended to make lower recommendations than men.[10] In sum, we again provide evidence suggesting that participants' inferences about the extent to which peer motivational problems arise from a lack of interest-value relate to the recommendations they make for students' future decisions about participating in classwork or majoring in a field.

[10]We also examined effects across the three stages (high school, college, major) separately, and the main effect of interest-value attributions on peer recommendations held across all three stages. There were three differences in the effects of other variables: 1) efficacy attributions and participant gender were only significant predictors of recommendations for college coursework, 2) the main effect of interest cue was only a marginally significant predictor of recommendations for high school coursework ($p = .064$); and 3) there were interactions between domain and interest cue, and participant gender and interest cue, on major recommendations. Overall, each level's results made clear the role that interest-value attributions play in peer recommendations.

Table 3

Study 2b regressions testing the associations between attributions and academic recommendations.

	Model 1			Model 2		
	b (SE)	ß	*p*	*b* (SE)	ß	*p*
History courses	.51 (.17)	.12	.003	.47 (.17)	.11	.005
Physics courses	.21 (.18)	.05	.241	.16 (.18)	.03	.365
Efficacy	.53 (.20)	.12	.007	.42 (.19)	.09	.030
Effort	-.13 (.12)	-.04	.268	-.20 (.12)	-.07	.089
Interest-value	-1.76 (.15)	-.53	<.001	-1.53 (.15)	-.46	<.001
Domain	---	---	---	.13 (.15)	.03	.401
Prior interest cue	---	---	---	.79 (.15)	.21	<.001
Participant gender	---	---	---	-.31 (.15)	-.08	.043
Domain x Interest cue	---	---	---	.23 (.15)	.06	.120
Participant gender x Domain	---	---	---	-.20 (.15)	-.05	.187
Participant gender x Interest cue	---	---	---	-.10 (.15)	-.03	.487
Participant gender x Domain x Interest cue	---	---	---	.08 (.15)	.02	.606
Model Statistics	$F(5, 470) = 36.79$, $p < .001$, $R^2 = .280$			$F(12, 463) = 19.25$, $p < .001$, $R^2 = .33$		

Note. Domain, prior interest cue, and participant gender were effect coded (-1/1) such that -1 corresponds to history, no interest cue, and women, respectively. The target student was female for all conditions in Study 2b.

General Major Recommendations

We also pre-registered a measure of general major recommendations to identify whether the association between interest-value attributions and peer recommendations was isolated to field-specific decisions (i.e. about history/physics) or generalized to recommendations about related academic domains (e.g., science in general). We used the same hierarchical regression

approach as for domain-specific academic recommendation with general major recommendations (STEM majors, male-stereotyped non-STEM majors, and female-stereotyped majors).

Greater attributions to interest-value were related to lower recommendations for STEM majors and female-stereotyped majors, but the latter effect did not hold when controlling for experimental manipulations, participant gender, and the interactions between them. As shown in Table 4, when participants were making recommendations to major in STEM fields, there was a significant interaction between domain and interest cue such that, when they were exposed to information about a student struggling in history, the interest cue had a negative impact on their STEM major recommendations (b = -.12, SE = .06, p = .048). In contrast, when participants were exposed to information about a student struggling in physics, seeing the corresponding interest cue had a *positive* impact on their STEM major recommendations (b = .26, SE = .06, p < .001). In other words, the interest cue appeared to buffer the extent to which a student's motivational struggle in physics reduced major recommendations for related, STEM fields. And, seeing a cue that signaled students' interest in history reduced recommendations to major in STEM. The reverse interaction pattern occurred for female-stereotyped major recommendations such that, when participants were exposed to a student struggling in physics, the interest cue had a negative impact on their recommendations for female-stereotyped majors (b = -.22, SE = .05, p < .001). When participants were exposed to a student struggling in history, the interest cue had no significant impact on their recommendations for female-stereotyped majors (b = .02, SE = .05, p =.709). These findings suggest that participant recommendations to women about majoring in female-stereotyped fields can be shifted by providing interest cues, but not for any male-dominated fields: the interest cue mattered most for a counterstereotypic field (i.e., physics), and

did not matter when the cue was about a field unrelated to stereotypes, but still relatively high in male representation (i.e., history). Overall, these analyses suggest that attributions about interest-value as a reason for struggling in one domain extend to recommendations for majoring in other STEM domains, and that individualizing information about women's interest can shift recommendations for both STEM and female-stereotyped majors.

Table 4

Study 2b regressions testing the associations between attributions and general major recommendations, and interactions between experimental conditions

	STEM Majors			Male-stereotyped non-STEM Majors			Female-stereotyped Majors		
	b (SE)	ß	*p*	*b* (SE)	ß	*p*	*b* (SE)	ß	*p*
History courses	.10 (.05)	.09	**.038**	.02 (.04)	.02	.662	.04 (.04)	.05	.289
Physics courses	.06 (.05)	.05	.241	.03 (.04)	.03	.480	-.04 (.04)	-.05	.271
Efficacy	.12 (.05)	.11	**.030**	.11 (.05)	.12	**.020**	.01 (.04)	.01	.780
Effort	-.04 (.03)	-.06	.214	-.04 (.03)	-.06	.183	.03 (.03)	.05	.296
Interest-Value	-.13 (.04)	-.16	**.003**	.02 (.04)	.04	.466	.05 (.03)	.09	.103
Domain	-.01 (.04)	-.01	.831	.005 (.04)	.006	.905	.04 (.03)	.06	.228
Prior interest cue	.07 (.04)	.07	.120	-.03 (.04)	-.04	.393	-.10 (.03)	-.14	**.004**
Participant gender	-.12 (.04)	-.13	**.004**	-.09 (.04)	-.11	**.018**	-.02 (.03)	-.03	.463
Domain x cue	.19 (.04)	.20	**<.001**	-.06 (04)	-.07	.117	-.12 (.03)	-.16	**<.001**
Participant gender x Domain	-.04 (.04)	-.05	.300	.01 (.04)	.02	.731	.02 (.03)	.03	.469
Participant gender x cue	.002 (.04)	.002	.969	.03 (.04)	.04	.417	.05 (.03)	.07	.111
Participant gender x Domain x cue	.04 (.04)	.05	.298	.01 (.04)	.01	.762	-.02 (.03)	-.03	.467
Model Statistics	$F(12, 463) = 4.17$, $p < .001$, $R^2 = .12$			$F(12, 463) = 1.65$, $p = .076$, $R^2 = .04$			$F(12, 463) = 3.08$, $p < .001$, $R^2 = .07$		

STUDY 3

Studies 1-2b examined students' considerations of interest-value for others' academic decisions and motivational struggles. However, these studies involved judgments about generic situations, for the average student, and in a hypothetical advising context. To examine the importance of interest-value in reasoning about one's own academic struggles in an actual class setting, we used data collected as part of a longitudinal project (the Online Evaluation Project 2020). This project was commissioned by college administration at a large public university in the United States to evaluate student motivation problems as a function of online learning during the COVID-19 pandemic. The survey tracked students' motivation challenges over the course of the semester, as well as students' final grades and other academic outcomes.

In Study 3 we focused on students who had experienced motivational problems in the final few weeks of the course to compare their use of explanations related to efficacy, effort and interest-value. We also examined whether the degree to which they attributed the problems to these causes related to their reported likelihood of taking additional classes in the field in the future and their final grade in the course.

In this study, we also explored distinctions of attribution level. We mention supplemental results across attribution levels in Studies 2a-2b, but some items in those studies were open to interpretation along the dimension of globality. In Study 3, questions about potential causes of motivation problems better distinguished between attributions made to global vs. situational interest-value by asking questions about specific assignment and course (situational interest-value attributions) and the field in general (global interest-value attributions).

Methods

Participants

All participants were enrolled in classes in the College of Social and Behavioral Sciences at the University of Utah during Fall of 2020. Instructors volunteered to disseminate the survey in their online course, titled the Online Evaluation Project 2020. Surveys were disseminated at four points, evenly distributed throughout the semester. Student participation was voluntary, and instructors did not know which students participated or see any responses. Students who submitted responses to the surveys were entered into a gift card raffle ($50 for any survey response, and $100 gift card raffle for those who completed at least three surveys). Students could participate in any timepoint regardless of prior participation.

For the current research, we included students from the deidentified dataset who completed the survey at the end of the semester because this time point included both primary measures (the attribution items and students' reported likelihood of taking additional classes in the field). Three-hundred and thirty-seven undergraduates participated in the final survey. From this sample, we included the students who reported experiencing problems with motivation in the prior section of the course, defined as the time between the last survey and the current survey (approximately final 3 weeks of the course), and responded to at least one or more attribution items per attribution type. Sixteen participants were excluded due to not reporting problems with motivation and 29 participants were excluded for failing to respond to one or more attribution types. This resulted in a final sample of 292 participants.

Of the 292 students in our final study sample, 176 identified as women, 65 as men, 6 as non-binary or gender fluid, and 45 did not report their gender. The sample was predominately White (n = 204), Asian (n = 31), and Latine (n = 27), with fewer participants who were Black (n = 8), Pacific Islander/Native Hawaiian (n = 4), American Indian/Alaska (n = 2), or other (n = 1). Fifteen participants did not report their race/ethnicity. Eighty-six participants were in their first

year of college, 70 were in their second year of college, 47 were in their third year of college, and 44 were in their fourth year of college; the remaining 45 participants did not provide their student status. The mean age of the sample was 21.53 (*SD* = 6.47). The mean socioeconomic status as measured by the MacArthur 10-point scale of Subjective Social Status (Adler et al., 2000) was slightly above the midpoint (*M* = 5.23, *SD* = 1.49). Two-hundred and seventy students from the last time point had also participated in the Time 1 survey.

Procedures and Measures

For the Online Evaluation Project 2020, students were asked to complete a survey at the beginning of the semester to assess backgrounds and expectations, and then take short surveys assessing current experiences and perceptions twice during and once at the end of the semester (four time points total). Each of the follow-up surveys asked about their experiences since the last survey and provided the date of the previous survey for reference.

The present study focused on the survey distributed at the end of the semester. This timepoint consisted of a survey distributed in the final three weeks of the academic calendar (i.e., two weeks prior to finals week). Students were asked to report on their experiences in the last section of the course (i.e., their experiences between the last survey and current survey, which represented a time period of about one month for most students) and included measures of students' perceived intensity and frequency of motivational difficulties, their attributions for their motivational difficulties, and their intention to take additional classes in the field. Survey measures for all four time points are available on OSF.

To measure perceived intensity of motivational difficulties, students were asked to rate how hard it had been to maintain their motivation to complete course assignments and requirements using a scale from 1 (*Not at all*) to 5 (*Very much*). If students indicated they

experienced trouble with motivation (i.e., a 2 or higher), they were asked to rate how frequently they experienced these motivational problems during this time period, using a scale from 1 (*Daily*) to 5 (*Once a month*). Frequency ratings were recoded after data collection so that higher scores reflected greater frequency of troubles with motivation. In our sample, students on average reported relatively high intensity (M = 3.44, SD = 1.09) and frequency (M = 3.56, SD = 1.15) of motivational problems during the last section of the course.

Following these two motivation problem ratings, participants who indicated they experienced trouble with motivation were asked to rate how much a series of possible causes explained their problem on a scale from 1 *(Not at all)* to 7 *(Very much)*. For the current study, we examined responses for eight attributions related to efficacy, effort, and interest-value with items reflecting situational and global level causes for each category. Other attributions, not analyzed in the current research, included attributions about the structure of the course (e.g., "The way the course is structured (e.g., online, in person or interactive video conferencing) made it difficult for me to keep on track"), lack of support (e.g., "I did not have enough support from the instructor, the TA, or university."), and personal health (e.g., "I have not been getting enough sleep").

Two items measured situational interest-value attributions for the motivation difficulties, expressed in terms of assignments in the last section of the course: 1) the assignments were not interesting and 2) the assignments were irrelevant (r = .61). Two items measured global interest-value attributions: 1) they [the respondent] are not interested in the field, and 2) they do not care about this field (r = .74). For efficacy attributions, one item measured causes at the situational level (the assignments are too difficult), and one item measured causes at the global level (they do not have the ability to do well in this field). Similarly, for the effort attributions, one item measured attributions at the situational level (they did not try hard enough), and one item

measured attributions at the global level (they lacked self-discipline). To measure intentions of taking future classes in the field, students were asked to consider their experiences in the course overall, and rate how much they agreed with the statement "I am likely to take additional classes in this field," using a scale from 1 *(Strongly disagree)* to 7 *(Strongly agree)*. Final letter grades were obtained from the course instructors after the end of the semester and converted to 4.0 GPA scores.

Results and Discussion

Relative Use of Interest-Value Attributions

We first tested, among students who experienced motivational problems in the final weeks of a course, the extent to which they attributed those problems to situational and global effort, efficacy, and interest-value. We conducted a 3 (attribution type: effort, efficacy, and interest-value) x 2 (level: situational and global) repeated measures ANOVA. Huynh Feldt corrections were used for violations of sphericity.

There was a significant main effect of attribution type, $F(1.65, 480.18) = 92.80$, $p < .001$, $\eta_p^2 = .24$, such that students used explanations of effort significantly more than of efficacy (mean difference = 1.09, 95%CI_{MDiff} [0.91, 1.27], $p < .001$) or interest-value (mean difference = 0.81, 95%CI_{MDiff} [0.63, 1.00], $p < .001$). Students also used explanations of interest-value significantly more than efficacy (mean difference = 0.27, 95%CI_{MDiff} [0.15, 0.39], $p < .001$). There was a significant main effect of attribution level, $F(1, 291) = 4.92$, $p = .027$, $\eta_P^2 < .02$, such that people endorsed situational attributions more than global attributions (mean difference = 0.10, 95%CI_{MDiff} [0.01, 0.19]).

These main effects were qualified by a significant interaction between attribution type and level, $F(1.84, 535.48) = 21.19$, $p < .001$, $\eta_p^2 = .07$. When comparing means by level within

each type of attribution, for both efficacy and interest-value attributions, students were more likely to attribute their problems to the assignments in that section of the course (situational level) than to the field in general (global level), (mean difference$_{efficacy}$ = 0.16, 95%CI$_{MDiff}$ [0.02, 0.31], p = .030; mean difference$_{interest\text{-}value}$ = 0.44, 95%CI$_{MDiff}$ [0.31, 0.58], p < .001). However, within effort attributions, students tended to endorse global-level explanations (lacking self-discipline) more than situational-level explanations, mean difference = 0.30, 95%CI$_{MDiff}$ [0.11, 0.49], p = .002. Table 5 depicts all mean differences.

Students' endorsement of interest-value attributions thus fell above those of efficacy, and below those of effort. Further, within categories of attribution types, students differentially emphasized level. We next examined whether these attributions were associated with students' intentions to take additional classes in the field and/or their course grade.

Table 5

Means, standard deviations, and correlations for all primary variables in Study 3.

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Situational effort	2.89	1.73	-								
2. Global effort	3.19	1.79	.56**	-							
3. Situational efficacy	2.01	1.24	.22**	.19**	-						
4. Global efficacy	1.86	1.28	.35**	.27**	.51**	-					
5. Situational interest-value	2.44	1.35	.38**	.27**	.45**	.50**	-				
6. Global interest-value	1.99	1.27	.31**	.12*	.36**	.50**	.60**	-			
7. Intentions to persist	5.52	1.78	-.14*	-.08	-.21**	-.29**	-.45**	-.57**	-		
8. Intensity of	3.44	1.09	.36**	.41**	.24**	.21**	.30**	.14*	-.09	-	

problem											
9. Frequency of problem	3.56	1.15	.32**	.40**	.15*	.19*	.23**	.10	-.05	.67**	-
10. Course grade	3.57	0.78	-.29**	-.23**	-.14*	-.21**	-.19*	-.10	-.20**	-.17*	-.11

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. *$p < .05$. **$p < .001$.

Consequences of interest-value attributions for academic decisions

To test Aim 2 and demonstrate the importance of interest-value attributions in a real-world context, we regressed intentions of taking future classes and course grade on effort, efficacy and interest-value attributions at both the situational and global levels. As shown in Table 6, participants' attributions to effort and efficacy at any level were not significantly related to their likelihood of taking future classes in the field. But, the degree to which participants attributed their motivational problems to a lack of interest-value at both the situational and global levels were significantly associated with lower intentions to participate in the field. We compared the slope for each level of interest-value attributions using a linear hypothesis test in the *psych* package in R, following recommendations in Shrout & Yip-Bannicq (2017) to test the difference between these coefficients. The effect of global interest-value attributions was significantly stronger than that of situational interest-value attributions, $p = .006$, suggesting that within interest-value attribution types, global interest-value attributions were weighed more heavily in decisions about future participation in the field. When predicting performance, attributions to effort were significantly, negatively related to course grades (i.e., students who reported their motivational problems as being due to effort had lower grades). Attributions to efficacy and interest-value were not significantly related to course grades.

We ran additional analyses to explore the extent to which these associations held when controlling for the reported intensity and frequency of these motivational problems, as well as

students' course grade for intentions to take future classes in the field. Neither intensity nor frequency of motivational problems were significantly related to intentions to take additional courses in the field, and there were no differences in the patterns of results when including intensity and frequency of the motivation problem in the model (see Table 6). As might be expected, course grade was positively associated with future course intentions, but the attribution results were unchanged when including course grade in the model.

Taken together, these results suggest that interest-value attributions, at least when made in the context of one's own motivational struggles, may be important for how one participates with the field in the future (i.e., intentions to take future classes), but are not necessarily related to performance in courses (i.e., final grade). Furthermore, intentions to take future classes in the field were not significantly related to how intense or frequent the motivation problems were, but rather to students' beliefs about their motivation problems as being due to interest-value. This demonstrates the unique potential for interest-value attributions to predict future participation with a field and topic. And, while interest-value attributions were overall related to lower intentions to take future courses regardless of the level at which they were made, the within-category emphasis of global or situational attributions to interest-value mattered for the strength of this association; global interest-value attributions were more strongly related to lower self-reported likelihood of taking future classes.

Table 6

Attributions for motivational struggles predicting performance and future course intentions

	Model 1			Model 2		
	b (SE)	ß	*p*	*b* (SE)	ß	*p*
Outcome: Performance (course grades)						
Situational effort	-.09 (.03)	-.19	.006	-.08 (.03)	-.18	.010

Global effort	-.03 (.03)	-.07	.259	-.03 (.03)	-.08	.272
Situational efficacy	-.03 (.04)	-.05	.446	-.02 (.04)	-.04	.573
Global efficacy	-.06 (.04)	-.10	.150	-.07 (.04)	-.11	.108
Situational interest-value	-.04 (.04)	-.07	.332	-.04 (.04)	-.08	.295
Global interest-value	.05 (.04)	.07	.301	.05 (.04)	.08	.248
Intensity of problem				-.03 (.03)	-.08	.296
Frequency of problem				-.06 (.05)	-.08	.288
Model Statistics	$F(6, 292) = 5.76$, $p < .001$, $R^2 = .10$			$F(8, 287) = 4.61$, $p < .001$, $R^2 = .11$		
Outcome: Future Course Intentions						
Situational effort	.08 (.06)	.08	.200	.11 (.06)	.10	.092
Global effort	-.03 (.06)	-.03	.656	-.02 (.06)	-.02	.791
Situational efficacy	.05 (.08)	.04	.510	.06 (.08)	.04	.453
Global efficacy	.02 (.08)	.01	.841	.04 (.08)	.03	.662
Situational interest-value	-.28 (.09)	-.21	.001	-.27 (.09)	-.20	.002
Global interest-value	-.70 (.09)	-.49	< .001	-.71 (.09)	-.50	< .001
Intensity of problem				-.02 (.11)	-.01	.841
Frequency of problem				.03 (.10)	.02	.744
Final course grade				.32 (.11)	.14	.005
Model Statistics	$F(6, 278) = 26.25$, $p < .001$, $R^2 = .36$			$F(9, 275) = 18.73$, $p < .001$, $R^2 = .38$		

General Discussion

Across four studies, we establish the validity of interest-value attributions and investigate antecedents and correlates of student beliefs about interest-value in academic contexts. The extent to which peers perceived the cause of a motivation problem as due to interest-value was sensitive to some features of the context, but not always in ways that aligned with gendered

stereotypes about interest in STEM, contrary to our expectations based on prior attribution research. However, there was evidence in Studies 2a-2b that category-level cues such as target gender and domain may impact the relative endorsement of global compared to situational interest-value attributions. Furthermore, we find evidence that when students attribute their own, or another student's, challenge with motivation to a lack of interest-value, they are less likely to consider or recommend future courses in the field.

Aim 1 sought to examine the conditions under which students make attributions to interest-value (right segment of Figure 1). Informed by social cognitive theory (differentiating category-based and target-based cues in social perception; Fiske et al., 1987), we expected that the attributions people make about others would align with gender stereotypes about STEM. We found limited evidence that interest-value attributions were made in ways that would be predicted by gendered stereotypes in academic fields. In Study 2a, when considering overall attributions to interest-value (i.e., averaged across level), neither target gender nor academic domain impacted endorsement of interest-value attributions. This pattern only emerged in subsequent analyses that differentiated attributions by level. And, in Study 2b, we did not see evidence that peers were more likely to attribute a girl's motivation problem to interest-value when the problem was in a STEM field. Rather, our results in Study 2b show the inverse pattern: the main effect of domain showed participants tended to make interest-value attributions for girls in history more often than girls in physics. The expected pattern only emerged for male participants when attribution level was taken into account. Overall, we did find evidence that individualizing target cues may influence interest-value attributions, and that the impact of these individualizing cues may be moderated by features of the context (and perhaps characteristics of the perceiver).

In Study 2b, one primary focus was to extend Aim 1 by testing whether a target-based cue would lower interest-value attributions. When an interest cue (operationalized as prior participation in a field-specific event) was provided, peers made lower interest-value attributions. That is, explicitly providing information about the female target's interest-value resulted in students being less likely to infer the specific motivation problem was due to lack of interest-value, and this was true for both domains. Although we expected that the individualizing information could be especially effective for the physics domain because participants would have lower expectations for a woman's interest in that domain, there was no significant interaction between domain and interest cue unless considering participant gender and attribution level. Thus, our findings may suggest that individualizing information can, in general, lower explanations to interest-value across domains.

With respect to Aim 2, findings consistently supported the role of interest-value beliefs in academic recommendations and intentions. Studies 2a-2b show that these attributions are associated with recommendations about whether a peer should participate in a field. Specifically, when making recommendations to a hypothetical student, attributions to a lack of interest-value were associated with lower recommendations that the student consider taking classes or majoring in the field, above and beyond attributions to a lack of effort or efficacy. Thus, when motivational challenges were perceived to stem from a student being uninterested, peers were less likely to recommend they engage in further participation in that field. This pattern provides validity for the consideration of interest-value attributions. It also delineates the social consequences of such a consideration, specifically how making attributions about a single instance of a motivation problem to a lack of interest-value can impact peers' recommendations for a student's academic path. Study 3 then demonstrated that the extent to which students in an

actual college course attributed their *own* motivation problems to interest-value was related to their intentions to take future courses in the field. Further, this relationship was significantly stronger for interest-value attributions made at the global relative to the situational level, consistent with supplementary results in Study 2a and Study 2b for peer attributions.

While the current work was focused on establishing the importance of beliefs about interest-value as explanations for motivational problems and tested whether category and target information moved interest-value attributions around, there were several interesting results that emerged when exploring how category and target information may moderate the link between interest-value attributions and academic recommendations (see SOM section 4). First, integrating Aims 1 and 2, a potentially informative pattern emerged in Study 2b. When there was an interest cue, participants were less likely to say the problem was due to Jordan's interest-value. But, to the extent that they did make interest-value attributions, it was much worse for their recommendations than if no interest cue was present in the first place. Said another way, when the interest cue was both present and absent, higher interest-value attributions were associated with lower recommendations to continue in the field. However, the strength of the association was stronger when the interest cue was present compared to when the interest cue was absent. Thus, when seeing a female peer struggle motivationally and asking why, students leaned away from explanations of interest-value when there was a cue about prior interest. But, those who tended to believe the problem stemmed from a lack of interest-value despite the presence of an interest cue were less likely to recommended the student consider that academic path. To the extent that interest-value attributions were “sticky” and continued to be used as explanations for others’ problems, they were related to lower recommendations that the student take additional classes or major in a field. This finding may highlight one potentially harmful backfiring effect

of having prior interest information. That is, it may be particularly damaging when a motivation problem is more strongly attributed to interest-value, despite receiving prior information to the contrary.

Broadening from our specific aims, these studies extend growing work on metamotivation. Across a range of domains, including at school, people reflect on and regulate their own motivational states with the knowledge that there are tradeoffs in directing motivation to a goal (for a review see Miele, Scholer, et al., 2020). We show that beliefs about interest-value play an important role in how students reason about academic decisions and whether to participate in or continue in certain academic domains. And, while we found mixed evidence that these attributions were contextually sensitive (e.g., lack of domain effects in Study 2a, higher interest-value attributions for history relative to physics in Study 2b), they did differ as a function of individualizing and person characteristics (e.g., interest cue in Study 2b). This aligns with past work (Thoman et al., 2019) showing that students hold different beliefs about the malleability of interest in different domains, but the pattern of these beliefs are not necessarily the same across students. It would thus be worthwhile for future work to pursue when and how people weigh different category and individuating factors when making attributions to interest-value.

We also extend work on people's reasoning about their own motivation to understanding how people think about *others'* motivational states. There are several advantages to this extension. By extending the link between interest-value attributions and beliefs about academic decisions to peer recommendations in Studies 2a-2b, we provide support for work showing students' educational paths are in part socially driven. Decisions that students make are constrained within the signals conveyed by peers and teachers—for example, stereotypical cues in office environments decrease women's participation in STEM (Cheryan et al., 2009),

interpersonal cues that a student will be supported by faculty impacts interest in joining a lab (Norman et al. 2022), and social interactions change the experience of interest (Thoman et al., 2007). The current work shows that, when a peer experiences motivational challenges, they may receive lower recommendations to participate in the field when people believe the challenge is due to a lack of interest-value.

Limitations

In examining how students reason about the role of interest-value in motivational struggles, and with what implications for academic decisions, we demonstrate how complex sources of information inform students' beliefs about why a student is struggling and whether they may overcome that struggle. Given the multiple sources of information that likely inform peer reactions, there were a number of limiting factors in the current study that we believe represent promising avenues to consider in future research.

As a primary limitation, we focused solely on gender and domain as category-based cues, and gender stereotypes about STEM as potential pre-existing expectations. In doing so, we chose to present only high school targets who were White in Studies 2a-2b, and girls in Study 2b. While informed by current STEM demographics (Fry et al., 2021), this methodological constraint limits the generalizability of our work and perpetuates the lack of representation in STEM beyond cisgender considerations (e.g., racial and LGBTQ+ disparities in STEM fields; see Freeman, 2020). Similarly, because we focused only on targets who were girls in Study 2b, we do not know whether people would weigh individuating information about interest-value in the same way for high school students of other genders.

Our findings also provided some evidence for participant gender effects. In Study 2a, we conducted exploratory moderation by participant gender; in Study 2b we pre-registered the

inclusion of participant gender in our analyses. In the future, it is important to consider how other participant characteristics may factor into these patterns, including ingroup dynamics between perceiver and target. Our samples were primarily White, consistent with the target's race, and comprised almost exclusively of first and second year college students. It is reasonable to expect there may be some differences in the structure, antecedents, and social consequences of interest-value attributions for others who drive students' academic choices, like advisors and instructors.

And, while we demonstrate that students' reasoning about motivation relates to their own intentions to take future classes in the field as well as their recommendations to peers about classes and majors, we were unable to explore potential category and target differences in how students reasoned about their own problems. We encourage further work that incorporates beliefs about interest-value in how people monitor and regulate metamotivational states. Despite not finding robust evidence for stereotypic patterns in Studies 2a-2b, it is possible that women in STEM are more likely to attribute their motivation challenges as due to a lack of interest-value compared to men, aligning with gender-based stereotypes about the field. This pattern could exacerbate misperceptions that gender disparity in STEM is driven by women being less interested in STEM fields (Cheryan et al., 2017). But, instead of lower initial interest, stereotypes about whether one *should* be interested, compounded with differential peer recommendations, may be driving factors in women's course of action following a motivation obstacle in STEM (cf. Master, 2021).

In terms of theoretical limitations, there are other attributional distinctions that are important to acknowledge and may be conflated within our studies. In some studies, we differentiated by the within-attribution component of globality but did not investigate other attributional components. Past work shows that we are most hurt when others make stable,

internal attributions for our failures (Hareli & Hess, 2008). And, prior work has criticized the conflation of internal vs. external causal attributions with other attribution distinctions such as intentionality (White, 1991). In Study 2b, we pre-registered distinguishing between global and situational explanations but our measurement was limited in several respects. Nonetheless, our supplementary analyses suggested that the components of attributions that vary within category types (e.g., whether the attribution reflects a more internal vs. external explanation, a globalized vs. temporary explanation, or is controllable vs. uncontrollable) could play a role in when they are endorsed. Additional research is needed to disentangle whether participants differentiate various within-category features of attributions, and if endorsement is different across these distinctions.

Thus, there is much to learn about when and why these attributions are sensitive to specific context and person variables. One possibility is that global level attributions are more sensitive to gendered stereotypes. Indeed, in Study 2b, we found some evidence that the impact of an interest cue on women's attributions to interest-value looked the same across domain and level (see Section 3 in SOM). Yet, the interest cue only reduced men's endorsement of global interest-value attributions in physics, not other conditions. Future research should expand on our findings by understanding relative within-category emphases of interest-value attributions. Future research may also benefit from increasing precision when measuring interest-value attributions, although differentiating internal vs. external components from situational vs. global may not be feasible, and additional consideration of measurement issues is needed. Being able to assess the tendency to attribute single instances of motivation to more globalized issues with interest-value could spur further work in this area, including potential links to STEM and connections between stereotypes judgments and attributions.

Relatedly, we elected to combine items assessing interest and value. Although there is theoretical precedent given the integrated nature of interest and value (e.g., Eccles & Wigfield, 2002), and this decision showed some empirical support in our data, it would be promising for future research to disaggregate the effects of interest attributions from those of value attributions. When separating these constructs in Study 2b, attributions to interest and value were both significantly related to lower recommendations for taking future classes and majoring in the field. However, we would caution against assuming the downstream effects of interest and value will always align. Notably, when considering the frequency of interest-value attributions, the main effects of domain and interest cue were both significant across interest and value as separate constructs. But patterns looked different for interest vs. value when attribution level was considered (see Table S12). Future work could attempt to delineate circumstances in which interest and value are separable, and/or experimentally vary whether motivational problems are due to interest or value (e.g., the target student saying they are having trouble staying motivated to work on the assignment because [they don't find physics fun vs. physics is irrelevant to everyday life]), then assess academic recommendations.

Finally, whether patterns of interest-value endorsement would generalize beyond physics to other STEM fields, and when thinking about performance rather than motivation, remain open questions. Differences across STEM fields, especially with respect to stereotypes, are potentially relevant given our theoretical rationale for stereotypes potentially driving these category-based differences. Future research can also compare attributions about physics to domains in which women are stereotyped to have higher interest (e.g., education), rather than the interest-neutral domain of history. This comparison may further disentangle when and why category vs. individual student information is relevant to these attributions. It is also unclear if interest-value

attributions are similarly related to recommendations in the context of performance-related failures. Based on past research indicating motivation-related concerns are used as attributions for performance, we predict that interest-value attributions would be relevant in this context. For example, if a student believes another student has failed an exam due to lack of interest in the topic area, it is possible that they will be less likely to recommend that student participate in the field. Future research should examine how students weigh motivational and performance-related academic challenges, and in what contexts interest-value attributions matter most for the recommendations they make to others.

Conclusion

Fluctuations in motivation, and how people explain these motivational struggles, can impact students' engagement in academic activities over time. We present evidence for the novel attribution of interest-value and demonstrate students' consideration of interest-value in academic decisions and recommendations to their peers. We tested several factors that may influence students use of interest-value attributions for peers' motivational struggles. We find evidence that these attributions can be influenced by some contextual cues such as academic domain and students' prior interest in the field. And, beliefs about interest-value were particularly important for students' intentions of taking similar classes in a field. Motivational processes, however, are in part driven by people in the environment: in higher education, college students receive a range of recommendations from family, teachers, advisors, and fellow peers. In line with this, the importance of interest-value attributions also extended to *peer* recommendations about taking additional classes or majoring in similar fields. Considering interest-value attributions has the potential to expand insight into how people react to students'

problems with motivation and how students navigate their educational pathways based on their own beliefs about a lack of interest-value as the source of motivational struggles.

References

Abramson, L. Y., Seligman, M. E., & Teasdale, J. D. (1978). Learned helplessness in humans: Critique and reformulation. *Journal of Psychopathology and Clinical Science, 87*(1), 49-74. https://doi.org/10.1037/0021-843X.87.1.49

Andrews, G. R., & Debus, R. L. (1978). Persistence and the causal perception of failure: Modifying cognitive attributions. *Journal of Educational Psychology, 70*(2), 154-166. https://doi.org/10.1037/0022-0663.70.2.154

Asher, M. W., Harackiewicz, J. M., Beymer, P. N., Hecht, C. A., Lamont, L. B., Else-Quest, N. M., Priniski, S. J., Thoman, D. B., Hyde, J. S., & Smith, J. L. (2023). Utility-value intervention promotes persistence and diversity in STEM. *Proceedings of the National Academy of Sciences of the United States of America*, *120*(19), e2300463120. https://doi.org/10.1073/pnas.2300463120

Bong, M. (2004). Academic motivation in self-efficacy, task value, achievement goal orientations, and attributional beliefs. *The Journal of Educational Research*, *97*(6), 287-298. https://doi.org/10.3200/JOER.97.6.287-298

Burger, J. M., Cooper, H. M., & Good, T. L. (1982). Teacher attributions of student performance: Effects of outcome. *Personality and Social Psychology Bulletin, 8*(4), 685-690. https://doi.org/10.1177/0146167282084013

Ceci, S. J., & Williams, W. M. (2011). Understanding current causes of women's underrepresentation in science. *Proceedings of the National Academy of Sciences*, *108*(8), 3157-3162. https://doi.org/10.1073/pnas.1014871108

Cheryan, S., Plaut, V. C., Davies, P. G., & Steele, C. M. (2009). Ambient belonging: how stereotypical cues impact gender participation in computer science. *Journal of personality and social psychology*, *97*(6), 1045. https://doi.org/10.1037/a0016239

Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2017). Why are some STEM fields more gender balanced than others? *Psychological bulletin*, *143*(1), 1. https://doi.org/10.1037/bul0000052

Cimpian, J. R., Kim, T. H., & McDermott, Z. T. (2020). Understanding persistent gender gaps in STEM. *Science*, *368*(6497), 1317-1319. https://doi.org/10.1126/science.aba7377

Cundiff, J. L., Ryuk, S., & Cech, K. (2018). Identity-safe or threatening? Perceptions of women-targeted diversity initiatives. *Group Processes & Intergroup Relations*, *21*(5), 745-766. https://doi.org/10.1177/1368430217740434

Danbold, F., & Huo, Y. J. (2017). Men's defense of their prototypicality undermines the success of women in STEM initiatives. *Journal of Experimental Social Psychology*, *72*, 57-66. https://doi.org/10.1016/j.jesp.2016.12.014

Dasgupta, N., & Stout, J. G. (2014). Girls and women in science, technology, engineering, and mathematics: STEMing the tide and broadening participation in STEM careers. *Policy Insights from the Behavioral and Brain Sciences*, *1*(1), 21-29. https://doi.org/10.1177/2372732214549471

Deci, E. L., & Ryan, R. M. (2012). Self-determination theory. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (pp. 416–436). Sage Publications Ltd. https://doi.org/10.4135/9781446249215.n21

Desy, E. A., Peterson, S. A., & Brockman, V. (2011). Gender differences in science-related attitudes and interests among middle school and high school students. *Science Educator, 20*(2), 23-30.

Diekman, A. B., Brown, E. R., Johnston, A. M., & Clark, E. K. (2010). Seeking congruity between goals and roles: A new look at why women opt out of science, technology, engineering, and mathematics careers. *Psychological science, 21*(8), 1051-1057. https://doi.org/10.1177/0956797610377342

Dweck, C. S., Davidson, W., Nelson, S., & Enna, B. (1978). Sex differences in learned helplessness: II. The contingencies of evaluative feedback in the classroom and III. An experimental analysis. *Developmental Psychology, 14*(3), 268–276. https://doi.org/10.1037/0012-1649.14.3.268

Dweck, C. S., Hong, Y. yi, & Chiu, C. yue. (1993). Implicit Theories Individual Differences in the Likelihood and Meaning of Dispositional Inference. *Personality and Social Psychology Bulletin, 19*(5), 644–656. https://doi.org/10.1177/0146167293195015

Eaton, A. A., Saunders, J. F., Jacobson, R. K., & West, K. (2020). How gender and race stereotypes impact the advancement of scholars in STEM: Professors 'biased evaluations of physics and biology post-doctoral candidates. *Sex Roles: A Journal of Research, 82*(3-4), 127–141. https://doi.org/10.1007/s11199-019-01052-w

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*(1), 109–132. https://doi.org/10.1146/annurev.psych.53.100901.135153

Fiske, S. T., Neuberg, S. L., Beattie, A. E., & Milberg, S. J. (1987). Category-based and attribute-based reactions to others: Some informational conditions of stereotyping and

individuating processes. *Journal of Experimental Social Psychology*, *23*(5), 399-427. https://doi.org/10.1016/0022-1031(87)90038-2

Freeman, J. B. (2020). Measuring and resolving LGBTQ disparities in STEM. *Policy Insights from the Behavioral and Brain Sciences*, *7*(2), 141-148. https://doi.org/10.1177/2372732220943232

Fry, R., Kennedy, B., & Funk, C. (2021). *STEM Jobs see uneven progress in increasing gender, racial and ethnic diversity.* Pew Research Center. https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/

Georgiou, S. N., Christou, C., Stavrinides, P., & Panaoura, G. (2002). Teacher attributions of student failure and teacher behavior toward the failing student. *Psychology in the Schools, 39*(5), 583-595. https://doi.org/10.1002/pits.10049

Gilbert, D. T. (1989). Thinking lightly about others: Automatic components of the social inference process. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 189–211). The Guilford Press.

Graham, S. (1991). A review of attribution theory in achievement contexts. *Educational Psychology Review, 3*(1), 5-39. https://doi.org/10.1007/BF01323661

Hareli, S., & Hess, U. (2008). The role of causal attribution in hurt feelings and related social emotions elicited in reaction to other's feedback about failure. *Cognition and Emotion*, *22*(5), 862-880. https://doi.org/10.1080/02699930701541641

Heider, F. (1958). *The psychology of interpersonal relations*. New York: Wiley.

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist, 41*(2), 111-127. https://doi.org/10.1207/s15326985ep4102_4

Houston, D. C. (2016). *Explaining race differences in academic performance: The role of perceived expectations & outcome valence*. [Unpublished Master's thesis]. Wright State University.

Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. *Science, 326*(5958), 1410-1412. https://doi.org/10.1126/science.1177067

Jones, E. E., & McGillis, D. (1976). Correspondent inferences and the attribution cube: A comparative reappraisal. *New Directions in Attribution Research, 1,* 389-420.

Kaplan, A., Cao, X., Dai, T., Obradovic, Z., Perez, T., Cromley, J. G., Mara, K., & Balsai, M. J. (2018, April). Motivation as a complex system: Semester-long recursive dynamics of expectancy-value constructs in undergraduate biology. Poster presented at the annual conference of the American Educational Research Association, New York City, NY.

Kaplan, A., Katz, I., & Flum, H. (2012). Motivation theory in educational practice: Knowledge claims, challenges, and future directions. In K. R. Harris, S. Graham, T. Urdan, S. Graham, J. M. Royer, & M. Zeidner (Eds.), *APA handbooks in psychology, APA educational psychology handbook, Vol. 2.: Individual differences and cultural and contextual factors* (pp. 165–194). American Psychological Association.

Kelley, H. H. (1973). The processes of causal attribution. *American Psychologist, 28*(2), 107–128. https://doi.org/10.1037/h0034225

Kelley, H. H., & Michela, J. L. (1980). Attribution theory and research. *Annual Review of Psychology, 31,* 457–501. https://doi.org/10.1146/annurev.ps.31.020180.002325

Kiefer, A., & Shih, M. (2006). Gender differences in persistence and attributions in stereotype relevant contexts. *Sex Roles, 54*(11), 859-868. https://doi.org/10.1007/s11199-006-9051-x

Kim, T., & Schallert, D. L. (2014). Mediating effects of teacher enthusiasm and peer enthusiasm on students' interest in the college classroom. *Contemporary Educational Psychology, 39*(2), 134-144. https://doi.org/10.1016/j.cedpsych.2014.03.002

Lakens, D., & Caldwell, A. R. (2021). Simulation-based power analysis for factorial analysis of variance designs. *Advances in Methods and Practices in Psychological Science, 4*(1), 1-14. https://doi.org/10.1177/2515245920951503

Ma, D. S., Correll, J., & Wittenbrink, B. (2015). The Chicago Face Database: A free stimulus set of faces and norming data. *Behavior Research Methods, 47*(4), 1122–1135.

Makarova, E., Aeschlimann, B., & Herzog, W. (2019). The gender gap in STEM fields: The impact of the gender stereotype of math and science on secondary students' career aspirations. *Fronteirs in Education, 4*(60). https://doi.org/10.3389/feduc.2019.00060

Markowitz, D. G. (2004). Evaluation of the long-term impact of a university high school summer science program on students' interest and perceived abilities in science. *Journal of Science Education and Technology, 13*(3), 395-407. https://doi.org/10.1023/B:JOST.0000045467.67907.7b

Master, A. (2021). Gender stereotypes influence children's STEM motivation. *Child Development Perspectives, 15*(3), 203-210. https://doi.org/10.1111/cdep.12424

Master, A., & Meltzoff, A. N. (2020). Cultural stereotypes and sense of belonging contribute to gender gaps in STEM. *International Journal of Gender, Science and Technology, 12*(1), 152-198. Retrieved from https://genderandset.open.ac.uk/index.php/genderandset/article/view/674

Master, A., Meltzoff, A. N., & Cheryan, S. (2021). Gender stereotypes about interests start early and cause gender disparities in computer science and engineering. *Proceedings of the*

National Academy of Sciences, 118(48), e2100030118. https://doi.org/10.1073/pnas.2100030118

Metalsky, G. I., Abramson, L. Y., Seligman, M. E. P., Semmel, A., & Peterson, C. (1982). Attributional styles and life events in the classroom: Vulnerability and invulnerability to depressive mood reactions. *Journal of Personality and Social Psychology, 43*(3), 612–617. https://doi.org/10.1037/0022-3514.43.3.612

Metzger, S. A., & Harris, L. (2018). Introduction: History education in (and for) a changing world. In S. A. Metzger & L. Harris (Eds.), *The Wiley international handbook of history teaching and learning* (pp. 1-10). Wiley. https://doi.org/10.1002/9781119100812.ch0

Miele, D. B., Browman, A. S., & Vasilyeva, M. (2020). Individual differences in students ’effort source beliefs predict their judgments of ability. *Motivation Science, 6*(2), 110–132. https://doi.org/10.1037/mot0000124

Miele, D. B., Scholer, A. A., & Fujita, K. (2020). Metamotivation: Emerging research on the regulation of motivational states. In A. J. Elliot (Ed.), *Advances in motivation science* (pp. 1–42). Elsevier Academic Press. https://doi.org/10.1016/bs.adms.2019.10.001

Mikulincer, M. (1986). Attributional processes in the learned helplessness paradigm: Behavioral effects of global attributions. *Journal of Personality and Social Psychology, 51*(6), 1248-1256. https://doi.org/10.1037/0022-3514.51.6.1248

Muenks, K., & Miele, D. B. (2017). Students’ thinking about effort and ability: The role of developmental, contextual, and individual difference factors. *Review of Educational Research, 87*(4), 707–735. https://doi.org/10.3102/0034654316689328

National Science Foundation. (2019). *Women, minorities, and persons with disabiliites in science and engineering: 2019* (NSF Special Report 19-304). National Science

Foundation, National Center for Science and Engineering Statistics. https://www.nsf.gov/statistics/wmpd

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91*(3), 328–346. https://doi.org/10.1037/0033-295X.91.3.328

Norman, J. B., Fuesting, M. A., Geerling, D. M., Chen, J. M., Gable, S. L., & Diekman, A. B. (2022). To Pursue or Not to Pursue STEM? Faculty Behavior Enhances Student Involvement in STEM Roles by Signaling Role-Specific Support. *Social Psychological and Personality Science, 13*(2), 583-594. https://doi.org/10.1177/19485506211035003

Olson & Riordan (2012). *Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics.* Report to the President. Executive Office of the President. Accessed from: https://eric.ed.gov/?id=ED541511

Renninger, K. A. (2009). Interest and identity development in instruction: An inductive model. *Educational Psychologist, 44*(2), 105-118. https://doi.org/10.1080/00461520902832392

Renninger, K. A., & Hidi, S. (2011). Revisiting the conceptualization, measurement, and generation of interest. *Educational Psychologist, 46*(3), 168–184. https://doi.org/10.1080/00461520.2011.587723

Renninger, K. A., & Hidi, S. E. (2015). *The power of interest for motivation and engagement*. Routledge.

Sansone, C., & Smith, J. L. (2000). Interest and self-regulation: The relation between having to and wanting to. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic and extrinsic*

motivation: The search for optimal motivation and performance (pp. 341-372). San Diego, CA: Academic Press.

Sansone, C., & Thoman, D. B. (2005). Interest as the missing motivator in self-regulation. *European Psychologist, 10*(3), 175-186. https://doi.org/10.1027/1016-9040.10.3.175

Scholer, A. A., Miele, D. B., Murayama, K., & Fujita, K. (2018). New directions in self-regulation: The role of metamotivational beliefs. *Current Directions in Psychological Science, 27*(6), 437–442. https://doi.org/10.1177/0963721418790549

Shrout, P. E., & Yip-Bannicq, M. (2017). Inferences about competing measures based on patterns of binary significance tests are questionable. *Psychological Methods, 22*(1), 84–93. https://doi.org/10.1037/met0000109

Siy, J. O., Germano, A. L., Vianna, L., Azpeitia, J., Yan, S., Montoya, A. K., & Cheryan, S. (2023). Does the follow-your-passions ideology cause greater academic and occupational gender disparities than other cultural ideologies? *Journal of Personality and Social Psychology.* Advance online publication. https://doi.org/10.1037/pspi0000421

Stodolsky, S. S., Salk, S., & Glaessner, B. (1991). Student views about learning math and social studies. *American Educational Research Journal, 28*(1), 89-116. https://doi.org/10.3102/00028312028001089

Su, R., & Rounds, J. (2015). All STEM fields are not created equal: People and things interests explain gender disparities across STEM fields. *Frontiers in Psychology, 6,* Article 189. https://doi.org/10.3389/fpsyg.2015.00189

Surber, C. F. (1984). Inferences of ability and effort: Evidence for two different processes. *Journal of Personality and Social Psychology, 46*(2), 249–268. https://doi.org/10.1037/0022-3514.46.2.249

Thoman, D. B., Lee, G. A., Zambrano, J., Geerling, D. M., Smith, J. L., & Sansone, C. (2019). Social influences of interest: Conceptualizing group differences in education through a self-regulation of motivation model. *Group Processes & Intergroup Relations*, *22*(3), 330-355. https://doi.org/10.1177/1368430219838337

Thoman, D. B., Sansone, C., & Geerling, D. (2017). The dynamic nature of interest: Embedding interest within self-regulation. In P. O'Keefe & J. Harackiewicz (Eds.), *The science of interest* (pp. 27-47). Springer, Cham. https://doi.org/10.1007/978-3-319-55509-6_2

Thoman, D. B., Sansone, C., & Pasupathi, M. (2007). Talking about interest: Exploring the role of social interaction for regulating motivation and the interest experience. *Journal of Happiness Studies*, *8*(3), 335-370. https://doi.org/10.1007/s10902-006-9016-3

Thoman, D. B., Sansone, C., Fraughton, T., & Pasupathi, M. (2012). How students socially evaluate interest: Peer responsiveness influences evaluation and maintenance of interest. *Contemporary Educational Psychology*, *37*(4), 254-265. https://doi.org/10.1016/j.cedpsych.2012.04.001

Tyler-Wood, T., Ellison, A., Lim, O., & Periathiruvadi, S. (2012). Bringing up girls in science (BUGS): The effectiveness of an afterschool environmental science program for increasing female students' interest in science careers. *Journal of Science Education and Technology*, *21*(1), 46-55. https://doi.org/10.1007/s10956-011-9279-2

Wang, H., & Hall, N. C. (2018). A systematic review of teachers' causal attributions: Prevalence, correlates, and consequences. *Frontiers in Psychology*, *9*, Article 2305. https://doi.org/10.3389/fpsyg.2018.02305

Weiner, B. (1972). Attribution theory, achievement motivation, and the educational process. *Review of Educational Research, 42*(2), 203-215. https://doi.org/10.3102/00346543042002203

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*(4), 548-573. http://dx.doi.org/10.1037/0033-295X.92.4.548

Weiner, B. (2018). The legacy of an attribution approach to motivation and emotion: A no-crisis zone. *Motivation Science, 4*(1), 4-14. https://doi.org/10.1037/mot0000082

Weiner, B., Frieze, I., Kukla, A., Reed, L., Rest, S., & Rosenbaum, R. M. (1987). Perceiving the causes of success and failure. In E. E. Jones, D. E. Kanouse, H. H. Kelley, R. E. Nisbett, S. Valins, & B. Weiner (Eds.), *Attribution: Perceiving the causes of behavior* (pp. 95-120). Lawrence Erlbaum Associates.

Wentzel, K. R., & Wigfield, A. (1998). Academic and social motivational influences on students' academic performance. *Educational Psychology Review, 10*(2), 155-175. https://doi.org/10.1023/A:1022137619834

White, P. A. (1991). Ambiguity in the internal/external distinction in causal attribution. *Journal of Experimental Social Psychology, 27*(3), 259–270. https://doi.org/10.1016/0022-1031(91)90015-X

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology, 25*(1), 68-81. https://doi.org/10.1006/ceps.1999.1015

Wolters, C. A. (2003). Regulation of motivation: Evaluating an underemphasized aspect of self-regulated learning. *Educational Psychologist, 38*(4), 189-205. https://doi.org/10.1207/S15326985EP3804_1