Social-Psychological Interventions in Education: They're Not Magic

David S. Yeager   Gregory M. Walton

Stanford University

Abstract

Recent randomized experiments have found that seemingly "small" social-psychological interventions in education—that is, brief exercises that target students' thoughts, feelings, and beliefs in and about school—can lead to large gains in student achievement and sharply reduce achievement gaps even months and years later. These interventions do not teach students academic content but instead target students' psychology, such as their beliefs that they have the potential to improve their intelligence or that they belong and are valued in school. When social-psychological interventions have lasting effects, it can seem surprising and even "magical," leading either to the desire to scale them up immediately or to consider them unworthy of serious consideration. The present article discourages both responses. It reviews the theoretical basis of several prominent social-psychological interventions and emphasizes that they have lasting effects because they target students' subjective experiences in school, because they use persuasive yet stealthy methods for conveying psychological ideas, and because they tap into recursive processes present in educational environments. By understanding psychological interventions as powerful but context-dependent tools, educational researchers will be better equipped to take them to scale. This review concludes by discussing challenges to scaling psychological interventions and how these challenges may be overcome.

Social-Psychological Interventions in Education: They're Not Magic

Several years ago a brief intervention was introduced in eight hospitals around the world in an effort to reduce medical errors. The intervention required surgeons and nurses to complete a one-page checklist of tasks before beginning a surgery, such as introducing themselves to one another and correctly timing the application of antiseptics. An evaluation of this simple intervention found that it reduced surgical complications by 36% and deaths by 47% (Haynes et al., 2009). Observers and medical professionals have wondered how this small intervention could have such a large effect, especially when it did not address such clearly important factors as surgeons' skills and training. Some have hailed the checklist intervention as "A classic magic bullet" (Aaronovitch, 2010); others have dismissed it as "[not] Harry Potter's magic wand," (Szalavitz, 2009). Atul Gawande (2009), creator of the checklist, argues that this sense of mystery arises because many people assumed that surgeons were already doing the set of practices included in the checklist. Hence, the checklist's effects were not easily understood (Gawande, 2009, p. 159). With a deeper understanding of why the intervention improved outcomes, he argues, the medical community would be better able to institutionalize the innovation in standard practice.

Interestingly, something similar is happening in education. In recent years, several rigorous, randomized field experiments have shown that seemingly "small" social-psychological interventions—typically brief exercises that do not teach academic content but instead target students' thoughts, feelings, and beliefs in and about school—have had striking effects on educational achievement even over months and years (see Table 1; for reviews see Garcia & Cohen, in press; Gehlbach, 2010; Walton & Dweck, 2009; Walton & Spencer 2009; Wilson, 2006). For example, Blackwell, Trzesniewski and Dweck (2007) found that middle school

students who attended an eight-session workshop teaching them that the brain is like a muscle and grows with effort displayed a sharp increase in math achievement for the rest of the school year, an effect not shown by students who attended a control workshop that taught them study skills. Walton and Cohen (2007, 2011) found that a 1-hour session designed to buttress African American college students' sense of social belonging in school increased the GPA of these students over the next three years, halving the Black-White achievement gap over this period. And Cohen, Garcia, Apfel and Master (2006), found that a 15-20 minute writing exercise in which students reflected on their core personal values reduced the gap in grades between African American and European American students by nearly 40% at the end of the semester, an effect that persisted, with a few additional writing exercises, for two years (Cohen, Garcia, Purdie-Vaugns, Apfel, & Brzustoski, 2009).

Like people who hear about Gawande's checklist, people who learn about social-psychological interventions may wonder: How could these effects be real? How could such interventions work? And how could brief experiences change students' outcomes months and years later? These questions are especially pressing in a context in which far more expensive and comprehensive interventions in education often yield disappointing results. For example, of the dozens of randomized controlled trials published by the Institute for Education Sciences in recent years, most have found no effects on student outcomes beyond the initial treatment period, including a one-year new teacher support program (Glazerman et al., 2010), a year-long middle school mathematics professional development program (Garet et al., 2010) and two year-long supplemental reading courses (James-Burdumy et al., 2010; Somers et al., 2010) among many other reforms.

In this context, social-psychological interventions can appear magical. As a

consequence, it is tempting either to deliver these interventions as quickly and as widely as possible or to dismiss them as snake oil—as entertaining side-shows, but not worthy of serious consideration in education reform.

We argue that neither response is appropriate. Social-psychological interventions hold significant promise for promoting broad and lasting change in education, but they are not silver bullets. They are powerful tools rooted in theory, but they are context-dependent and reliant on the nature of the educational environment. Although we believe that social-psychological interventions can be scaled effectively to reach larger numbers of students, how to do so is not simply a matter of handing out a worksheet. Rather, scaling social-psychological interventions raises important theoretical, practical, and ethical questions that as yet have not been adequately explored.

To illustrate the effects of social-psychological interventions, take a second analogy.[1] Consider a passenger jet that speeds down a runway and lifts into the air. It can seem surprising even to an experienced flier how an object that weighs many tons could fly. This is because the miracle of flight relies on numerous interrelated forces, some more obvious than others. It is not hard to see that a plane needs an engine, wings, and a pilot to fly. Similarly, a student needs content to learn, a teacher to teach, and a place or community to support that learning. These factors shape the objective school environment and create essential capacities for success. But less obvious features of airplanes and of education systems are also critical to their success. One reason planes fly is because their wings are sculpted to create an aerodynamic force ("lift") that elevates the plane. It is natural to wonder how a small change in the shape of a wing could make a heavy object fly. Basic laboratory research helps explain the principles of air-flow and shows that the shape and position of wings cause air to flow faster below them than above them, lifting

a plane beyond what might seem possible. In a similar way, hidden yet powerful psychological forces, also investigated through basic science, can raise student achievement. An engineer uses theories of fluid dynamics to fine-tune a wing, which, in the context of other factors, makes a plane fly. Analogously, a social-psychological perspective uses basic theory and research to identify educationally-important psychological processes and then subtly alters these processes in a complex academic environment to raise performance.

More specifically, social-psychological interventions can seem mysterious for at least four reasons. First, it is often hard to see the forces on which these interventions operate (see Lewin, 1952; Ross & Nisbett, 1991). We do not see air flowing over a wing; nor do we directly observe how negative intellectual stereotypes or beliefs about the nature of intelligence affect students. Indeed, we may see the power of these processes only when they are altered. For this reason, below we describe laboratory experiments that illustrate the causal effect of basic theoretical processes relevant to motivation, and then review how interventions designed to alter these processes affect achievement.

Second, psychological interventions seem "small" relative to traditional educational reforms, and people may assume that large problems require "large" solutions. How could a brief psychological intervention make headway in the face of structural problems that contribute enormously to inequality and poor outcomes in education? To presage later arguments, psychological interventions do not replace traditional educational reforms but operate within the context of existing structures to make them more effective at promoting learning and achievement. Psychological interventions change students' mindsets to help them take greater advantage of available learning opportunities.

This analysis draws on a core tenet of social psychology, namely that every attitude and

behavior exists in a complex field of forces—a "tension system," in which some forces promote a behavior while other forces restrain that behavior (Lewin, 1952; Ross & Nisbett, 1991; Wilson, 2006). One lesson from this analysis is that the structure of the system determines its potential for change—an intervention that increases students' motivation to learn or that removes barriers to learning will improve academic outcomes only when learning opportunities exist in the educational environment.

Another lesson of this analysis is that there are two routes to behavior change (see Miller & Prentice, in press). One route is to increase forces that promote a behavior, for instance by giving students incentives for better grades. But when promoting forces are adequate—as when learning content is present, when teachers are qualified, and when students at some level already want to learn—student success may be held back instead by restraining forces, such as worries about ability or negative stereotypes. In these cases, less intuitively, one can remove forces that restrain the behavior, allowing students to take greater advantage of learning opportunities. As a consequence, even a seemingly small intervention but one that removes a critical barrier to learning can produce substantial effects on academic outcomes. At a broader level, this theoretical foundation underscores the fundamental inappropriateness of viewing social-psychological intervention as silver bullets; rather than operating in isolation, such interventions rearrange forces in a complex system.[2]

A third challenge to understanding the effects of social-psychological interventions is that it is hard to see how relatively brief messages can affect students' views and behavior, especially when students receive many messages from adults that seemingly have little effect on their behavior. As we will explain, social-psychological interventions can be brief yet impactful because they target students' subjective experience in school and because they rely on a rich

tradition of research on persuasion and attitude change to powerfully convey psychological ideas.

Fourth, what can seem especially mysterious is how a time-limited or one-shot social-psychological intervention can generate effects that persist far ahead in time. For instance, people may assume that an intervention has to remain in mind to continue to be effective. But like any experience, a psychological intervention will become less focal as it recedes in time. As we suggest below, a key to understanding the long-lasting effects of social-psychological interventions is to understand how they interact with recursive processes already present in schools, such as the quality of students' developing relationships with peers and teachers, their beliefs about their ability, and their acquisition of academic knowledge. It is by affecting self-reinforcing recursive processes that psychological interventions can cause lasting improvements in motivation and achievement even when the original treatment message has faded in salience (e.g., Walton & Cohen, 2011).

In the next section, we describe how we conducted this review. We then summarize four prominent social-psychological interventions, emphasizing the psychological process each intervention targeted and relevant laboratory and field research. Next we discuss how the effects of these interventions persisted over time. In doing so, we aim to provide a more nuanced understanding of how social-psychological interventions work and to suggest how this understanding can inform efforts to deliver these interventions more broadly.

Methodology for the Current Review

This is a theoretical review designed to elucidate the theoretical underpinnings of social-psychological interventions in education, not a comprehensive review of them. To locate relevant interventions, we searched the tables of contents and abstracts of highly-cited relevant journals

including *Child Development, Developmental Psychology, Journal of Applied Developmental Psychology, Journal of Educational Psychology, Journal of Experimental Social Psychology, Journal of Personality and Social Psychology, Personality and Social Psychology Bulletin, Psychological Science,* and *Science* (see Table 1). We searched for studies that (a) evaluated an intervention that communicated a social-psychological message but did not teach academic content; (b) randomly assigned students to treatment or control conditions; and (c) observed effects on students' grades in a course or in school overall over time. In addition, we examined the Curriculum Vitaes of prominent psychologists conducting intervention research, searching for replications, extensions, or studies examining boundary conditions. Some important studies were excluded because they met only some of our criteria. Among the excluded studies were those that used social-psychological interventions to motivate specific behaviors in school, such as mastering an individual learning objective or performing better on a single task, rather than raising achievement in general (e.g., Aronson, Blaney, Stephin, Sikes, & Snapp, 1976; Destin & Oyserman, 2009; Duckworth, Grant, Loew, Oettingen, & Gollwitzer, in press; Ramirez & Beilock, 2011; Jamieson, Mendes, Blackstock, & Schmader, 2009; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004).

Notably, our search targeted specifically *social*-psychological interventions—interventions designed to change students' thoughts and feelings in and about school. This approach excluded cognitive psychology interventions, which investigate instead how principles of human cognition and learning can inform the design of effective curricula and pedagogy (and which have been reviewed elsewhere, e.g., Bransford, Brown, & Cocking, 1999; Ritter, Anderson, Koedinger, & Corbett, 2007). Nonetheless, in some cases we use the term "psychological interventions" as shorthand to refer to social-psychological interventions. --------------------------------------

INSERT TABLE 1 ABOUT HERE

Four Social-Psychological Interventions to Improve Student Achievement

To illustrate general lessons, we focus on basic theory and research underpinning four prominent social-psychological interventions that have produced some of the most striking effects observed in the field and that illustrate key theoretical themes. Although we present the studies separately, we note that the processes they target are few in number and interrelated, including students' beliefs about their potential for growth and belonging in the classroom and their efforts to cope with negative stereotypes in school. It is important to note, however, that similar conclusions could be drawn from an analysis of other interventions. Table 1 provides a summary of relevant studies that we do not discuss in detail (see also Gehlbach, 2010).

Interventions to Change Students' Attributions for Academic Setbacks

A long line of basic theory and research in social psychology shows that people's *attributions*—how they explain the causes of events and experiences—shape their responses to those events and subsequent behavior (Kelley, 1973; Weiner, 1982). For instance, if a student concludes that a bad grade means that he cannot cut it in math, the student may not invest the time and effort needed to improve his math grades (Bandura, 1977). If so, he may continue to perform poorly, reifying his attribution of inability, leading to an *exacerbation cycle* of negative attributions and poor performance (cf. Storms & Nisbett, 1970; see also Wilson, 2006). On the other hand, if a student thinks that a bad grade means that she needs time to learn the ropes, the student may redouble her efforts and perform better over time. Is it possible to change students' attributions so they see poor grades as due to a temporary and not permanent cause? Would such an intervention improve students' academic performance over time?

Intervention 1: Wilson and Linville (1982). Wilson and Linville (1982, 1985) tested this hypothesis (see also Wilson, Damiani, & Shelton, 2002). They developed a brief intervention to teach students that poor academic performance is normal at first in the transition to a new school, does not reflect a lack of ability, and that students' grades typically improve as they adjust to the new school.

In a series of classic studies, Wilson and Linville (1982, 1985) brought struggling first-year college students to a laboratory and told them that they had interviewed college students about their transition to college. They asked students to watch some of these videotaped interviews. Students in the treatment group (randomly assigned) saw videos of upperclassmen describing how their grades in college were low at first but got better with time. These upperclassmen attributed their early poor performance to unstable causes that dissipate with time, such as a lack of familiarity with college classes. Students in a control group saw videos of the same upperclassmen talking about their academic and social interests with no mention of first-year grades. A year later, students' official GPAs were collected. Students in the treatment group had earned higher GPAs than students in the control group (see Table 1). Moreover, this effect seemed to gain in strength with each successive term. This finding is consistent with the hypothesis that the intervention set in motion a recursive or self-reinforcing attributional process whereby better performance each term reinforced more adaptive attributions for early academic struggles. In addition, treated students were 80% less likely to drop out of college. This basic intervention has been replicated many times with diverse populations (see Wilson et al., 2002) including adolescents (e.g., Good et al., 2003).

Intervention 2: Blackwell et al. (2007). Dweck and colleagues have investigated how students' implicit theories of intelligence shape their interpretation of and response to academic

setbacks (Dweck & Leggett, 1988; Molden & Dweck, 2006; Dweck, 2006). In laboratory

research, Dweck finds that students who believe that intelligence is fixed and unchangeable (an

entity theory of intelligence) are more likely to attribute academic setbacks to a lack of ability

than students who believe that intelligence is malleable and improvable with hard work and

effort (an *incremental* theory of intelligence). Students with the incremental theory instead see

setbacks as due to insufficient effort or a poor strategy. In turn, such attributions shape whether

students respond to setbacks helplessly (withdrawing effort) or resiliently (redoubling effort,

seeking help, using a better strategy, etc.).

In one series of laboratory studies, Mueller and Dweck (1998) gave 5th grade students a

moderately difficult set of logic problems. After completing them, students were praised. Some

children (randomly assigned) received intelligence praise—praise that could induce an entity

theory of intelligence ("That's a really high score, you must be very smart at these problems").

Others received effort praise predicted to induce an incremental theory of intelligence ("That's a

really high score, you must have worked hard at these problems") or neutral praise ("That's a

really high score"). Next, students were given an especially difficult set of problems on which

all students performed poorly. Finally, students were given a crucial third set of problems

equally challenging as the first set.

The effect of the type of praise was dramatic. On the final set of problems, children who

received neutral praise performed no better and no worse than they had on the first set. Children

who received effort praise did better and asked to do more challenging problems in the future.

But children who received intelligence praise solved 30% fewer problems and asked to do only

easy problems from then on. Being led to attribute success to fixed intelligence with just a

sentence of praise undermined students' motivation and performance following a failure

experience (for a relevant longitudinal study, see Blackwell et al., 2007, Study 1).

On the basis of these and other results, Blackwell and colleagues (2007, Study 2) designed an intervention to lead middle school students to view intelligence as malleable. Students in a New York City public school attended an 8-session workshop in which they learned about study skills and scientific research showing that the brain grows connections and "gets smarter" when a person works on challenging tasks. Students in a randomized control group learned only about study skills. Results showed that students in the control group continued the downward decline in math grades that normally occurs in middle school. But students who learned the incremental theory reversed this trend, and earned better math grades over the course of the year (see Figure 1). Study skills alone did not lead to improvement in math; students needed the incremental mindset and motivation to put those skills into practice.

The effect of implicit theories is robust. Other implicit theories interventions have generated similar improvements in diverse populations (e.g., Aronson et al., 2002; Good et al., 2003; see Table 1). In addition, implicit theories interventions have been implemented structurally in middle and high school math classes across the United States by the Charles A. Dana Center (2008) at the University of Texas, yielding large effects on such important outcomes as the percentage of high school students who repeat algebra (e.g., reducing this figure from 24% to 9%).

Interventions to Mitigate Stereotype Threat

A significant problem in education involves the persistence of large differences in academic achievement between different social groups, such as between racial or ethnic minority students and non-minority students and, in math and science, between women and men. Although structural factors contribute to these differences, psychological processes also play an

important role (Walton & Spencer, 2009). Research on *stereotype threat* shows that the worry that one could be perceived through the lens of a negative intellectual stereotype in school can undermine academic performance (Steele, 2010; Steele, Spencer, & Aronson, 2002). For instance, the stereotype that certain ethnic groups are less intelligent than others and that women are less skilled in quantitative fields than men creates stress, distraction, and anxiety for people targeted by negative stereotypes in performance situations and this, in turn, undermines academic performance (see Schmader, Johns, & Forbes, 2008). Stereotype threat is sufficiently powerful that it causes common measures of academic performance including grades and test scores to systematically underestimate the ability of negatively stereotyped students (Walton & Spencer, 2009). Can psychological strategies mitigate stereotype threat in field settings? Could these strategies raise stereotyped students' performance and reduce achievement gaps? (For related interventions that raise the performance of ethnic minority students, see Aronson et al., 1978; Steele, 1997.)

     Intervention 3: Cohen et al. (2006, 2009). Cohen and colleagues (2006, 2009) hypothesized that helping negatively stereotyped ethnic minority students reduce the stress and worry caused by stereotype threat could boost academic performance. Their intervention was designed on the basis of a long line of psychological research investigating how people cope with threats to their sense of self (Festinger, 1957; Greenwald, 1980). Most relevant here, *self-affirmation* theory proposes that people are motivated to protect their view of themselves as good, moral, and efficacious (Sherman & Cohen, 2006; Steele, 1988). When people's sense of self is threatened, they experience high levels of stress. Self-affirmation theory proposes that reminding people of diverse, positive aspects of themselves can lead people to see negative events and information as less threatening and reduce stress and thus help people function more

effectively (Sherman & Hartson, in press). One way to shore up people's sense of self is by asking people to write about values that are personally important to them. Indeed, laboratory experiments find that brief value-affirmation writing exercises can help negatively stereotyped students perform better on academic tasks (Martens, Johns, Greenberg, & Schimel, 2006; Taylor & Walton, in press).

Cohen and colleagues (2006, 2009) tested whether a value-affirmation could improve stereotyped students' real-world school performance. In a double-blind, randomized controlled experiment, they delivered a value-affirmation intervention to White and Black 7th grade students as an in-class writing exercise. Half of students completed a value-affirmation—they identified two or three values that were personally important to them and wrote about why those values mattered to them. Control students identified values that were not important to them and wrote about why they might matter to someone else. The 15- to 20-minute exercise was administered at the beginning of the school year, before a recursive cycle of feelings of threat and poor academic performance could take hold. Teachers were blind to students' condition assignment to forestall expectancy effects.

The results were striking. Students' grades were collected over the next two years. By the end of the first semester, treated Black students earned significantly higher grades than peers in the control condition, reducing the gap between Black and White students by about 40% (see Figure 2). A boost in students' GPA across all academic classes persisted for two years with a few additional values-affirmations exercises (Cohen et al., 2009). This basic effect has been replicated in multiple studies, including among women in science and with Latino adolescents (see Miyake et al., 2010; Sherman & Hartson, in press).

Intervention 4: Walton and Cohen (2007, 2011). One consequence of negative

stereotypes is to cause people to wonder whether they will be fully included and valued in an academic environment. Anyone may wonder if they will get along with others in a new setting, like a transfer student at a new school. But students who face negative stereotypes may worry about their belonging more pervasively. This feeling of uncertainty about belonging can cause students to perceive negative social events in school—such as feelings of loneliness or receiving criticism from an instructor—as evidence that they do not belong in the school in general, an inference that undermines motivation (Walton & Cohen, 2007; see also Mendoza-Denton, Purdie, Downey, Davis, & Pietrzak, 2002). For instance, negatively stereotyped students such as African Americans and women in science are attuned to cues embedded in critical feedback that could convey that the criticism results from bias and stereotyping rather than from an honest assessment of the merits of their work and of opportunities for improvement (Cohen, Steele, & Ross, 1999). Such cues can cause stereotyped students to withdraw effort.

Walton and Cohen (2007, Experiment 1), examined students' response to social adversity directly in a laboratory study. They posed a subtle threat to college students' sense of social belonging in a given field of study. They asked students to list either two friends who would fit in well in the field or eight such friends (cf. Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatka, & Simmons, 1991). Listing eight friends was difficult, and equally so for White and Black students. The question the study tested was what meaning, if any, this difficulty had for students. For White students, the difficulty listing friends carried no particular meaning—White students' interest and motivation in the field was unchanged whether they had been asked to list eight friends or two. But for Black students, the difficulty experienced listing eight friends seemed to mean that they and, moreover, their racial group did not belong in the field. As compared to control participants, their motivation in the field dropped precipitously and they discouraged a

Black peer from pursuing the field as an area of study.

Building on this laboratory research, Walton and Cohen created an intervention to forestall global inferences of non-belonging in school (Experiment 2). Adopting procedures developed by Wilson and Linville (1982, 1985), they gave first-year college students information indicating that students of all ethnicities worried at first about their belonging in the transition to college but that these worries dissipated with time and eventually all students came to feel at home. This information was designed to convey that doubts about belonging and negative social events are normal at first in college and are non-diagnostic of an actual lack of belonging. Students then engaged in a series of activities designed to reinforce the treatment message—for instance, they wrote an essay for incoming students the next year about how their own feelings of belonging in college had changed over time (see Aronson et al., 2002). Control students went through the same exercises but the information they were exposed to was irrelevant to issues of belonging. In total, the intervention lasted about an hour.

The intervention had striking benefits for Black students. In two cohorts of students and relative to several control groups, the intervention improved Black students' grades in college from sophomore through senior year. The intervention reduced the Black-White achievement gap over this period by 52% (see Figure 3; Walton & Cohen, 2007, 2011). This effect was statistically mediated by a change in Black students' construal of social adversity on campus. Daily diary surveys completed in the week following the intervention showed that, in the control condition, Black students' daily sense of belonging in school rose and fell with the level of adversity they experienced each day. To these students, negative social events seemed to convey that they did not belong in the school in general. This construal predicted worse grades over the next three years. The treatment cut off this relationship—here, Black students experienced

similar levels of adversity but adversity no longer led them to question their belonging. This change in construal mediated the effect of the intervention on the 3-year gain in Black students' GPA. In addition, 3-years post-treatment, the intervention also improved Black students' self-reported physical health and happiness, both outcomes linked in prior research to a secure sense of belonging.

In research in progress, tailored versions of the social-belonging intervention have improved grades and school-related attitudes and behaviors among African American middle school students (Walton, Cohen, Garcia, Apfel, & Master, 2011) and female undergraduate engineering students (Walton, Logel, Peach, & Spencer, 2011).

Understanding Social-Psychological Interventions in Education

Readers may wonder: How did these interventions work at all—how could they change students' psychology to improve academic outcomes even in the short term? And how did they maintain their effects over time? Below we address each question in turn, followed by a discussion of how social-psychological interventions could be delivered effectively to more students.

(1) How do social-psychological interventions change students' psychology to improve academic outcomes in the short term? They do so by precisely targeting students' experience in school from the student's perspective and by using impactful delivery mechanisms. Although the four psychological interventions reviewed above targeted different (albeit related) psychological processes, each began with a precise understanding of students' subjective experience in school—what school seems like to the student in the classroom, not how school appears from the perspective of an observer, researcher, or teacher. These interventions may seem "small" to observers and often they are in terms of time and cost and in relation to

other school reforms. From the perspective of a researcher or teacher, an implicit theories workshop or a value-affirmation writing exercise is just one of many classroom experiences given to students. But to a student sitting at a desk in the third row worrying about whether she has what it takes to perform well on an upcoming exam or whether others will reduce her to a negative stereotype, an experience like learning that the brain can grow and form new connections when challenged or being invited to describe personally important values may feel quite "large" (Aronson et al., 1978). Such interventions directly address students' experience in school and thus their school-related behavior.

Critically, if a social-psychological intervention does not deliver its message in a way that changes how students think or feel about school or about themselves in school, then nothing has been delivered at all. Each intervention reviewed above used a delivery mechanism that, although brief, drew on research on the psychology of persuasion to make the intervention maximally impactful for students. Rather than simply delivering an appeal to a student who passively receives it, each intervention enlisted students in actively participating in or generating the intervention itself (see Lewin, 1952). These strategies can induce deep processing and prepare students to transfer the content to new academic experiences (Chase, Chin, Oppezzo & Schwartz, 2009; Schwartz & Martin, 2004). For instance, one delivery mechanism featured in several interventions involved asking students to write letters to younger students advocating the treatment message (e.g., Aronson et al., 2002; Walton & Cohen, 2007). As research on the "saying-is-believing" effect shows (Aronson, 1999), generating and then advocating a persuasive message for a receptive audience is a powerful means of persuasion (for a related example, see Hulleman & Harackeiwicz, 2009).

Although these delivery mechanisms are psychologically powerful, the interventions are

in an important sense "stealthy" (Robinson, in press). In none of the interventions were students

exposed to a direct persuasive appeal or told that they were receiving "an intervention" to

improve their performance. Students in Wilson and Linville's (1982, 1985) intervention thought

they were responding to a survey. Students in the Walton and Cohen (2007, 2011) intervention

took the role of mentor to younger students (see also Aronson et al. 2002). They were not told

that they themselves were the targets of the persuasive message. Other studies used class

assignments to deliver the intervention, such as a neuroscience workshop (Blackwell et al., 2007)

or an in-class writing assignment (Cohen et al., 2009; Hulleman & Harackeiwicz, 2009), both of

which had no obvious link to students' academic performance. In addition, past research has

shown that a subtle but powerful way to motivate behavior change is to expose people to

information about what is normal for people like themselves (Cialdini, 2003). The Walton and

Cohen intervention (2007, 2011) took advantage of normative processes by giving students the

results of a survey indicating that most "students like you" worried that they did not belong at

first in college, but came to feel at home over time. Overall, these indirect approaches may be

more effective than overt strategies. They allow students to take credit for their success, rather

than risking the possibility that students attribute positive outcomes to a heavy-handed

intervention. Further, stealthy interventions do not stigmatize students—they do not convey to

students that they are seen as in need of help or perceived as likely to fail, which could

undermine an intervention's intended effect. Indeed, telling people that a value-affirmation is

intended to make them feel better can reduce its effectiveness (Sherman, Cohen, Nelson,

Nussbaum, Bunyan, & Garcia, 2009).

Another way these interventions are "stealthy" is by being brief. One recent randomized

field experiment found behavior change after a short (5 minute) intervention to reduce drinking

among college students, but not after a longer (50 minute) intervention (Kulesza, Apperson, Larimer, & Copeland, 2010; see also Petry, Weinstock, Ledgerwood & Morasco, 2008). Although these studies did not focus on educational outcomes, they suggest that longer interventions may feel controlling, and thus prevent people from internalizing the treatment message. They also contradict the intuition that "bigger" interventions are necessarily "better."

This analysis leads to counter-intuitive predictions about how to maximize the impact of psychological interventions. It would be reasonable to think, for example, that training teachers (or parents) to reinforce psychological messages, or doubling the length of an in-class growth mindset workshop from 8 to 16 sessions, would amplify an intervention's benefits. However, if adolescents perceive a teacher's reinforcement of a psychological idea as conveying that they are seen as in need of help, teacher training or an extended workshop could undo the effects of the intervention, not increase its benefits. Moreover, in the case of the Cohen et al. (2006) intervention, for example, if stereotype threat was a force preventing students from achieving their potential and this force was removed through a values-affirmation, it is not clear that additional strategies to remove the same restraining force in other ways, for instance by having teachers reinforce a student's values, would increase the effect. In this way, the teaching of academic content in school is fundamentally different from the delivery of psychological interventions. Academic content is complex and taught layer upon layer: the more math students are taught, in general the more math they learn. Changing students' psychology, by contrast, sometimes requires a lighter touch.

Nevertheless, when different interventions target different psychological barriers to learning, combining different interventions may produce additive effects. For instance, one recent study found that both a social-belonging intervention and an intervention to train students

to self-affirm in times of stress (an "affirmation training" intervention) raised the achievement of female engineering students, yet they did so through different mechanisms. The social-belonging intervention led women to perceive that others viewed female engineers more positively; the affirmation-training intervention prevented the perception that others viewed female engineers negatively from undermining women's engineering grades (Walton, Logel et al., 2011). It is intriguing to speculate that a combined intervention could yield greater effects, provided that the mechanism used to deliver one intervention does not interfere with the meaning of the other intervention.

In summary, social-psychological interventions change students' behavior by (1) targeting students' experience in school from the student's perspective and (2) deploying powerful yet stealthy persuasive tactics to deliver the treatment message effectively without generating problematic side effects, such as stigmatizing recipients.

(2) How do social-psychological interventions affect student outcomes over long periods of time? They do so by affecting recursive processes that accumulate effects over time. A critical question about psychological interventions is how brief exercises could improve students' achievement months and years later. In general, we think it is exceedingly unlikely that psychological interventions generate long-lasting benefits because students keep the treatment message vividly in mind over long periods of time. Consistent with this analysis, in Walton and Cohen's (2011) social-belonging intervention, students were asked at the end of their college careers to recall the treatment message. Despite the large benefits of the intervention for African American students over the three-year assessment period, few students accurately recalled the treatment message. Further, the vast majority of students denied that taking part in the 1-hour study had had any effect on their college experience.

How then do psychological interventions generate long-lasting benefits? They do so by tapping into recursive social, psychological, and intellectual processes in school. As students study and learn and build academic skills and knowledge, they are better prepared to learn and perform well in the future. As students feel more secure in their belonging in school and form better relationships with peers and teachers, these become sources of support that promote feelings of belonging and academic success later. When students achieve success beyond what they thought possible, their beliefs about their potential may change, leading them to invest themselves more in school, further improving performance and reinforcing their belief in their potential for growth. As students do well, they are placed in higher-level classes—gateways that raise expectations, expose them to high-achieving peers, and improve subsequent academic opportunities. Through these recursive processes, students gain momentum and achieve better academic outcomes over time—or they do not. A well-timed, well-targeted psychological intervention affects these recursive processes and thus changes the trajectory of students' experiences and outcomes in school (see Cohen et al., 2009).

Consistent with this analysis, research tracking the long-term effects of social-psychological interventions finds repeatedly that such interventions change students' academic trajectories. Indeed, the mean-level effects of psychological interventions on student grades are accounted for by changes in the trajectory of students' academic performance over time. The value-affirmation intervention, for instance, was delivered to students early in 7th grade and had long-term effects primarily among previously poor-performing African American students (see Figure 2; Cohen et al., 2009). Evidence suggests the affirmation cut off a downward spiral in performance, preventing worse performance from leading to greater feelings of stress and threat and undermining subsequent performance (see also Blackwell et al., 2007; Sherman & Hartson,

in press). Similarly, the Walton and Cohen (2007, 2011) social-belonging intervention set in motion a positive recursive process that improved students' grades over three years in a steady step-by-step fashion (see Figure 3; see also Wilson & Linville, 1985).

How do psychological interventions change the trajectory of students' academic outcomes? Research directly addresses this question. For example, Blackwell and colleagues (2007, Study 1) found that when students believed that they could get smarter over time, they were more likely to believe that working hard could help them succeed in school and they endorsed the goal of learning from coursework. These beliefs and goals motivated greater use of effective learning strategies (such as increasing effort after setbacks) and less use of ineffective strategies (such as spending less time on a subject after setbacks). Over time, this increased effort and use of more productive learning strategies helped students take advantage of instruction in school, persist longer, seek help when needed, and ultimately learn more in school. These changes in beliefs and strategies statistically mediated a two-year upward trajectory observed in middle school math grades for students with an incremental mindset. By understanding this interaction between psychological processes (e.g., students' beliefs about the nature of intelligence) and school structures (e.g., learning opportunities present in school), it is easier to see how changing students' beliefs could affect their school achievement over long periods of time.

Other research investigates how interventions that mitigate concern about negative stereotypes can raise stereotyped students' achievement over long periods of time. For example, research shows that stereotype threat can undermine learning, not just academic performance. In one laboratory experiment, African American students who studied novel academic material in a threatening rather than nonthreatening learning environment performed worse on a test of that

material a week later even in a nonthreatening performance setting (Taylor & Walton, in press; see also Rydell, Shiffrin, Boucher, Van Loo, & Rydell, 2010). This effect did not occur for European Americans. In a second study, Taylor and Walton found that a value-affirmation undid this effect of threat—it helped African American students learn more despite threat. The results suggest that one way a value-affirmation intervention may improve long-term academic outcomes is by helping students acquire the building blocks of academic skills and knowledge needed to perform well in subsequent academic settings.

Other studies examine recursive social-relational processes. For instance, as noted, Walton and Cohen's (2007, 2011) social-belonging intervention led to a term-by-term improvement in African American students' grades over three years (see Figure 3), and this boost in grades was mediated by a change in students' construal of adverse social events in school—such events no longer carried a global, threatening meaning to students (Walton & Cohen, 2011). If students feel more secure in their belonging in school, they may approach others in the academic environment more and with more positive attitudes, building better relationships, reinforcing their feelings of belonging, and laying the groundwork for later academic success (see also Mendoza-Denton et al., 2002).

If effective psychological interventions alter recursive processes in school, then the timing of such interventions is critical. In many cases, it may be essential to deliver psychological interventions at key educational junctures, such as at the beginning of an academic year (Cohen et al., 2006, 2009), during an important transition such as when students enter a new school (Walton & Cohen, 2007, 2011; Wilson & Linville, 1982, 1985), or before an academic gateway, such as before students are tracked into algebra versus lower-level math classes (Crosnoe, Lopez-Gonzalez, & Muller, 2004; Hallinan, 2001) or before a high-stakes exam

(Papay, Murnane, & Willett, 2010). Illustrating the importance of timing, one study found that the earlier a value-affirmation intervention was delivered the more it improved students' grades and, further, that timing mattered more than frequency (Cook, Purdie-Vaughns, Garcia, & Cohen, 2011). This finding echoes Raudenbush's (1984) classic meta-analysis of teacher expectancy effects, which found that teacher expectancy interventions were effective only when delivered within the first few weeks of school.

The importance of recursive processes in sustaining the effects of psychological interventions over time reinforces the proposition that these interventions do not work in isolation; rather, they operate in a complex system involving numerous structural factors (Lewin, 1952). When well-targeted and well-timed, a psychological intervention takes advantage of recursive social, psychological, and intellectual processes that are present in school to produce sustained gains in students' school achievement.

Discussion

How Can Social-Psychological Interventions Be Scaled To Benefit More Students?

The review above discusses how social-psychological interventions can boost student achievement and address long-standing achievement gaps. But as Bryk (2009) argues, to scale an educational innovation it is not enough to know that it *can* work in one context; "we need to know *how to make it work* reliably over many diverse contexts and situations" (p. 598; see also Morris & Hiebert, 2011). There are several challenges to scaling psychological interventions, many of which are common to educational innovations in general. Instead of reviewing the vast literature on scaling educational interventions, in this discussion we address how lessons from this literature apply specifically to efforts to scale social-psychological interventions, and suggest how key challenges might be overcome. In particular, we focus on two topics: (1) What should

be scaled, and what are the barriers to scaling this? and (2) What kinds of strategies and expertise are needed to scale social-psychological interventions effectively?

What Should Be Scaled, And What Are The Barriers To Scaling This?

It is the specific psychological experience created by a psychological intervention that should be reproduced at scale, not incidental features of the intervention. For instance, a scaled-up growth mindset intervention should lead students to believe that when they experience setbacks their ability can improve, not necessarily ensure that students master neuroanatomy. This is analogous to other well-designed reforms in education, where it is essential to scale the student learning experience rather than the specific activities, worksheets or examples used to create this experience. When a psychological intervention is delivered to more students, what barriers can prevent the intended psychological experience from being replicated? We address three barriers below.

First, past research reminds us that it can be easy to scale up superficial features of an educational innovation without reproducing the intended psychological or educational experience (see, e.g., Fullan, 2001; Labaree, 1998; Tyack & Cuban, 1995). Under these circumstances the intervention would not be predicted to have the intended effect. Take the case of the California mission project. The project began as a small but successful initiative in which 4th grade students conducted independent research on one of the Spanish missions in California, created a replica of the mission—in some cases, they even made adobe bricks by hand—and presented a class report. The project seemed to increase intrinsic motivation (Checkley, 2008); for instance, in news reports teachers said students were highly engaged and students reported planning summer vacations around visiting their mission ("Drawings Aid," 1931; Haessler, 1973). Excited by the early returns, reformers quickly took the initiative to scale, requiring

nearly every 4th grader in California to do a mission project. Soon enough, local stores sold pre-made "mission kits" with fact sheets on each. What began as a project requiring original research and intensive thinking ended as a trip to an arts and crafts store. Although no formal evaluation has been done, it would be surprising if this version of the project continued to produce benefits for student motivation. When an intervention is taken to scale without the theoretically essential components it will not have the intended effects.

Similarly, if scaled improperly, social-psychological interventions could become something different entirely—not a test of whether the theory works at scale, but a worksheet to be handed out or a lesson to "get through." It is easy to imagine, for instance how a value-affirmation intervention, if delivered poorly, could become a caricature—a hollow, ego-boosting, exercise in self-praise (perhaps one reminiscent of a scene from *Saturday Night Live's* Stuart Smalley skit; "I'm good enough, I'm smart enough, and doggone it, people like me")—not a tool for affirming students' values and reducing stress and threat in school.

Second, even when interventions are delivered with an effort to reproduce the theoretically-essential components, research finds that they can sometimes be derailed by seemingly small changes in how the intervention is delivered. This occurs if these changes lead recipients to perceive a different meaning in the intervention (for striking examples, compare Langer & Rodin, 1976 to Schulz & Hanusa, 1978; compare Paluck, 2009 to Paluck, 2010; see also Marigold, Holmes & Ross, 2007, Study 3). For instance, in the effective Hulleman and Harackiewicz (2009) intervention reviewed in Table 1, students generated and wrote reasons why schoolwork was relevant to their lives, and this led to a .80 grade point (out of 4.0) boost at the end of the school year for students with low expectations for success in class. But when students were *told* why the schoolwork was important instead of generating their own reasons,

the intervention had a *negative* effect on students with low expectations for success—in effect, by telling low-ability students how important their schoolwork was, they were reminded that they might not be able to accomplish those important goals, leading them to withdraw interest (Godes, Hulleman, & Harackeiwicz, 2007).

Such challenges may be especially acute when psychological interventions are delivered by teachers or other educational practitioners (cf. Morris & Hiebert, 2011). The history of school reform reminds us that teachers can vary in whether they deliver an intervention in the way intended or, on the other hand, in name only, changing the meaning and effect of the intervention (Fullan, 2001; Tyack & Cuban, 1995). Labaree (1998) argues that each teacher has a "duchy" that operates relatively independently once the classroom door closes, leading to excellence that is unhampered by outside control in some classrooms and low-performance that is resistant to attempts at improvement in other classrooms. Any educational reform that relies on teachers to deliver a message in a classroom is affected by this reality. This certainly applies to social-psychological interventions.

However, unlike many traditional educational reforms, psychological interventions involve relatively brief, discrete exercises, potentially reducing heterogeneity in implementation. For example, a values-affirmation or social-belonging intervention consists of a self-contained reading and writing activity. Implicit theories interventions can be delivered effectively online (through, e.g., www.brainology.us or www.perts.net; for an evaluation, see Romero, Paunesku, & Dweck, 2011), as could many of the other interventions summarized in Table 1 (see also Morisano, Hirsh, Peterson, Pihl, & Shore, 2010). Of course, even when using an online approach, basic preconditions such as classroom management may be necessary for an intervention to succeed. Just completing an intervention in a rowdy classroom or one where

other students can read or comment on a student's responses (e.g., her description of her core values) could undermine an intervention's effectiveness. One study that examined this possibility found that a social-psychological intervention administered in classrooms had reduced fidelity to experimental protocols and yielded no positive effect on average, while the same intervention delivered in a controlled setting (a laboratory) was effective (Hulleman & Cordray, 2009).

A third potential challenge to scaling psychological interventions involves how the meaning of an intervention can change in different contexts. If the meaning of an intervention changes, its effect may change as well. One way to help make an intervention meaningful for diverse students is to structure the intervention to create the intended psychological experience but simultaneously allow students to personalize their responses to intervention materials to evoke this experience in the way that is most relevant to them. For instance, in an affirmation intervention, students rank order values in terms of their importance to themselves, and then write about their top-ranked value; they are not told which value to select because it may or may not be important to them. In a social-belonging intervention, students think about their personal experience in the transition to a new school, and write about how their experience illustrates the general process of change students experience transitioning to the school and coming to feel at home there. This element of personalization allows each student to make the intervention their own. In many settings, identical materials, if administered in well-managed classrooms and with fidelity, can be personally meaningful to diverse students and thus produce positive effects for them.

However, the effectiveness of social-psychological interventions may also be enhanced by embedding contextually-appropriate elements . For instance, the values students rank-order

in an affirmation intervention should include values that are, in fact, personally important to

students in the population at hand; if the list fails to include values that are especially important

in the local context (e.g., in some settings more than others, religious values), the intervention

may be less effective. Similarly, contextually-appropriate colloquialisms or anecdotes embedded

in a social-belonging intervention—specific stories about older students' feelings of belonging in

the transition to students' own school—may increase the intervention's effectiveness. Of course,

making the materials more specific to some students could reduce the intervention's relevance

for dissimilar other students.

In addition, relational dynamics between teachers and students could affect the meaning

an intervention carries for students (cf. Raudenbush, 1984). It could seem insincere if a teacher

with whom a student has a hostile relationship asks the student to complete a value-affirmation,

perhaps undermining the effectiveness of the intervention. Similarly, an incremental mindset

intervention might have no effect if students suspect that the person who tells them about their

potential for growth and improvement over time does not believe this him- or herself.

Can the materials and procedures used in an intervention be different across contexts but

still result in a similar psychological experience? Past research shows that they can, when

changes are guided by theory. For example, Dweck and colleagues have taught an incremental

theory of intelligence by asking participants in laboratory studies to read brief scientific articles

describing how the brain can get smarter (e.g., Nussbaum & Dweck, 2008) and by providing

effort vs. intelligence praise after success (Mueller & Dweck, 1998). In the field, an incremental

theory has been taught using neuroscience workshops (Blackwell et al. 2007), emails exchanged

during a year-long program with a mentor (Good et al., 2003), and a brief experience writing a

pen pal letter to a younger student (Aronson et al., 2002). These approaches differ in many

ways. But each conveys the core message that intelligence is malleable. When equipped with a well-specified theory of the psychological experience an intervention is designed to create, materials and procedures can be modified, as necessary, to create the target experience most effectively for a particular context and population.

In sum, we do not believe that practitioners should pick up previously-effective experimental materials and freely adapt them without planning or evaluation. Nor do we believe they should hand out the original materials without considering whether they would convey the intended meaning in the local context. Although in many cases the materials and procedures developed for previous experiments may work well in new contexts, adapting them might increase their effectiveness. As in a curricular initiative, deciding how, when and whether to adapt materials and procedures is difficult. We therefore turn to one set of principles for engineering instructional materials and procedures so as to create the intended psychological experience for students in diverse contexts.

What Kinds Of Expertise And Collaborations Are Required To Scale Social-Psychological Interventions Effectively?

To increase the reliability of social-psychological interventions across contexts, researchers and practitioners will have to decide whether to customize an intervention and, if so, how to do so to best evoke the intended psychological experience. Making these decisions requires wisdom in two important areas: (1) *theoretical expertise*, or an understanding of the psychological experience that is targeted by the intervention and (2) *contextual expertise*, or an understanding of the psychological experiences and backgrounds of students in the local context

If so, delivering psychological interventions at scale requires an equal collaboration between researchers with a basic theoretical understanding of psychological processes and

contextual experts, including qualitative researchers, administrators, and educational

practitioners who have profound, intuitive knowledge or *metis* (Scott, 1998) of local students and

contexts. Contextual experts can identify areas where the procedures or materials used in an

intervention match or do not match local constraints and meanings. Theoretical experts can

assess whether potential modifications lead an intervention to hit or miss its intended

psychological mark. Because subtle changes to delivery mechanisms can shift the meanings of

interventions for students, sometimes in non-obvious or unpredictable ways, researchers and

practitioners should approach efforts to scale psychological interventions with humility and with

rigorous, step-by-step evaluation. Qualitative methods could supplement experimental methods

in these evaluations.

Such equal collaborations have proven effective in other contexts, such as the National

Writing Project (McDonald, Buchanan, & Sterling, 2004), which scaled an initiative to improve

writing instruction using a network of researchers and teachers who customized, refined and

delivered writing instruction to more than 5,000 students in seven states. Across fifteen

evaluation studies, National Writing Project students made more gains in writing than matched

comparison group students (National Writing Project, 2010)—a promising result considering the

variability in instruction across contexts. Another education research and development initiative,

the Strategic Education Research Partnership (Donovan, Wigdor, & Snow, 2003) has found

similarly positive results for students' academic vocabulary (see also Morris & Hiebert, 2011).

More relevant here, some organizations are beginning to apply a similar approach to social-

psychological interventions. For instance, the new education research and development

enterprise created by the Carnegie Foundation for the Advancement of Teaching has formed a

network of community colleges and researchers focused on the improvement of outcomes for

developmental (or remedial) math students (Bryk, 2009; Bryk, Gomez & Grunow, in press); psychological interventions constitute one part of this team's strategy. This collaboration and others like it—because of an emphasis on the equal partnerships between researchers and practitioners—can create relational trust, a critical component of educational change (Bryk & Schneider, 2002; Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010), and can increase the likelihood that materials and procedures will be appropriate and adopted in local contexts. As such, these collaborations may prove fruitful for scaling psychological interventions.

Along similar lines, it may be useful to revisit past suggestions for creating a new class of professional—a "psychological engineer"—a person with the expertise needed to scale psychological interventions effectively. Such professionals would be trained in experimental methodology and psychological theory, but their primary work would be not to advance psychological theory but to understand and alter psychological dynamics in applied settings. This would require expertise in user-centered design and related qualitative inquiry, in the conduct of equal collaborations across the "theory"/"real world" divide, in the measurement of psychological processes, and in the delivery and experimental evaluation of psychological interventions. Such a professional could design and implement interventions, evaluate their effects, and troubleshoot interventions that do not produce their intended effect. For instance, using measures of psychological processes, a psychological engineer could examine whether an intervention failed to affect the intended process and, if so, examine with practitioners how the delivery mechanism could be improved. Alternately, if the intervention affected the intended process, the psychological engineer and practitioners could examine whether this process was important in the local context in affecting relevant outcomes.

In collaborative efforts to scale social-psychological interventions, the flow of ideas

between theory and application will be a two-way street (Lewin, 1952; Bronfenbrenner, 1979).

As interventions are created and deployed and their effects assessed, theories of psychological

processes may be refined, leading to improved interventions. This is directly analogous to work

in other applied sciences, where basic research and application feed back on each other in a

mutually beneficial cycle. When social-psychological interventions are taken to scale, the

constraints of application at many schools may lead to refinements in their essential elements and

the elimination of less important features, making them more streamlined, powerful, and robust.

For instance, it could be useful for scaling purposes to reduce Blackwell et al.'s (2007)

incremental theory intervention to fewer workshop sessions. But the process of reducing this

intervention would require experimental work to identify the theoretically critical elements,

potentially resulting in both new insights about basic psychological processes and an improved

intervention.

Second, when interventions are tested on broad samples, important boundary conditions

will likely be discovered. It could be that for some students or in some conditions the suite of

interventions reviewed in Table 1 might be ineffective. When contextual experts collaborate on

these projects and see these results, they may think of other psychological processes that were

not addressed—most likely, processes that psychologists did not anticipate. This could lead to

new experiments investigating these processes, new theories, and new interventions. Indeed, an

important source of theory in the social sciences is the attempt to explain failed interventions

(see, e.g., the discussion of McCord, 1978, in Ross & Nisbett, 1990). This interplay of theory,

research, and application would benefit both psychological science and the solution of social

problems.

In sum, psychological interventions may be scaled more effectively when researchers and

practitioners combine requisite theoretical and contextual expertise. Existing organizations provide guidance for how to do this, but this process may also be expedited by the creation of new roles within the field of education. We anticipate that such efforts will benefit both basic psychological theory and student outcomes.

Conclusion

Social-psychological interventions are not magic. They are not inputs that go into a black box and automatically yield positive results. Instead, they are tools to target important psychological processes in schools. These interventions grew out of basic laboratory research and theory and have produced long-lasting gains in achievement in multiple studies, but they are dependent on the capacities, meanings, and recursive processes present in local contexts. If scaled up in appropriate ways, social-psychological interventions have the potential to contribute, in conjunction with other reforms, to the solution of endemic problems in education.

Nevertheless, because social-psychological interventions rely on subtle, non-obvious forces, they can lead to polarized reactions—either "uncritical acceptance and overgeneralization on one hand; [or] vilifying criticism on the other" (Jussim & Harber, 2005, p. 135; see also Wineburg, 1987; cf. Gawande, 2009). By understanding the mechanisms underlying the effects of social-psychological interventions, we hope that educational researchers can move past such reactions. Social-psychological interventions complement—and do not replace—traditional educational reforms. They do not teach students academic content or skills, re-structure schools, or improve teacher training. Instead, they allow students to take better advantage of learning opportunities that are present in schools and tap into existing recursive processes to generate long-lasting effects. Just at it would be absurd to replace skilled surgeons with Gawande's (2010) one-page checklist, it would be absurd to replace traditional educational reforms with

social-psychological interventions. Instead, as a surgical checklist allows a trained doctor to perform as well as he or she is capable, social-psychological interventions can unleash the potential of students and of the educational environments in which they learn. Indeed, social-psychological interventions may make the effects of high-quality educational reforms such as improved instruction or curricula more apparent (Cohen et al., 2009).

Although we are optimistic that social-psychological interventions can be taken to scale, doing so will require hard work. These are not quick fixes that can be administered broadly without consideration for local contexts or the meaning students make of them. They require an R&D model that incorporates authentic collaborations between researchers and contextual experts and rigorous experimental and observational evaluation at each step (Bryk, 2009; Bryk, Gomez & Grunow, in press; Morris & Hiebert, 2011). But in a context in which many reforms in education have produced at best uneven results, psychological interventions have a demonstrated potential to address fundamental problems, including low student achievement and large group differences, at low cost and over significant periods of time. We look forward to future research that includes psychological strategies in the broader suite of reforms for promoting positive change in education.

References

Aaronovitch, D. (2010, January 23). In a world of hi-tech medicine and machinery, the best

safeguard is the low-tech checklist. *The Times*. Retrieved from http://entertainment.

timesonline.co.uk/tol/arts_and_entertainment/books/book_reviews/article6995508.ece

Aronson, E. (1999). The power of self-persuasion. *American Psychologist, 54*, 875-884.

Aronson, E., Blaney, N., Stephin, C., Sikes, J., & Snapp, M. (1978). *The jigsaw classroom.*

Beverly Hills, CA: Sage Publishing Company.

Aronson, J., Fried, C., & 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.

Axsom, D. & Cooper, J. (1985). Cognitive dissonance and psychotherapy: The role of effort

justification in inducing weight loss. *Journal of Experimental Social Psychology*, *21*,

149-160.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change.

Psychological Review, 84, 191-215.

Blackwell, L. A., Trzesniewski, K. H., & Dweck, C. S. (2007). Theories of intelligence and

achievement across the junior high school transition: A longitudinal study and an

intervention. *Child Development*, *78*, 246-263.

Bransford, J., Brown, A., & Cocking, R. (1999). *How people learn: Brain, mind, experience,

school.* Washington, DC: National Academy of Sciences.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and

design.* Cambridge, MA: Harvard University Press.

Bryk, A. S. (2009). Support a science of performance improvement. *Phi Delta Kappan*, *90*, 597-

600.

Bryk, A.S., Gomez, L., Grunow, A. (in press). Ruminations II - Getting ideas into action: Building networked improvement communities in education. In Hallinan, M. (Ed.) *Frontiers of Social Science Research*.

Bryk, A. S., & Schneider, B. L. (2002). *Trust in schools: A core resource for improvement*. New York, NY: Russell Sage Foundation.

Bryk, A. S., Sebring, P. B., Allensworth, E., Luppescu, S., & Easton, J. Q. (2010). *Organizing schools for improvement: Lessons from Chicago*. Chicago, IL: University of Chicago Press.

Charles A. Dana Center. (2008). *Summary of results from the 2008 evaluation conducted on academic youth development: Improving achievement by shaping the culture of algebra classrooms*. Retrieved from http://www.utdanacenter. org/academicyouth/downloads/ implementation/12-ayd- evaluation-results.pdf

Chase, C.S., Chin, D. B., Oppezzo, M.A., & Schwartz, D.L. (2009). Teachable agents and the protégé effect: Increasing the effort towards learning. *Journal of Science and Educational Technology*, 18, 334–352.

Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science, 12*, 105-109.

Checkley, K. (2008). *The essentials of social studies, grades K-8: Effective curriculum, instruction, and assessment*. Alexandria, Virginia: Association for Supervision and Curriculum Development.

Cohen, G. L., Garcia, J., Apfel, N., & Master, A. (2006). Reducing the racial achievement gap: A social-psychological intervention. *Science, 313,* 1307-1310.

Cohen, G. L., Garcia, J., Purdie-Vaugns, V., Apfel, N., & Brzustoski, P. (2009). Recursive

processes in self-affirmation: Intervening to close the minority achievement gap. *Science, 324*, 400-403.

Cohen, G. L., Steele, C. M., & Ross, L. D. (1999). The mentor's dilemma: Providing critical

feedback across the racial divide. *Personality and Social Psychology Bulletin, 25*, 1302-1318.

Cook, J., Purdie-Vaughns, V., Garcia, J., & Cohen, G. (2011). Longitudinal impact of a values

affirmation and its timing on minority students' belonging and performance in middle

school. *Presentation at the 2011 Biannual Meeting for the Society for Research on Child Development in Montreal, Canada.*

Crosnoe, R., Lopez-Gonzalez, L., & Muller, C. (2004). Immigration from Mexico into the

math/science pipeline in American education. *Social Science Quarterly*, *85*, 1208-1226.

Destin, M., & Oyserman, D. (2009). From assets to school outcomes: How finances shape

children's perceived possibilities and intentions. *Psychological Science, 20*, 414-418.

Drawings aid school studies. (1931, October 25). *Oakland Tribune,* p. B5.

Duckworth, A. L., Grant, H., Loew, B., Oettingen, G., & Gollwitzer, P. M. (in press). Self-

regulation strategies improve self-discipline in adolescents: Benefits of mental

contrasting and implementation intentions. *Educational Psychology*.

Duit, R. (1991). On the role of analogies and metaphors in learning science. *Science Education*,

75, 649-660.

Dweck, C.S. (2006). *Mindset*. New York: Random House

Dweck, C.S., & Leggett, E.L. (1988). A social-cognitive approach to motivation and personality,

Psychological Review, 95, 256-273.

Festinger, L. (1957). *A theory of cognitive dissonance.* Evanston, IL: Row, Peterson.

Haessler, J. (1973, April 5). Fourth grade class to build scale model of San Antonio mission in

EDH. *Mountain Democrat.*

Fullan, M. (2001). *The new meaning of educational change*. New York: Teachers College Press.

Garcia, J., & Cohen, G. L. (in press). Social psychology and educational intervention. In E.

Shafir (Ed.), *Behavioral foundations of policy*. New York: Russell Sage Foundation.

Garet, M., Wayne, A., Stancavage, F., Taylor, J., Walters, K., Song, M., Brown, S., Hurlburt, S.,

Zhu, P., Sepanik, S., & Doolittle, F. (2010). *Middle School Mathematics Professional*

Development Impact Study: Findings After the First Year of Implementation (NCEE

2010-4010). Retrieved from: ies.ed.gov/ncee/pubs/20104009/pdf/20104010.pdf

Gawande, Atul. (2009) *The checklist manifesto: How to get things right.* New York:

Metropolitan Books.

Gehlbach, H. (2010). The social side of school: Why teachers need social psychology.

Educational Psychology Review, 22, 349-362.

Glazerman, S., E. Isenberg, S. Dolfin, M. Bleeker, A. Johnson, M. Grider, & M. Jacobus. (2010).

Impacts of Comprehensive Teacher Induction: Final Results From a Randomized

Controlled Study (NCEE 2010 4028). Retrieved from: ies.ed.gov/ncee/pubs/20104027/

pdf/20104027.pdf

Godes, O., Hulleman, C. S., & Harackiewicz, J. M. (2007). Boosting students' interest in math

with utility value: Two experimental tests. *Paper presented at the meeting of the*

American Educational Research Association, Chicago, IL.

Goldstein, N., Cialdini, R., & Griskevicius, V. (2008). A room with a viewpoint: Using social

norms to motivate environmental conservation in hotels. *Journal of Consumer*

Research, *35*, 472-482.

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.

Greenwald, A. G. (1980). The totalitarian ego: Fabrication and revision of personal history. *American Psychologist*, *35*, 603-618.

Hallinan, M. (2001). Sociological perspectives on Black/White inequalities in American schooling. *Sociology of Education, Extra Issue, 74,* 50-70.

Hudley, C., & Graham, S. (1993). An attributional intervention to reduce peer-directed aggression among African-American boys. *Child Development, 64,* 124–138.

Hulleman, C. S., & Cordray, D. S. (2009). Moving from the lab to the field: The Role of fidelity and achieved relative intervention strength. *Journal of Research on Educational Effectiveness, 2,* 88-110.

Hulleman, C. S., & Harackiewicz, J. M. (2009). Making education relevant: Increasing interest and performance in high school science classes. *Science, 326,* 1410-1412.

James-Burdumy, S., Deke, J., Lugo-Gil, J., Carey, N., Hershey, A., Gersten, R., Newman Gonchar, R., Dimino, J., Haymond, K., and Faddis, B. (2010). *Effectiveness of Selected Supplemental Reading Comprehension Interventions: Findings From Two Student Cohorts* (NCEE 2010-4016). Retrieved from: ies.ed.gov/ncee/pubs/20104015/ pdf/20104016.pdf

Jamieson, J., Mendes, W. B., Blackstock, E., & Schmader, T. (2009). Turning the knots in your stomach into bows: Reappraising arousal improves performance on the GRE. *Journal of Experimental Social Psychology*, *46*, 208-212.

Jussim, L., & Harber, K. D. (2005). Teacher expectations and self-fulfilling prophecies: Knowns and unknowns, resolved and unresolved controversies. *Personality and Social Psychology Review, 9,* 131-155.

Kelley, H. H. (1973). The process of causal attribution. *American Psychologist, 28,* 107-128.

Kulesza, M., Apperson, M., Larimer, M. E. & Copeland, A. L. (2010). Brief alcohol intervention for college drinkers: How brief is it? *Addictive Behaviors, 35,* 730-733.

Kuhn, T. S. (1979). Metaphor in science. In A. Ortony (Ed.) *Metaphor and Thought*. (2nd ed, pp. 403–419). Cambridge: Cambridge University Press.

Labaree, D. F. (1998). Educational researchers: Living with a lesser form of knowledge. *Educational Researcher*, *27*, 4-12.

Langer, E.J., & Rodin, J. (1976). The effects of choice and enhanced personal responsibility for the aged: A field experiment in an institutional setting. *Journal of Personality and Social Psychology, 34*, 191-198.

Lewin, K. (1952). Group decision and social change. In G.E. Swanson, T.M. Newcomb, & E.L. Hartley (Eds.), *Readings in social psychology* (2nd ed., pp. 330–344). New York: Holt.

Logel, C., & Cohen, G. L. (2011). The role of the self in physical health: Testing the effect of a values affirmation intervention on weight loss. *Unpublished Manuscript, Stanford University.*

Martens, A., Johns, M., Greenberg, J., & Schimel, J. (2006). Combating stereotype threat: The effect of self-affirmation on women's intellectual performance. *Journal of Experimental Social Psychology, 42*, 236-243.

McCord, J. (1978). A thirty-year follow-up of treatment effects. *American Psychologist, 33,* 284-289.

Mendoza-Denton, R., Purdie, V., Downey, G., Davis, A., & Pietrzak, J. (2002). Sensitivity to

status-based rejection: Implications for African–American students' college experience.

Journal of Personality and Social Psychology, 83, 896–918.

Miller, D. T., & Prentice, D. A. (in press). Psychological levers of behavior change. In E. Shafir

(Ed.), *Behavioral foundations of policy*. New York: Russell Sage Foundation.

Miyake, A., Kost-Smoth, L.E., Finkelstein, N.D., Pollock, S.J., Cohen, G.L., & Ito, A. (2010).

Reducing the gender achievement gap in college science; A classroom study of values

affirmation. *Science*, *330,* 1234-1237.

Molden, D. C., & Dweck, C. S. (2006). Finding "meaning" in psychology: A lay theories

approach to self-regulation, social perception, and social development. *American*

Psychologist, *61*, 192-203.

Morisano, D., Hirsh, J. B., Peterson, J. B., Shore, B., & Pihl, R. O. (2010). Setting, elaborating,

and reflecting on personal goals improves academic performance. *Journal of Applied*

Psychology, *95*, 255-264.

Morris, A.K., & Hiebert, J. (2011). Creating shared instructional products: An alternative

approach to improving teaching. *Educational Researcher*, *40*, 5-13.

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's

motivation and performance. *Journal of Personality and Social Psychology*, *75*, 33-52.

National Writing Project. (2010). Research Brief No. 2. Retrieved on February 22, 2011 from

http://www.nwp.org/cs/public/download/nwp_file/14004/FINAL_2010_Research_Brief.

pdf?x-r=pcfile_d.

Nussbaum, A. D., & Dweck, C. S. (2008). Defensiveness vs. remediation: Self-theories and

modes of self-esteem maintenance. *Personality and Social Psychology Bulletin, 34*, 127-

134.

Oyserman, D., Bybee, D., & Terry, K. (2006). Possible selves and academic outcomes: How and when possible selves impel action. *Journal of Personality and Social Psychology*, *91*, 188-204.

Page-Gould, E., Mendoza-Denton, R., & Tropp, L. R. (2008). With a little help from my cross-group friend: Reducing anxiety in intergroup contexts through cross-group friendship. *Journal of Personality and Social Psychology*, *95*, 1080-1094.

Paluck, E.L. (2009). Reducing intergroup prejudice and conflict using the media: A field experiment in Rwanda. *Journal of Personality and Social Psychology,* 96, 574-587.

Paluck, E.L. (2010). Is it better not to talk? Group polarization, extended contact, and perspective-taking in eastern Democratic Republic of Congo. *Personality and Social Psychology Bulletin*, 36, 1170-1185.

Papay, J., Murnane, R., & Willett, J. (2010). The consequences of high school exit examinations for low-performing urban students: Evidence from Massachusetts. *Educational Evaluation and Policy Analysis, 32*, 5-23.

Paunesku, D., Romero, C., & Dweck, C. (2011). Brainology in the classroom: An online growth mindset intervention affects GPA, conduct, and implicit Theories. *Poster presented at the Biennial Meeting for the Society for Research in Child Development.*

Pennebaker, J. W. (1997). *Opening up: The healing power of expressing emotion*. New York: Guilford.

Pennebaker, J. W., & Beall, S. K. (1986). Confronting a traumatic event: Toward an understanding of inhibition and disease. *Journal of Abnormal Psychology, 95*, 274–281.

Petry, N. M., Weinstock, J., Ledgerwood, D. M., & Morasco, B. (2008). A randomized trial of

brief interventions for problem and pathological gamblers. *Journal of Consulting and Clinical Psychology, 76*, 318−328.

Ramirez, G., & Beilock, S. (2011). Writing about testing worries boosts exam performance in the classroom. *Science, 331,* 211-213.

Raudenbush, S. (1984). Magnitude of teacher expectancy effects on pupil IQ as a function of the credibility of expectancy induction: A synthesis of findings from 18 experiments. *Journal of Educational Psychology*, *76,* 85-97.

Reis, H. T., & Gosling, S. D. (2010). Social psychological methods outside the laboratory. In S. T. Fiske, D. T. Gilbert, & G. Lindzey, (Eds.), *Handbook of Social Psychology* (5th ed., Vol. 1, pp. 82-114). New York: Wiley.

Ritter S., Anderson, J.R., Koedinger, K.R., & Corbett, A. (2007). Cognitive tutor: Applied research in mathematics education. *Psychonomic Bulletin & Review, 14,* 249–255.

Robinson, T. N. (in press). Stealth interventions for obesity prevention and control: Motivating behavior change. In L. Dube, A. Bechara, A. Dagher, et al., (Eds). *Obesity prevention: The role of brain and society on individual behavior.* New York: Elsevier.

Rodin, J., & Langer, E. J. (1977). Long-term effects of a control-relevant intervention with the institutionalized aged. *Journal of Personality and Social Psychology*, *35*, 897-902.

Ross, L., & Nisbett, R. E. (1991). *The person and the situation: Perspectives of social psychology.* New York: McGraw-Hill.

Rydell, R.J., Shiffrin, R.M., Boucher, K.L., Van Loo, K., & Rydell, M.T. (2010). Stereotype threat prevents perceptual learning. *Proceedings of the National Academy of Science, 107,* 14042-14047.

Schulz, R., Hanusa, B.H. (1978). Long-term effects of control and predictability-enhancing

interventions: Findings and ethical issues. *Journal of Personality and Social Psychology, 36,* 1194-1201.

Schmader, T., Johns, M., & Forbes, C. (2008). An integrated process model of stereotype threat effects on performance. *Psychological Review*, *115*, 336-356.

Schwarz, N., Bless, H., Strack, F., Klumpp, G., Rittenauer-Schatka, H., & Simmons, A. (1991). Ease of retrieval as information: Another look at the availability heuristic. *Journal of Personality and Social Psychology*, *61*, 195-202.

Scott, J. C. (1998). *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven, CT: Yale University Press.

Sherman, D. K., & Cohen, G. L. (2006). *The psychology of self-defense: Self-affirmation theory*. In M. P. Zanna (Ed.), Advances in Experimental Social Psychology (Vol. 38, pp. 183-242). San Diego, CA: Academic Press.

Sherman, D. K., Cohen, G. L., Nelson, L. D., Nussbaum, A. D., Bunyan, D. P., & Garcia, J. P. (2009). Affirmed yet unaware: Exploring the role of awareness in the process of self-affirmation. *Journal of Personality and Social Psychology, 97*, 745-764.

Sherman, D.K. & Hartson, K.A. (in press). Reconciling self-defense with self-criticism: Self-affirmation theory. Alicke & Sedikides (Eds). *Handbook of Self-Enhancement and Self-Protection.*

Szalavitz, M. (2009, January 14). Study: a simple surgery checklist saves lives. *Time*. Retrieved from http://www.time.com/time/health/article/0,8599,1871759,00.html

Somers, M.-A., Corrin, W., Sepanik, S., Salinger T., Levin, J., & Zmach, C. (2010). *The Enhanced Reading Opportunities Study Final Report: The Impact of Supplemental Literacy Courses for Struggling Ninth-Grade Readers* (NCEE 2010-4022). Retrieved

from: ies.ed.gov/ncee/pubs/20104021/pdf/20104021.pdf

Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In

L. Berkowitz (Ed.), *Advances in experimental social psychology* (pp. 261-302). New

York: Academic Press.

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and

performance. *American Psychologist, 52*, 613-629.

Steele, C. (2010). *Whistling Vivaldi: And other clues how stereotypes affect us*. New York:

Norton & Company Inc.

Steele, C. M., Spencer, S. J., & Aronson, J. (2002). Contending with group image: The

psychology of stereotype and social identity threat. In M.P. Zanna (Ed.), *Advances in

Experimental Social Psychology* (Vol. 34, pp. 379-440). San Diego, CA: Academic

Press.

Storms, M. D., & Nisbett, R. E. (1970). Insomnia and the attribution process. *Journal of

Personality and Social Psychology, 16,* 319-328.

Taylor, V. J. & Walton, G. (in press). Stereotype threat undermines academic learning.

Personality and Social Psychology Bulletin.

Thibodeau, P.H., & Boroditsky, L. (2011) Metaphors we think with: The role of metaphor in

reasoning. *PLoS ONE* 6(2): e16782.

Thomaes, S., Bushman, B. J., Orobio de Castro, B., Cohen, G., & Denissen, J. A. (2009).

Reducing narcissistic aggression by buttressing self-esteem: An experimental field study.

Psychological Science, 20, 1536-1542.

Tyack, D. B., & Cuban, L. (1995). *Tinkering toward utopia: A century of public school reform*.

Cambridge, MA: Harvard University Press.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating

    learning, performance, and persistence: The synergistic role of intrinsic goals and

    autonomy-support. *Journal of Personality and Social Psychology*, *87*, 246-260.

Walton, G. M. & Cohen, G. L. (2007). A question of belonging: Race, social fit, and

    achievement. *Journal of Personality and Social Psychology, 92,* 82-96.

Walton, G. M. & Cohen, G. L. (2011). A brief social-belonging intervention improves academic

    and health outcomes among minority students. *Science*.

Walton, G. M., Cohen, G. L., Garcia, J., Apfel, N., & Master A. (2011). A brief intervention to

    buttress middle school students' sense of social-belonging: Effects by race and gender.

    Unpublished manuscript. Stanford, CA.

Walton, G. M. & Dweck, C. S. (2009). Solving social problems like a psychologist. *Perspectives*

    on Psychological Science, 4, 101-102.

Walton, G. M., Logel, C., Peach, J., & Spencer, S. (2011). Two interventions to boost women's

    achievement in engineering: Social-belonging and self-affirmation-training. *Unpublished*

    manuscript. Stanford, CA.

Walton, G. M. & Spencer, S. J. (2009). Latent ability: Grades and test scores systematically

    underestimate the intellectual ability of negatively stereotyped students. *Psychological*

    Science, 20, 1132-1139.

Weiner, B. (1982). *The emotional consequences of causal attributions*. In M.S. Clark & S.T.

    Fiske (Eds.). Hillsdale. NJ: Erlbaum.

Wilson, T. D. (2006). The power of social psychological interventions. *Science*, *313*, 1251-1252.

Wilson, T. D., & Linville, P. W. (1982). Improving the academic performance of college

    freshmen: Attribution therapy revisited. *Journal of Personality and Social Psychology*,

42, 367-376.

Wilson, T. D., & Linville, P. W. (1985). Improving the performance of college freshmen with attributional techniques. *Journal of Personality and Social Psychology*, *49*, 287-293.

Wilson, T. D., Damiani, M., & Shelton, N. (2002). Improving the academic performance of college students with brief attributional interventions. In J. Aronson (Ed.), *Improving academic achievement: Impact of psychological factors on education* (pp. 88-108). San Diego, CA: Academic Press.

Wineburg, S. S. (1987). The self-fulfillment of the self-fulfilling prophecy. *Educational Researcher*, *16*, 28-37.

Yeager, D.S., Trzesniewski, K., & Dweck, C.S. (2011). An implicit theories intervention changes aggressive and prosocial responses to peer exclusion and victimization among high school students. *Unpublished manuscript. Stanford, CA.*

Footnotes

1. Although analogies can mislead if taken too far, they can also be helpful for understanding new ideas in science and, in particular in this case, for understanding how multiple variables relate (Duit, 1991; Kuhn, 1979; Thibodeau, & Boroditsky, 2011).

2. Notably, poor academic achievement is not the only social problem that social-psychological interventions can address, even in the presence of structural impediments (for an overview, see Reis & Gosling, 2010). For instance, among other social problems, brief social-psychological interventions can have lasting effects on the health of the elderly (Langer & Rodin, 1976; Rodin & Langer, 1977), and college students (Pennebaker, 1997; Pennebaker & Beall, 1986), the success of dieters (Axsom & Cooper, 1985; Logel & Cohen, 2011), environmental conservation (Goldstein, Cialdini, & Griskevicious, 2008), youth aggression (Hudley & Graham, 1993; Thomaes, Bushman, Orobio de Castro, Cohen, & Denissen, 2009; Yeager, Trzesniewski, & Dweck, 2011), and intergroup relations (e.g., Page-Gould, Mendoza-Denton, & Tropp, 2008; Paluck, 2009; cf. Paluck, 2010).

Table 1.

Summary of Selected Social-Psychological Interventions to Improve Student Achievement.

Study	Student Sample	Theoretical Approach	Summary of Randomized Treatment and Control Group(s)	Summary of Results	Effect on Achievement
Attributions and Implicit Theories of Intelligence:					
Wilson and Linville (1982, 1985)	First-year college students struggling academically.	Leading students to attribute academic setbacks to unstable factors rather than stable factors can motivate students to work harder and not give up after setbacks in school.	In one laboratory session, ostensibly as a part of a survey, students watched videos of upper-year students describing how their grades in college were low at first but improved over time. In a control group, students saw videos of the same upper-year students talking about their interests but not their grades.	One week later, students in the treatment condition performed better on a GRE exam. A year later, these students had earned higher college GPAs and were 80% less likely to have dropped out of college. The treatment effect on GPA appeared to gain strength over time.	.27 grade points
Blackwell, Trzesniewski, and Dweck (2007)	Low-income, Black and Hispanic/Latino 7th grade students at an urban school.	Teaching students that people's core intelligence is malleable and grows with effort and challenge can motivate students to work hard and not give up after setbacks in school.	In eight sessions over eight weeks, students took part in scientific workshops on the function of the brain and how the brain can get stronger when a person works on challenging tasks. Students in a control group learned extensive study skills.	At the end of the academic year, the normative decline in math grades exhibited by students in the control group was reversed such that students in the treatment condition had earned significantly higher math grades.	.30 grade points
Implicit Theories of Intelligence and Stereotype Threat:					
Aronson, Fried, and Good (2002)	Black and White college students.	Teaching students that people's core intelligence is malleable will buffer students from the threat of being a member of a negatively stereotyped group in school.	In a laboratory session, ostensibly as a part of a "pen pal" program to support younger students, students wrote letters to middle school students endorsing the belief that intelligence is malleable. In a control group, students wrote "pen pal" letters advocating a theory of multiple intelligences. A second control group did not write letters.	At the end of the academic year, both Black and White students' GPAs rose significantly in the treatment condition as compared to both control groups.	.23 grade points
Good, Aronson, and Inzlicht (2003)	Low- and middle-income Black and Hispanic/Latino 7th grade students at a rural school.	One treatment group received an attributional retraining intervention similar to Wilson and Linville (1982). A second treatment group received an implicit theories of intelligence intervention. A third treatment group received both interventions.	Students met with college student mentors twice and exchanged occasional emails throughout the school year. Mentors were taught to endorse the relevant treatment message. A control group received an anti-drug message from mentors.	At the end of the academic year, in all three treatment groups girls' math scores on a state-wide standardized test rose relative to the control group, eliminating the gender difference in math performance present in the control condition. In addition, both boys' and girls' reading scores increased in all three treatment groups relative to the control group.	NA[1]

Table 1.
Continued.

Stereotype Threat:					
Cohen, Garcia, Apfel and Master (2006); Cohen, Garcia, Purdie-Vaughns, Apfel, and Brzustoski (2009)	Low- and middle-income Black and White 7th grade students at a suburban school.	Affirming important values can buffer people from the effects of stereotype threat.	In one or several 15 to 20 minute classroom sessions beginning at the beginning of the school year, students wrote about values that were personally important to them as an in-class writing exercise. In a control group, students wrote about values that were not important to them but might matter to someone else.	At the end of the first semester, the value-affirmation intervention increased Black students' class grades, reducing the gap between Black and White students by 40%. Subsequently, the treatment effect extended to Black students' GPA in core academic classes and persisted for at least two years through the end of middle school.	.30 grade points among Black students.
Miyake, Kost-Smith, Finkelstein, Pollock, Cohen, and Ito (2010).	Men and women in a college physics class.	Same as above.	Same as above.	At the end of the 15-week course, the value-affirmation intervention eliminated a substantial gender gap in physics grades and on scores on a nationally normed physics test that was present in the control condition.. The effect was strongest for women who endorsed gender stereotypes.	.33 grade points among women.[2]
Walton and Cohen (2007, 2011)	First-year Black and White college students.	Leading students to attribute worries about belonging to the difficulty of the transition to college rather than to students' personal or racial identity can buttress ethnic minority students' sense of social belonging in school and increase motivation and performance.	In a 1-hour laboratory session, students read the results of a survey indicating that many students feel they do not belong in college at first but that such worries dissipate with time. Students then wrote an essay and gave a speech ostensibly for the next year's freshmen about how their worries about belonging had changed over time in college. In control groups, students were exposed to information irrelevant to issues of belonging.	As compared to students in both experimental control groups and a campus-wide control group, Black students in the social-belonging treatment condition earned higher GPAs from sophomore-through-senior year, reducing the racial achievement gap by 52%, were more likely to be in the top 25% of their college class, and, 3-years posttreatment reported being happier and healthier.	.34 grade points among Black students
Possible selves:					
Oyserman, Bybee and Terry (2006)	Low-income Black and Hispanic/Latino 8th grade students.	Leading ethnic minority students to see that their future selves can be academically successful will increase students' motivation and prevent students from seeing academic success as "acting white" and seeing academic failures as reflecting their ethnic identity.	In ten workshop sessions, students wrote about how their future selves might be academically successful, completed exercises to make those future selves seem more attainable, and described strategies to achieve these selves. A control group took standard elective classes.	Two years later, students in the treatment group had higher GPAs, fewer absences, fewer nominations for disruptive behavior, fewer depressive symptoms, and were 60% less likely to repeat 8th grade.	.28 grade points

Expectancy-value theory:

Hulleman and Harackewicz (2009)	Middle-income, ethnically diverse 9th grade students.	Making science classes personally relevant will increase interest in science, engagement with the learning process, and improved performance especially among students who do not expect to succeed in science.	Every three or four weeks starting at the beginning of the semester students wrote a brief essay describing how the material studied in their high school science class that week could be applied in their lives. Control students summarized the week's science class topic.	At the end of the semester treated students who expected to perform poorly in science had earned higher science grades; no effects were found among students with high expectations for success in science.	.80 grade points among students with low expectations for success in science

Note. [1] The effects of Good et al.'s (2003) attributional retraining, implicit theories, and combined interventions on girls' math test scores were Cohen's d=1.13, 1.30, and 1.50, respectively. [2] Miyake et al. (2010) reported grades on a 100-point scale, and so these numbers were converted to grade points for inclusion in this table.

Figure 1. Math grades by experimental condition (covariate-adjusted means) in Blackwell, Trzesniewski, and Dweck (2007). Experimental = Incremental theory workshop group; Control = Study skills workshop group. Source: Blackwell, Trzesniewski, and Dweck (2007).
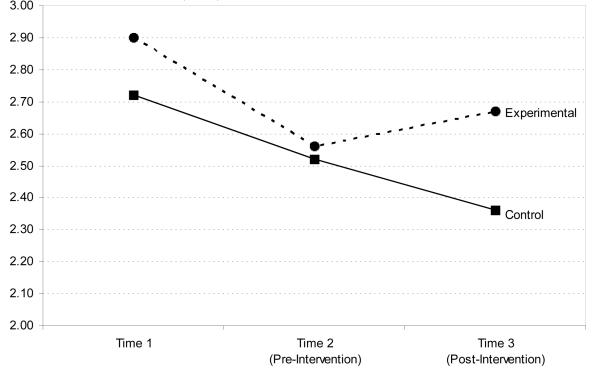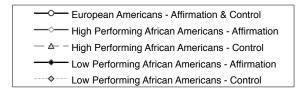
Figure 2. Mean GPA in core courses for each term over 2 years, as a function of student group (African American versus European American), experimental condition, and pre-intervention level of performance of African Americans (an average of the prior year's GPA and pre-intervention seventh-grade performance) in Cohen, Garcia, Purdie-Vaughns, Apfel, and Brzustoski (2009). Data from participants with complete data are presented. African Americans were categorized into low and high performers based on a median split within their racial group, reflecting their relative standing within their group. Because European Americans in the two conditions did not differ significantly, their data were combined. Means adjusted for base-line covariates and students' assigned teacher team. Source: Cohen, Garcia, Purdie-Vaughns, Apfel, and Brzustoski (2009)
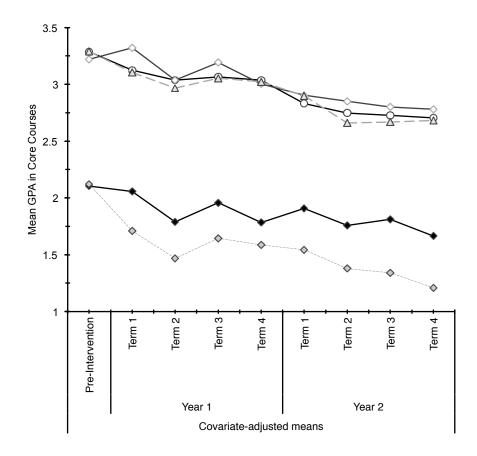
Figure 3. Mean academic performance as a function of semester, student race, and experimental condition in Walton and Cohen (2011). <u>Source</u>: Walton and Cohen (2011).