Journal of the Scholarship of Teaching and Learning, Vol. 25, No. 1, March 2025., pp.122-139.
doi:10.14434/josotl.v25i1.36374

Student Perceptions of Faculty Mindset

Christy Jarrard
Augusta University
christy.jarrard@gmail.com

Deborah South Richardson
Augusta University

Robert Bledsoe
Augusta University

Abstract: This study investigates the influence of instructor mindset on student perceptions. Due to the need for increasing science, technology, engineering, and mathematics (STEM) student retention and the issue of underrepresentation of minority groups in STEM disciplines, we also examined whether instructor mindset impacts underrepresented students more than represented students in the context of STEM education. Undergraduate student participants (N = 273) reviewed growth and fixed mindset syllabi and responded to a questionnaire to assess perceptions about their likely response and the professor. The significant main effect of faculty mindset revealed that students anticipated better grades and reported a more positive view of the instructor, greater self-efficacy, and higher expectations the professor would treat them fairly after reading a growth mindset syllabus than after reading a fixed mindset syllabus. Women reported lower expected grades, less self-efficacy, and lower expectations of fair treatment than men after reading a fixed mindset syllabus; there were no gender differences after reading a growth mindset syllabus. The results of underrepresented racial/ethnicity group analyses were less clear cut. Our findings, alongside similar research, suggest that students have more positive perceptions of their ability to succeed when an instructor endorses a growth mindset than when an instructor endorses a fixed mindset. Implications include interventions to enhance growth-mindset orientation among instructors.

Keywords: instructor mindset, syllabus, student perceptions, STEM education

Considerable evidence suggests that an influential factor in student academic success is the mindset the student endorses (e.g., Blackwell et al., 2007; Burnette et al., 2013; Grant & Dweck, 2003). Although researchers have examined the impact of student mindset on student success, we know less about how an instructor's mindset may influence student motivation and expectations. This study considers how students' perceptions of instructor mindset, as conveyed in a course syllabus, may influence student expectations and efficacy in the context of science, technology, engineering, and mathematics (STEM) education. Students majoring in STEM disciplines are relatively likely to drop their STEM major or take a different direction (Whitcomb & Singh, 2021). Moreover, students who are underrepresented in STEM fields commonly exhibit higher attrition rates than represented students (Beasley & Fischer, 2012; National Science Board [NSB], 2015; Whitcomb & Singh, 2021). The issues of STEM student retention, in conjunction with issues of limited diversity in the STEM workforce (NSB, 2022), suggest a need for creating an open environment in which all students can thrive, regardless of minority or majority status (NSB, 2022; e.g., Canning et al., 2019).

Mindset

Dweck and Leggett's (1988) social-cognitive model connects implicit theories (i.e., mindset), motivation, and goal orientation to student learning. According to this model, individuals who believe intelligence cannot be changed (i.e., entity theorists) endorse a fixed mindset. They are likely motivated by performance goals and, therefore, seek validation of their competency and desire others to see them as capable and intelligent, both of which lead the individual to avoid possible challenges that might lead to failure. Conversely, individuals who consider intelligence to be malleable are likely to endorse a mastery goal orientation in which challenges are welcomed and failures are seen as opportunities to learn. Those individuals are, then, likely to exert effort to become more competent and to endorse a desire to learn. Individuals who view intelligence as malleable are considered to have a growth mindset (i.e., incremental theorists). Essentially, Dweck and Leggett's model proposes that an individual's mindset impacts the adoption of performance or mastery goals, and this goal orientation then affects behaviors such as facing or avoiding challenges. Burnette and colleagues' (2013) analysis of 113 studies indicates that, as a whole, research supports this theory. In their review, growth mindset was positively related to mastery goal orientation and negatively associated with performance goal orientation and behaviors such as avoiding challenges.

Instructor Mindset

Instructor mindset is related to teaching behaviors; instructors with more of a growth mindset are more likely to adopt evidence-based effective teaching practices (Ferrare, 2019; Richardson et al., 2020). Thus, the way a course is organized, presented, and taught by an instructor can reflect that instructor's mindset and beliefs about student success. The impact of such beliefs on students are seen in Rattan and colleagues' (2018) manipulation of instructor mindset. In this study, students read a paragraph presented as an instructor's introduction to a STEM course, communicating either that all students have the potential for success in the course or that only some students have the potential for success in the course. Their findings revealed that students, especially those underrepresented in STEM, were affected by the instructor's beliefs regarding student ability. Specifically, students from the majority group (European Americans) had a more positive view of the STEM course and instructor than students from the minority group (African Americans) when the instructor reported the belief that only some students would succeed. However, this racial gap did not exist when the instructor communicated that all students have the ability to succeed. They also found that men reported a greater sense of belonging than women when the instructor communicated that only some students have the potential for success, and again this difference was not apparent when the instructor told the students that everyone has the potential to succeed.

More evidence of the impact of instructor mindset is seen in LaCosse et al.'s (2020) research with a similar focus on STEM professor mindset. They found that students who read a review suggesting that an instructor had a fixed mindset reported lower course interest, expressed more concerns about being treated unfairly, anticipated poorer academic performance, and reported less sense of belonging than students who read the reviews of a STEM instructor with a growth mindset. Additionally, LaCosse and colleagues noted that women expected a more negative experience in courses led by fixed mindset instructors than men did, and that gender differences were not apparent in courses taught by an instructor with a growth mindset.

Canning et al. (2019) found that students taught by an instructor who endorsed a fixed mindset were less motivated, less likely to recommend the course to another student, and had more negative experiences in the class than students who were taught by an instructor who endorsed a growth mindset. Furthermore, results indicated that the racial achievement gap was more pronounced when

the instructor endorsed a fixed mindset than when the instructor endorsed a growth mindset. Subsequent research by Canning and colleagues (2022) revealed similar findings for gender. The gender achievement gap was greater when students imagined or took a course from an instructor who endorsed a fixed mindset than when the instructor endorsed a growth mindset.

Role of Syllabi

The present study examines how the instructor's mindset, as conveyed in a syllabus, may impact student expectations in a STEM course. While the primary purpose of a syllabus is to provide course information, it also functions as a first impression of the instructor (Nusbaum et al., 2021). Thus, syllabi outline fundamental information about course requirements, assignments, and grading, while simultaneously providing insight into the instructor's expectations of student performance in the class.

Considerable evidence suggests that the way information is conveyed in a syllabus impacts student evaluations and expectations of the instructor and the course (e.g., Lightner & Benander, 2018; Nusbaum et al., 2021). Harnish and Bridges (2011), for example, investigated differences between students who read a positive/friendly syllabus and students who read an unfriendly syllabus. Information about the course was consistent across both syllabi; however, the tone was manipulated such that the friendly syllabus used more positive language, incorporated humor, and conveyed compassion, while the unfriendly syllabus was harsher in tone and did not convey a positive outlook on student expectations. Students perceived the instructor of the friendly syllabus to be warmer, more approachable, and more motivated to teach the course than the instructor of the unfriendly syllabus.

Current Study

We evaluated academic self-efficacy and grade expectations, both of which reflect a student's expectation of success in the course (Honicke & Broadbent, 2016; van der Zanden et al., 2018). Additionally, we evaluated students' perceptions of the instructor, including the extent to which the instructor's characteristics were those expected from a growth-oriented instructor and the extent to which students would anticipate fair treatment from the instructor. Previous research has demonstrated that perceptions of the instructor are related to student engagement, actual and expected performance, and course interest (Canning et al., 2022; LaCosse et al., 2020; Muenks et al., 2020; Schussler et al., 2021). Thus, the first two hypotheses tested in this study are as follows:

H1. Students who read a growth mindset syllabus will report higher expected grades and more academic self-efficacy than those who read a fixed mindset syllabus.
H2. Students who read a growth mindset syllabus will report a more positive view of the instructor and greater expectations of fair treatment from the instructor than students who read a fixed mindset syllabus.

We also assessed student attributions for the grade they would receive in the class. Students made attributions about their grade along the stability and locus dimensions of Weiner's model of causal attributions (Weiner et al., 1971: Weiner, 1985). The four attributions included in Weiner's model are effort (unstable, internal), luck (unstable, external), intelligence (stable, internal), and difficulty of the course (stable, external). Although effort is an unstable attribution in Weiner's model, it is the internal factor over which students have some control. By definition, the fixed mindset syllabus emphasizes the importance of one's intelligence. Attributions to gender and minority status were also included due to our focus on underrepresented students. Thus, our third and fourth hypotheses were:

H3. Students who read a growth mindset syllabus will attribute their grade more to effort and less to intelligence than students who read a fixed mindset syllabus.
H4. Students who read a growth mindset syllabus will attribute their grade less to minority status and gender than students who read a fixed mindset syllabus.

Consistent with previous research (e.g., Canning et al., 2019; Canning et al., 2022; LaCosse et al., 2020; Rattan et al., 2018), we expected the negative effects of reading a fixed mindset syllabus to be stronger for students from underrepresented groups in STEM. That is, we anticipated:

H5. There will be fewer differences in expected grades, academic self-efficacy, perspective of instructor, and expected fair treatment between men and women after reading a growth mindset syllabus than after reading a fixed mindset syllabus.
H6. There will be fewer differences in the critical dependent variables between students from represented racial groups in STEM (White and Asian students) and students from underrepresented racial groups in STEM (all other racial groups) after reading a growth mindset syllabus than after reading a fixed mindset syllabus.

Method

Participants

Undergraduate students (N = 294) were recruited from the Psychological Sciences research participant pool and from Math and Computer Science classes at Augusta University to complete the study online via Qualtrics. Responses of participants who responded incorrectly to at least one of the two attention check items (n = 17) were removed from the dataset; additionally, one participant withdrew from the study following the debriefing statement at the end of the survey. Three reviewers blind to the experimental condition reviewed syllabus reflections. If all reviewers agreed that they could not determine if a response reflected either a growth or fixed mindset, that participant's data were removed (n = 3). Responses from 273 participants remained in the dataset.

Of the participants, 194 identified as female (71.1%), 74 as male (27.1%), 3 as transgender or non-binary (1.1%); 2 participants chose not to report gender (0.7%). Participants' age ranged from 18 to 44 years (M = 20.69, SD = 3.30). The largest proportion of participants (43.6%) identified as White (n = 119), 31.5% identified as Black/African American (n = 86), 11.0% as Asian (n = 30), 5.9% Hispanic/Latino (n = 16), 5.5% multi-ethnic (n = 15), 1.5% self-described as other (n = 4), 0.7% declined to state their racial identity (n = 2), and 0.4% did not respond to the item (n = 1). Sixty-seven participants (24.5%) indicated that they were in their first year in college; 61 (22.3%) in their second year; 67 (24.5%) in their third year; 52 (19%) in their fourth year; and 26 (9.5%) were either in their fifth year or other.

For this study, the most recent NSB report (2022) was used to classify participants into represented and underrepresented groups based on the race/ethnicity the participants reported. The represented group included participants who identified as White and Asian (n = 149), and the underrepresented group included participants who identified as any other race/ethnicity (i.e., Black/African American, Hispanic/Latino, Multi-ethnic, and Other; n = 121). Additionally, women were considered underrepresented in STEM (NSB, 2022).

Materials

Syllabi

Four syllabi were created, two to reflect a fixed mindset and two to reflect a growth mindset. For each set of mindset syllabi, one syllabus was for an introductory physics course and one for an introductory chemistry course. Each syllabus included the course title, semester and year, time of the class, available office hours, course description, course expectations, grading policy, exam policy, and homework policy. All syllabi depicted a difficult/intense course, and basic aspects of the course were held constant (e.g., time of the course, office hours, assignment of homework). Instructor mindset as projected in the syllabus was manipulated by varying the course expectations and policies to reflect behaviors and attitudes that have been found to be associated with instructor mindset (Ferrare, 2019; Richardson et al., 2020). The syllabi varied in messages about the malleability of ability, expectations for success, attitude about challenge, importance of effort, opportunities for feedback, and instructor availability.

The growth mindset syllabus included statements that reflected an instructor who believes all students can succeed with effort and willingness to face challenges and who is willing to support their learning:

> Although this is a challenging course, students can do well. When facing a challenge, it is best for students to embrace it and use it as an opportunity to develop. Students from previous semesters have done well in this course. This is a difficult course, and I am expecting students to come to me with any questions they may have and for constructive criticism. I would like for you to put in effort and seek help when you need it. Learning is a shared responsibility. I will do my best to facilitate your learning. If you complete the assignments and readings, you will do well.

The course design mirrored these beliefs, with the instructor allowing students to resubmit homework for additional points, including the homework grade as part of the final grade, and providing opportunities for feedback (e.g., answer keys for each exam and homework assignments).

The fixed mindset syllabus included statements that reflected an instructor who believes only some students will succeed, that effort does not guarantee success, and that it is the students' responsibility to learn:

> Not every student will do well in this…course. Students from previous semesters either do great or they fail. If a student consistently gets grades toward the lower end of the distribution of scores, they should consider withdrawing. You may put in a lot of effort and still perform poorly in this class…. Everything you need for this class will be in the textbook or on the class page. It is your responsibility to read the materials and come to class prepared.

The course design mirrored these beliefs, with homework not counting toward the grade in the course but reporting that students who do well on the homework typically do well in the course. The fixed mindset instructor's syllabus also suggested limited access to feedback (e.g., requiring students to make an appointment to come to the instructor's office to see the answer key), with an emphasis on comparative feedback (e.g., showing students where they place in the grade distribution).

Questionnaire

Expected grade was assessed by asking participants the grade they would expect to receive using a scale of "A" to "F" (i.e., *A* = 5, *B* = 4, *C* = 3, *D* = 2, and *F* = 1). They were also asked to indicate the extent to which six factors contributed to their grade in the class: gender, minority status, effort/hard work, difficulty of the course, luck, and intelligence/ability (1 = *No contribution*; 5 = *Major contribution*).

Perception of instructor characteristics was assessed by asking participants about the extent to which the instructor would be likely to have each of the following characteristics: helpful, approachable, encouraging, and believes students can succeed. Responses were reported on 5-point scales anchored with 1 (*Not at all likely*) and 5 (*Very likely*). These items created an internally consistent scale (fixed mindset $\alpha = .93$; growth mindset $\alpha = .92$), so the four responses were averaged to create a measure of Perception of Instructor.

Academic self-efficacy was assessed with 5 items from the Patterns of Adaptive Learning Strategies Scales (Midgley et al., 2000). Participants indicated the extent to which they agreed with items addressing their perception of their ability to do their course work (e.g., "I could do even the hardest work in this class if I tried") on 5-point scales anchored 1 (*strongly disagree*) to 5 (*strongly agree*). Internal consistency for this sample was strong (fixed mindset $\alpha = .89$; growth mindset $\alpha = .89$).

Fair treatment concerns were assessed with two items from LaCosse et al. (2020): "I think I would be treated fairly by the professor," and "I think I would trust the professor to treat me fairly," to which participants indicated their level of agreement on 5-point scales (1 = *strongly disagree*; 5 = *strongly agree*). The two items were highly correlated (fixed mindset $r = .88$; growth mindset $r = .85$).

Items were included at the end of the survey to gather information about gender, race/ethnicity, age, year in school, major and minor area of study, and the highest level of education obtained by each parent/guardian.

To encourage attention to the syllabus and to provide data for the manipulation check, participants provided a short reflection immediately following presentation of each syllabus: "After reading this syllabus, what would you tell other students about what to expect from this class? Please write one to two sentences." In addition, an attention check item appeared approximately halfway through each questionnaire (e.g., "If you are reading this, please select the option "Strongly agree" from those listed below").

Procedure

Participants were first presented with an informed consent statement; those who agreed to participate were presented with two syllabi, each followed by the manipulation check reflection and dependent variable measures. After completing the two sets of syllabus, reflection, and questions, participants then completed the background questions. In order to assure fully informed consent, participants were given the option to withdraw from the study after reviewing the debriefing statement. The study was reviewed and approved by the university's Institutional Review Board.

Design and Analysis

Faculty mindset as projected in the syllabus was manipulated as a within-subjects variable; that is, each participant responded to both a fixed and a growth mindset syllabus. In order to address possible order effects, mindset order and course order were randomized. Thus, we created syllabi for two courses (one physics syllabus and one chemistry syllabus) and created versions for each that reflected fixed and growth instructor mindsets.

Because we were especially interested in examining responses of students underrepresented in STEM disciplines, some of the analyses used gender as an independent variable and some used underrepresented racial group as an independent variable. We conducted analyses of variance (ANOVA) in which represented/underrepresented group (between-groups) and instructor mindset (repeated measure) served as independent variables. Order of syllabus orientation and order of course were initially included as independent variables. Those analyses indicated the order effects did not modify the interpretation of other effects, so we report analyses without order factors.

Results

Gender x Instructor Mindset Analyses

Instructor Mindset Effects

As reported in Table 1, the results of the 2 (Instructor Mindset) x 2 (Student Gender) ANOVA with repeated measures on the first factor revealed strong main effects of instructor mindset. Students anticipated making higher grades, reported greater academic self-efficacy, had higher expectations of fair treatment by the professor, and perceived the instructor more positively after reading a syllabus in which the instructor endorsed a growth mindset than after reading a syllabus in which the instructor endorsed a fixed mindset. Students also reported that gender would contribute more to their grade after reading a fixed mindset syllabus than after reading a growth mindset syllabus.

Table 1. Main Effects of Instructor Mindset.

Dependent Variables	Fixed		Growth		Main Effect of Instructor Mindset
	M (*SD*)	*95% CI*	*M* (*SD*)	*95% CI*	
Expected Grade	3.19 (1.02)	[3.14, 3.42]	4.37 (0.71)	[4.29, 4.49]	$F(1, 265) = 295.88$, $p < .001$, $\eta_p^2 = .53$
Self-Efficacy	2.95 (0.93)	[2.94, 3.18]	4.15 (0.73)	[4.07, 4.27]	$F(1, 266) = 300.17$, $p < .001$, $\eta_p^2 = .53$
Fair Treatment	2.87 (1.27)	[2.79, 3.13]	4.51 (0.74)	[4.40, 4.60]	$F(1, 266) = 255.97$, $p < .001$, $\eta_p^2 = .49$
Perception of Instructor	2.10 (1.14)	[1.98, 2.28]	4.46 (0.84)	[4.35, 4.57]	$F(1, 266) = 559.68$, $p < .001$, $\eta_p^2 = .68$
Gender Attribution	1.40 (0.90)	[1.22, 1.46]	1.26 (0.73)	[1.13, 1.33]	$F(1, 266) = 4.85$, $p = .029$, $\eta_p^2 = .02$

Attributions

A 2 (Student Gender) x 2 (Instructor Mindset) x 4 (Attribution Source) ANOVA with repeated measures on the second two factors revealed a main effect of instructor mindset, $F(1, 264) = 81.85$, $p < .001$, $\eta_p^2 = .24$, and of attribution source, $F(1, 264) = 163.09$, $p < .001$, $\eta_p^2 = .65$. The main effect of instructor mindset revealed that students made stronger attributions for their grades in the fixed condition ($M = 4.16$, $SD = 0.95$, 95% CI [4.10, 4.25]) than in the growth mindset condition ($M = 3.85$, $SD = 0.91$, 95% CI [3.75, 3.90]). Pairwise comparisons for the main effect of attribution source revealed statistically significant differences between each grade attribute; students attributed their expected grade to effort ($M = 4.60$, $SD = 0.80$, 95% CI [4.52, 4.69]) the most, followed by difficulty

of the course (M = 4.39, SD = 0.81, 95% CI [4.28, 4.46]), intelligence (M = 4.22, SD = 0.88, 95% CI [4.10, 4.30]), and lastly, luck (M = 2.79, SD = 1.21, 95% CI [2.69, 2.97]).

The significant interaction between Instructor Mindset and Attribution Source, $F(1, 262) = 28.00$, $p < .001$, $\eta_p^2 = .24$, provides a more nuanced picture of the effect of Instructor Mindset (see Table 2). Analysis of simple effects of syllabus mindset for each attribution revealed that, as expected, students attributed their anticipated grade more to course difficulty, luck, and intelligence in the fixed mindset condition than in the growth condition. Furthermore, analysis of simple effects of attribution source and pairwise comparisons indicated that after reading a fixed mindset syllabus, students reported that effort and difficulty of the course contributed more to their grade than intelligence; the attribution to intelligence was greater than to luck. After reading a growth mindset syllabus, students attributed their grade most to effort, followed by difficulty of the course and intelligence, with luck again being seen as the least likely contributor to the students' expected grade. Notably, although attributions to luck are the lowest in both conditions, luck is perceived to make a significantly greater contribution to the final grade in the fixed than in the growth condition.

Table 2. Descriptive statistics and simple effects for Instructor Mindset x Grade Attribution interaction.

Dependent Variables	Fixed			Growth			Simple Effect of Instructor Mindset
	M	*SD*	*95% CI*	*M*	*SD*	*95% CI*	
Effort/Hard work	4.53_a	0.93	[4.43, 4.68]	4.67_a	0.67	[4.56, 4.74]	$F(1, 263) = 2.19$, $p = .14$, $\eta_p^2 = .01$
Luck	3.07_c	1.32	[2.95, 3.31]	2.50_c	1.12	[2.38, 2.68]	$F(1, 263) = 52.52$, $p < .001$, $\eta_p^2 = .17$
Difficulty of Course	4.69_a	0.69	[4.60, 4.78]	4.09_b	0.94	[3.92, 4.17]	$F(1, 263) = 114.24$, $p < .001$, $\eta_p^2 = .30$
Intelligence	4.34_b	0.86	[4.21, 4.44]	4.12_b	0.90	[3.95, 4.19]	$F(1, 263) = 15.19$, $p < .001$, $\eta_p^2 = .05$
Simple Effect of Grade Attribution	$F(1, 262) = 100.38$, $p < .001$, $\eta_p^2 = .54$			$F(1, 262) = 190.56$, $p < .001$, $\eta_p^2 = .69$			

Note. Subscripts indicate differences in the column.

Gender Effects

As reported in Table 3, men anticipated better grades and reported greater self-efficacy than women, and women believed that gender would contribute more to their grade than men did.

Table 3. Main Effects of Gender.

Dependent Variables	Men		Women		Main Effect of Gender
	M (SD)	*95% CI*	*M (SD)*	*95% CI*	
Expected Grade	3.96 (0.78)	[3.79, 4.13]	3.71 (0.89)	[3.61, 3.81]	$F(1, 265) = 6.24$, $p = .013$, $\eta_p^2 = .02$
Self-Efficacy	3.74 (0.68)	[3.59, 3.90]	3.48 (0.87)	[3.38, 3.58]	$F(1, 266) = 7.94$, $p = .029$, $\eta_p^2 = .03$
Fair Treatment	3.81 (0.96)	[3.64, 3.99]	3.65 (1.02)	[3.54, 3.75]	$F(1, 266) = 2.62$, $p = .106$ $\eta_p^2 = .01$
Perception of Instructor	3.33 (0.83)	[3.17, 3.49]	3.26 (1.04)	[3.17, 3.36]	$F(1, 266) = 0.44$, $p = .506$, $\eta_p^2 = .002$

Gender Attribution	1.18 (0.53)	[1.02, 1.35]	1.39 (0.89)	[1.28, 1.49]	$F(1, 266) = 4.17$, $p = .042$, $\eta_p^2 = .02$

The analysis also revealed significant interactions between Instructor Mindset and Student Gender for expected grade ($F(1, 265) = 6.48$, $p = .011$, $\eta_p^2 = .024$), self-efficacy ($F(1, 266) = 4.34$, $p = .002$, $\eta_p^2 = .036$), and professor fair treatment ($F(1, 266) = 5.78$, $p = .017$, $\eta_p^2 = .021$). Consistent with our expectation that the effect of instructor mindset would be greater for students from groups underrepresented in STEM disciplines, subsequent analysis of simple effects revealed that, when presented with a fixed mindset syllabus, women expected lower grades, reported less self-efficacy, and expected less fair treatment than men. However, men and women did not differ on these variables after reading a growth mindset syllabus (see Figure 1 and Table 4).

Figure 1. Syllabus orientation and student gender interactions on Fair Treatment, Self-Efficacy, and Expected Grade. Means are displayed inside bars. Error bars display 95% CI. Simple Effects of Gender: * $p < .05$.

Table 4. Descriptive statistics and simple effects for Syllabus Orientation x Gender interaction on Expected Grade, Self-Efficacy, and Professor Fair Treatment.

	Fixed			Growth			Simple Effect of
Expected Grade	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	Instructor Mindset
Men	3.49	0.94	[3.26, 3.72]	4.43	0.62	[4.37, 4.60]	$F(1, 265) = 74.28$, $p < .001$, $\eta_p^2 = .22$
Women	3.07	1.03	[2.93, 3.22]	4.35	0.74	[4.25, 4.45]	$F(1, 265) = 351.74$, $p < .001$, $\eta_p^2 = .57$
Simple Effect of Student Gender	$F(1, 265) = 9.08$, $p = .003$, $\eta_p^2 = .03$			$F(1, 265) = 0.77$, $p = .381$, $\eta_p^2 = .00$			
	Fixed			Growth			Simple Effect of
Self-Efficacy	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	Instructor Mindset
Men	3.19	0.77	[3.08, 3.50]	4.20	0.60	[4.03, 4.37]	$F(1, 266) = 69.41$, $p < .001$, $\eta_p^2 = .21$
Women	2.83	0.96	[2.70, 2.96]	4.14	0.75	[4.03, 4.24]	$F(1, 266) = 379.54$, $p < .001$, $\eta_p^2 = .59$

Simple Effect of Student Gender	$F(1, 266) = 13.88$, $p < .001$, $\eta_p^2 = .05$			$F(1, 266) = 0.38$, $p = .537$, $\eta_p^2 = .00$			
	Fixed			Growth			Simple Effect of
Fair Treatment	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	Instructor Mindset
Men	3.16	1.20	[2.87, 3.45]	4.47	0.73	[4.30, 4.64]	$F(1, 266) = 63.82$, $p < .001$, $\eta_p^2 = .19$
Women	2.76	1.29	[2.58, 2.94]	4.53	0.75	[4.42, 4.63]	$F(1, 266) = 306.67$, $p < .001$, $\eta_p^2 = .54$
Simple Effect of Student Gender	$F(1, 266) = 5.36$, $p = .021$, $\eta_p^2 = .02$			$F(1, 266) = 0.38$, $p = .541$, $\eta_p^2 = .00$			

Race x Instructor Mindset Analyses

The 2 (Instructor Mindset) x 2 (Race) analyses of variance (ANOVA) with repeated measures on the first factor revealed the same main effects of mindset on the dependent variables as was found in the analysis including Gender. Results did not reveal main effects of race. However, interactions of Race and Syllabus Instructor Mindset were found for perception of instructor ($F(1, 268) = 4.18$, $p = .042$, $\eta_p^2 = .02$) and professor fair treatment ($F(1, 268) = 4.05$, $p = .045$, $\eta_p^2 = .02$), with simple effects of syllabus mindset indicating similar outcomes for the two dependent variables. Although students from both represented and underrepresented racial groups reported more positive perceptions of instructor and higher expectations of fair treatment after reading a growth mindset syllabus than after reading a fixed mindset syllabus, this difference was greater for represented students. See Figure 2 and Table 5 for descriptive statistics and results of analysis of simple effects.

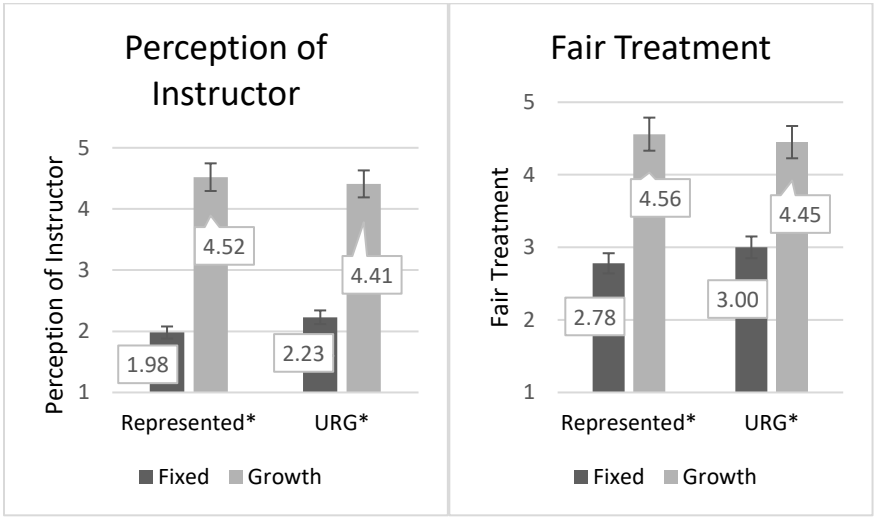

Figure 2. Syllabus orientation and student race/ethnicity interactions on Perception of Instructor and Fair Treatment. URG = underrepresented racial/ethnicity groups. Means are displayed inside bars. Error bars display 95% CI. Simple Effects of Mindset: * $p < .05$.

Table 5. Descriptive statistics and simple effects for Syllabus Mindset x Race/Ethnicity interaction on Perception Instructor and Professor Fair Treatment.

Perception of Instructor	Fixed			Growth			Simple Effect of Mindset
	M	*SD*	*95% CI*	*M*	*SD*	*95% CI*	
Represented	1.98	1.04	[1.80, 2.16]	4.52	0.76	[4.38, 4.65]	$F(1, 268) = 470.74$, $p < .001$, $\eta_p^2 = .64$
URG	2.23	1.23	[2.03, 2.44]	4.41	0.93	[4.26, 4.56]	$F(1, 268) = 282.22$, $p < .001$, $\eta_p^2 = .51$
Simple Effect of Group	$F(1, 268) = 3.37$, $p = .067$, $\eta_p^2 = .01$			$F(1, 268) = 1.02$, $p = .314$, $\eta_p^2 = .00$			
	Fixed			Growth			Simple Effect of Mindset
Fair Treatment	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	
Represented	2.78	1.23	[2.57, 2.98]	4.56	0.67	[4.44, 4.68]	$F(1, 268) = 240.72$, $p < .001$, $\eta_p^2 = .47$
URG	3.00	1.32	[2.78, 3.23]	4.45	0.81	[4.31, 4.58]	$F(1, 268) = 127.09$, $p < .001$, $\eta_p^2 = .32$
Simple Effect of Group	$F(1, 268) = 2.17$, $p = .142$, $\eta_p^2 = .0$			$F(1, 268) = 1.69$, $p = .195$, $\eta_p^2 = .01$			

Note. URG = underrepresented racial/ethnicity groups.

The 2 (Instructor Mindset) x 2 (Race/Ethnicity) ANOVA with repeated measures on the first factor revealed a main effect of instructor mindset on attribution of grade to minority status, $F(1, 266) = 13.82$, $p < .001$, $\eta_p^2 = .049$; students made more attribution to minority status after reading a fixed mindset syllabus ($M = 1.52$, $SD = 1.03$, 95% CI [1.42, 1.66]) than after reading a growth mindset syllabus ($M = 1.35$, $SD = 0.82$, 95% CI [1.26, 1.45]). No other effects were found in this analysis. The 2 (Instructor Mindset) x 4 (Attribution Source) x 2 (Race/Ethnicity) ANOVA with repeated measures on the first two factors revealed the same effects of instructor mindset, attribution source, and interaction between instructor mindset and attribution source as was found in the analysis including Gender (see Instructor Mindset Effects); there were no main effects of race.

Discussion

The purpose of this study was to investigate the role of instructor mindset on students' perception of success in the course and the instructor of the course. Prior research suggests that an instructor's beliefs can affect students' motivation, grade expectations, sense of belonging, interest in the course, and how the students view the instructor (e.g., Canning et al., 2019; Canning et al., 2022; LaCosse et al., 2020; Rattan et al., 2018). We found support for H1; students who read a growth mindset syllabus reported more academic self-efficacy and expected higher grades than students who read a fixed mindset syllabus. Results also revealed support for H2; students who read a growth mindset syllabus perceived the instructor more positively and expected fairer treatment from the instructor than students who read a fixed mindset syllabus.

The interaction between instructor mindset and grade attribution revealed that after reading a fixed mindset syllabus, students reported that effort and the difficulty of the course would have the greatest contributions toward their expected grade; on the other hand, after reading a growth mindset syllabus, students attributed their grade more to effort than to any other source. Moreover, students attributed their grade more to luck, intelligence, and difficulty of the course after reading a fixed

mindset syllabus than after reading a growth mindset syllabus. Considering the emphasis on effort within the context of the growth mindset syllabus and the emphasis on innate ability in the fixed mindset syllabus, we anticipated students would attribute their grade more to effort and less to intelligence after reading a growth-oriented syllabus than after reading a fixed-oriented syllabus (i.e., H3). While students did attribute their grade more to intelligence after reading a fixed mindset syllabus than after reading a growth mindset syllabus, this hypothesis as a whole was not directly supported as results did not reveal a statistical difference between the fixed and growth condition for the attribution to effort. Although, it is notable that students made stronger attributions to effort than to any other attribution after reading a growth mindset syllabus, while they made stronger attributions to difficulty of the course *and* effort after reading a fixed mindset syllabus. Taken together with the findings that students expected factors out of their control (i.e., luck, intelligence, difficulty of the course) to have greater influence after reading a fixed syllabus than a growth syllabus, these results suggest that students believe they have more internal control over their success in the growth mindset condition than in the fixed.

While prior work has found similar effects on different student perception measures with other manipulations of instructor attitude or mindset (e.g., Canning et al., 2019; LaCosse et al., 2020; Rattan et al., 2018), our findings show that instructor mindset conveyed in a syllabus can impact students' anticipated performance and their views of the instructor. Using a syllabus to convey the mindset of the instructor limits potential biases toward the instructor based on physical characteristics (e.g., gender, race/ethnicity, age). Additionally, our results show evidence of how a syllabus as a stand-alone document can impact student expectations of how well they will perform in the course. These results, coupled with prior studies' findings, show that when a student comes across a fixed mindset instructor, whether that be in the form of a course introduction, reviews of the instructor, or a syllabus, they anticipate worse performance in the course and view the instructor more negatively than when the instructor endorses a growth mindset.

Underrepresented Groups in STEM

We predicted that students would attribute their grade more to gender and minority status in the fixed mindset condition than in the growth mindset condition (H4). Our findings reveal support for this prediction as students reported that gender and minority status would contribute more to their grade after reading a fixed-oriented syllabus than after reading a growth-oriented syllabus. Additionally, one of the primary goals of this study was to examine whether the disadvantages experienced by underrepresented groups might be mitigated by a perceived growth mindset on the part of an instructor. Evidence from this study suggest that the answer may be "yes" for women as an underrepresented group. While men reported more self-efficacy, expected better grades, and expected fairer treatment than women after reading a fixed mindset syllabus, those gender differences were eliminated in the growth mindset condition. Thus, our results provided support for H5. Overall, these findings support the argument that a growth-oriented instructor's approach to teaching and learning may level the playing field for women who might otherwise doubt their own ability to succeed in STEM disciplines.

Further, women generally anticipated gender would contribute more to their grade than men did. This finding suggests that women may be more aware of gender stereotypes, resulting in a suspicion that their gender might impact their grade. This awareness may contribute to stereotype threat, which has been found to have an impact on women's performance in STEM disciplines (Canning et al., 2022; Spencer et al., 1999). Given that gender stereotypes commonly favor men and evidence suggests that stereotypes have a negative effect on women (Moè et al., 2021), women anticipating lower grades, lower self-efficacy, and that their gender contributes more to their grade

than men is not unexpected in today's climate of gender inequality awareness. Yet, it is possible that part of the explanation behind women being disadvantaged in STEM is rooted their perception of the beliefs endorsed by the instructor (e.g., Canning et al., 2022). The interaction found in the current study between syllabus orientation and gender provide evidence of this phenomenon.

The present study also examined how students from racial groups represented and underrepresented in STEM disciplines might respond to growth and fixed mindset instructors (i.e., H6). In this case, the findings were not what we had anticipated. We found few interactions between student race and instructor mindset, and those we did find were not what we expected; nor were our findings consistent with results from previous research (e.g., Canning et al., 2019; Rattan et al., 2018). We found that students from racially represented groups seemed to be more affected by a fixed mindset syllabus than were the students from underrepresented racial groups. Both groups reported more positive views of the instructor and expected more fair treatment after reading a growth mindset syllabus than after reading a fixed mindset syllabus; however, the difference was greater for the represented than the underrepresented students. It is possible that institutional cultures that may impact the experience of racially underrepresented students may play a role here. For example, at the university where this study was conducted, the representation of the racial groups categorized as underrepresented was notably larger than many other institutions. It would be interesting to examine, for example, how differences in proportion of underrepresented students in the student body, sense of belonging, and stereotype threat might play a role in students' response to fixed and growth mindset instructors.

Implications

Our findings add to the growing body of research indicating that projection of faculty mindset impacts student perceptions. To ensure all students have an equal opportunity to thrive in the learning environment, especially in the context of STEM education, faculty must be aware of the consequences of their mindset and beliefs regarding student ability. Faculty interventions aimed at increasing growth mindset could potentially lead to more growth mindset-oriented STEM professors, which in turn could lead to the retention of students from underrepresented groups. Additionally, encouraging underrepresented students (e.g., women) to develop and maintain a growth mindset orientation might also mitigate the effects of an entity-oriented professor.

The results of this study also suggest that the messages conveyed in a syllabus impact students' perception of the instructor and of their own ability to succeed. Thus, faculty should be acutely aware of how a course syllabus can set the tone for student success or failure in the class. Since the syllabus serves a variety of purposes (i.e., course introduction, explaining requirements, describing grade calculations, etc.), it is important that instructors are aware of the additional impact they can have on students' perceptions of their likelihood of success and of the instructor as someone who is likely to nurture student growth. As we only measured student perceptions immediately following presentation of the syllabi, it is possible that the effects may wear off over the course of the semester once students have more opportunity to interact with instructor and have their actual performance as an indicator for expectations. Nevertheless, the initial exposure may start students down a path of expecting success or failure, producing a self-fulfilling prophecy that will be borne out over the course of the term.

Limitations and Future Research

Students who participated in this study developed their perceptions solely on a short, focused syllabus. In the real world, the syllabi are much longer, and the context is somewhat different. First impressions of an instructor and the development of expectations about course and likely performance are conveyed to students through in-person or virtual interactions with an instructor, primarily in the classroom during class time. Interactions with, and the appearance/nonverbal communication from, the instructor provide additional information to influence student perceptions and expectations. Our results might be more applicable in the context of asynchronous online courses in which the students view the syllabus independently and have limited interactions with the instructor. Nevertheless, studies that have observationally investigated the effect of faculty mindset have found similar results (Canning et al., 2019; Canning et al., 2022). Therefore, while we were not able to see how these effects play out in actual classrooms in this study, our results do provide evidence that faculty mindset as expressed in syllabi can affect student perceptions.

As noted above, the institutional context and individual experiences of students may play a role in their response to syllabi representing fixed and growth mindset. For example, there is some evidence that the students' own mindset may interact with the instructor's apparent mindset (Yeager et al., 2021). Institutional context may involve factors such as geographical location, student population, and institutional history. Future research should also continue to consider and investigate other factors that may impact student perceptions, such as students' experience with STEM courses. Lastly, the mechanisms that underlie the effects of faculty mindset are an additional area ripe for future research. Canning et al. (2022) reported that students' sense of belonging and stereotype threat play a role in how they are affected by instructor mindset. Understanding the underlying mechanisms could help us create solutions to lessen the impact of fixed mindset faculty.

Conclusion

Within the context of STEM education, creating an atmosphere that encourages all students to succeed is vital for increasing student retention. The results of our study and other similar investigations tell a clear story: Instructor mindset matters. Instructors need to be aware of how their beliefs regarding student ability can impact students and how a syllabus can set the tone for student expectations of success or failure. Faculty workshops aimed at increasing growth mindset orientation in instructors and emphasizing the importance of syllabi for creating an atmosphere that encourages success could help mitigate the issue of retention in STEM disciplines.

Acknowledgements

Christy Jarrard was affiliated with Augusta University at the time of the study and is currently affiliated with Georgia State University.

Appendix

Appendix 1. Sample Growth Mindset Syllabus.

Chemistry Syllabus- Fall 2019

Class Times
Mon/Wed/ Fri
8:00-8:50am
Office Location
Science Hall
Office Hours
Mon/Wed
10-11:45am or by appointment

Course Overview
In this course, students will learn about the theories and applications of chemistry in relation to research.

Course Expectations

Although this is a challenging course, students can do well. When facing a challenge, it is best for students to embrace it and use it as an opportunity to develop. Students from previous semesters have done well in this course. This is a difficult course and I am expecting students to come to me with any questions they may have and for constructive criticism. I would like for you to put in effort and seek help when you need it. Learning is a shared responsibility. I will do my best to facilitate your learning. If you complete the assignments and readings, you will do well.

Grade Distribution

Assignment	Percent of grade (out of 100%)
Homework assignments	20%
Exam 1	20%
Exam 2	20%
Exam 3	20%
Final Exam	20%

Exam Policy
In this course, there will be three exams and a final. Each exam will be worth 20% of the final grade and the final is worth 20% of the final grade. An answer key for each exam will be available online. Students may also come to my office hours to view what they missed and ask questions.
Homework Policy
For each homework assignment, an answer key will be posted two days after the graded assignment is returned. Students will have the opportunity within those two days to correct their answer to receive partial credit on the questions they missed. For homework assignments, students can come to my office hours or visit my office by appointment to get help with the questions they missed.

Appendix 2. Sample Fixed Mindset Syllabus.

Physics Syllabus- Fall 2019

Class Times
Mon/Wed/ Fri
8:00-8:50am
Office Location
Science Hall
Office Hours
Mon/Wed
10-11:45am or by appointment

Course Overview
This course covers the theories and applications of physical science with emphasis on evidence acquired through rigorous research.

Course Expectations

Not every student will do well in this physics course. Students from previous semesters either do great or they fail. This is a difficult course and I am expecting many students to drop this class within the first week. It is important for students to maintain a high rank in this course. It is important for students to make sure their grades are near the top of the class. If a student consistently gets grades toward the lower end of the distribution of scores, they should consider withdrawing. You may put in a lot of effort and still perform poorly in this class. It is your responsibility to do well in this class. Everything you need for this class will be in the textbook or on the class page. It is your responsibility to read the materials and come to class prepared.

Grade Distribution

Assignment	Percent of grade (out of 100%)
Exam 1	20%
Exam 2	20%
Exam 3	20%
Exam 4	20%
Final Exam	20%

Exam Policy
In this course, there will be four exams and a final. Each exam will be worth 20% of the final grade. If a student wishes to see the answer key, they must make an appointment to stop by my office. I will show students where they are in the grade distribution after every exam.

Homework Policy
The homework will not count for a grade. In the past, students who have done well on the homework have done well in the class.

References

Beasley, M. A., & Fischer, M. J. (2012). Why they leave: The impact of stereotype threat on the attrition of women and minorities from science, math and engineering majors. *Social Psychology of Education, 15*, 427–448. http://doi.org/10.1007/s11218-012-9185-3

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development, 78*(1), 246-263. https://doi.org/10.1111/j.1467-8624.2007.00995.x

Burnette, J. L., O'Boyle, E. H., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin, 139*(3), 655–701. https://doi.org/10.1037/a0029531

Canning, E. A., Ozier, E., Williams, H. E., AlRasheed, R., & Murphy, M. C. (2022). Professors who signal a fixed mindset about ability undermine women's performance in STEM. *Social Psychological and Personality Science, 13*(5), 927-927. https://doi.org/10.1177/19485506211030398

Canning, E. A., Muenks, K., Green, D. J., & Murphy, M. C. (2019). STEM faculty who believe ability is fixed have larger racial achievement gaps and inspire less student motivation in their classes. *Science Advances*, *5*(2). https://doi.org/10.1126/sciadv.aau4734

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*(2), 256–273. https://doi.org/10.1037/0033-295X.95.2.256

Ferrare, J. J. (2019). A multi-institutional analysis of instructional beliefs and practices in gateway courses to the sciences. *CBE—Life Sciences Education*, *18*(2), ar26. https://doi.org/10.1187/cbe.17-12-0257

Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology, 85*(3), 541–553. https://doi.org/10.1037/0022-3514.85.3.541

Harnish, R. J., & Bridges, K. R. (2011). Effect of syllabus tone: Students' perceptions of instructor and course. *Social Psychology of Education, 14*(3), 319-330. https://doi.org/10.1007/s11218-011-9152-4

Honicke, T., & Broadbent, J. (2016). The influence of academic self-efficacy on academic performance: A systematic review. *Educational Research Review, 17*, 63-84. https://doi.org/10.1016/j.edurev.2015.11.002

LaCosse, J., Murphy, M. C., Garcia, J. A., & Zirkel, S. (2020). The role of STEM professors' mindset beliefs on students' anticipated psychological experiences and course interest. *Journal of Educational Psychology, 113*(5), 949-971. https://doi.org/10.1037/edu0000620

Lightner, R., & Benander, R. (2018). First impressions: Student and faculty feedback on four styles of syllabi. *International Journal of Teaching and Learning in Higher Education*, 30(3), 443-453.

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., Gheen, M., Kaplan, A., Kumar, R., Middleton, M. J., Nelson, J., Roeser, R., & Urdan, T. (2000) *Manual for the patterns of adaptive learning scales*. University of Michigan. http://websites.umich.edu/~pals/PALS%202000_V13Word97.pdf

Moè, A., Hausmann, M., & Hirnstein, M. (2021). Gender stereotypes and incremental beliefs in STEM and non-STEM students in three countries: Relationships with performance in cognitive tasks. *Psychological Research, 85*, 554-567. https://doi.org/10.1007/s00426-019-01285-0

Muenks, K., Canning, E. A., LaCosse, J., Green, D. J., Zirkel, S., Garcia, J. A., & Murphy, M. C. (2020). Does my professor think my ability can change? Students' perceptions of their STEM professors' mindset beliefs predict their psychological vulnerability, engagement, and performance in class. *Journal of Experimental Psychology: General, 149*(11), 2119-2144. https://doi.org/10.1037/xge0000763

National Science Board. (2015). Revisiting the STEM workforce, a companion to science and engineering indicators 2014. Retrieved from https://www.nsf.gov/nsb/publications/2015/nsb201510.pdf

National Science Board. (2022). The state of U.S. science and engineering in 2022. Retrieved from https://ncses.nsf.gov/pubs/nsb20221/u-s-and-global-stem-education-and-labor-force

Nusbaum, A. T., Swindell, S., & Plemons, A. (2021). Kindness at first sight: The role of syllabi in impression formation. *Teaching of Psychology, 48*(2), 130-143. https://doi.org/10.1177/0098628320959953

Rattan, A., Savani, K., Komarraju, M., Morrison, M. M., Boggs, C., & Ambady, N. (2018). Meta-lay theories of scientific potential drive underrepresented students' sense of belonging to science, technology, engineering, and mathematics (STEM). *Journal of Personality and Social Psychology, 115*(1), 54-75. https://doi.org/10.1037/pspi0000130

Richardson, D. S., Bledsoe, R. S., & Cortez, Z. (2020). Mindset, motivation, and teaching practice: Psychology applied to understanding teaching and learning in STEM disciplines. *CBE-Life Sciences Education, 19*(3). https://doi.org/10.1187/cbe.19-11-0238

Schussler, E. E., Weatherton, M., Chen Musgrove, M. M., Brigati, J. R., England, B. J. (2021). Student perceptions of instructor supportiveness: What characteristics make a difference? *CBE – Life Sciences Education, 20*(2). https://doi.org/10.1187/cbe.20-10-0238

Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35*, 4-28.

van der Zanden, P. J.A.C., Denessen, E., & Cillessen, A. H. N. (2018). Predictors of first-year student success: A systematic review. *Educational Research Review, 23,* 57-77. https://doi.org/10.1016/j.edurev.2018.01.001

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*(4), 548-573.

Weiner, B., Frieze, I. H., Kukla, A., Reed, L., Rest, S., & Rosenbaum, R. M. (1971). *Perceiving the causes of success and failure.* General Learning Press.

Whitcomb, K. M., & Singh, C. (2021) Underrepresented minority students receive lower grades and have higher rates of attrition across STEM disciplines: A sign of inequality? *International Journal of Science Education, 43*(7), 1054-1089. https://doi.org/10.1080/09500693.2021.1900623

Yeager, D. S., Carroll, J. M., Buontempo, J., Cimpian, A., Woody, S., Crosnoe, R., Muller, C., Murrary, J., Mhatre, P., Kersting, N., Hulleman, C., Kudym, M., Murphy, M., Duckworth, A. L., Walton, G. M., & Dweck, C. (2021). Teacher mindsets help explain where a growth-mindset intervention does and doesn't work. *Psychological Science, 33*(1). https://doi.org/10.1177/09567976211028984