THE WAYS CHARACTER STRENGTHS SUPPORT K–8 MATHEMATICS AND THE COMMON CORE STATE STANDARDS

Melinda C. Bier
University of Missouri–St. Louis

Stephen A. Sherblom
Lindenwood University

Marvin W. Berkowitz
University of Missouri–St. Louis

Bob Coulter
Missouri Botanical Garden

Character strengths support academic learning and can and should be incorporated into all content areas. This article articulates ways character strengths, including self-efficacy, positive-attitude, perseverance, growth-mindset, intrinsic motivation, intellectual carefulness, and courage specifically support mathematics education (K–8) and can help meet the Common Core Standards. In this article we use Shield's model, which organizes character strengths into 5 categories: performance character, intellectual character, civic character, moral character, and collective character—a form of group character. This article articulates a practical application of character strengths to mathematics education.

There is renewed interest in *character education* as a result of recent research by a diverse group of scholars and scientists demonstrating that our current educational policy paradigm does not address some of the things that matter most to a child's healthy development and future success (Berkowitz & Bier, 2004; Ridley, 2013; Seider, 2012). As Paul Tough explains in his best-selling book *How Children Succeed: Grit, Curiosity, and the Hidden Power of Character* (2012) what matters most is more likely to be our ability to

> nurture the development of a very different set of qualities, a list that includes persistence, self-control, curiosity, conscientiousness, grit, and self-confidence. Economists refer to these qualities as noncognitive skills, psychologists call them personality traits, and the rest of us think of these traits as character. (p. xv)

Whether one uses the term character education, moral education, positive youth development, values education, social and emotional learning, positive psychology, youth empowerment, psychosocial or noncognitive development, when it comes to K–12 programming these once distinct approaches have converged (Battistich, 2007; Berkowitz & Bier, 2004; Character Education Partnership, 2010).

• **Correspondence concerning this article should be addressed to:** Melinda C. Bier bierm@umsl.edu

Journal of Character Education, Volume 12(1), 2016, pp. 35–53 ISSN 1543-1223

Although consensus on terminology has yet to be achieved, many scientists and practitioners agree that this convergence is accurately represented by what we think of as the field of character education. This includes the intentional efforts of schools to promote students' positive development as people—intellectually, socially, emotionally, and ethically (Battistich, 2007). There is strong interest in the practical application of what we know about character strengths to supporting academic achievement. New questions of interest include how our past and current investments in character education can be leveraged for tackling educational transformation, such as the challenge posed by the Common Core Standards. In this article we explore ways that character strengths support mastery in mathematics, as outlined by the Common Core Standards.

COMMON CORE STANDARDS IN MATHEMATICS (CCSS-M): CONCEPTS AND SHIFTS

The Common Core Standards are intended to provide clear learning goals for all K–12 students with each step designed to assist students in the college and career readiness process (National Governors Association, 2010). In terms of mathematic achievement it is important to note that differences exist between U.S. models of instruction and the models used by our international counterparts. After an extensive review of the international education systems that are producing superior achievement in mathematics (Phillips, 2007), designers of the CCSS-M determined that in comparison to these successful systems American education was "a mile wide and only an inch deep." To improve this situation the new CCSS-M development was guided by three design principles—the program was to be: (1) focused on the essentials, (2) coherent in the progression across grade levels, and (3) rigorous in optimally challenging students to achieve mastery of mathematical concepts and skills.

The CCSS-M standards are organized in grade bands of K–5, 6–8, and high school. CCSS-M standards have two strands: (1) the content standards, and (2) the standards for mathematical practice. In this article we focus on CCSS-M—K–5 and 6–8. The mathematics content standards in Grades K–8 have a user-friendly organizational structure. Related content standards are arranged into clusters. Clusters are arranged into larger groups of related standards called domains. Grade level K–5 domains: (1) counting and cardinality; (2) operations and algebraic thinking; (3) number and operations in base 10; (4) numbers and operations of fractions; (5) measurement and data, and (6) geometry. Grade levels 6–8 domains: (1) ratios and relationships (6–7); (2) the number system; (3) expressions and equations; (4) functions (Grade 8); (5) geometry; and (6) statistics and probability.

Standards for Mathematical Practice. As in the past, the new content standards describe what students need to know and be able to do to be considered proficient in math. In particular, we look to the mathematics practice standards that describe what students ought to *be* and *do*. According to the CCSS-M, "Proficient students are experimenters and inventors" they are active problem-solvers who possess the "courage to plunge in and try something," they think strategically and adapt known strategies to new problems. They possess the qualities and habits expert mathematical thinkers seek in apprentices. Individually and with their classmates, they discover ideas and gain insights that spur them to pursue mathematics beyond the classroom walls (National Governors Association, 2010 p. 4).

The inclusion of the CCSS-M practice standards make clear that acquiring content knowledge is necessary but not sufficient for students to achieve mathematical proficiency. Strengths of character are necessary for the effective engagement of the eight practice standards:

1. making sense of problems and fostering perseverance in the problem-solving process,
2. concrete and abstract thinking,
3. constructing viable arguments and critiquing others' reasoning,
4. modeling with mathematics
5. strategic selection of tools,
6. attending to precision,
7. looking for and making use of structure, and
8. looking for and expressing regularity in repeated reasoning.

Successful achievement of these practice standards will require the intentional development of attitudes and behaviors that have historically been called excellences or virtues.

DIMENSIONS OF CHARACTER

Lickona and Davidson (2005) propose one of the most elegant and educationally useful conceptualizations of character as encompassing two broad dimensions—performance character and moral character.

> Performance character consists of qualities such as effort, diligence, perseverance, a strong work ethic, a positive attitude, ingenuity, and the self-discipline needed to realize one's potential for excellence in academics, cocurricular activities, the workplace, or any other area of endeavor. (p. 18)

Moral character "consists of the qualities—such as integrity, justice, caring, and respect—needed for successful interpersonal relationships and ethical behavior" (p.18).

Shields (2011) builds on this in distinguishing 5 conceptual dimensions of character (four dimensions at the individual level and one dimension at the group level) that are particularly relevant to K–12 education—performance character, intellectual character, civic character, moral character, and collective character. *Performance character* describes how people approach tasks: Do they work hard and persevere in their efforts? Are they focused on doing their best and achieving mastery? *Intellectual character* describes ways in which people approach information and ideas: Do they keep an open mind and weigh evidence? Are they willing to reconsider previously held beliefs in light of new information? *Civic character* moves past the individual to describe ways in which people show their commitment to their community: Are they committed to improving the quality of life for themselves and others? Are they seeking to improve the local environment? *Moral character* generally refers to how people interact with each other. Issues of kindness, consideration, and empathy are key here. What does it mean to be a good person, and to see the value in others? *Collective character* refers to the patterns of school life, the procedures and routines that reflect the groups' norms, goals, values, expectations and teaching, learning and leadership style (Shields, 2011). Maintaining an atmosphere of excellence, respect, and trust in the leadership, faculty, parents and students as a whole is vital. Do students and teachers feel safe and happy at school? Does our school inspire adults and children to excel?

It is important to recognize that these dimensions of character are only conceptually distinct—in an actual person they are highly integrated. For example, performance character strengths are reinforced by the activities that develop effective intellectual, civic, and moral character. Likewise, highly developed performance character will contribute to more effective intellectual, civic, and moral character. These dimensions are a convenient way to organize and represent the complex psychological and personality dynamics involved in the development of human character. In the following sections, we review research that demonstrates the value of character focused strategies to mathematics achievement, and frame that research in terms of performance, intellectual, civic, moral, and collective character.

PERFORMANCE CHARACTER AND MATHEMATICS

Performance character describes a set of virtues people use when they approach tasks or goals they want to accomplish. Lickona and Davidson propose that "character isn't just about doing the right thing in an ethical sense" (2005, p. 373) but also about becoming disciplined, doing your best work, and developing your talents. In the case of K–12 students, performance character refers to those aspects of motivation and behavior that are nostalgically referred to as "the other side of the report card"—items such as "comes to class prepared," "pays attention," "uses time wisely," and "participates in class discussions." These classroom behaviors, which may carry over onto the playing field and other dimensions of school life, demonstrate highly valued and mutually reinforcing virtues such as confidence, diligence, and perseverance.

A critical step in learning any subject matter is having a positive attitude and confidence in one's ability to learn new things. Bandura (1993, 1997) demonstrated that confidence in ones' ability to be successful at a given task—what he termed "self-efficacy"—influences how a person thinks and behaves as s/he attempts to accomplish that task. Regardless of what may be objectively true about a student's capabilities, that students' subjective beliefs about her abilities guide the choices s/he will make, the effort s/he will invest, and the persistence s/he will display when encountering obstacles (Walton & Spencer, 2009). A study of math anxiety in college students found that elementary education majors had the highest levels of math anxiety on campus (Hembree, 1990). According to a 2005 poll of 1,000 American adults, twice as many respondents said they hated math as said they hated any other subject (AP-AOL News Poll, 2005).

Combating Math Negativity in Youth. Judy Willis, a neuroscientist turned elementary math teacher, articulates a host of reasons for students' negative attitudes (2010). These include their parents' and significant others' negative attitudes toward math, low expectation of success as a result of previous negative experiences, inadequate skills and preparation for doing math successfully, failure to be engaged in math through their individual learning strengths, and fear of "looking dumb" if they make mistakes. A growing body of research into the psychological and behavioral consequences of math negativity supports Willis's (2010) classroom experience of students who lack self-confidence in math (Good, Aronson, & Inzlicht, 2003; Stephanou, 2012). These negative consequences include high stress, low motivation, feelings of helplessness and hopelessness, decreased class participation, boredom, diminished tolerance for challenge, failure to keep pace with the class, behavior problems, and avoidance of the advanced math classes necessary for subsequent professional success (Stephanou, 2004, 2012; Willis, 2010). Several strands of social learning and expectancy theory research have demonstrated that students tend to actively approach activities when they are confident they can succeed and they tend to avoid activities when they lack confidence of success (Kyriacou & Goulding, 2005).

How do students develop confidence—the psychological construct known as self-efficacy? Researchers have identified three main sources of self-efficacy: (1) past success or failure or "enactive mastery," (2) vicarious experiences or observation of other's seen as similar to oneself, and (3) verbal/social persuasions or messages received from others (Usher & Pajares, 2008). When teachers, parents, and peers are authentically encouraging, self-efficacy for a task increases, as does the effort the student is willing to put forth (DeWitz, Woolsey, & Walsh, 2009). However, when parents, teachers, or peers appear to expect a less than successful outcome, a student's confidence decreases and she becomes less motivated to persevere in the assignment. This further exacerbates the problem in what has been described as a vicious recursive cycle. Teachers can employ strategies that encourage memories of positive school experi-

ences and use those memories to activate students' feelings of competence and motivation.

Teachers can trigger positive memories at the beginning of a new year by prompting students to write about a math activity from a previous year that they really enjoyed. Teachers can use prompts, such as "What was the most exciting thing you learned last year?" or "What was the best math activity you can remember doing from any prior year?" This confidence building activity can be the first assignment of a math journal that students will keep all year (and that can be passed on to the next year's teacher). Another beginning of the year activity to include in a math journal might be a math experience autobiography. Judy Willis (2010) shows interest in her students as individuals by giving them the opportunity to tell what they liked about math and what previous teachers did that they found particularly helpful or unhelpful. Willis provides students with prompts to help focus their answers: What do you like about group work? Describe your best study habits. What do you do when you get "stuck"? How do you memorize material? What did you do differently when you were more successful compared to when you were less successful? What gets in the way of studying? What did past teachers do that helped you learn best? In what ways have you used math outside of school? Do your parents or other close relatives have jobs or hobbies where they use math? Willis uses these accounts to help her choose strategies to use or avoid in differentiating learning activities for individual students.

Developing a student's tendency to persevere in the accomplishment of goals has historically been a targeted outcome of most character education programs and is explicitly included in the first CCSS mathematics practice standard, "Making sense of problems and fostering perseverance in the problem-solving process." Perseverance in academic tasks is defined by Farrington et al. (2012) as a "student's tendency to complete school assignments in a timely and thorough manner, to the best of one's ability, despite distractions, obstacles, or level of challenge" (p. 9) thus encompassing the character strengths of diligence, self-discipline, ability to delay gratification, grit, and tenacity (Duckworth, Quinn, & Tsukayama, 2012). In fact, after an extensive review of the literature, Farrington et al. (2012) developed a logic-model of how what they call noncognitive factors influence academic performance. In their model, academic mindsets lead to academic perseverance, which increases academic behaviors that ultimately result in improved academic performance.

Farrington et al.'s (2012) model reflects the convergence of multiple lines of psychological research. This research includes foundational work in personality, motivation, and social learning theories (Bandura & McClelland, 1977; Dweck, 1986; Dweck & Leggett, 1988; Eccles et al., 1983) that support the notion that students are more likely to persevere through difficult problems and succeed academically if they have a "growth" as opposed to a "fixed" mindset. Students with a fixed mindset believe that ability is a fixed or innate characteristic over which they have little to no control. A growth mindset is developed through individual effort and grows with intentional practice. Having a growth mindset enables students to see that ability is at least partly under their control and a result of their own actions.

A number of relatively small interventions have demonstrated success in ameliorating the causes and consequences of math negativity discussed above. The Charles A. Dana Center has applied this line of theory to middle and high school math classes across the United States producing large effects on educational outcomes, including reducing the percentage of students who repeat algebra from 24% to 9% (Stano, 2012; Yeager & Walton, 2011). Several "gold standard" experimental studies have produced significant gains in middle school math achievement after implementation of activities designed to introduce and reinforce the idea that intelligence is malleable and that, like a muscle, it grows stronger with effort (Blackwell, Trzesniewski, & Dweck,

2007; Good et al., 2003; Mueller & Dweck, 1998).

In accord with the growth mindset model, we need to praise student effort rather than ability. In a series of experimental studies, Mueller and Dweck (1998) gave fifth-grade students a moderately difficult set of logic problems. After completing the problems, one group of the students received praise for their ability ("That's a really high score. You must be very smart at these problems"), a second group of students received praise for their effort ("That's a really high score. You must have worked hard at these problems"), and a third group received praise that was neutral ("That's a really high score"). All students were then given a very difficult set of problems on which they all performed poorly. Finally, students were given another set of moderately difficult problems. On this final set of problems the "neutral praise" students performed at the same level as they had on the first set. The "effort praise" group of students did better than they did originally and asked for more challenging problems in the future. Most notably, the "intelligence praise" students solved 30% fewer problems and asked for easier problems in the future. Just one sentence of praise that reflected the theory that intelligence is fixed undermined students' performance after an experience of failure, while just one sentence of praise that acknowledged the positive effect of effort promoted improved performance after an experience of failure.

Blackwell et al. (2007) conducted a study in which middle school students were randomly assigned to one of two groups. One group included a treatment condition which involved attending an eight-session workshop designed to teach study skills and share the findings of scientific research showing how the brain grows connections and "gets smarter" when a person exerts effort to accomplish challenging tasks. Middle school students assigned to the control group were given an eight-session workshop in which they learned only study skills. Results showed that students who learned what has come to be called the "growth" mindset theory earned better math grades over the course of the year while students in the control group continued on the downward math grade trajectory that typically begins in middle school. Learning about study skills alone was not sufficient to produce better performance in math; students needed the motivation to apply the skills. Other strength promoting interventions based on these theories have generated similar academic gains in diverse populations (Aronson et al., 2002; Good et al., 2003).

Most teachers have, at times, resorted to bribery as a motivational strategy. Students earn candy for correct answers, cartoon shaped erasers on walk-to-school-day, and school store dollars for turning in homework, helping a classmate master a difficult concept, or simply picking up trash on the playground. Extrinsic rewards are pervasive in schools despite several decades worth of research demonstrating that rewards, including praising ability over effort, often reduce rather than increase the desired behavior.

INTELLECTUAL CHARACTER AND LEARNING MATHEMATICS

Usually categorized under performance character, intellectual character has recently gained more of its own identity (Baehr, 2013; Dow, 2013; Ritchhart, 2004; Tishman, Perkins, & Jay, 1995). Intellectual character describes ways in which people approach concepts and information. In the Character Education Partnership's *Eleven Principles of Effective Character Education* Sourcebook (2003), Kathy Beland concludes that,

> Character has not only to do with how people interact with others (i.e., whether they treat others with fairness, respect, honesty, and kindness) but also how people interact with thoughts and ideas (i.e., whether they are curious about things, open to considering other viewpoints, and committed to pursuing truth and understanding). (p. 18)

One of the most widely cited intellectual virtue frameworks is *Habits of Mind Across the Curriculum: Practical and Creative Strategies for Teachers* (Costa & Kallick, 2009). *Habits of Mind* describes the process of cultivating a disposition toward behaving intelligently when confronted with problems for which an answer is not immediately available. The focus is on meeting challenges that require strategic reasoning, insightfulness, perseverance, creativity, precision and craftsmanship. In his book *Intellectual Character: What It Is, Why It Matters and How to Get It* (2004), educational researcher Ron Ritchhart reports on an in-depth study of exemplary teachers and concludes that, "a person of strong intellectual character is curious, open-minded, reflective, strategic, skeptical, and truth-seeking." Jason Baehr, author of *Inquiring Minds: On Intellectual Virtues and Virtue Epistemology* (2012) and founder of a new charter school dedicated to the development of intellectual virtues, defines intellectual virtues as the personal qualities or character traits of a good thinker, learner, or inquirer. Baehr (2013) further identifies a selection of intellectual virtues—curiosity, autonomy, attentiveness, carefulness, thoroughness in learning, humility, open-mindedness, courage, and perseverance—which he endeavors to develop in his undergraduate students.

The development of intellectual carefulness is targeted throughout CCSS-M, both implicitly and explicitly. For instance, intellectual carefulness involves paying close attention to details, accuracy, and associations in both the acquisition and presentation of information. It promotes the deep foundational knowledge needed to persevere successfully in solving increasingly difficult and abstract problems. Mathematically proficient students continually ask themselves "Does this make sense?" Being careful in K–8 mathematics can include showing the details of the procedural steps one takes to solve a problem and checking one's work using alternative methods. When a student has thoroughly and carefully engaged in intellectual inquiry she gains the confidence to thoughtfully consider and meaningfully respond to challenges and critiques (Dow, 2013).

Closely related to carefulness, *precision*, one of the 16 habits of mind (Costa & Kallick, 2009) appears explicitly in the description of Math Practice Standard 6: "Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning" (National Governors Association, 2010). This language-rich standard gives early elementary teachers the opportunity to build on the strengths of the more verbally and/or artistically inclined student. For example, in *Math Literacy and the Common Core* (2012), author Steven James describes a third-grade activity that engages students in an interactive process of creating and acting out skits or plays that help students become fluent and precise in their use of math vocabulary. For example, students play the roles of math characters such as Equation, Equal, Variable, Plus, Minus and the numbers 1 through 10. The play begins with Equation acting like a braggart and bully. He proclaims to the audience that he is the most important character in the math kingdom and details all the functions and characteristics that make him the most 'special' of characters. Equation concludes that nothing in the kingdom can happen without him. The other math characters roll their eyes and introduce themselves and their definitions. They happily work together, rearranging themselves into a variety of math problems and explaining their functions to the audience. In the end Equation comes to see how integrated the characters are and how each one helps him accomplish his goals. Equation is properly humbled and promises not to make such hasty and self-centered claims in the future. With this type of creative math activity teachers can engage students in fun, relatively errorless math as well as in discussions related to conflict management and antibullying strategies. The play can be performed for parents and peers allowing the whole school community to experience the fun of math.

Courage has been defined as the ability to do what needs to be done despite fear. The preamble to the mathematical practice standards states "Proficient students are experimenters and inventors," they are active problem-solvers that possess the "courage to plunge in and try something," (National Governors Association, 2010). "Courage in today's classrooms involves making a commitment to excellence in the face of uncertainty, adversity or the absence of support" (Taulbert, 1997, p. 95). Many students are fearful of speaking out in class, especially if they are unsure of a solution strategy or if their ideas are contrary to those of their peers. If we aim to promote intellectual courage in all our students then teachers must become adept at establishing and maintaining safe and supportive classroom environments, that is, environments in which students have many opportunities to actively grapple with difficult or new problems and feel free to make mistakes. Class norms and routines can be designed to promote a sense of trust, confidence, and psychological safety that allow students to take risks, admit errors, ask for help, and struggle along the way to higher levels of learning (Delpit, 2012).

CIVIC CHARACTER AND TEACHING MATH

The United States is said to be the first nation founded on the shared commitment of all citizens to the protection of equal rights. Although we have often fallen short of its most lofty ideals, our American *democracy* is said to be characterized by "government by the people," "social equality," and "majority rule" (American Heritage Dictionary, 2017). John Dewey asserted that, "Democracy is a mode of associated living, or conjoint communicated experiences" under which citizen participation is premised on informed opinions, self-reflective practice, open-mindedness, and a toleration of diversity (Dewey, 1916, p. 93). Civic character involves how one participates in the national democracy as well as in one's local community. American civic character includes commitment to the common good and understanding and respecting *due process*. Having good character does not simply mean being competent as an individual. Good character also includes being committed to making positive contributions to one's community, and to participating in a democratic way of life based upon justice, equality, and respect for all people (Battistich, 2007). How do children develop democratic values & skills? Children develop the knowledge, skills, values, and habits necessary for active and effective participation as citizens in a democratic society through direct experience as members of a participatory school/classroom community (Battistich, 2007; Dewey, 1900, 1916).

One of the most successful Child Development Project strategies—class meetings—has been widely adopted and adapted. As conceived by William Glasser in *Schools Without Failure* (1969), class meetings enhance students' sense of belonging and responsibility to the classroom by providing opportunities for all students to express their opinion and contribute to class decisions (Developmental Studies Center, 1996). Amy Dousis and Margret Wilson in *Doing Math in Morning Meeting* (2010) offer several examples of morning meeting activities that engage students in errorless confidence-building math while practicing democratic decision-making and cooperative learning skills. In the following example of a morning meeting math activity, a first grade class engages in the process of fairly choosing a single field trip destination from the four or five available choices. First the teacher and students gather in a circle to discuss the field trip options and the decision-making process. Then the teacher makes a large grid on the board and labels the field trip choices at the bottom of the grid columns. Then each student puts a check mark in a cell on the grid (creating a neatly spaced stack – one on top of the other) in the column representing his or her field trip choice. Students add up the checks in each column and note that the check marks in the grid create a

bar chart. Students can discuss the democratic principle of "majority rule" and whether they could think of a better process for choosing a field trip destination. Using this method to make class decisions gives each student voice and fosters students' sense of belonging (Bier & Berkowitz, 2005). Additionally, teachers can extend or vary the activity and get kids moving around the classroom by having students form a human bar chart in which they line up in columns that represent their choices.

MORAL CHARACTER AND MATH TEACHING MOTIVATION

Proponents of character education, in truth most educators, would agree with David T. Hansen that a central aim of education must be the cultivation of moral persons "with a humane, reflective, and responsible approach toward other people and the shared features of public life" (p. vii). Recent research into how individuals develop as moral agents is producing a growing body of empirical evidence suggesting that the concept of *moral character*, a core sense of oneself as a moral person, is critical to moral agency (Althof & Berkowitz, 2006; Bergman, 2004; Blasi, 2004; Higgins-D'Alessandro & Power, 2005; Sherblom, 2012). Moral character involves knowing, caring about, and doing the right thing in an ethical sense. Shields (2011) describes moral character as "a disposition to seek goodness," to act in ways that are kind, helpful and true with regard to the needs and interests of other people.

Aspects of individual character, including moral character, are often discussed in terms of specific virtues, as we do above. Another conceptualization is offered by Dewey (Fesmire, 2003), in his framing of moral values as part of a pragmatic social intelligence. A person faced with moral choices needs the situational awareness to understand the relevant issues and make a choice that is appropriate for the time and place. A different set of circumstances may call for a different response. While it may seem odd to consider the moral dimensions of mathematics education, we believe it might just hold the key to sparking a new enthusiasm for math in both teachers and students, especially those most at risk of negative math outcomes.

Evidence has begun to mount demonstrating that character strength building considerations, those aimed at developing the positive beliefs, attitudes and dispositions of students, can produce lasting improvement in students' academic achievement, ability to manage conflicts, health and overall life outcomes (Battistich, 2007; Bier et al., 2011; Proctor, Powell, & Mcmillen, 2013). In contrast to remedial approaches aimed at fixing what is wrong with students, a character building approach applies learning theory and the associated teaching strategies from a perspective of helping students attain their academic potential and become confident learners by focusing on the sources of support and strength in their lives (Bier, Zwarun, & Warren, 2011; Caprara, Barbaranell, Pastorelli, Bandura, & Zimbardo, 2000). In the following paragraphs we discuss a sampling of theories, empirical studies, and classroom applications that have produced positive results in mathematical performance.

When asked about what influences students' achievement principals, parents, and students all emphasized the teacher-student relationship (Hattie, 2008). The perception of the importance of these relationships is borne out by a large body of research. Cornelius-White (2007) conducted a meta-analysis for which he identified 119 studies that took place in 2,439 schools, involved 355,325 students and 14,851 teachers, and measured 1,450 effects of positive teacher-student relationships. Cornelius-White's analysis found that teachers' positive relationships with students had a large effect on student achievement with outcomes being highest in critical/creative thinking, and math (Cornelius-White, 2007). Cornelius-White cautions that students who dislike school and do not wish to attend feel that way primarily because they dislike the teacher. He concludes that improving teacher-student relationships

requires that teachers be able to empathize with students—"see their perspective, communicate it back to them so that they have valuable feedback to self-assess, feel safe, and learn to understand others and the content with the same interest and concern" (p. 23).

Those who teach in high poverty schools, where students may see little relevance to pursuing education and are mistrustful of teachers, may need to be especially intentional and conscientious about establishing caring and academically demanding teacher-student relationships. In a study of students attending an academically elite magnet school, Noguera (2009) found that a barely believable 80% of the Black male students did not feel that their teachers supported or cared about their success in their class, a feeling shared by significantly fewer but a still shockingly high, 46% of White male students. When children believe their teachers don't believe they will succeed or are not interested in teaching them they may "dis-identify" with the academic domain (i.e., a psychological coping strategy that allows an individual to maintain self-esteem in the face of failure). For example, a student for whom it does not come easily may stop seeing herself as a "math person," and a student who is not doing well in math may dispense with his goal of being an engineer, thereby relieving the stress he is experiencing. Strategies that ameliorate these negative student perceptions center around promoting a sense of belonging in students—a sense that they belong in the school community and "club" of scholars (Delpit, 2012). In this article we use the term *school belonging* as a multidimensional construct that includes the notion that one feels comfortable, attached to, and part of school, as well as feeling that the activities that take place there are appropriate and of value to the student.

Motivation research provides convincing evidence that students pay closer attention and invest more effort when learning activities are personally meaningful and/or related to their lives outside the classroom (Krapp, 2002; Schiefele, Krapp, & Winteler, 1992; Stipek, 2004). Hulleman and Harackiewicz (2009) conducted an experimental study based on the expectancy-value model of motivation in which ninth-grade students wrote between one and eight essays over the course of a semester. Students in the control group wrote essays summarizing their coursework while the intervention students generated and wrote about reasons why their coursework was relevant to their lives. There was 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 who received the intervention. Reflection on the personal relevance of coursework can be integrated into student math journals.

Another way teachers can get students' attention and ensure that students feel personally *known* is by incorporating students' individual interests or personal information into math problems. Asking a math question that uses the name of a student's pet, siblings, street or hobby creates connections between students' interests and classroom activities and demonstrates that teachers are interested in students as individuals. In his book, *Lessons from the Classroom* (2003), Hal Urban describes how he developed the technique of greeting each student at the classroom door every day. Urban wanted to make education more personal without taking time away from academics. His belief was that reaching out with a personal greeting every day was a way to convey a sense of belonging and acceptance to each student. This may be especially important where academic identities are fragile. Distinguished author and educator, Lisa Delpit, in her latest book, *Multiplication Is for White People: Raising Expectations for Other People's Children* (2012), warns that "when teachers stumble over the unique names common to a place, then there is a deep disconnect. As one New Orleans child summed this up, "I don't like it when they don't say my name right." Teachers can and should use stealth in gathering personal and background information about students. Teachers can practice the correct pronunciation of student names by having students introduce themselves before taking

roll on the first day of class, and then playing name games in which students interview each other and then introduce their partners and something they learned in the interview. Teachers can pick up additional "connecting" information in class meetings, math journals, parent conferences and by simply observing and listening to kids as they go about their day—*kidwatching* (Willis, 2010).

Homeside Activities (Developmental Studies Center, 1996) are short activities that the teacher periodically assigns for students to do at home with the family. Homeside activities can involve students in discussions with family members about diverse topics such as family history, values, and school experiences including nonthreatening math activities. This element of the elementary CDP project was designed to help family members connect with their child's education (Battistich, 2007). The goal of this component is to help families experience school as a welcoming, supportive place and to strengthen families' support for students' social, ethical, and intellectual development. Intentionally including activities that introduce CCSS-M learning activities will help parents experience math as fun and potentially reduce their own math negativity.

The pipeline toward careers in science, technology, engineering, and mathematics (STEM) begins leaking in late elementary school when students start choosing NOT to participate in science fairs and math enrichment activities. Student disenchantment with more challenging math and science continues in middle school on to high school as students choose to take the minimum allowable math and science courses. Harackiewicz, Rozek, Hulleman, and Hyde (2012) conducted an experimental study that targeted parents with a relatively inexpensive intervention that consisted of mailing two brochures and reference to a website that highlights the usefulness of STEM courses. This relatively simple intervention led students whose parents were in the experimental group to take, on average, nearly one semester more of science and mathematics in the last 2 years of high school, compared with the control group. Harackiewicz et al. (2012, p. 899) concluded "Parents are an untapped resource for increasing STEM motivation in adolescents." This study has implications for reducing the math negativity that often surrounds students and saps their confidence and motivation. The design of Harackiewicz et al.'s (2012) intervention is practical and consistent with the conclusions of a substantial body of research evidence. Hattie (2008) analyzed the results of 11 separate meta-analyses of parental involvement and found, likewise, that across all measured variables parental aspirations and expectations had the strongest relationship with student achievement, parental communication about school learning and progress had a moderate size effect, and parental supervision at home was weakest. Hattie concludes that schools need to work with parents to make their expectations appropriately high and challenging, and then work in partnership with children and the home to realize, and even surpass, these expectations. Too often, the alienation of the home from school reduces the initial expectations. One study found that when their children started school 98% of the parents considered education to be very important to their children's future and two thirds of these parents expected their children to attain diplomas and degrees. By the time they left elementary school, these ambitions had been doused and the parents mainly wanted their children to "get a job" (Clinton, Hattie, & Dixon, 2007).

It is important to recognize that as children progress to higher level math, parents may lack the confidence and background knowledge to help their children with math assignments. Schools may want to consider what they can do to provide parents the support they need to help their student succeed in their math studies outside the classroom. Some schools initiate programs such as Parent U which aim to teach or refresh parents' knowledge of basic math skills and allow parents to learn and practice communication strategies they can use to support their children's learning at home. Many schools have periodic Family Math Nights

during which games and group activities are undertaken to help parents and children experience math as fun and engaging. All schools can provide parents with information and reminders that parents positively influence children's math achievement simply by communicating the relevance and importance of math and that math success is achievable through strategic student effort.

As articulated by Claude Steele, the theory of self-affirmation posits another psychological concept premised on the notion that people are motivated to protect their view of themselves as good, moral, and efficacious (Sherman & Cohen, 2006; Steele, 1988). Students will experience levels of stress that inhibit learning when their sense of self-worth and integrity are threatened. Self-affirmation theory proposes that reminding students of diverse, positive aspects of themselves, especially those that are unrelated to the perceived threat, can significantly reduce feelings of threat and enable students to stay motivated and function more effectively (Sherman & Hartson, 2011; Wentzel, 2001). Randomized control trials of self-affirmation interventions in which students were asked to write about personally meaningful values have produced improvements in math performance (Yeager & Walton, 2011). In the following paragraphs we describe several studies that utilized and/or promoted aspects of individual character in the service of improving attitudes and math performance in students most likely to experience the negative consequences of math negativity.

Cohen, Garcia, Apfel, and Master (2006) found that a short 15- to 20-minute writing assignment in which suburban seventh graders were asked to reflect upon and write about things that were most important to them—their personal interests and relationships with friends or family—increased the achievement of Black students and reduced the gap in grades between Black and White students by nearly 40% by the end of the semester. With only a few additional writing exercises at critical times (the beginning of the school year, prior to standardized tests, and near the holiday season) the effects persisted over the next 2 years (Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009). The lowest performing students benefitted most, with their rate of remediation or grade repetition dropping from 18% to 5% (Cohen et al., 2009). This type of intervention and the positive results have been replicated with fifth graders and college students (Yeager & Walton, 2011). Professional development for teachers to incorporate writing interventions that invoke student strengths seems extremely practical and supports the literacy curriculum as well as math achievement.

Shnabel, Purdie-Vaughns, Cook, Garcia, and Cohen (2013) analyzed student values-affirmation essays and found that those who wrote about social belonging (activities that made them feel more socially connected to others, such as family events or playing soccer with friends) had the largest gains in academic performance. Black seventh graders and college-aged women who wrote about social belonging showed significant academic improvement, suggesting that this type of intervention may help explain the gross underrepresentation of negatively stereotyped minority and female students in STEM fields (Shnabel et al., 2013).

Interventions like these help students form positive math identities and take full advantage of supportive learning environments—environments in which opportunities for student growth, committed teachers, and a solid curriculum already exist. The authors stress that it is important to note that students were not aware that they were the target of the intervention, rather they believed they were helping future students, not being helped themselves.

Social justice topics as well are often intrinsically motivating to students. Engaging students in project-based mathematics within a social justice context motivates students to think critically and apply math skills to real world problems. Students can explore the concentration of liquor stores or fast food restaurants in their neighborhood and compare that to concentrations in different communities, for a local connection. Similarly, a global project

may involve comparing the industrial waste produced by various countries, which students can map using Google Earth, producing striking visuals for public display. In this type of activity students deeply engage with the concepts of area, density, and ratio. In *Rethinking Mathematics: Teaching Social Justice by the Numbers*, Eric Gutstein and Bob Peterson (2005) tell us that teachers can make mathematics more lively, accessible, and personally meaningful for students, who will, in turn, learn in more depth.

COLLECTIVE CHARACTER AND MATHEMATICS ACHIEVEMENT

Traditional character education is sometimes characterized as a transparent attempt to habituate students to the behavior required by the dominant culture or as nothing more than a superficial approach to moral education. While this may be true of some character education efforts, most of today's experts agree that the best approach to character education is a fully integrated whole school initiative that involves the collective commitment of all stakeholders (Bier & Berkowitz, 2005; Character Education Partnership, 2010; Vincent & Grove, 2013). Students learn to identify and process social conventions within the core values of the school community and have opportunities to learn practical reasoning skills in supportive learning communities where the moral mission of schools is integrated into all aspects of the educational process and defines the collective character of the school. Thus, Shield's conceptualization of character as including both an individual developmental aspect and a group or collective aspect is particularly appropriate, especially in light of recent research establishing the strong relationship between a school's collective character and student success (Bryk & Schneider, 2002; Hattie, 2008; Hoy, Sweetland, & Smith, 2002; Goddard, 2001; Goddard, Hoy, & Hoy, 2004; Thapa, Cohen, Higgins-D'Alessandro & Guffey, 2012).

Unfortunately, the growing body of evidence supporting the critical nature of the collective character of schools is another area in which the terminology, definitions and distinctions, remain ill-defined. School climate, school culture, school context, school atmosphere, school ambiance, and school health are constructs found in the research literature with a great deal of conceptual overlap but little definitional consensus. Far from distinct, these constructs and related literatures all highlight the importance of a socially and academically positive and supportive school character that underlies student growth and maturation across all domains (Lovat, Clement, & Toomey, 2010). In this article we use school character as an encompassing term including the central principle that positive collective character gives psychological, social, and academic support fundamental to student development and academic achievement. In the following paragraphs we highlight aspects of what research has shown to predict or influence mathematics achievement including teacher collaboration, collective efficacy, student peer influences, and social networks (Hattie, 2008).

Distinguished researcher Asa Hilliard reports that many people and policymakers believe that teachers should collaborate to find the magic bullet of effective teaching—while he believes the data show that teacher collaboration **is** the magic bullet (Delpit, 2012). This conclusion is supported by Leana's (2011) large-scale study of the relationship between students' progress in mathematics and the quality of their particular teacher. The study assessed the education, experience, and mathematics teaching ability of more than 1,000 fourth- and fifth-grade teachers in 130 New York City elementary schools and the mathematics progress of their students over the course of 1 year. Teachers that scored highest on education, experience, and teaching ability were also those with the strongest faculty relationships and opportunities to collaborate. As expected, students of high-ability teachers outperformed those of average and low-ability

teachers. Students of low ability teachers performed worst with one surprising exception—students of low-ability teachers in highly supportive and collaborative faculty settings performed just as well as students with average ability teachers. That said, these findings also suggest that schools that promote and maintain authentically collaborative organizational character may be able to deflect some of the negative consequences students face from having low ability teachers (Leana, 2011). As author Carrie Leana concluded:

> In trying to improve American public schools, educators, policymakers, and philanthropists are overselling the role of the highly skilled individual teacher and undervaluing the benefits that come from teacher collaborations that strengthen skills, competence, and a school's overall social capital. (Leana, 2011, p. 1)

Collective teacher efficacy reflects the shared beliefs of teachers and administrators that the efforts of the faculty as a whole will succeed in promoting student learning (Hoy & Miskel, 2005). Collective teacher efficacy creates a work environment that builds teacher commitment to the school and improves student performance. The most promising implication of this line of research, suggests Jerald (2007), is that self and collective efficacy perceptions are not fixed in stone. Bandura (1993) reported that the positive effects of collective teacher efficacy on student academic performance outweighed the negative effects of low socioeconomic status. Goddard et al. (2004) studied 452 urban elementary teachers in 47 schools and reported that between-school differences in collective efficacy had a stronger positive relationship with mathematics and reading achievement than low socioeconomic status had a negative relationship. This suggests that in schools with otherwise similar demographics, Principals who work to build collective teacher efficacy will make greater strides toward closing the achievement gap in their schools (Brinson & Steiner, 2007). After accounting for other demographic factors such as race, socioeconomic status, and gender, a school's collective teacher efficacy remained a strong predictor of academic performance, explaining 53% of the difference in mathematics achievement between schools.

Curt M. Adams (2013) investigated the effect of collective student trust on school identification, self-regulated learning, and math and reading achievement in 1,646 students nested in 56 urban elementary schools. Adams found that student trust in their school positively contributed to their identification with school, internal control over learning tasks, and math and reading achievement. Adams' research extends a body of research that shows higher levels of school connectedness are associated with higher grade point averages; and a positive sense of school community is associated with positive academic attitudes and motives among students (Anderman, 2002; Maddox & Prinz, 2003; Marchant, Paulson, Rothlisberg, 2001; Osterman, 2000). Additional support and a more nuanced understanding of the power of social connections and peer influences is being explored through social network analysis. In a pioneering study of peer group influence Maroulis and Gomez (2008) investigated the relationship between the degree of student connectedness to peers and their academic achievement. Student membership in a network of high performing peers had a positive impact on grades, whereas membership in a network of lower performing peers was negative.

CONCLUSION

Earlier in the article we mentioned journalist Paul Tough's inquiry into *How Children Succeed: Grit, Curiosity, and the Hidden Power of Character,* the best selling book that resulted from his extensive investigative discussions with administrators, teachers, scientists, students and educational innovators in schools (good and bad) and research labs across the United States. Tough came to the conclusion that what matters most to the future success of American children is not how much knowl-

edge we can help them acquire but is instead that quality that most of us call "character." Nearly the same conclusion is reached by Amanda Ridley, another investigative journalist and author of *The Smartest Kids in the World and How They Got that Way* (2013). In her extensive inquiry into the world's highest achieving school systems for math and science—Finland, Korea, and Poland—Ridley writes:

> Over the next 3 decades, more and more studies showed that when it came to predicting which kids grew up to be thriving adults—who succeeded in life and in their jobs—cognitive abilities only went so far. Something else mattered just as much, and sometimes more, to kids' life chances. This other dark matter had more to do with attitude than the ability to solve a calculus problem. In one study of U.S. eighth graders, for example, the best predictor of academic performance was not the children's IQ scores—but their self-discipline. Successful skill sets had more to do with motivation, empathy, self-control, and persistence. These were core habits, workhorse traits sometimes summed up by the old-fashioned word character. (p. 120)

This article is a first attempt to examine the ways in which character education and the K–8 CCSS-M intersect to increase mathematics achievement—primarily in Grades K–8. While we found sufficient research to demonstrate the value of character strengths in the achievement of mathematically proficient students we found few of the specifically aligned curriculum materials and professional development resources that will be necessary if schools are going to benefit from the synergy of character education supported CCSS-M implementation. It is our belief that comprehensive character education supports the achievement of CCSS-M and applied together they will help us achieve our highest educational goal—to provide teachers and children with the tools they need to create their very best selves.

Acknowledgments: This paper is one of a series of papers and we thank the following colleagues for their reviews and contributions; Marcia Argyris, Michael Hylen, Mary Anne Hoppe, Jan Keenoy, Diane Stirling, Emilie Johnson, Billy D. Rucker, Jr., John Travis Schmidt, and Alena Tunprasert-Ahrens. The research underlying this publication was made possible through the support of the S.D. Bechtel Jr. Foundation, John Templeton Foundation and the Harry S. Singer Foundation. The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the sponsors.

REFERENCES

Adams, C. M. (2013). Collective student trust: A social resource for urban elementary students. *Educational Administration Quarterly*. doi:10.1177/0013161X13488596

Althof, W., & Berkowitz, M. W. (2006). Moral education and character education: Their relationship and their roles in citizenship education. *Journal of Moral Education, 35*, 495–518.

American Heritage Dictionary. (2017). Retrieved from https://ahdictionary.com/

Anderman, E. M. (2002). School effects on psychological outcomes during adolescence. *Journal of Educational Psychology, 94*(4), 795.

AP-AOL News Poll. (2005, August 17). *The most unpopular school subject.* Retrieved from http://diamondskyinc.com/research.asp?sid=3&cid=102&aid=73

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology*, *38*(2), 113–125.

Baehr, J. (2012). *The inquiring mind: on intellectual virtues and virtue epistemology*. New York, NY: Oxford University Press.

Baehr, J. (2013). Educating for intellectual virtues: From theory to practice. *Journal of Philosophy of Education, 47*(2), 248–262.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, *28*(2), 117–148.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Worth.

Bandura, A., & McClelland, D. C. (1977). *Social learning theory*. Retrieved from http://www

.jku.at/org/content/e54521/e54528/e54529/e178059/Bandura_SocialLearningTheory_ger.pdf

Battistich, V. A. (2007). The child development project: Creating caring school communities. In L. Nucci & D Navaerz (Eds.) *Handbook of moral and character education* (pp. 328–351). New York, NY: Routledge-Falmer.

Beland, K. (2003). *Eleven principles for character education sourcebook: How to achieve quality character education in k–12 schools*. Washington, DC: Character Education Partnership.

Bergman, R. (2004). Identity as motivation: Toward a theory of the moral self. In D. Lapsley & D. Navaerz (Eds.) *Moral development, self, and identity* (pp. 21–46). Mahwah, NJ: Erlbaum.

Berkowitz, M. W., & Bier, M. C. (2004). Research-based character education. *The Annals of the American Academy of Political and Social Science*, *591*(1), 72. Retrieved from http://ann.sagepub.com/content/591/1/72.short

Bier, M. C., & Berkowitz, M. W. (2005). What works in character education: A review of the research. *Leadership for Student Activities, 34*(2).

Bier, M., Schmidt, S., Shields, D., Zwarun, L., Sherblom, S., Primack, B., & Rucker, B. (2011). School-based smoking prevention with media literacy: A pilot study. *Journal of Media Literacy Education*, *2*(3), 185–198. Retrieved from http://jmle.org/index.php/JMLE/article/view/38

Bier, M. C., Zwarun, L., & Warren, V. (2011). Getting universal primary tobacco use prevention into priority area schools in an era of high stakes academic accountability: A media literacy approach. *Health Promotion Practice, 12*(S2) 152–158.

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, *78*(1), 246–263.

Blasi, A. (2004). Moral functioning: moral understanding and personality. In D. Lapsley & D. Navaerz (Eds.), *Moral development, self, and identity* (pp. 335–348). Mahwah, NJ: Erlbaum.

Brinson, B. D., & Steiner, L. (2007, October). *Building collective efficacy: how leaders inspire teachers to achieve* (Issue Brief). Washington, DC: Center for Comprehensive School Reform and Improvement.

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

Caprara, G. V., Barbaranelli, C., Pastorelli, C., Bandura, A., & Zimbardo, P. G. (2000). Prosocial foundations of children's academic achievement. *Psychological Science*, *11*(4), 302–306.

Character Education Partnership. (2010). *11 principles of effective character education: A framework for school success*. Retrieved from www.character.org

Clinton, J., Hattie, J. A. C., & Dixon, R. (2007). Evaluation of the Flaxmere Project: When families learn the language of school. Retrieved from http://www.educationcounts.govt.nz/__data/assets/pdf_file/0008/10007/Evaluation_Flaxmere.pdf

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-Vaughns, V., Apfel, N., & Brzustoski, P. (2009, April). Recursive processes in self-affirmation: intervening to close the minority achievement gap. *Science*, *324*, 400–403.

Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research*, *77*(1), 113–143.

Costa, A., & Kallick, B. (2009). *Habits of mind across the curriculum: Practical and creative strategies for teachers.* Alexandria, VA: Association for Supervision and Curriculum Development.

Coulter, B., & Bier, M. (in press). Building a school climate that fosters mathematical brilliance: Bringing character to the Common Core State Standards. In K. Fink, J. Cohen, & S. Slade (Eds.), *Integrating prosocial learning with education standards*. New York, NY: Routledge.

Delpit, L. (2012). *Multiplication is for White people: Raising expectations for other people's children*. New York, NY: The New Press.

Developmental Studies Center. (1996). *Ways we want our class to be: Class meetings that build commitment to kindness and learning*. Oakland, CA: Author.

Dewey, J. (1900). *The school and society*. New York, NY: Cosimo Classics.

Dewey, J. (1916). *Democracy and education*. New York, NY: Macmillan Press.

DeWitz, S. J., Woolsey, M. L., & Walsh, W. B. (2009). College student retention: An exploration of the relationship between self-efficacy beliefs and purpose in life among college students. *Journal of College Student Development*, *50*(1), 19–34.

Dousis, A., & Wilson, M. B. (2010). *Doing math in morning meeting: 150 quick activities that connect to your curriculum*. Turners Falls, MA: Northeast Foundation for Children.

Dow, P. E. (2013). *Virtuous minds: Intellectual character development*. Downers Grove, IL: InterVarsity Press.

Duckworth, A. L., Quinn, P. D., & Tsukayama, E. (2012). What no child left behind leaves behind: The roles of IQ and self-control in predicting standardized achievement test scores and report card grades. *Journal of Educational Psychology*, *104*(2), 439–451.

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist*, *41*(10), 1040–1048. Retrieved from http://psycnet.apa.org/psycinfo/1987-08696-001

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

Farrington, C. A., Roderick, M., Allensworth, E., Nagaoka, J., Keyes, T. S., Johnson, D. W., & Beechum, N. O. (2012). Teaching adolescents to become learners: The role of noncognitive factors in shaping school performance: A critical literature review. Chicago, IL: University of Chicago Consortium on Chicago School Research.

Fesmire, S. (2003). *John Dewey and moral imagination*. Bloomington, IN: Indiana University Press.

Glasser, W. (1969). *Schools without failure*. New York, NY: Harper & Row.

Goddard, R. D. (2001). Collective efficacy: A neglected construct in the study of schools and student achievement. *Journal of Educational Psychology*, *93*(3), 467–476. http://doi.org/10.1037//0022-0663.93.3.467

Goddard, R. D., Hoy, W. K., & Hoy, A. W. (2004). Collective efficacy beliefs: Theoretical developments, empirical evidence, and future directions. *Educational Researcher*, *33*(3), 3–13.

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*(6), 645–662.

Gutstein, E., & Peterson, B. (2005). *Rethinking mathematics: Teaching social justice by the numbers.* Milwaukee, WI: Rethinking Schools.

Hansen, D. T. (2013). Forward. In M. N. Singer & R. D. Osguthorpe (Eds.), *The moral work of teaching and teacher education: Preparing and supporting practitioners* (pp. vii–ix). New York, NY: Teacher's College Press.

Harackiewicz, J. M., Rozek, C. S., Hulleman, C. S., & Hyde, J. S. (2012). Helping parents to motivate adolescents in mathematics and science: An experimental test of a utility-value intervention. *Psychological Science*, *23*(8), 899–906. Retrieved from http://doi.org/10.1177/0956797611435530

Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge Falmer.

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education, 21*, 33–46.

Higgins-D'Alessandro, A., & Power, F. C. (2005). Character, responsibility, and the moral self. In D. Lapsley & F. Clark Power (Eds.), *Character psychology and character education* (pp. 101–120). South Bend, IN: University of Notre Dame Press.

Hoy, W., & Miskel, C. G. (2005). *Educational administration: Theory, research, and practice* (7th ed.). New York, NY: McGraw-Hill.

Hoy, W. K., Sweetland, S. R., & Smith, P. A. (2002). Toward an organizational model of achievement in high schools: The significance of collective efficacy. *Educational Administration Quarterly, 38*(1), 77–93.

Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. *Science*, *326*(5958), 1410–1412.

James, S. (2012). *Math literacy and the common core: 3rd and 4th grade common core edition.* Charleston, SC: CreateSpace Independent Publishing Platform.

Jerald, C. D. (2007). *Believing and achieving.* Washington, DC: Center Comprehensive School Reform Improvement.

Krapp, A. (2002). An educational-psychological theory of interest and its relation to SDT. In E. Deci & R. Ryan (Eds.), *The handbook of self-determination research* (pp. 405-427). Rochester, NY: University of Rochester Press.

Kyriacou, C., & Goulding, M. (2005). A systematic review of raising pupil motivation in KS4 mathematics. Retrieved from http://www.bsrlm.org.uk/IPs/ip25-3/BSRLM-IP-25-3-Full.pdf#page=85

Leana, C. R. (2011). The missing link in school reform. *Stanford Social Innovation Review.* Retrieved from http://www.ssireview.org/articles/entry/the_missing_link_in_school_reform/

Lickona, T., & Davidson, M. (2005). *Smart & good high schools: Integrating excellence and ethics for success in school, work, and beyond*. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Smart+&+Good+High+Schools#3

Lovat, T. J., Clement, N., & Toomey, R. (2010). *International research handbook on values education and student wellbeing.* London, England: Springer.

Maddox, S. J., & Prinz, R. J. (2003). School bonding in children and adolescents: Conceptualization, assessment, and associated variables. *Clinical Child and Family Psychology Review, 6*(1), 31–49.

Marchant, G. J., Paulson, S. E., & Rothlisberg, B. A. (2001). Relations of middle school students' perceptions of family and school contexts with academic achievement. *Psychology in the Schools*, *38*(6), 505–519.

Maroulis, S., & Gomez, L. M. (2008). Does "connectedness" matter? Evidence from a social network analysis within a small-school reform. *The Teachers College Record*, *110*(9), 1901–1929.

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology*, *75*(1), 33–52.

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). Common core state standards (mathematics). Washington, DC: Author.

Noguera, P. A. (2009). The trouble with Black boys: The role and influence of environmental and cultural factors on the academic performance of African American males. *Urban Education*, *38*(4), 431–459.

Osterman, K. F. (2000). Students' need for belonging in the school community. *Review of Educational Research*, *70*(3), 323–367.

Phillips, G. W. (2007, November). *Chance favors the prepared mind: Mathematics and science indicators for comparing states and nations*. Washington, DC: American Institutes for Research.

Proctor, E. K., Powell, B. J., & Mcmillen, J. C. (2013). Implementation strategies: Recommendations for specifying and reporting. *Implementation Science, 8*, 139.

Ritchhart, R. (2004). *Intellectual character: What it is, why it matters, and how to get it*. San Francisco, CA: Jossey-Bass.

Ridley, A. (2013). *The smartest kids in the world and how they got that way.* New York, NY: Simon & Schuster.

Schiefele, U., Krapp, A., & Winteler, A. (1992). Interest as a predictor of academic achievement: A meta-analysis of research. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 183–211). Hillsdale, NJ: Erlbaum.

Seider, S. (2012). *Character compass: How powerful school culture can point students toward success.* Cambridge, MA: Harvard Education Press.

Sherblom, S. A. (2012). What develops in moral development?: A model of moral sensibility. *Journal of Moral Education, 41*(1), 117–142.

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., & Hartson, K. A. (2011). Reconciling self-protection with self-improvement: Self-affirmation theory. In M. Alicke & C. Sedikides (Eds.), *The handbook of self-enhancement and self-protection* (pp. 128–151). New York, NY: Guilford Press.

Shields, D. (2011, May). Character as the aim of education. *Phi Delta Kappan*, *92*, 48–53.

Shnabel, N., Purdie-Vaughns, V., Cook, J. E., Garcia, J., & Cohen, G. L. (2013). Demystifying values-affirmation interventions: Writing about social belonging is a key to buffering against identity threat. *Personality & Social Psychology Bulletin*, *39*(5), 663–676.

Stano, N. (2012). *Math and science engagement: Identifying the processes and psychological theories that underlie successful social-psychological interventions*. Retrieved from http://www.noycefdn.org/documents/Stano_Math_Science_Engagement.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, NY: Academic Press.

Stephanou, G. (2004). *Effects of ability self-perception, perceived task-difficulty, performance expectations and importance of performance on performance and attributions in specific academic domains.* In J. Baumert, H. W. Marsh, U. Trautwein, & G. E. Richards (Eds.), *Proceedings of the 3rd International SELF Research Conference: Self-concept, motivation and identity.* Berlin, Germany: Max Planck Institute for Human Development.

Stephanou, G. (2012). Students' school performance in language and mathematics : Effects of hope on attributions, emotions and performance expectations. *International Journal of Psychological Studies 4*(2), 93–120.

Stipek, D. J. (2004). *Motivation to learn: Integrating theory and practice.* Boston, MA: Allyn & Bacon.

Taulbert, C. L. (1997). *Eight habits of the heart for educators*. Thousand Oaks, CA: Corwin Press.

Thapa, A., Cohen, J., Higgins-D'Alessandro, A., & Guffey, S. (2012). *School Climate Research Summary: August 2012* (School Climate Brief, No. 3). New York, NY: National School Climate Center.

Tishman, S., Perkins, D., & Jay, E. (1995). *The thinking classroom*. Needham Heights, MA: Allyn & Bacon.

Tough, P. (2012). *How children succeed: Grit, curiosity, and the hidden power of character*. Boston, MA: Mariner Books.

Urban, H. (2003). *Life's greatest lessons: 20 things that matter*. New York, NY: Simon & Schuster.

Usher, E., & Pajares, F. (2008). Sources of self-efficacy: Critical review of the literature and future directions. *Review of Educational Research, 78*, 751–796.

Vincent, P. F., & Grove, D. (2013). *Relationships + rules + routines = results*. Boone, NC: Character Development Group.

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.

Wentzel, K. R. (2001). Peer groups. In R. Lerner & J. Lerner (Eds.), *Today's teenagers: Adolescence in America*. Denver, CO: ABC-CLIO.

Willis, J. (2010). *Learning to love math: Teaching strategies that change student attitudes and get results*. Alexandria, VA: Association for Supervision & Curriculum Development.

Yeager, D. S., & Walton, G. M. (2011). Social-psychological interventions in education: They're not magic. *Review of Educational Research*, *81*(2), 267–301.