

***Malleable Minds:
Translating Insights From
Psychology and Neuroscience to
Gifted Education***

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Growth Mindsets in the Laboratory and the Real World

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Our current research is rooted in the very first experiment the first author (Aronson) carried out as a graduate student under the tutelage of his mentor, Ned Jones, one of the fathers of attribution theory. The idea was this: A teacher engaged in mentoring a student faces an attributional conundrum when judging that student's intelligence. On the one hand, as a teacher, you want to believe that your teaching is effective in influencing student learning, as when a student dutifully and successfully follows your advice about how to fix a badly written paragraph or analyze a set of data. On the other hand, from a purely attributional standpoint, a student who succeeds with little input from a teacher is, by definition, really smart. So how do teachers and mentors perform the difficult attributional calculus of disentangling their own influence when evaluating a student?

In a nutshell, those experiments found that it depends a lot on the teacher's specific mindset. If she (our teacher-participants were all female) is invested primarily in boosting her student's *performance*, she will be prone to make snap judgments about the student's ability based on scant performance evidence. But if she is invested in improving her student's underlying ability and future outcomes, she is likely to withhold judgment for a while, waiting for more evidence to judge if the student improves over time. In the study, the confederate-student's performances were carefully scripted so that all of them solved the same number of items over all, but varied in the pattern of right and wrong answers. In one condition, the student started out strong and then declined; in the comparison condition, performance improved after a slow start. When the teachers were asked to evaluate

the abilities of their student, the performance-oriented teachers (who were offered rewards for boosting immediate performance) were most impressed by the student who performed well early; the learning oriented teachers (who were promised rewards for boosting the student's *ability* to solve problems in the future) were most impressed by the student who took a while to catch on, who seemingly improved over time. This research meant a lot to Aronson; it

was, after all, his first publication (Aronson & Jones, 1992), and it represented an interesting exception to the general rule that first impressions (such as how a student performs early in a semester) will determine the ability attributions we make. But mostly it was important because it exposed him to an important paper by Dweck (Dweck & Leggett, 1988), which elucidated the cognitive underpinnings of human motivation and demonstrated the very powerful ramifications of the way we think about the nature of intelligence. This opportunity makes up for the fact that the paper went unnoticed and un-cited, with the notable exception of a paper (Wallach & Wallach, 1994), which argued that experiments like the Aronson and Jones studies—which made seemingly obvious and “tautological” predictions—were of little use to the field. Ouch!

Given this chilly reception, it is ironic that the issues addressed in that “unnecessary” paper have taken center stage in schools. In the wake of the *No Child Left Behind* legislation mandating that schools show progress on annual tests or face stiff penalties, educators are now forced into a mindset of boosting performance at any cost. The mentality has become primarily this: Do not worry about long-term learning or the child's well-being or the teacher-student relationship—just get the scores up. This mindset has been fairly disastrous for student well-being, particularly those students most behind to begin with (Baker et al., 2010).

Stereotype Threat

Aronson's research with his other mentor, Claude Steele, on what they called “stereotype threat” (Steele & Aronson, 1995), took him further into the realm of academic achievement. This time, however, the focus was not on the teacher evaluating a student's intelligence, but rather on the student facing such evaluations. “Stereotype threat” is the predicament students experience when evaluated in a situation where a negative cultural stereotype about their group's intellectual abilities is relevant. Because of the nature of stereotyping in this country, Black and Latino students face this predicament very often; girls and women face it in the traditionally male-dominated domains of math and physical sciences. Dweck and Leggett's critical distinction between the entity theory (“intelligence is fixed”) and the incremental theory (“intelligence can grow with effort”) and their relationship provided a useful lens through which to examine the process and remediation of stereotype threat. After all, the chief concern for the student under stereotype threat is that he or she will confirm the stereotype of low ability. Surely, we reasoned, how the student construes that ability must matter in this process.

Over 200 published studies show that the experience of stereotype threat can undermine test performance, and, over time, interfere with students' long-term academic performance and development (see Aronson & Dee, 2011; Aronson & McGlone, 2009, for reviews). In the initial studies (Steele & Aronson, 1995), we reasoned that the activation of a negative stereotype (e.g., "Black people are unintelligent") in a stereotype-relevant situation (e.g., taking an intelligence test) can create in the test-taker a disruptive level of anxiety, one rooted in the fear of performing in a way that makes the group stereotype an apt characterization of the test-taker himself. This anxiety, in turn, interferes with his ability to think well and focus. Our initial studies examined this in several ways. In one study Black and White undergraduate students took a difficult verbal reasoning test. For half of these students, the test was presented to them as such tests are typically presented—as a means of measuring their abilities and knowledge, and their suitability for high level scholarship. We reasoned that stereotype threat would be operative in such a situation for the Black students, who like most people in this culture, would be aware of the stereotype depicting Black Americans as having lower intelligence than Whites. For the remaining test-takers, we greatly downplayed the evaluative nature of the situation; we presented the same exact test as a way for us as psychologists to explore the psychology of verbal reasoning. We assured them that we had little interest in measuring their abilities with the test.

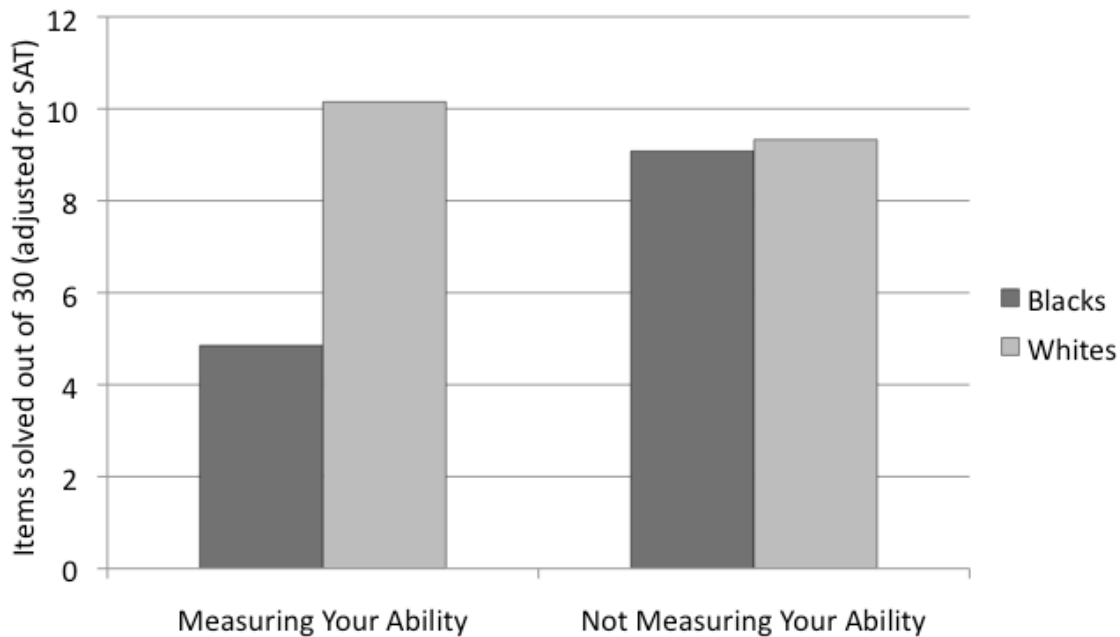


Figure 3.1. Verbal test performance as a function of test diagnosticity and race.

As is clear from Figure 1, presenting a test in this less threatening way made a significant difference for the Black test-takers. Black students in the non-evaluative condition performed much better on the test than Black students who thought the test was being used to measure their intelligence. It is also clear that the difference in the presentation of the test had virtually no effect on the White test-takers. Steele

and Aronson (1995) conducted several experiments of this sort. One of the most dramatic experiments showed how easy it is to take a nonthreatening situation and spoil it for students who are targeted by ability stereotypes. In that experiment, all test-takers were assured that we were not interested in measuring their abilities. But for half of them, we included a subtle detail that reminded them of the stereotype; all students filled out a brief demographic questionnaire, which requested them to indicate their major, their age, and gender. In the stereotype threat condition, one additional item at the end asked them to indicate their race. As can be seen in Figure 2, being asked about one's race had the effect of suppressing the Black students' test performance; the Black students in this condition performed significantly worse than Black students not asked to indicate race and White students in the race-prime condition. Thus, it does not take much to turn a comfortable, non-evaluative situation into a threatening one, and thereby spoil performance.

Stereotype threat has been demonstrated in a wide variety of situations—not merely academic situations, but also those that involve interpersonal performances such as applying for a job, answering political-knowledge questions during a phone interview, playing chess, driving a car, or putting golf balls. Virtually any situation where a stereotype can be relevant to a performance (e.g., “women are bad drivers”; “White people are not naturally athletic”) can produce these kinds of debilitating effects (see Aronson & McGlone, 2009, for a review of these effects).

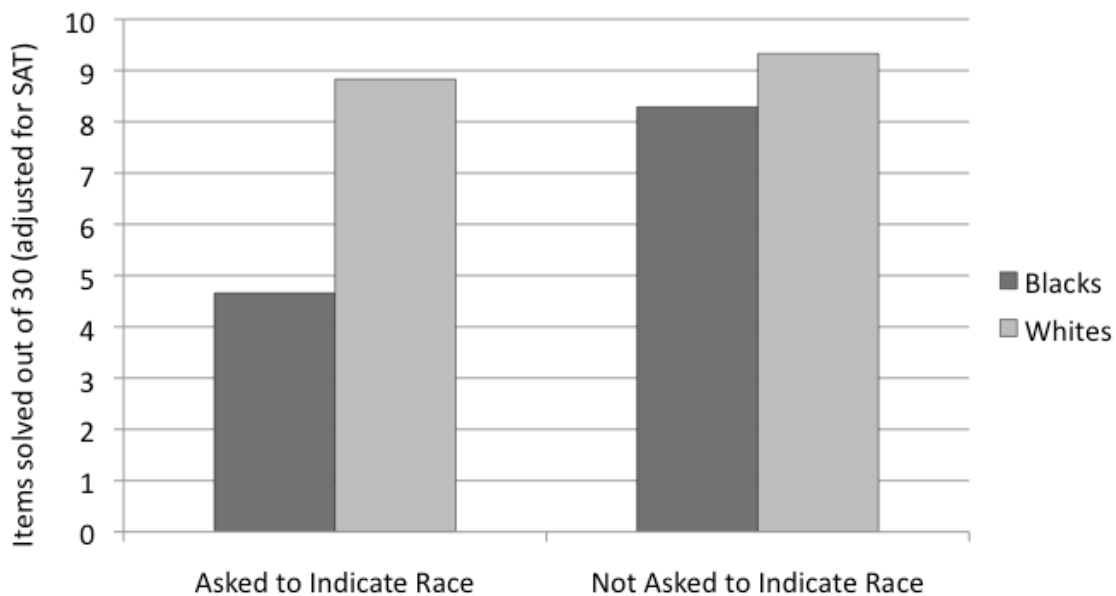


Figure 3.2. Verbal test performance on a non-evaluative verbal test as a function of race salience.

Stereotype Threat as Mindset

Stereotype threat has been shown over and over again to respond to subtle manipulations of situational cues, task instructions, test difficulty, and so on. For

example, Inzlicht and his colleagues (Inzlicht, Aronson, Good, & McKay, 2006; Inzlicht & Ben-Zeev, 2000) have found that simply mixing students into heterogeneous (race or gender) groups is often sufficient to interfere with the test performance of the stereotyped group. The presence of a male in an otherwise all-female group or of a White test-taker in a classroom of Black students serves as a clear identity cue for stereotyped individuals, a reminder that they do not belong to the dominant group, and a reminder of the stereotype. Similarly, being exposed to cues that remind one of one's gender or race has similar effects. For example, watching a brief television commercial depicting women in traditional homemaker roles prompted lower math test performance among a sample of college women (Davies, Spencer, Quinn, & Gerhardstein, 2002); drawing a picture of a family eating with chopsticks improved the performance of a sample of Asian females (Ambady, Shih, Kim, & Pittinsky, 2001). The mechanism in these studies is "identity salience" (e.g., McGlone & Aronson, 2006; Steele, Spencer, & Aronson, 2002); something reminds the test taker of his or her identity, and if that "primed" identity is linked with a positive stereotype (e.g., "Asians are good at math"), performance improves. But if the identity is negatively linked to performance (e.g., "women are bad at math"), performance declines. One implication of identity salience research is that racially homogeneous environments may give rise to very little stereotype threat, because the reminders of Black-White differences are scant. For example, in a recent meta-analysis that includes both published and unpublished stereotype threat experiments, Wicherts and de Han (under review) find that despite numerous attempts to replicate the original Steele and Aronson paradigm at historically Black colleges, significant stereotype threat effects have never been found.

One way to think about such phenomena is to view them as effects of distinct "mindsets." Some environmental cues prompt a "threat mindset," which gets the individual focused on performing poorly and the consequences of that poor performance, an extra mental burden that saps cognitive resources. Other kinds of cues induce a more positive kind of mindset that does not arouse such worries about performance. One of the more exciting developments in stereotype threat research is that it can be quite an easy matter to substitute one mindset for another.

For example, McGlone and Aronson (2006) had students at a highly selective liberal arts college in the Northeast complete a "mental rotation" test. Mental rotation is the ability to mentally rotate a 2-dimensional image of a 3-dimensional object and compare that image to similar 2-dimensional images of similar objects. The goal is to determine which of the objects is the same as the target object. Mental rotation performance figures importantly into the ongoing debate about gender differences in math and science, because whenever—and wherever—the tests are given, large sex differences occur. Regardless of age group or nationality, males perform better than females, leading some to believe the difference is innate and mediated by hormones like testosterone (Halpern et al., 2007). In the McGlone and Aronson experiment, prior to taking a difficult mental rotation test, the students were induced to adopt one of three mindsets—gender identity, good student, or irrelevant. In the gender identity mindset students were asked a question that

reminded them of their gender (“Tell us what a student might like about living in a coed dorm.”). In the irrelevant mindset condition, they were asked to indicate a few things a student might like about living in the Northeast. In the good student mindset condition, they were asked to list a few things they liked about being a student at a “highly selective liberal arts college.” Test scores showed a large gap in the gender identity mindset condition; men’s performance improved relative to the control condition, whereas women’s performance declined. The gap was significant in the control condition, but it nearly disappeared in the good student mindset condition, both because women’s performance improved and because men were not primed to think about their maleness.

Threat Mindsets vs. Challenge Mindsets

Very early on in our work on stereotype threat, we speculated about individual differences that might moderate the experience of stereotype threat, such as how invested a person is in the domain that is stereotyped, how much they are “staking their salvation,” as William James put it, on doing well there. For example, Aronson et al. (1999) examined the performance consequences of caring about math a great deal (vs. only moderately) for math performance under stereotype threat. We found that students who cared about math the most performed the worst when confronted with the stereotype that their group was inferior to Asians at math. But the group that was only moderately “identified” with math actually performed better when confronted with the stereotype. For the “highly math identified,” as we call them, caring a lot about a domain where their group is suspected of being inferior to Asians put them in a threat mindset, and their performance declined by nearly a full standard deviation. In contrast, the moderately identified students seemed to experience a “challenge” mindset. In other words, the unfavorable comparison with Asians seemed to make them want to disprove the stereotype, but the fact that their egos were not too engaged meant that they did not feel threatened by the comparison. This threat vs. challenge distinction, we believe, is a vital distinction, one that is not merely a question of semantics. Blascovich and his colleagues have shown, for example, that the threat mindset correlates with negative physiological markers (e.g., Blascovich, Mendes, Hunter, Lickel & Kowai-Bell, 2001; Blascovich, Mendes, Hunter, & Salomon, 1999), whereas the challenge mindset is arousing but not negative (e.g., Vick, Seery, Blascovich, & Weisbuch, 2008). A key question for our research and intervention is this: Can we find ways that reliably transform threatening situations into challenging ones, thereby improving student performance and motivation?

The Growth Mindset and Stereotype Threat

The Dweck and Leggett (1988) perspective—on the way fundamental beliefs about intelligence underlie learning and performance goals—led to early speculations that a key factor in how one responds in potentially stereotype-threatening situations was one’s conception of the nature of intelligence. Specifically, we (Aronson, Fried, & Good, 2002) reasoned that the mindset that intelligence is fixed gives stereotype threat much of its power to create anxiety, because what is particularly unsettling is

the apprehension that a test can mark an individual as unalterably limited. An expandable intelligence mindset, by contrast, should reduce the degree to which one feels threatened by the stereotype; after all, if one can get smarter with hard work, a low score on a test is simply a marker of one's current level of skill—it is not a life sentence. What Dweck would later name the “growth mindset” (Dweck, 2006) has been a central focus in our stereotype threat research for many years.

Rooted in the belief that intelligence can grow with effort, the growth mindset has a number of distinct advantages over some of the other approaches to reducing stereotype threat. For example, it has been shown repeatedly (e.g., Croizet & Claire, 1998; Davis, Aronson, & Salinas, 2006; Steele & Aronson, 1995) that reducing the evaluative scrutiny in academic situations improves the performance of stereotyped group members. Similarly, reducing the salience of one's social identity—or replacing it with a more facilitative one (e.g., good student)—also reliably improves performance in potentially threatening situations. Yet a moment's reflection suggests that these are very hard to accomplish outside of the laboratory. Evaluation of ability and knowledge are *de rigueur* in the American classroom, and high stakes testing is not going away any time soon. Moreover, the integrated school setting is one that naturally evokes the salience of one's identity; so reducing identity salience would seem difficult in the real world. Indeed, we suspect that the laboratory studies that demonstrate this kind of passive priming of race or identity (e.g., by having boys and girls simply seated in the same testing room, checking one's race on a demographic questionnaire) probably underestimate the effects of identity salience in many academic situations. For example, interviews with students who were asked to evaluate their experience working on a task in mixed-ethnicity groups revealed frequent and strong emotions (e.g., “It was a nightmare; I could tell nobody thought my ideas were any good because I am Latino.”).

Our first use of the growth mindset (Aronson et al., 2002) was a randomized field experiment in which we attempted to reduce the negative responses to stereotype threat. Specifically, we wanted to create and test an intervention to protect students from impaired performance, devaluing in response to failure, and unpleasantness associated with academic pursuits among a group highly at risk—African American college students at an elite college. In brief, we created an elaborate intervention designed to shape students' beliefs about the malleability of intelligence. The Black and White undergraduates who participated in the intervention first learned about the new research suggesting that brains form new connections when people learn, which has the effect of increasing their intelligence. We then had these students write letters of encouragement to struggling middle school students in an “academic pen-pal program” that ostensibly matched college students with younger students who were like them demographically. Students were instructed to use what they had learned about the way the brain rewires itself into the letters they wrote. In a control condition, the students wrote encouraging letters as well, but their messages were crafted around the notion of “multiple intelligences,” that people have different strengths and weaknesses and that the goal was therefore to find one's strengths and capitalize on them in school. Students in both conditions wrote

several of these letters and wrote and recorded a speech based on the theme they had developed in them. All this was designed to make the college student adopt mindsets about the nature of intelligence that were at once certain and accessible, an attitude that they would not simply hold, but one they would use as they navigated their educational experiences.

Three months later, we examined the official transcripts of these students to see if our intervention had had any impact on them. To our surprise, the intervention worked for both Black students and for White students. Students in the growth mindset condition showed a significant increase in their GPAs: an increase of about one half of a grade point for the Black students and one third of a grade point for the White students. We supplemented the GPA data with attitude data. An interviewer telephoned the students in the study posing as a researcher interested in gauging the attitudes and interests of students at the college. Among the key questions were, “How much do you enjoy the educational process at the college?” and other questions tapping the degree to which the students identified with academics and valued it as a self-defining feature. Students’ responses mirrored the GPA data; if they had been taught the growth mindset they reported enjoying college more, and they identified more with academics than if they had been assigned to the multiple intelligences condition. The message of this study was very clear. Having a growth mindset is very helpful, especially to Black students. And, far from being simply an attitude that one has or does not have, a growth mindset can be instilled by teaching people about the true nature of intelligence—that is by debunking the myth that intellectual ability is fixed.

In a follow-up randomized controlled school intervention (Good, Aronson, & Inzlicht, 2003), we replicated these effects among low-income middle school students in Texas. Latino seventh grade students interacted with same gender and same ethnicity university mentors, who introduced the growth mindset to the young students and consulted with them to create web pages that featured the science of neuroplasticity. Two additional groups also interacted with mentors but did not receive the growth mindset intervention. One of these groups received attribution retraining, a method that focuses students on the inherent difficulty of seventh grade and middle school and fosters an understanding that most people improve over time as they adjust to the new environment. This can be seen as a close cousin of the growth mindset, in that it creates an understanding that people improve, but it does not explicitly push the notion that intelligence itself is malleable. In the third condition (the control group), students worked with their mentors to create web pages that contained anti-drug use messages. Latino students in the two growth mindset groups performed significantly better on their end of year statewide assessment of reading than did students not trained in the mindset. Additionally, as may be seen in Figure 3, in the control condition there was a significant gender gap on the math portion of the test. This gap was closed by both growth mindset interventions; girls earned significantly higher scores than their control group counterparts when taught to see their abilities as under their control and expandable by effort. Blackwell and her associates (Blackwell, Trzesniewski, & Dweck, 2007) found similar results in a conceptual replication of this

intervention. Students who went through the malleable intelligence intervention were much less likely to experience the GPA decline in math that frequently characterizes the transition from elementary to middle school.

An even more recent set of studies shows how simply framing particular tasks as opportunities to learn can transform typically debilitating threats into energizing challenges (Alter, Aronson, Darley, Rodriguez, & Ruble, 2010). In one study, we examined the stereotype that many students face when they go to highly selective, Ivy League colleges—their insecurity that, relative to the majority of their classmates who attended prep school or came from rigorous feeder schools, they do not really fit in the Ivy League. Such students often feel like they do not fully belong (academically or culturally) because they went to public schools that were not orienting them to the environment of the “elite” college. In the experiment, Princeton students were presented with a difficult math test. Before they began, they were asked to indicate the kind of high school they had attended. For these “low-representation” students, this made their status as outsiders salient, and the effect was to lower their performance. However, as is evident in Figure 4, if we also added the simple suggestion to view the test as a “challenge that they could learn math from,” they performed just as well as their prep school-trained “high-representation” insiders.

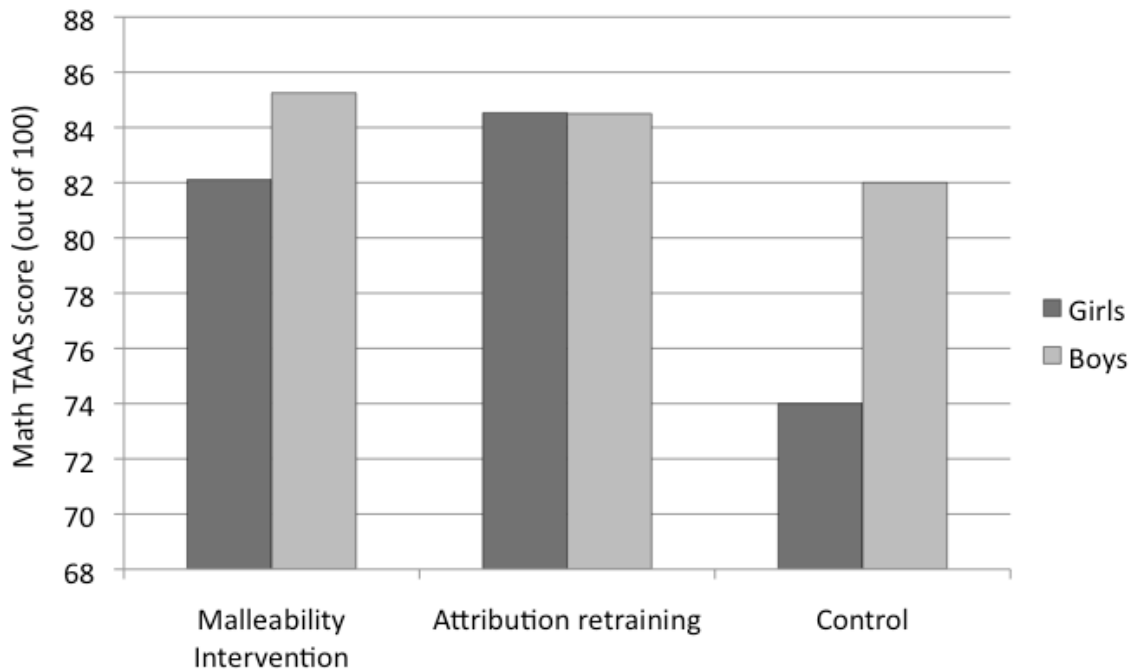


Figure 3.3. Grade 7 math TAAS performance as a function of gender and mindset intervention.

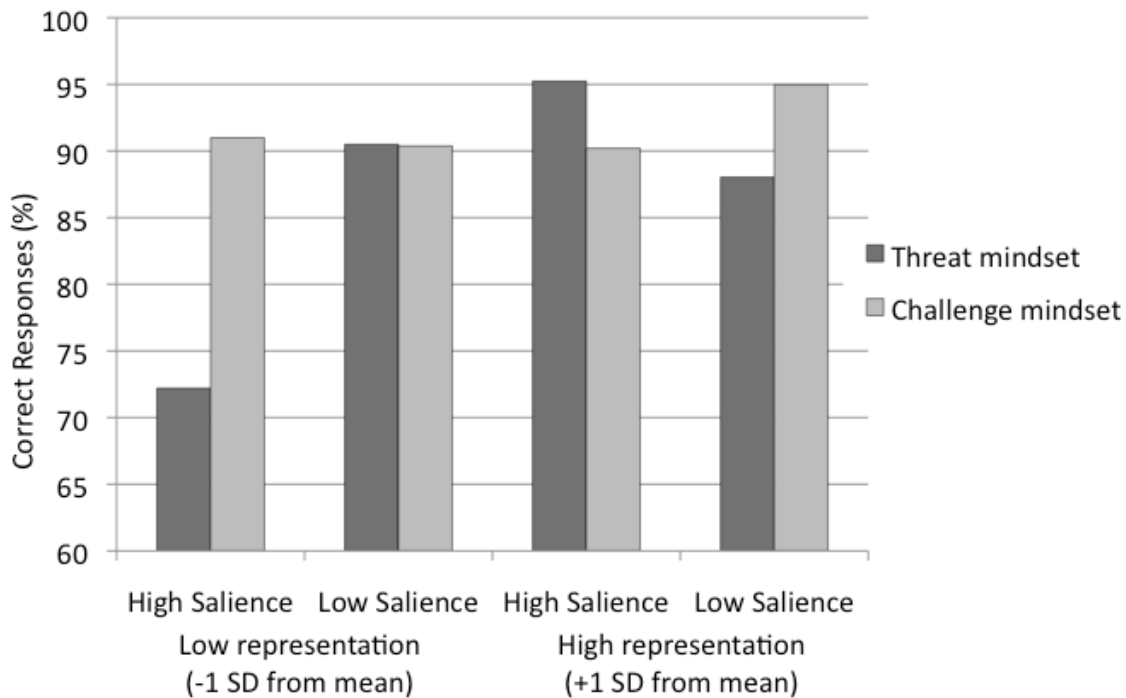


Figure 3.4. College student math performance as a function of outsider status, salience, and challenge mindset.

We replicated this effect among Black elementary students in North Carolina, who took a practice version of their end-of-grade mathematics exam (see Figure 5). Making race salient interfered with performance, but invoking the growth mindset—“this is challenging, but a great opportunity to learn math”—seems to have transformed the debilitating threat into an energizing challenge. That is, students performed best when their race was salient *and* they were encouraged to see it as a learning experience. It appears to be the case that if students embrace a growth mindset, threats (e.g., a reminder of racial identity) can confer a motivational advantage. Recently, we conducted an interview with Maryland’s principal of the year, who transformed her school from failing (0% proficient on the state test) to high flying (100% proficient) in just a few short years. Among the tactics that she used to improve test scores was the constant reminder that “the tests are there to help us learn.” She had never heard of the growth mindset, but she weaves it into virtually every aspect of her reform efforts, from test preparation, to school projects, to the way she talks to children about making mistakes. “This is how you did today,” she tells her children, “tomorrow is another day, and you will do better.”

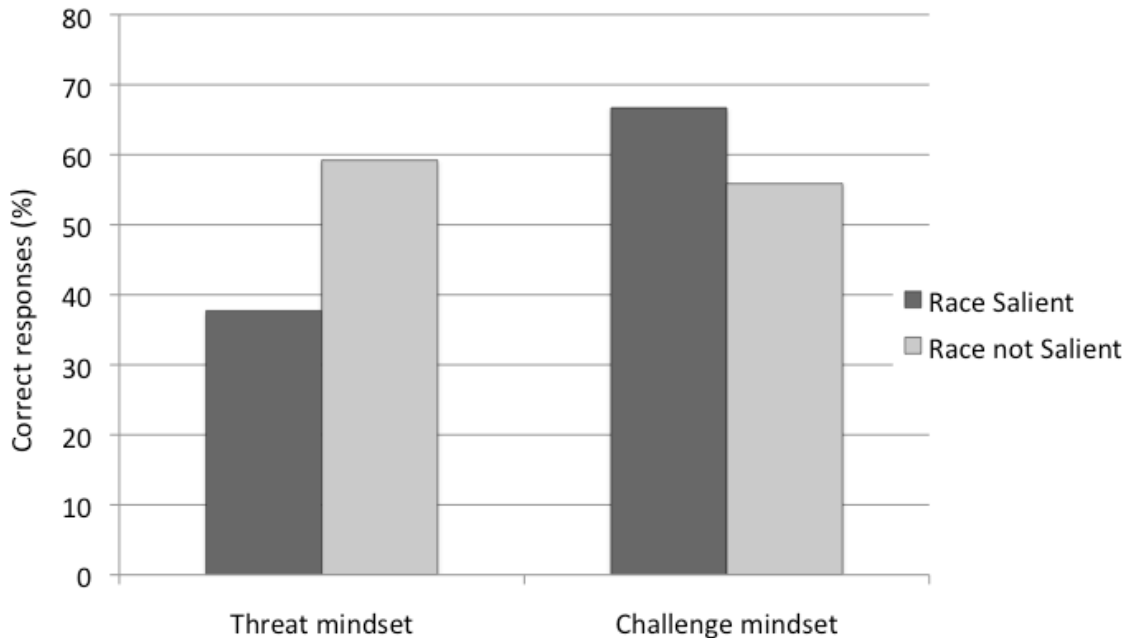


Figure 3.5. Math end-of-grade practice exam performance as a function of stereotype threat and challenge mindset.

There is now abundant evidence from interventions, experiments, and the real world that promoting a growth mindset helps students resist the pernicious effects of conditions that frequently threaten their learning and performance (stereotypes, difficult school transitions, feeling like an outsider, etc.).

Some Puzzles and Complexities

Because of effects such as these, we have long assumed that simply believing that intelligence is malleable is sufficient to promote achievement. Yet, we have found this to be true mainly in the breach. For example, in a study aimed at determining the developmental onset of stereotype threat (Aronson & Good, 2009), we placed low income Latino students in fourth, fifth and sixth grades into threat situations; we gave them a test and told half we were interested in measuring their intelligence with the test. This had no discernable effect on test performance until students reached the sixth grade, when the standard stereotype threat effects became apparent (Latinos performed somewhat worse when they believed their intelligence was being measured). Some weeks prior to testing, we had measured their beliefs about intelligences, using the now famous scale developed by Dweck (Dweck, 2000), which asks students to agree or disagree with statements such as “although you can learn new things, you can’t really change your basic intelligence.” We did not find clear effects on performance, as one would expect from our interventions, although as can be seen in Figure 6, we did find interesting effects among sixth graders when we examined the effects of stereotype threat on challenge seeking. Specifically, we told students they would be given another “special” test on which they were to choose the difficulty level of the problems, thus giving us an indication of how much challenge they preferred. When students were under stereotype threat—that is,

when we told them that the upcoming test would be used to gauge their abilities—students who favored an incremental view of intelligence chose more difficult problems to be included on the test than did students who favored an entity theory of intelligence (see Figure 6).

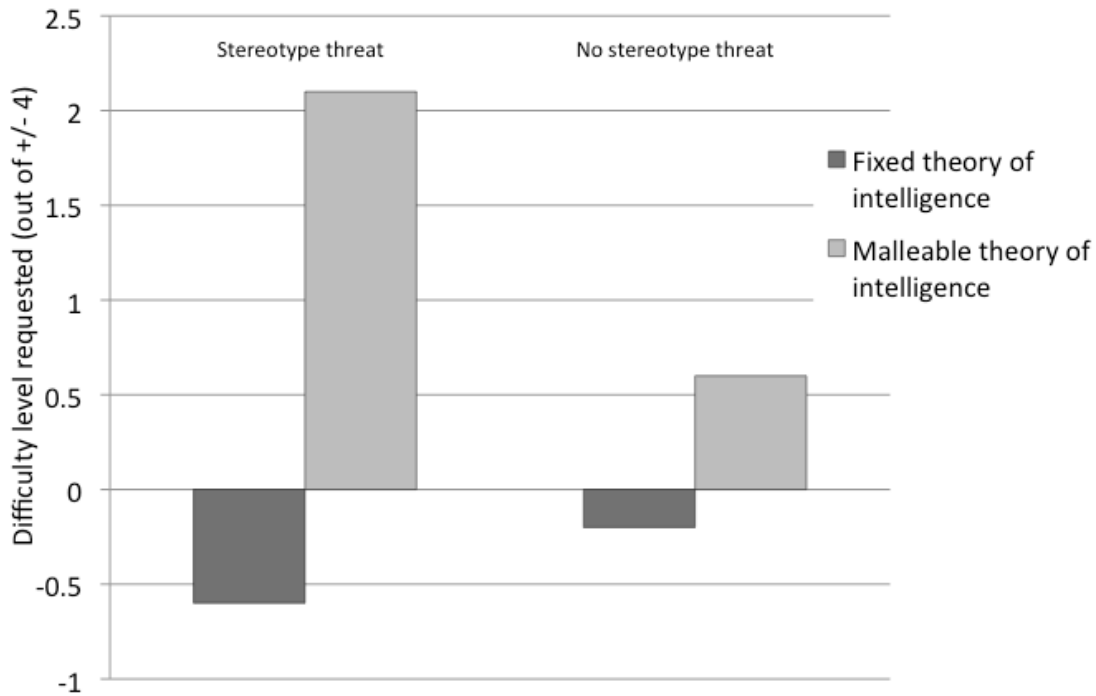


Figure 3.6. Grade 6 minority students avoid challenge under stereotype threat as a function of theory of intelligence.

Although this is a very encouraging finding, we find that agreeing on a questionnaire that intelligence is malleable or fixed predicts very little, despite years of searching for correlations between these measured beliefs and indices of performance. For example, there seems to be no relationship between beliefs about intelligence and performance on the SAT, with performance on tests we give students during experiments, or with measures of stereotype vulnerability. Why might this be? We cannot be certain, but our best guess is that it reflects the classic finding in social psychology indicating that *holding* an attitude and *using* it are two different things, because, to guide behavior, attitudes need to be cognitively accessible. Our interventions quite intentionally aimed to teach the malleability of intelligence in a way that made them both deeply held and readily accessible. Because attitudes need to be activated to make a difference psychologically and behaviorally, agreeing with an item on a questionnaire during pretesting does not guarantee that the attitude will shape one's responses or performance, and it is quite possible that when we simply measure beliefs or attitudes about intelligence, we are not tapping into convictions that our students think about much or hold with great conviction. Our interventions and experiments work to lift performance and protect motivation, we believe, because they turn attitudes into *mindsets*. But new research is suggesting

even more complex reasons for the difference between intervention effects and the effects of holding particular theories of intelligence.

Because of the positive effects of mindset interventions, it is often suggested that the incremental theory of intelligence is preferable to an entity theory (Dweck, 2000; Hong, Chiu, Dweck, Lin, & Wan, 1999; Niiya, Crocker, & Bartmess, 2004). Yet more recent studies have shown that a student's beliefs about intelligence and his or her academic outcomes may have a more complicated relationship than originally supposed. For example, in a recent series of studies, Plaks and Stecher (2007) experimentally manipulated performance-theory consistency using false feedback. After performing moderately well on a novel task, students were given a list of plausible tips for improving their performance. Following this "learning opportunity" and a second test of the ability, students received randomized feedback indicating that their performance had either improved, declined, or stayed the same. Students whose pre-study questionnaire responses indicated a belief that intelligence is fixed reported more anxiety if they received feedback indicating their performance had changed, even if the change was positive (improvement). Students holding an incremental theory were not made anxious by feedback indicating their performance had changed. Moreover, students with a fixed-intelligence theory appeared to respond to this change feedback (either improvement or decline) with heightened control-seeking behavior than did students with a malleable-intelligence theory. Specifically, students worked harder and longer on a computer task shown to be a good measure of the desire for control. Students who reported an incremental view of intelligence worked harder and longer on the computer task when feedback on their performance indicated they *had not* changed. In other words, regardless of theory, people seem to be made anxious and to feel out of control when performances are dissonant with their theory of intelligence, and they appear to attempt to restore a sense of control when this happens.

This apparent preference for theory-confirming performances also held when experimenters manipulated the subjects' theory of intelligence via priming. The induced theory of intelligence appeared to overwhelm the participants' lay theories, such that the theory-feedback inconsistency effects described above held, even when the feedback was consistent with the student's usual perception of intelligence. For example, a student who reports a malleable theory of intelligence on the questionnaire and is later primed with an entity theory in the lab becomes anxious and control-seeking when presented with feedback that indicated a change in his or her performance. This study supports our contention that behavior and emotions are most likely to be determined by currently active mindsets—what a person believes at a given moment—rather than longstanding attitudes that are measured by questionnaires at a remove from the situation in question.

This preference for outcomes that match mindsets can result in impaired performance. In a final variation of the study (Plaks & Stecher, 2007), experimenters measured actual performance on a third repetition of the novel skill task and found that theory-inconsistent feedback led to increased anxiety, which in turn, led to

significantly lowered performance. Thus, the potential for negative anxiety when performances contradict theories appears to go beyond disappointment.

Ensuring that the task outcome can be improved by practice and hard work is an important criterion for determining the appropriateness of an incremental mindset. If there is insufficient time for practice and improvement, an incremental theorist may be more easily discouraged, and his or her performance is unlikely to benefit by this more long-term approach. Similarly, if a student is highly skilled and confident, an entity theory of intelligence may reinforce positive expectations and self-esteem, resulting in better performance. A recent study (Burns & Isbell, 2007) examined the interactions between students' theories of intelligence and abilities with the effects of priming. High-ability female math students completed theories of intelligence measures and were recruited for participation in a pair of ostensibly unrelated math studies. At the lab, participants read a short chapter from a new math textbook that presented the theories of intelligence manipulation. They then completed a difficult math test and several follow-up measures. In the fixed intelligence-prime condition, entity-theorist students performed much better on the test than malleable-theorist students. Presenting entity-theorist students with a malleable prime appeared to soothe nerves as indicated on an anxiety measure; but this reduction in stress did not help them perform better. The best performance for these talented students appears to be the result of a complicated relationship between ability and theories of intelligence, arousal, and situational context. However, when the experimenters repeated the procedure with students with only average abilities, the interactions did not hold. Students with moderate math abilities did not demonstrate any group differences in performance as a function of priming a theory of intelligence, pre-existing theories of intelligence, or the interaction between priming and pre-existing theory. Thus high ability students may need some affirmation of their abilities as fixed to perform their best—perhaps because they enjoy the benefits of having their theories confirmed.

One way researchers are approaching the complexity of such findings is to apply the notion of “fit” between situational demands, performance goals, and theories of intelligence (e.g., O’Keefe, 2009), but no published studies have found conclusive or consistent results. It is plausible that the ability of traditional measures of theories of intelligence to offer insight may be limited with regard to meaningful academic outcomes. As noted, Dweck’s *Theories of Intelligence* measure (2000) does not reliably predict much, but we also find intensive interventions lift grades, test scores, and engagement.

As suggested above, the limitations on teaching and measuring malleability of intelligence may be particularly complex in the context of gifted education. High ability students may benefit from the self-esteem boost that can accompany entity theories of intelligence, and on school measures of performance such as standardized tests they may already be performing at a level that limits the amount of improvement they can experience (Burns & Isbell, 2007; Elliot & Dweck, 1988). Developing an entity theory of intelligence might be a natural and adaptive response

for the gifted child who is not regularly challenged in the classroom. On the other hand, the label of “gifted” has the potential to become a curse when academic tasks become very challenging. As Mueller and Dweck (1998) have shown, having the mindset that one succeeds through one’s gifts rather than one’s efforts can give rise to the withdrawal of effort. When children identified as gifted fail to fulfill the great promise they showed early in life, a possible explanation is that they get mired in the expectation that things will always come easily. When faced with a challenge not easily resolved they may withdraw effort to reduce the risk of feeling “ungifted.” The current work directly looking at theories of intelligence manipulations and gifted education is limited, and the research assessing gifted students’ goal orientation and theories of intelligence is mixed. Some work suggests that gifted students are susceptible to performance goals and may shy away from challenges and academic risks, but other studies find that gifted students endorse incremental views of intelligence (for a review, see Dai, Moon, & Feldhusen, 1998), and the relationship may be particularly complex for high-achieving Black students (Harper, 2010).

We are hoping to embark on the direct study of children who are gifted as well as children who are labeled learning disabled and how they cope with the threats and challenges that each of these labels can confer. It will be important in future work to look at what individual or group differences drive a preference for a particular theory of intelligence and what circumstances shape its impact.

References

- Alter, A. L., Aronson, J. M., Darley, J. M., Rodriguez, C., & Ruble, D. N. (2010). Rising to the threat: Reducing stereotype threat by reframing the threat as a challenge. *Journal of Experimental Social Psychology, 46*, 166-171.
- Ambady, N., Shih, M., Kim, A., & Pittinsky, T. L. (2001). Stereotype susceptibility in children: Effects of identity activation on quantitative performance. *Psychological Science, 12*, 385-390.
- Aronson, J. M., & Dee, T. S. (2011). Stereotype threat in the real world. In M. Inzlicht, & T. Schmader (Eds.), *Stereotype threat: Theory, process, and application* (pp. 264-269). New York, NY: Oxford University Press.
- Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology, 38*, 113-125.
- Aronson, J., & Good, C. (2009). *Conceptions of ability, challenge seeking, and test performance in minority children*. Unpublished manuscript, Department of Applied Psychology, New York University, New York, NY.
- Aronson, J. M., & Jones, E. E. (1992). Inferring abilities after influencing performance. *Journal of Experimental Social Psychology, 28*, 277-299.
- Aronson, J., Lustina, M. J., Good, C., Keough, K., Steele, C. M., & Brown, J. (1999). When White men can't do math: Necessary and sufficient factors in stereotype threat. *Journal of Experimental Social Psychology, 35*, 29-46.
- Aronson, J., & McGlone, M. S. (2009). Stereotype and social identity threat. In T. Nelson (Ed.), *The handbook of prejudice, stereotyping, and discrimination* (pp. 153-178). New York, NY: Psychology Press.
- Baker, E. L., Barton, P. E., Darling-Hammond, L., Haertel, E., Ladd, H. F., Linn, R. L., . . . Shepard, L. A. (2010). *Problems with the use of test scores to evaluate teachers* (EPI briefing paper No. 278). Washington, DC: Economic Policy Institute. Retrieved from <http://www.epi.org/page/~pdf/bp278.pdf>
- 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*, 246-263.
- Blascovich, J., Mendes, W. B., Hunter, S. B., Lickel, B., & Kowai-Bell, N. (2001). Perceiver threat in social interactions with stigmatized others. *Journal of Personality and Social Psychology, 80*, 253-267.
- Blascovich, J., Mendes, W. B., Hunter, S. B., & Salomon, K. (1999). Social "facilitation" as challenge and threat. *Journal of Personality and Social Psychology, 76*, 68-77.
- Burns, K. C., & Isbell, L. M. (2007). Promoting malleability is not one size fits all: Priming implicit theories of the intelligence as a function of self-theories. *Self and Identity, 6*, 51-63.
- Croizet, J., & Claire, T. (1998). Extending the concept of stereotype threat to social class: The intellectual underperformance of students from low socioeconomic backgrounds. *Personality and Social Psychology Bulletin, 24*, 588-594.
- Dai, D. Y., Moon, S. M., & Feldhusen, J. F. (1998). Achievement motivation and gifted students: A social cognitive perspective. *Educational Psychologist, 33*, 45-63.

- Davies, P. G., Spencer, S. J., Quinn, D. M., & Gerhardstein, R. (2002). Consuming images: How television commercials that elicit stereotype threat can restrain women academically and professionally. *Personality and Social Psychology Bulletin, 28*, 1615-1628.
- Davis III, C., Aronson, J., & Salinas, M. (2006). Shades of threat: Black racial identity as a moderator of stereotype threat. *Journal of Black Psychology, 32*, 399-417.
- Dweck, C. S. (2000). *Self-theories: Their role in motivation, personality, and development*. Lillington, NC: Psychology Press.
- Dweck, C. S. (2006). *Mindset: The new psychology of success*. New York, NY: Random House.
- Dweck, C. S., & Leggett, E. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256-273.
- Elliott, E. S., & Dweck, C. S. (1988). Goals: An approach to motivation and achievement. *Journal of Personality and Social Psychology, 54*, 5-12.
- Good, C., Aronson, J., & Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Journal of Applied Developmental Psychology, 24*, 645-662.
- Halpern, D. F., Benbow, C. P., Geary, D. C., Gur, R. C., Hyde, J. S., & Gernsbacher, M. A. (2007). The science of sex differences in science and mathematics. *Psychological Science in the Public Interest, 8*, 1-51.
- Harper, B. E. (2010). Show and prove: Investigating differences in the self-beliefs of Black and White honor students. *Social Psychology of Education*, Online First. DOI 10.1007/s11218-010-9122-2.
- Hong, Y., Chiu, C., Dweck, C. S., Lin, D. M.-S., & Wan, W. (1999). Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology, 77*, 588-599.
- Inzlicht, M., Aronson, J., Good, C., & McKay, L. (2006). A particular resiliency to threatening environments. *Journal of Experimental Social Psychology, 42*, 323-336.
- Inzlicht, M., & Ben-Zeev, T. (2000). A threatening intellectual environment: Why females are susceptible to experiencing problem-solving deficits in the presence of males. *Psychological Science, 11*, 365-371.
- McGlone, M. S., & Aronson, J. (2006). Stereotype threat, identity salience, and spatial reasoning. *Journal of Applied Developmental Psychology, 27*, 486-493.
- Mueller, C. M., & Dweck, C. S. (1998). Intelligence praise can undermine motivation and performance. *Journal of Personality and Social Psychology, 75*, 33-52.
- Niiya, Y., Crocker, J., & Bartmess, E. N. (2004). From vulnerability to resilience: Learning orientations buffer contingent self-esteem from failure. *Psychological Science, 15*, 801-805.
- O'Keefe, P. A. (2009). *The situational adaptiveness of implicit theories of intelligence and achievement goal orientations*. (Doctoral dissertation). Available from ProQuest Dissertations & Theses database. (UMI No. 3366813)
- Plaks, J. E., & Stecher, K. (2007). Unexpected improvement, decline, and stasis: A prediction confidence perspective on achievement success and failure. *Journal of Personality and Social Psychology, 93*, 667-684.

- Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69*, 797-811.
- Steele, C. M., Spencer, S. J., & Aronson, J. (2002). Contending with group image: The psychology of stereotype and social identity threat. *Advances in Experimental Social Psychology, 34*, 379-440.
- Vick, S. B., Seery, M. D., Blascovich, J., & Weisbuch, M. (2008). The effect of gender stereotype activation on challenge and threat motivational states. *Journal of Experimental Social Psychology, 44*, 624-630.
- Wallach, L., & Wallach, M. A. (1994). Gergen versus the mainstream: Are hypotheses in social psychology subject to empirical test? *Journal of Personality and Social Psychology, 67*, 233-242.
- Wicherts, J. M., & de Han, C. (under review). *A meta-analysis of the effects of stereotype threat on the cognitive test performance of African Americans*. Amsterdam, Holland: University of Amsterdam.