



Skills for Today:

What We Know about Teaching
and Assessing Self-Management



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Foreword

Self-management is a multi-faceted skill that involves intentionally and strategically managing one's emotions, behavior, effort, and/or environment in the pursuit of goals. It is easy to think of occasions, whether in school or the workplace, where we need to pay attention when distracted, plan out the steps of a project, or keep our cool in emotionally tense situations. In order to successfully resolve each of these situations, we would utilize our skills in self-management. Good self-management, including prioritizing my to-do-list, completing big projects before the final deadline, and figuring out the steps to accomplish my goals, has been one of the keys to my success in school and the workplace.

While instructors and employers attest to the importance of self-management, graduates may be leaving schools without fully developing these skills. This gap may be partially due to the complexity with which self-management is discussed in the research literature. In order to gain a complete understanding of self-management, you would need to consult research in several fields including education, organizational psychology, clinical psychology, and cognitive psychology. Our hope with this summary is to synthesize research and terminology from these different fields into a holistic framework of self-management.

Research supports a variety of approaches for teaching skills in self-management. Students benefit from direct instruction around specific strategies including time management, goal-

setting, organization, and cognitive reappraisal. Implementation intentions are a particularly useful goal-setting strategy where students develop "if-then" plans that connect good opportunities to act on goals with the specific behaviors that will help accomplish goals. Additionally, feedback regarding successes and failures can impact students' capacity for self-management. Feedback emphasizing effort and hard work supports the development of a "growth mindset" which helps students persist in the face of obstacles or difficulty. While most assessments of self-management currently involve self- or teacher-report questionnaires, there is growing interest in leveraging real-time performance data from games and simulations as evidence of self-management skills.

This paper builds on a series of summaries around Pearson's Personal and Social Capabilities (PSC) skills, the "soft" skills that are crucial for employability. In collaboration with P21, Pearson has already released papers detailing the four Cs: collaboration, critical thinking, communication, and creativity. This paper extends this work by reviewing specific skills in self-management, as well as strategies for teaching and assessing these skills. Through this series, we at Pearson hope to provide educators, employers, and policy-makers with the best practices for helping students succeed in school, work, and life.

Leah Jewell, Managing Director, Career Development



Introduction

Effective self-management is a crucial skill in every sphere of life. Whether in our education, jobs, or relationships, we have to manage some combination of our time, environment, attention, effort, and emotions. People who struggle with self-management often have difficulties working effectively toward their goals and persisting at important activities when they become frustrating or dull. This white paper synthesizes existing research into a formal model of self-management and its component skills and provides guidance around assessing and fostering self-management.

Self-management is broadly defined as the ability to intentionally and strategically manage one's emotions, behavior, effort, and environment in the pursuit of goals. Research consistently demonstrates the importance of self-management for academic success. Students' ability to self-regulate and delay gratification in one semester predicted their academic performance in the following semester (Duckworth & Seligman, 2005). More importantly, self-management was a stronger predictor of final grades than IQ (Duckworth & Seligman, 2005). Meta-analyses (statistical reviews of research) have also documented strong associations between conscientiousness, a personality trait related to self-management, and academic performance (e.g., Poropat, 2009). Several self-management skills also fall under the broad category of "Study Habits, Skills, and Attitudes," which are associated with successful college performance, even after controlling for high-school grade point average (GPA) and standardized test scores (Credé & Kuncel, 2008). These skills include time and resource management, knowledge monitoring, stress and anxiety management, and persistence in studying.

In addition to school success, self-management skills are important within the workforce. In the National Association of Colleges and Employers (NACE) 2014 Career Readiness Competencies survey, 97.5 percent of employers rated professionalism and work ethic as either "essential" or "absolutely essential" when considering job candidates. NACE's definition of professionalism includes many self-management skills such as time and workload management, punctuality, and personal accountability. Meta-analyses and other reviews demonstrate the large body of evidence linking the personality trait of conscientiousness with better occupational performance (e.g., Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007; Schmidt & Hunter, 1998). Moreover, empirical research supports the longitudinal link between self-management and occupational success. Greater childhood self-management skills were associated with a lower likelihood of experiencing unemployment across the lifespan (Daly, Delaney, Egan, & Baumeister, 2015).

Importantly, this effect remained significant even after controlling for intelligence and socioeconomic status. Likewise, self-control measured within the first eleven years predicted income, savings behavior, and financial security in adulthood (Moffitt et al., 2011).

Self-management is also important for functioning outside of school and work. Individuals with better self-control reported fewer psychological symptoms, higher self-esteem, better relationships, and stronger interpersonal skills (Tangney, Baumeister, & Boone, 2004). Additionally, young adults with more self-control and who are better able to delay gratification are less likely to engage in risky behaviors such as substance use and binge eating (Romer, Duckworth, Sznitman, & Park, 2010; Tangney et al., 2004). Childhood self-control was also associated with better physical health, less substance use, and fewer criminal convictions in adulthood (Moffitt et al., 2011).

Many individuals view self-management as an area for improvement. In an international study, both children and adults rated self-control as one of their least prevalent character strengths (Park & Peterson, 2006; Park, Peterson, & Seligman, 2006). Additionally, a survey conducted on behalf of the Association of American Colleges and Universities found that employers perceived new college graduates as lacking in self-knowledge and self-direction. Only 28 percent and 23 percent (respectively) of respondents rated college graduates as very well prepared in these areas (Hart, 2008). Although individuals may find themselves lacking in self-management, there is evidence that these skills tend to develop over time. Research suggests that the prefrontal cortex, which supports the executive functions needed for effective self-management, is a relatively late developing area of the brain (Fuster, 2002). As a result, individuals' capacity for self-management increases through adolescence and young adulthood. Additionally, longitudinal studies indicate that the relevant personality trait of conscientiousness also increases as individuals age, suggesting that older individuals exhibit better skills in self-management (Roberts, Walton, &

Viechtbauer, 2006). Beyond the natural development of these skills, there are also several interventions designed to improve self-management, which we will review in later sections.

The terminology used to refer to self-management and its components skills varies across disciplines. These terms include “self-control,” “self-discipline,” “self-regulation,” “self-regulated learning,” “effortful control,” and “willpower.” To meet the challenge of creating a unified framework, we carefully analyzed and compared discipline-specific terms and definitions to ensure a valid synthesis. In this white paper,

we integrate these different strands of research to develop a single framework and terminology around self-management. We then review research on teaching self-management skills to primary, secondary, and post-secondary students and discuss existing frameworks and strategies for assessing self-management skills. By addressing the definition, teaching, and assessment of self-management skills, we hope to provide context to our readers on how to effectively foster these skills.



Definitions and Models

PEARSON SELF-MANAGEMENT FRAMEWORK

The relevance of self-management and self-control to success is not a new idea. Binet and Simon, developers of one of the earliest IQ tests, recognized that “other things than intelligence” contribute to academic success; “to succeed in his studies, one must have qualities which depend especially on attention, will, and character” (Binet & Simon, 1916, p. 254). These aspects of attention and will correspond to self-management. Galton (1892, p. 40) also noted that “self-denial” in the face of “hourly temptations” was a key determinant of everyday success.

Before presenting our model of self-management, we consider the overlap between the skill of self-management and the personality trait of conscientious. Conscientiousness is a multifaceted competency that includes tendencies related to being attentive, hard-working, careful, detail-minded, reliable, organized, productive, and persistent (Nofle & Robins, 2007; Roberts, Chernyshenko, Stark, & Goldberg, 2005) and consistently predicts academic and occupational performance (Poropat, 2009; Roberts et al., 2007; Schmidt & Hunter, 1998). As such, conscientiousness is the personality trait most aligned to self-management. MacCann, Duckworth, and Roberts (2009) empirically identified eight major facets of conscientiousness using confirmatory factor analysis:

- **industriousness** (working hard and efficiently);
- **perfectionism** (demanding quality and perfection);
- **tidiness** (ordering of physical possessions);
- **task planning** (ordering of tasks and time);
- **procrastination refrainment** (avoidance of putting off work);
- **control** (control of impulses);
- **cautiousness** (thinking ahead and being careful);
- **perseverance** (maintaining attention and continuing despite frustration).

While conscientiousness is considered a trait or disposition, the study by MacCann et al. (2009) makes it clear that conscientiousness can also be understood as a pattern of distinct behaviors. For this reason, we utilize the research on conscientiousness to help us identify and delineate the specific behavioral skills that contribute to self-management. By describing self-management as a set of skills that can be improved, our framework provides clear targets for intervention, ensuring pedagogical value. This strategy corresponds to work on college and career readiness. Conley's (2014) four keys to college and career readiness include forty-two actionable components, meaning that each skill can be taught and learned (Conley & French,

2014). Indeed, targeting core behaviors is gaining support as one method for improving conscientiousness (e.g., Hudson & Fraley, 2015; Magidson, Roberts, Collado-Rodriguez, & Lejuez, 2014).

In the following section, we provide a thorough description of the Pearson Self-Management Framework, which includes the following six skills (see Table 1):

- **planning;**
- **organization;**
- **persistence;**
- **progress monitoring;**
- **control;**
- **attention to detail.**

PLANNING

We define planning as the ability to set goals and determine what activities need to be completed to accomplish specific goals. Goals direct action, effort, and persistence in the pursuit of valued outcomes, with more specific and appropriately challenging goals having a positive impact on performance (Locke & Latham, 2002). Research suggests that the act of planning and setting goals may help to transform the intention to act into actual action (Sniehotta, Scholz, & Schwarzer, 2005; Wiedemann, Schuz, Sniehotta, Scholz, & Schwarzer, 2009). Planning is important to academic success. Many models identify planning and setting goals for a learning activity as the first stage in self-regulated learning (e.g., Pintrich, 2004; Schunk, 2005; Zimmerman & Campillo, 2003). Aspects of planning such as goal-setting, making to-do lists, using time constructively, and using aids to manage time are associated with better academic performance and fewer disciplinary infractions (Britton & Tesser, 1991; Liu, Rijmen, MacCann, & Roberts, 2009; Zimmerman & Martinez-Pons, 1986). Additionally, planning and time-management skills are key skills needed for employability. In the UK Commission for Employment and Skills' Employer skills survey 2015 (2016), employers rated the ability to manage time and prioritize tasks as the “soft” skill most lacking among applicants.

DEFINITIONS AND MODELS

SKILL	DEFINITION	EXAMPLE EVIDENCE	RELATED CONCEPTS
Planning	Setting realistic goals and planning activities ahead of time Managing time according to plans	Makes a calendar to schedule exam studying Breaks down a work task into specific activities and schedules time to work on each	Task-planning Self-regulated learning
Organization	Keeping work artifacts in an organized fashion to improve efficiency	Keeps files in a computer ordered in folders around themes Keeps one's work desk free of clutter	Tidiness
Persistence	Applying appropriate levels of effort to tasks, in spite of obstacles or difficulty	Spends time on a difficult math problem Continues working on a project despite setbacks	Industriousness Perseverance Grit
Progress Monitoring	Accurately tracking and assessing one's knowledge, skills, and progress Choosing appropriate strategies to evaluate and improve knowledge, skills, and progress	Self-testing before an exam Evaluating whether one is making progress towards workplace goals	Metacognition Self-regulated learning
Control	Effectively regulating behaviors and emotions, typically to support goal pursuit	Remaining calm while studying for a test Investing money instead of spending it immediately	Emotional intelligence Control
Attention to Detail	Having careful and precise work habits Ensuring work products are accurate, clear, and precise	Checking for grammatical errors in a paper Reviewing a work brief before submitting it	Cautiousness

Table 1 Pearson Self-Management Framework with example behaviors and related concepts.

ORGANIZATION

Research suggests that ordering tasks and time and ordering one's physical possessions and environment represent separate and distinct skills (MacCann et al., 2009). We maintain that distinction in our framework by separating out the skill of organization, which we define as keeping work artifacts and one's physical environment in an organized fashion to improve efficiency. Organization can include keeping computer files ordered within folders around themes or maintaining notebooks where one can easily access needed information.

PERSISTENCE

We define persistence as applying and maintaining appropriate effort to tasks in spite of obstacles, difficulty, or frustration. Our definition combines elements of the conscientiousness facets of industriousness and perseverance (MacCann et al., 2009), grit (Duckworth & Gross, 2014), and the self-regulated learning concept of effort regulation (Pintrich, Smith, Garcia, & McKeachie, 1991). As part of maintaining effort, persistence also involves sustaining attention and concentration. Notably, persistence at a young age predicts a host of positive adult outcomes including educational attainment, income level, and occupational functioning (Andersson & Bergman, 2011).

PROGRESS MONITORING

Our facet of progress monitoring involves accurately tracking and assessing knowledge, skills, and progress as well as choosing appropriate strategies to evaluate and improve knowledge, skills, and progress. This definition draws heavily from research on metacognition, which means “cognition about cognitive phenomena,” or more simply “thinking about thinking” (Flavell, 1979, p. 906). Metacognition has two constituent parts: knowledge about cognition and monitoring of cognition (Cross & Paris, 1988; Flavell, 1979; Paris & Winograd, 1990; Schraw, Crippen, & Hartley, 2006; Schraw & Moshman, 1995). Knowledge about cognition includes knowledge about:

- **oneself as a learner;**
- **the factors that might affect performance;**
- **learning strategies;**
- **when and why to use different strategies.**

Monitoring of cognition includes having an awareness of comprehension and task performance and the ability to evaluate the effectiveness of learning. Progress monitoring allows students to take an active role in their learning. By assessing and monitoring current knowledge states and then engaging in effective learning strategies to improve knowledge, students become more efficient learners (Credé & Kuncel, 2008; Credé & Phillips, 2011). Progress monitoring is also relevant to performance outside of academics. Effective workers will continually monitor their performance and how well they are progressing on work projects. This practice enables them to make adjustments and to apply new strategies when things are not proceeding optimally.

CONTROL

Control refers to the ability to regulate behaviors and emotions, typically to support goal pursuit. In describing our facet of control, we draw heavily from Duckworth & Seligman’s (2006, p. 199) definition of self-control as “the ability to suppress prepotent responses in the service of a higher goal.” Behaviorally, control means engaging in activities that support goal pursuits while ignoring other options that provide more immediate reinforcement or enjoyment. Examples include choosing homework over TV or investing money instead of spending it immediately. Our facet of control is also exemplified in the delayed gratification research. One of the most well-known delayed gratification paradigms involves giving children two options, with one clearly preferred (i.e. two marshmallow or one; Mischel, Shoda, & Rodriguez, 1989). Children can get the less preferred option at any time, but to get the better option, they have to wait an undetermined amount of time for an experimenter to return to the room. Children who are able to wait longer (i.e. to delay gratification for longer) have better social, emotional, and academic outcomes in adolescence (see Mischel et al., 1989 for review).

Control also involves identifying and regulating emotions. Effectively managing emotions supports academic achievement through improved attention control and memory (Davis & Levine, 2013; Trentacosta & Izard, 2007). Cognitive reappraisal or restructuring, which involves changing how one thinks about a situation or emotional trigger, is a particularly effective strategy for managing emotions (Gross & John, 2003). Within the field of education, researchers are particularly interested in addressing student difficulties managing anxiety and stress around tests and other evaluative situations, which is referred to as test anxiety (Spielberger, 1972). Higher levels of test anxiety are associated with poor academic performance (Hembree, 1988), possibly because anxious thoughts and the physical symptoms of anxiety distract students

Self-management in Practice

In her role as Freshman Academy Director at Kings Mountain High School, Liza Dellinger helps provide ninth-grade students with the self-management skills they need to succeed academically. A key part of Mrs. Dellinger's work is coordinating with teachers to identify students who are at risk of not progressing to the tenth grade. She then meets with these students and their families to determine how best to address areas of concern. Parents are certainly instrumental in this process by providing necessary structure, but Mrs. Dellinger also works individually with students to help them develop skills for academic success. Two skills she often focuses on are planning and organization. For example, students are taught to consistently write down their assignments in their agenda book, which ensures that they have a reliable record of their academic responsibilities in a single location. This helps students better manage their time and plan for the completion of their assignments. Mrs. Dellinger also highlights the importance of addressing student motivation or, as she calls it, helping them find their "why." Whether it is graduating high school, getting a certain job, or attending college, it helps students stay on track if they can connect the mundane, day-to-day school activities with a more meaningful future goal.

Mrs. Dellinger has also found a way to provide instruction about self-management and other key nonacademic skills to all first-year students. Kings Mountain High School utilizes a SMART lunch schedule where the entire school breaks for an hour at lunchtime. During that hour, students spend half the time in lunch and the other half receiving tutoring, socializing, or participating in extracurricular activities. For ninth-grade students, once a week their SMART lunchtime is spent doing enrichment activities that provide them with the knowledge and skills needed for success in high school. These activities are called "Mountie Moments" (The high school's mascot is the mountaineer or mountie.) Mountie Moments can include watching YouTube videos about goal-setting from motivational speaker Eric Thomas or working through activities from Sean Covey's *The Seven Habits of Highly Effective Teens*, which addresses skills like planning and time management. Mountie Moments typically include both instruction and discussion so students are able to think through how the knowledge and skills covered can be applied to their own lives. Mountie Moments provide an excellent example of how a high school can achieve a balance where students can learn important non-academic skills without sacrificing instructional time.

Liza Dellinger, Freshman Academy Director, Kings Mountain High School, Kings Mountain, NC

from focusing effectively on exams (Beilock & Ramirez, 2011). Interventions that support emotional management skills such as relaxation training, cognitive-behavioral therapy, and attentional training reduce the experience of test anxiety and support improved academic performance (Hembree, 1988).

The Self-Regulatory Strength Model of Self-Control provides a useful framework for understanding how control functions (Baumeister, Vohs, & Tice, 2007). Control is a fixed resource that can be depleted through overwork. Like a muscle, control can be "tired out" and not function as efficiently. If individuals expend considerable effort controlling thoughts, emotions, or unwanted impulses (i.e. not eating sweets when on a diet) in one situation, they will be less successful in subsequent situations. This is termed self-regulatory depletion or failure (Baumeister et al., 2007). Research suggests that practicing control can develop the self-regulatory muscle, and that practice in one domain can translate to increased self-regulatory strength in other areas (Oaten & Cheng, 2006a, 2006b, & 2007). Positive emotional states can also protect against self-regulatory depletion (Tice, Baumeister, Shmueli, & Muraven, 2007).

ATTENTION TO DETAIL

Attention to detail refers to having careful and precise work habits and ensuring that work products are accurate. Specific examples include checking over work before submitting it, reading and following instructions for projects and assignments, and making sure information included in a research report is correct. Among students, attention to detail is associated with better grades and classroom behavior and with fewer disciplinary infractions (MacCann et al., 2009). It is also a skill valued by employers. The International Data Corporation, together with Microsoft (Anderson & Gantz, 2013), examined over 14.6 million job postings and found that attention to detail was the second most commonly listed skill.

CONTRIBUTING FACTORS TO SELF-MANAGEMENT

A variety of factors contribute to an individual's capacity and willingness to self-manage. While we do not include these factors as specific components of our model, they do offer avenues for intervention. Since we will discuss these factors in our section on intervention, we provide a brief overview of them here to familiarize readers with these terms.

EXPECTANCY-VALUE THEORY

Eccles and colleagues, building on the work of Atkinson (1957), developed the Expectancy-Value Model of Academic Motivation (e.g., Eccles, 1983; Eccles, Wigfield, & Schiefele, 1998; Wigfield, & Eccles, 2000). This model suggests that academic motivation is driven by two factors: expectations for success on academic tasks and the value ascribed to academic tasks. The expectancy component of the model is influenced by beliefs about one's ability to successfully complete a task, which is conceptually related to the concept of self-efficacy (Bandura, 1997). Task value can come from a variety of sources, including one's intrinsic interest in a task, the usefulness of a task, how important a task is to one's identity, and the cost of completing the task. Task expectancy and value contribute to motivation, helping to explain why individuals exercise self-management. For example, students are much more likely to persist on a difficult or frustrating task if they believe they will ultimately be successful, if the task is intrinsically interesting, or if the task is viewed as very important to reaching a meaningful goal.

GROWTH MINDSET AND ATTRIBUTIONS

Research has also examined how individuals' beliefs about qualities such as intelligence, ability, and effort relate to academic performance (e.g., Dweck, 2006; Dweck, Chiu, & Hong, 1995). One set of beliefs are referred to as implicit theories or "core assumptions about the malleability of personal qualities" (Yeager & Dweck, 2012, p. 303). Much of this work has focused on beliefs about intelligence. If students believe that intelligence is fixed, experiencing academic difficulty means that they fundamentally lack the intelligence needed to succeed. This belief is profoundly discouraging, and students are less likely to persevere when academic tasks are difficult, since they believe they cannot do anything to develop their intelligence. In contrast, treating intelligence as malleable allows challenges to be viewed as areas for growth. As a result, students are willing to work harder and to persist more in the face of challenges. This belief that intelligence can be developed and enhanced has been termed a "growth mindset" (Yeager & Dweck, 2012). Research suggests that having a growth mindset is associated with better academic performance, particularly during challenging periods such as the transition from middle to high school (Blackwell et al., 2007).

In relation to this, research has examined the relevance of attribution theory. Attributions are the beliefs individuals hold about the causes of events in their lives (Weiner, 1986) and can influence future behavior. For example, a student might attribute academic difficulty to lack of effort ("I didn't try hard enough") or lack of ability ("I'm just not good at this"). Attributing difficulty to something changeable like effort, compared to something stable like ability, helps individuals have better expectations for future performance; thus, they are more willing to work harder in the future. Attributions and mindset also appear to influence one another, as individuals with more of a growth mindset have more positive beliefs about the role of effort in academic performance (e.g., Blackwell, Trzesniewski, & Dweck, 2007). Research documents the importance of attributions to both academic and occupational performance (e.g., Harvey, Madison, Martinko, Crook, & Crook, 2014; Lazowski, & Hulleman, 2016).

CONTRIBUTING FACTORS TO SELF-MANAGEMENT

EXECUTIVE FUNCTION

Executive functions “refer to a family of top-down mental processes needed when you have to concentrate and pay attention, when going on automatic or relying on instinct or intuition would be ill-advised, insufficient, or impossible” (Diamond, 2013, p. 1). Executive functions fall into three major categories:

- **inhibitory control** (sustaining attention and not acting impulsively);
- **cognitive flexibility** (thinking creatively and switching between mental tasks);
- **working memory**.

Essentially, executive functions are the cognitive processes that individuals draw on in order to engage in self-management or to practice self-controlled behavior. In the field of education specifically, research suggests that executive functions support metacognition, which in turn drives self-regulated learning (Follmer & Sperling, 2016). Executive functions develop and strengthen throughout childhood and adolescence, with peaks in these capacities occurring in late adolescence and early adulthood. In addition to the natural developmental progression of executive functions, research suggests that they can be further enhanced through training programs. Two such programs with a strong evidence base are Tools of the Mind (Diamond, Barnett, Thomas, & Munro, 2007) and Promoting Alternative Thinking Strategies (Riggs, Greenberg, Kusché, & Pentz, 2006). Tools of the Mind is a full curriculum for preschool and kindergarten children developed by Bodrova and Leong (2007). Promoting Alternative Thinking Strategies is a supplemental program that helps students identify their feelings and engage in self-control strategies (i.e. taking deep breaths, self-talk) to keep from acting impulsively on feelings (Kusché & Greenberg, 1994). Mindfulness interventions have also been implemented to improve aspects of executive functioning, particularly regarding attention (Eberth & Sedlmeier, 2012; Flook et al., 2010; Napoli, Krech, & Holley, 2005). Mindfulness is “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn, 1994, p. 4). Mindfulness supports executive functioning by helping students maintain attention and dismiss distracting thoughts, emotions, and sensations.



Teaching Self-Management Skills

PLANNING

PRIMARY AND SECONDARY SCHOOL

The use of “implementation intentions” has received considerable attention as a method to support planning and goal-setting. Implementation intentions are “if-then plans that connect good opportunities to act with cognitive and behavioral responses that are effective in accomplishing one’s goals” (Gollwitzer & Sheeran, 2006, p. 82). Instead of simply specifying one’s goals, implementation intentions consider the timing, setting, and processes that will support goal achievement. For example, suppose a student wants to study for one hour each weekday evening and realizes she has an hour available after returning from campus at 4:30 p.m. before going to the gym. The student could then make the implementation intention that if it is 4:30 p.m. and I have just returned from campus, then I will sit down in the kitchen and study for one hour. Implementation intentions can be particularly useful in helping individuals act on goals at opportune times or plan around anticipated obstacles. A recent meta-analysis found that implementation intentions had a strong impact on successful completion of academic goals (Gollwitzer & Sheeran, 2006).

Studies have specifically examined the impact of implementation intentions in elementary and high-school settings (Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2011; Duckworth, Kirby, Gollwitzer, & Oettingen, 2013). These interventions also included mental contrasting, where students imagined completing a goal and then contrasted that image with current obstacles that might prevent goal achievement. Implementation intentions were used to plan around current obstacles. Findings showed that the intervention had a positive impact on the academic achievement, attendance, and conduct of fifth-grade students (Duckworth et al., 2013) and helped high-school sophomores complete more Preliminary Scholastic Aptitude Test practice problems over the summer (Duckworth et al., 2011).

Time-management skills have also been a target of intervention in primary and secondary schools. During a five-week training program (modified from Zimmerman, Bonner, & Kovach, 1996), fourth-grade students were taught about self-evaluation and monitoring, goal-setting, time management, and organization. Across the five weeks, students revisited their goals and reflected on goal progress. Findings suggest that this intervention resulted in improved time-management skills (Stoeger & Ziegler, 2008).

HIGHER EDUCATION

Among college students, implementation intentions (if-then plans that connect good opportunities to act with behaviors that support goal pursuit) supported better class attendance (Webb, Christian, & Armitage, 2007). More importantly, the intervention was most effective for students low in trait conscientiousness. These findings suggest that implementation intentions might address important deficits for individuals with limited self-management skills.

Time-management interventions have also shown promise among college students. Two studies examined the effects of a brief (two-hour) time-management intervention with college students (Häfner, Oberst, & Stock, 2014; Häfner, Stock, Pinneker, & Ströhle, 2014). Students learned how to prioritize and set goals and were taught specific time-management strategies. The intervention also included a discussion about structuring the work day and the development of implementation intentions. In one study, the intervention decreased procrastination (Häfner, Oberst, & Stock, 2014). More specifically, while students in both the experiment and control groups spent the same amount of time studying for an important academic task, the control group spent more time studying in the last week before the due date. In another sample, the intervention increased perceived control of time and appeared to buffer against elevated stress during the first few weeks of the semester (Häfner, Stock, Pinneker, & Ströhle, 2014).

An online goal-setting intervention supported academic achievement among struggling college students (GPA below 3.0; Morisano, Hirsh, Peterson, Pihl, & Shore, 2010). The intervention consisted of a 2.5-hour online experience. Students first free-wrote about an ideal future and things they would like to improve about themselves. They then identified specific goals that would help them attain their desired future and worked through an intensive elaboration of these goals. Specifically, they rank-ordered their goals, identified subgoals, considered obstacles to goal pursuit, and developed benchmarks to help them assess their goal progress. GPA for students in the intervention group increased from the semester prior to the intervention to the semester following the intervention while grades did not change for students in a comparison group.

ORGANIZATION

PRIMARY AND SECONDARY SCHOOL

A recent meta-analysis supports the effectiveness of organizational-skills interventions for primary and secondary students with Attention Deficit Hyperactivity Disorder (Bikic, Reichow, McCauley, Ibrahim, & Sukhodolsky, 2017). The interventions surveyed taught strategies and provided organizational aids to help students keep their notebooks, lockers, book bags, and study spaces organized. Some interventions included other aspects of self-management (e.g., goal-setting, planning) as well as strategies to help parents reward appropriate behavior and communicate with schools to support organization. Interventions were both school- and clinic-based. Organizational-skills interventions had an overall positive effect on both teacher-rated and parent-rated organizational skills along with GPA.

PERSISTENCE

PRIMARY AND SECONDARY SCHOOL

Attribution-training programs have been applied in academic contexts. These programs typically teach students to attribute academic difficulty or struggles to factors that students have control over. One meta-analysis found that attribution-training programs had a moderately strong, positive effect (Lazowski & Hulleman, 2016) on persistence and other educational variables such as academic performance. It is important to note that interventions in this meta-analysis were administered to primary, secondary, and college-aged students.

An attribution-training program emphasizing the causal role of effort had a positive impact on persistence among seventh-grade and eighth-grade students (Reiher & Dembo, 1984). Students were randomly assigned to one of three groups—two experimental and one control group. The training took place over five days, with one forty-minute session each day. The two experimental groups received instruction about how self-monitoring and self-statements can influence behavior. Students practiced monitoring their effort level during academic tasks and making self-statements about how effort influences performance. The two experimental groups differed in how these concepts were initially presented, with one group receiving a lecture and the other group engaging in an activity. The control group spent the same amount of time practicing academic tasks. Students in both experimental groups demonstrated greater persistence as measured by the number of times they attempted to spell words that were beyond their grade level. Students in the experimental groups were also more likely to say their performance on the spelling task was due to effort as opposed to ability, luck, or task difficulty.

Another study examined the effectiveness of a similar training program with children aged eight to twelve who were diagnosed with specific learning difficulties (Thomas & Pashley, 1982). Students were taught to attribute performance to effort during a variety of academic and non-academic tasks (i.e. tangram puzzles, mazes, number patterns, and spelling words). The training had a positive impact on persistence as measured by the time spent trying to solve unsolvable puzzles as well as the number of attempts students made at solving unsolvable puzzles. It should be noted that these findings were only based on analyses of male students, so it is uncertain whether the effects generalize to female students.

Interventions to support persistence and academic achievement have also been developed from the research on growth mindsets. Researchers examined whether growth mindsets could be taught in the educational video game *Refraction*, which is designed to teach fractions to elementary-school students (O'Rourke, Haimovitz, Ballweber, Dweck, & Popović, 2014). In the experimental version of the game, students were rewarded for effort, for using new or creative strategies, and for incremental progress as opposed to simply progressing through levels. The experimental version of the game also included growth-mindset statements in the game narrative, and praise was structured to support a growth mindset. For example,

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for successfully completing a level in the experimental version, students might be told “You worked hard and used your math brain,” while in the control version students were simply told which fraction they had completed in the level. Students playing the experimental version of the game played the game for more time and played more unique levels within the game.

An intervention with seventh-grade students taught them about learning’s impact on the brain and how it can help them grow their intelligence (Blackwell et al., 2007). The intervention had a positive impact on motivation and math grades. More specifically, students in the control group continued to experience a downward trajectory in math grades following the intervention while math grades increased for the experimental group.

HIGHER EDUCATION

Research suggests that persistence on difficult tasks is influenced by past experiences, particularly the prior consequences of hard work. This phenomena is termed “learned industriousness” (Eisenberger, 1992). In one experiment, participants were randomly assigned to solve impossible, hard, or easy anagrams and then take a perceptual comparison task where they were asked to detect as many differences as possible between two pictures (Eisenberger & Leonard, 1980, Experiment 1). Participants in the impossible-anagram condition spent the most time on the perceptual comparison task (a measure of persistence), followed by those in the hard condition, and then those in the easy condition. The authors concluded that initial failure in one task (unsolvable anagrams) increases subsequent effort on another task. More specifically, initial failure serves as a cue that high effort is required, resulting in greater effort in the future.

Additionally, rewarding hard work and effort also contributes to increased persistence (Eisenberger & Leonard, 1980, Experiment 3). One group of participants completed complex anagrams and another group experienced the same pattern of successes and failures, but their anagrams were presented such that low effort was associated with success and high effort was associated with failure. The latter group showed less persistence on a perceptual comparison task, suggesting that some of the persistence benefits of exerting effort on one task come from rewards associated with high effort.

There is considerable interest in increasing retention among college students. Among students starting at four-year colleges in 2008, only 60 percent completed their degree within six years (including 63 percent of Caucasian students, 54 percent of Hispanic students, and 41 percent of African-American students; National Center for Education Statistics, 2016). While distinct from the skill of persistence, academic retention is conceptually related. Individuals with higher levels of persistence are better able to manage the stresses and difficulties of college without dropping out. We therefore consider several interventions that address college and college course retention.

An attribution-retraining program supported retention for first-year college students with concerns about their performance (Wilson & Linville, 1982). Students in the program were told that many students had lower grades than expected during the first year of college and that grades often improved over time. This information was intended to help students believe that their current academic problems were not stable, helping them to have better expectations for future performance. Students who participated in the program were much less likely to leave the university in the following year compared to those who did not (5 percent versus 25 percent).

Another attribution-retraining intervention with first-year college students helped lower course withdrawal rates (Ruthig, Perry, Hall, & Hladkyj, 2004). The intervention included an informational session that emphasized the benefits of attributing academic performance to effort (controllable) as opposed to ability (uncontrollable). Students

were also told that academic performance typically improves throughout students' educational development. The intervention had a positive impact on course withdrawal rates such that students who participated in the intervention withdrew from significantly fewer credit hours over the course of their first year than those who did not receive the intervention. This effect appeared to be driven by students with high, and perhaps unrealistic, levels of optimism, who primarily benefited from the intervention. It should be noted that because the groups were based on existing classes and not random assignment, it is unclear whether the two groups could be considered equivalent.

Growth mindsets also appear to help community-college students placed in remedial mathematics courses, a group at a particularly high rate of academic failure. In one intervention, community-college students read an article that emphasized how intelligence, and particularly math ability, could be developed, even for adults. Students then wrote a letter to future students summarizing key points from the article. At the end of the semester, 20 percent of students in the control group withdrew from the remedial mathematics class, compared to only 9 percent of students who received the growth mindset intervention (Paunesku, Yeager, Romero, & Walton, 2018).

PROGRESS MONITORING

PRIMARY AND SECONDARY SCHOOL

Dignath, Buettner, and Langfeldt (2008) meta-analyzed forty-eight studies investigating the effect of self-regulation training on the use of metacognitive strategies among students in first grade to sixth grade. When taught in conjunction with planning or evaluation, teaching the metacognitive skill of progress monitoring (i.e. regularly checking one's knowledge during a learning activity) had a strong, positive effect on strategy use during learning. Teaching the skills of planning and evaluation together also had a strong positive impact on metacognitive strategy use. Relatedly, Haller, Child, and Walberg (1988) meta-analyzed twenty empirical studies, comprising more than 1,500 students, on the effects of metacognitive instruction on students' metacognition during reading. Their findings suggest that instruction in metacognition can have robust effects on children's reading awareness and comprehension. Effects were largest for students in the seventh and eighth grades but were also strong among students in the second and third grades. Results suggest that instructional interventions involving fewer than ten minutes of instruction per lesson are insufficient for producing these types of effects. Self-questioning, or teaching students to generate questions to assess their own reading comprehension, was a particularly effective monitoring strategy.

Within the domain of mathematics, metacognitive training had a positive impact on the mathematical reasoning and metacognitive skills of eighth-grade students (Kramarski & Mevarech, 2003). Researchers found that students exposed to metacognitive instruction in either cooperative or individualized learning environments outperformed comparison students with respect to level of domain-specific metacognitive knowledge, such as strategies for representing math concepts in multiple ways and specific mathematical strategies for interpreting graphs, and mathematical reasoning ability.

HIGHER EDUCATION

MetaTutor is an adaptive tutoring software that supports students' self-regulated learning while reading science texts. MetaTutor specifically targets planning, monitoring knowledge, using learning strategies, and reflecting. The processes are encouraged by prompting and feedback from four pedagogical agents. One study examined the effectiveness of different patterns of prompting and feedback within the MetaTutor environment (Azevedo et al., 2012). Undergraduate students were randomly assigned to one of three conditions: (1) prompt and feedback; (2) prompt only; and (3) no prompt. In the prompt and feedback

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condition, the pedagogical agents prompted the learner to use specific self-regulated learning strategies and provided immediate feedback about the use of these strategies. For example, a student self-assesses his understanding of a topic and then takes a quiz. Feedback is provided based on the correspondence between his confidence and his actual performance. In the prompt-only condition, learners received the same prompts but no feedback on their metacognitive skills. In the no-prompt condition, students had the option of self-selecting to use self-regulated learning strategies from the drop-down menu but were not prompted to use these strategies. Prompting was adaptive to each individual learner based on their reading behavior. Analyses revealed that students who received prompting and feedback demonstrated better learning efficiency compared to students who did not receive any prompts. Learning efficiency was calculated by dividing students' post-test scores on a test of text content by the number of minutes they spent learning.

CONTROL

PRIMARY AND SECONDARY SCHOOL

Within Mischel's delay-of-gratification paradigm, researchers have evaluated several strategies to increase preschool-aged children's behavioral control. Children were able to wait longer for a reward when the rewarding item was removed from view, suggesting that avoiding a tempting trigger is an effective strategy to manage temptation (Mischel & Ebbesen, 1970). Other research suggests that preschool-aged children are able to manage their own attention to resist temptation. Children who were told that they should avoid looking at an interesting toy were better able to ignore the toy and work longer on a boring task (Patterson & Mischel, 1976). Since the interesting toy remained in the room during the task, these findings suggest that children utilized the strategy of moderating their own attention. In addition, thoughts about the reward can influence waiting time. Children who were instructed to transform a treat by imagining it as something other than food waited longer for a bigger reward (Mischel & Baker, 1975). For example, children were told to think about how marshmallows were like clouds and pretzels were like tree trunks.

Among older children (fourth and fifth grade), modeling was shown to improve delay of gratification (Bandura & Mischel, 1965). Children who witnessed an adult delaying gratification and verbalizing the benefits of waiting for larger rewards were more likely to choose long-term vs. immediate rewards (i.e. a small bag of salted peanuts today versus a can of mixed nuts in two weeks) compared to children who did not view a model. This effect was also present at a follow-up one month later.

A situation-modification intervention helped high-school students manage behaviors to pursue academic goals (Duckworth, White, Matteucci, Shearer, & Gross, 2016). Students in the intervention group were instructed to remove temptations that might distract them from achieving an academic goal. In particular, they were told that "removing temptations from sight" was more effective "than trying to resist them directly" (Duckworth et al., 2016, p. 335). Students were given particular strategy ideas such as installing apps to block sites like Facebook that might distract them from work. Students who received the intervention reported greater improvements in studying efficiency and better goal progress than a control group.

Additionally, many interventions address emotional control and management skills among primary- and secondary-school students. Social and emotional learning programs represent one category of these interventions. A meta-analysis of 213 school-based universal social and emotional learning programs for kindergarten through to high-school students found that these programs had a significant and moderately strong effect on social and emotional skills (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011). Social and emotional skills include aspects of emotional control, social skills, and other self-management skills such as

planning. The programs had smaller but still significant effects on symptoms of depression, anxiety, and stress, on conduct problems, and on academic performance. Results also suggest that programs were more effective if they followed four recommended practices:

- 1. if they used a connected and coordinated set of activities to achieve objectives relative to skill development;**
- 1. if they used active forms of learning;**
- 1. if they had at least one component devoted to developing personal or social skills; and**
- 1. if they targeted specific social and emotional learning skills rather than skills or positive development in general terms.**

Mindfulness interventions also support improved emotional management among primary- and secondary-school students (Broderick & Metz, 2009; Mendelson et al., 2010). Following mindfulness interventions, students reported that they responded to social stress in more effective ways and experienced decreased levels of negative affect and increased feelings of calmness and relaxation.

Researchers hypothesize that, as a result of better emotional control, students will perform better academically. Direct evidence for this assertion is provided by studies examining the impact of emotional-management training on learning or academic performance outcomes. One study demonstrated that using a more effective emotion regulation strategy (cognitive reappraisal) while watching a sad video supported better memory of a subsequent, educational video (Davis & Levine, 2013). More specifically, children who used reappraisal demonstrated better memory than students who were not instructed to use any emotion regulation strategy. The researchers hypothesized that reappraisal helps to alleviate feelings of sadness after watching a sad film, which frees up attentional resources for the memory task.

Additionally, a stress-management intervention helped improve high-stakes testing performance among secondary-school students (Keogh, Bond, & Flaxman, 2006). Weekly intervention sessions were based on cognitive-behavioral techniques and included lectures about stress and anxiety, strategy instruction on challenging problematic thinking patterns (cognitive reappraisal), and information about physical relaxation strategies. Approximately eight weeks after the intervention concluded, students completed the UK's General Certificate of Secondary Education examination. Compared to a randomly assigned control group, students who participated in the intervention scored significantly higher on the exam.

HIGHER EDUCATION

Within the Self-Regulatory Strength Model of Self-Control, control represents a resource that can be depleted (Baumeister et al., 2007). Limiting this self-regulatory depletion helps increase one's capacity for control. A meta-analysis on this model considered the effectiveness of two strategies for avoiding self-regulatory depletion (Hagger, Wood, Stiff, & Chatzisarantis, 2010). The first strategy involved motivational incentives such as monetary rewards or framing a task as particularly important or meaningful. Motivational incentives had a strong, positive impact on participants' performance on self-control tasks (i.e. persistence at an unsolvable puzzle, resisting tempting food, paying attention in the presence of a distractor) following self-regulatory depletion. Additionally, practicing self-control tasks also protected against self-regulatory depletion. Specifically, practice in one domain translated to increased self-regulatory strength in other areas (Oaten & Cheng, 2006a, 2006b, 2007). In these studies, self-control practice included following an academic

study plan, financial monitoring, and regular physical exercise. It should be noted that these studies included participants of all ages, although many involved college-aged students.

A situation-modification intervention also supported goal progress for college students (Duckworth et al., 2016). Students were instructed on how to remove temptations that might distract them from achieving an academic goal (i.e. installing apps to block distracting sites like Facebook) and were told that this strategy was typically more effective than trying to directly resist temptations. Students receiving the intervention reported better progress toward their goals and that they were less tempted by distractions in their environment compared to a control group.

Mindfulness interventions have been implemented with success in higher-education populations (Deckro et al., 2002; Dvořáková et al., 2017; Hall, 1999). In one study, students participated in two hour-long study sessions each week for a semester (Hall, 1999). For students in the experimental group, brief meditation (natural breathing techniques, relaxation, and attention-focusing techniques) was incorporated at the beginning and end of each study group. Students in the control group simply studied for the entire time, without the addition of meditation. At the end of the intervention semester, students who participated in the meditation intervention had significantly higher semester and cumulative GPAs than the control group.

In addition to managing negative emotions, emotional control interventions can also target the experience of positive emotion. One such intervention was based on the process model of emotional regulation (Gross & John, 2003). The six-week intervention focused on five strategies for enhancing positive emotions (Weytens, Luminet, Verhofstadt, & Mikolajczak, 2014):

- 1. situation selection;**
- 2. situation modification;**
- 3. attentional deployment;**
- 4. cognitive change;**
- 5. response modulation.**

Situation selection included intentionally participating in activities that generate positive emotions, and situation modification involved optimizing events to increase enjoyment. Attentional deployment taught students to be intentionally present in pleasant moments or to relive previous positive experiences. Cognitive change helped students interpret events in a positive way, and response modulation taught them to facilitate positive emotional expression through activities such as sharing good news. Students in the intervention group demonstrated increases in subjective happiness and satisfaction with life and decreases in depressive symptoms when compared to a waitlist control group.

One meta-analysis examined the impact of emotional and behavioral regulation interventions on academic performance among college students (Robbins, Oh, Le, & Button, 2009). The authors describe these programs as “self-management” interventions, and they primarily target emotional-management skills (i.e. anxiety reduction, desensitization, and stress management/prevention programs) as well as behavioral control. These interventions had an overall positive effect on GPA, course grades, and measures of emotional control. Results also indicated that the interventions’ impact on academic performance was partially explained by the effects on emotional control. These findings illustrate how providing college students with the tools to effectively manage their emotions can support improved academic performance.

ATTENTION TO DETAIL

PRIMARY AND SECONDARY SCHOOL

There is little research on interventions that specifically target attention to detail as described in our self-management model. The capacity to pay attention can be considered a precursor to this skill, and several interventions have shown promise for improving children's ability to pay attention. For example, one computer program supporting visual working memory improved attention in preschool-aged children (Thorell, Lindqvist, Nutley, Bohlin, & Klingberg, 2009). In this program, images were presented on a screen, and the children had to remember their location and order. The program lasted for five weeks and included fifteen minutes of training each day. The working-memory intervention had a positive impact on both visual and auditory attention. Additionally, mindfulness interventions have been shown to improve attention and other aspects of executive functioning among primary-school students (Flook et al., 2010; Napoli et al., 2005).

Research on writing instruction suggests that teaching self-regulated writing strategies improves writing quality for fourth-grade students by supporting better planning and revising behaviors (Brunstein & Glaser, 2011). This intervention is based on the self-regulated strategy-development model (Graham & Harris, 2000). More specifically, students were taught to self-monitor during planning, to evaluate the quality of their first draft, and to self-monitor while revising their essays. While not specifically measured in this study, it is possible that this type of instruction makes students more careful writers. Future research should address more specifically whether this type of instruction increases attention to detail while writing.

SUMMARY OF TEACHING SELF-MANAGEMENT SKILLS

There is a robust research literature around teaching self-management skills to children, adolescents, and young adults. In some areas, enough research has been conducted to generate meta-analyses documenting the overall impact of different instructional approaches across studies. More specifically, meta-analyses suggest that implementation intention goal-setting interventions, organizational-skills training, mindfulness interventions, attribution training, and school-based social and emotional learning programs support various aspects of self-management. Individual studies also suggest that providing strategy instruction about goal-setting, time management, metacognitive monitoring, cognitive restructuring and situation management develop self-management skills. Giving students feedback that helps them develop growth mindsets and effort attributions also supports greater academic persistence.



Image: Somenath Mukhopadhyay

Assessing Self-Management

Reliable and valid measurement of self-management skills is also important to the development of these skills. Assessment is first needed to document whether interventions have a meaningful impact. Perhaps more importantly, proper assessment can serve as a tool in teaching self-management. By providing feedback on students' level of competency with various self-management skills, assessments can guide instructors about what type and level of intervention is needed.

SKILL	REPRESENTATIVE MEASURES
Planning	Conley Readiness Index (CRI; Conley, 2014): time management, goal-setting strategies Learning and Study Strategies Inventory (LASSI; Weinstein & Palmer, 2002): time management Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, et al., 1991): time and study environment
Organization	Revised NEO Personality Inventory (NEO-PI-R; Costa, McCrae, & Dye, 1991): conscientiousness, order
Persistence	CRI: effort, persistence strategies MSLQ: effort regulation NEO-PI-R: conscientiousness, self-discipline
Progress Monitoring	CRI: self-awareness, progress monitoring MSLQ: metacognitive self-regulation Junior Metacognitive Awareness Inventory (MAI; Sperling, Howard, Miller, & Murphy, 2002) Situational Judgment Tests (Handel, Artelt, & Weinert, 2013; Schlagmuller & Schneider, 2007)
Control	Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004) Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA; Gullone & Taffe, 2012) MSLQ: test anxiety LASSI: anxiety Situational Test of Emotion Management (STEM; MacCann & Roberts, 2008) Mayer-Salovey-Caruso Emotional Intelligence Test – Youth Version (MSCEIT-YV; Rivers, Brackett, Reyes, Mayer, Caruso, & Salovey, 2012) Values in Action Inventory of Strengths for Youth – Self-Regulation (VIA-Youth; Park & Peterson, 2006)
Attention to Detail	CRI: precision and accuracy NEO-PI-R: conscientiousness, deliberation

Table 2 Pearson Self-Management Framework with representative measures.

Table 2 presents several measures relevant to self-management, along with their alignment to our specific facets. It includes self-report measures in addition to measures based on situational judgment tests (SJTs). We review many of these measures, as well as more behaviorally based measures, in more detail in later sections. We will first provide an overview of evidence-centered design (ECD), which is the framework we use for our discussion about assessing self-management.

EVIDENCE-CENTERED DESIGN

ECD provides a systematic framework for developing assessment tasks to elicit targeted skills (Mislevy, Steinberg, & Almond, 2003). ECD is particularly useful because it provides a process for developing assessments that go beyond traditional activity types (e.g., self-report questionnaires).

The ECD framework consists of three models:

- 1. Student model: defines the claims to be made about learners' competencies;**
- 2. Evidence model: establishes what constitutes valid evidence of the claim;**
- 3. Task model: determines the nature and form of tasks that will elicit that evidence.**

ECD requires thoughtful consideration of the skills one would like to make claims about, tasks or activities that will elicit these skills, and how behaviors within the activity provide evidence of the target skills. We will structure our discussion of measures of self-management within an ECD framework to provide the reader with more concrete examples of how ECD can be applied to self-management.

ASSESSING SELF-MANAGEMENT

The student model is typically the skills outlined within a particular framework, in this case our specific facets of self-management. We will describe task and evidence models aligned to these skills in more detail below.

ASSESSMENT TASK MODELS

SELF-REPORT AND INFORMANT-REPORT

Measures of self-management most commonly involve self-report and informant-report questionnaires, which ask individuals to report on their own or others' characteristics and behavior. These questionnaires include several items (i.e. "I am always prepared"), and respondents rate the extent to which each item is true for them, typically on a Likert scale. Individuals can also complete a questionnaire as an informant, meaning that they comment on how true an item is for someone else (such as a teacher rating the behavior of a student).

A large body of evidence suggests that these measures are reliable, converge with other measures of self-management, and predict relevant outcomes such as academic and occupational performance (e.g., Credé & Phillips, 2011; McCrae & Costa, 1987; Duckworth & Kern, 2011; Duckworth, Tsukayama, & May, 2010; Gullone & Taffe, 2012; Roberts et al., 2005; Roberts et al., 2007; Tangney et al., 2004). Despite this evidence, there are concerns about the use of self-report measures. First, self-report measures can rely heavily on cognitive ability (particularly verbal skills), which can skew measurement among some individuals, particularly younger children (e.g., Nisbett & Wilson, 1977; Whitebread et al., 2009). Additionally evidence suggests that, for some facets of self-management, behavioral or task measures are only weakly associated with self-report measures (e.g., Duckworth & Kern, 2011; Brackett & Mayer, 2003). This finding indicates that different measures may tap into different aspects of self-management, suggesting the need for using multiple measurement approaches to most accurately assess self-management (Duckworth & Yeager, 2015).

GAMES AND SIMULATIONS

Education researchers are increasingly recognizing the potential of games and simulations as assessment tools (DiCerbo, 2014). Games and simulations present students with complex scenarios where they are required to apply knowledge and skills, representing more authentic activities compared to self-report forms. Simulations in particular use technology to mimic a real-world context (i.e. flight simulators, simulated patients; De Jong & Van Joolingen, 1998). By directly eliciting student behaviors, games and simulations provide evidence about specific skills. Additionally, games are often motivating and enjoyable, and simulations mimic real-world phenomena. These characteristics support the validity of assessment embedded within games and simulations since students are more likely to try their best on these activities. Lastly, games typically follow the process loop of activity selection, presentation, evidence

identification, and evidence accumulation (Behrens, Frezzo, Mislevy, Kroopnick, & Wise, 2006), similar to an ECD conceptualization of assessment. For example, in a mathematics class, a teacher may assign a math problem (activity selection) which the student reads and provides an answer to (presentation). The teacher then evaluates whether the answer is correct (evidence identification) and combines this information with information from other math problems to assign an overall score (evidence accumulation). Likewise, within a game, an individual is assigned to a specific level based on past performance (activity selection) and is presented with relevant tasks for that level (presentation). The individual's task performance is scored (evidence identification) and combined with past performance to determine their current level (evidence accumulation). This similarity facilitates the integration of assessments into games.

There are a variety of games and simulations that can assess facets of self-management. Researchers have developed measures of conscientiousness (particularly persistence) based on in-game behavior within Poptropica and Physics Playground (DiCerbo, 2014; Ventura & Shute, 2013). Flight and driving simulators can also provide evidence of emotional management through the detection of physiological signals (i.e. galvanic skin response, heart rate, and temperature) during simulated stressful situations (Hudlicka & McNeese, 2002; Lisetti & Nasoz, 2005). Student behavior, as captured by log files, can provide information on monitoring and other metacognitive processes during an interactive computer-based chemistry simulation (Chang, 2010).

SITUATIONAL JUDGMENT TESTS

SJTs present individuals with a hypothetical, realistic scenario and then ask them about possible responses to the scenario. Individuals are typically asked to either indicate the best response, usually by selecting one response or rank-ordering several responses based on effectiveness, or to indicate how they would respond in the scenario. While not completely authentic, SJTs mimic real-life situations and provide evidence about how students would behave if placed in that situation.

SJTs have been utilized in the assessment of emotional management (e.g., MacCann & Roberts, 2008) and monitoring (e.g., Schlagmuller & Schneider, 2007). Research supports the validity of these assessments. SJTs of emotional management are associated with self-report measures of emotional management, symptoms of depression, anxiety, and stress, coping strategies, and school grades and are unrelated to personality (Games, Fogarty, MacCann, & Robert, 2010; MacCann & Roberts, 2008; Rivers et al., 2012). Likewise, SJTs of monitoring within a learning context relate to academic performance (Lockl, 2012; Schlagmuller & Schneider, 2007).

ASSESSING SELF-MANAGEMENT

ASSESSMENT EVIDENCE MODELS

EVIDENCE MODELS FOR GAME-BASED ASSESSMENTS OF PERSISTENCE AND PLANNING

DiCerbo (2014) described one game-based assessment of persistence using the game Poptropica. In Poptropica, players explore islands where they have to complete quests. These quests typically involve several steps (twenty-five or more) such as collecting and using items and navigating maps while avoiding enemy characters. The game provides time-stamped, log-file data on players' in-game actions. DiCerbo identified two behavioral indicators of persistence: time spent on quest-related events and the number of quest events completed. Each indicator was measured on three different islands. Factor analysis indicated that there was a single underlying factor that explained the variance across indicators fairly well. These findings suggest that the indicators within the game provide evidence of a single persistence construct and can be combined to assign each participant a persistence score. The internal consistency of the indicators indicated adequate reliability. Persistence scores tended to be higher for participants in higher grades, which provided initial evidence of validity because persistence is known to increase with age; however, the author noted that future evidence of validity, including how well the measure correlates with other measures of persistence, is needed.

Ventura and Shute (2013) used an ECD framework to develop an assessment of persistence within the educational game Physics Playground. Physics Playground helps middle and high-school students develop their conceptual understanding of physics. The primary objective in the game is to move a green balloon to a red balloon, which students do by utilizing several agents of force and motion (i.e. ramps, levers, pendulums, and springboards). Students draw the agents, which are then animated and behave according to principles of physics. Students earn a silver trophy if they move the green balloon to the red balloon using any number of objects. Each level has a target number of objects that students can use, and if students beat the level using fewer objects, they earn a gold trophy. Based on time data for both solved and unsolved problems derived from log files, they created a game-based assessment of persistence that was validated against an existing measure of persistence. Ventura and Shute (2013) found that the game-based assessment of persistence predicted learning of qualitative physics after controlling for gender, video-game experience, pretest knowledge and enjoyment of the game. These findings support the implementation of a real-time formative assessment of persistence to be used to dynamically change gameplay. In addition, Shute and Ventura (2013) provide an overview of how Physics Playground in-game actions can provide evidence for other self-management skills. For example, reaching fewer object limits and having fewer unsolved problems with extremely long play times would indicate better planning skills.

EVIDENCE MODELS FOR SJTS OF CONTROL AND PROGRESS MONITORING

MacCann and Roberts (2008) developed an assessment of emotional control skills (the Situational Test of Emotion Management [STEM]) which used an SJT paradigm. In STEM, individuals are presented with a brief description of an emotional situation and asked to choose which of four options would be the most effective strategy for managing the emotion and addressing the problems faced in the situation. The scoring system was based on expert opinion—the best response options were determined by administering the measure to a group of experts (individuals with training in psychology). Alignment between an individual's responses and expert opinion provided evidence of emotional-management skills. The measure showed acceptable reliability. The original STEM was altered for a younger audience, leading to the development of the Situational Test of Emotion Management for Children (STEM-C). Items on the STEM-C focused on situations in school life, such as dealing with a classmate who is cheating. While a formal validation of the STEM-C has not been published, it was used for research purposes by Games et al. (2010). In this study, the STEM-C showed acceptable reliability.

ASSESSING SELF-MANAGEMENT

Rivers et al. (2012) also conducted a validation study of an emotional intelligence measure for children using SJTs: the Mayer–Salovey–Caruso Emotional Intelligence Test—Youth Version (MSCEIT-YV). Emotional intelligence is a broader concept that includes aspects of emotional control. The MSCEIT-YV measures four facets of emotional intelligence, each with distinct assessment tasks:

1. To measure perceiving and expressing emotions, students rate the emotions depicted on a set of faces.

1. To measure using emotions, students describe emotions using texture, color, and energy terms.

1. To measure understanding emotions, students read an emotional description, cause, or consequence and select the associated emotion.

1. To measure regulating emotions, students read vignettes about emotionally charged situations and rate the effectiveness of different responses.

As with the STEM, scoring on the MSCEIT-YV is based on expert ratings, with greater alignment providing more evidence of emotional intelligence. The MSCEIT-YV is designed for children and adolescents aged between ten and seventeen and is reasonably reliable.

The SJT paradigm has also been used to develop measures of progress monitoring that involve students' knowledge and understanding of learning strategies. For example, Schlagmuller and Schneider (2007) presented students with a learning task (typically involving reading strategies) along with several descriptions of different learning approaches. Students then rated each approach regarding its effectiveness for accomplishing the task. Students' ratings were then compared to expert ratings, with stronger alignment providing evidence of greater knowledge about appropriate learning strategies. Schlagmuller and Schneider (2007) report good internal consistency and test-retest reliability.

Handel, Artelt, and Weinert (2013) developed a similar SJT, but with more domain-general items. A domain-general, school-related item could include exam preparation, with students rating the usefulness of strategies such as working practice items or discussing topics with peers. Likewise, a general, non-school-related item could involve rating strategies for planning a birthday party. For each of the items, students rated the usefulness of six different strategies. As with the previously mentioned measures, scoring was based on expert ratings, particularly regarding whether one strategy was superior to another.

EVIDENCE MODELS FOR ASSESSMENTS OF PROGRESS MONITORING AND CONTROL

One method of assessing progress monitoring within the metacognition literature is determining how well an individual's judgments about their performance on a learning task match their actual performance. For example, an individual is asked to

read a text and answer multiple-choice comprehension questions (e.g., Maki, Shields, Wheeler, & Zacchilli, 2005). For each question, the individual rates how confident they are that the question was answered correctly on a scale from 0 percent to 100 percent. Performance on each item is then determined and scored as either 0 percent (incorrect) or 100 percent (correct). Schraw (2009) describes five ways that the fit between performance judgments and actual performance provides evidence of different monitoring skills:

1. absolute accuracy;

2. relative accuracy;

3. bias;

4. scatter;

5. discrimination.

Absolute accuracy measures the average absolute value of the discrepancy between confidence and performance while relative accuracy represents the correlation between confidence and performance. Bias depicts the degree to which an individual either overestimates or underestimates their confidence compared to actual performance. Scatter measures whether an individual's confidence ratings varies more for correct or for incorrect items. Lastly, discrimination assesses how well an individual is able to discriminate between correct and incorrect items based on confidence ratings. Researchers have noted some concerns regarding the psychometric properties of these assessment methods. Notably, some studies have found low reliability for accuracy measures (i.e. Thompson, 1999), and there is little evidence for the validity of these measures (Schraw, 2009).

Galla and colleagues developed a behavioral measure of academic diligence (the Academic Diligence Task [ADT]), which they define as "working assiduously on academic tasks which are beneficial in the long-run but tedious in the moment, especially in comparison to more enjoyable, less effortful diversions" (Galla et al., 2014, p. 3). Academic diligence corresponds to our control facet of self-management because of the emphasis on choosing an activity that is meaningful in the long term over more immediately gratifying options. In the task, students were presented with a split-screen interface with the choice of completing single-digit subtraction problems or watching YouTube videos or playing Tetris. Students were encouraged to do well on the math task and provided with a rationale for how completing math problems helps develop problem-solving skills, while also being told there would be no consequence for choosing to engage in the other activities. Students then spent twenty minutes completing that task. Students' ability to remain on task provided evidence of their control. Data on two specific behavioral indicators were collected: (1) productivity (the number of problems answered correctly); and (2) time spent solving math problems. Nine hundred and twenty-one high-school seniors in two different high schools completed the ADT as part of a study to validate the measure.

ASSESSING SELF-MANAGEMENT

Self-management in Practice

In 2013, Middlesex Community College began a collaboration with Persistence Plus to implement a text-based “nudging” intervention supporting student achievement and retention. “Nudges” are reminders or messages that are structured in a particular way to encourage effective behavior – in this case behaviors that contribute to academic success. This intervention draws heavily on the work of Dr. Richard Thaler and Cass Sunstein, authors of the book *Nudge*, which details how behavioral science research can be used to develop effective nudges. Nudges have the potential to support several self-management skills. For example, nudges can shape more effective planning and goal-setting behavior, help students develop mindsets that drive persistence, and encourage students to leverage campus supports. Dr. Adrienne Maslin, Dean of Students and Chief Student Affairs Officer at Middlesex Community College, shared her experiences with this program.

Through this program, nudges were provided via text message and fell into three different categories: (1) check-in and goal-setting; (2) mindset; and (3) resource engagement. The check-in and goal-setting nudges helped students identify effective behavioral strategies to address current issues. For example, if students indicated that they were experiencing academic challenges, they were encouraged to set academic goals such as studying at regular times or forming a study group. Students practiced good planning by specifying a time and a place where they would accomplish a goal – often referred to as setting an implementation intention. Mindset nudges, the second category, helped enhance student motivation. Early in the semester, students provided the system with a personal motivation message which would be sent to them later, when encouragement was needed. Lastly, resource-engagement nudges helped students think through and engage with their support systems on campus. When feeling stressed by school, students were prompted to identify sources of support including peers or institutional structures such as the advising or counseling offices.

Dr. Maslin was encouraged by student response to the program. Additionally, data suggests that in the first year of the program, fall-to-spring retention (i.e. students enrolled in one fall semester who were still enrolled the following spring semester) rose by seven percentage points. This figure was even higher among students who faced additional barriers to success such as first-generation students, and a randomized study found a similar effect with part-time students. Dr. Maslin also described how the program could provide a foundation for long-term behavioral change. Through this program, students were given the opportunity to practice setting specific, time-linked goals that could help make more effective goal-setting a habit. Additionally, students learned to identify their support systems, which is a skill that extends beyond Middlesex Community College to other academic institutions or the workplace.

Dr. Adrienne Maslin, Dean of Students and Chief Student Affairs Officer, Middlesex Community College, Middletown, CT

Performance on the task decreased across the twenty-minute testing session, indicating that performance was primarily driven by control as opposed to math ability (which would suggest that performance remained constant over time). Correlational analyses provided evidence of validity as both indices of academic diligence were associated with conscientiousness, grit, and a self-report measure of self-control. They were not associated with other, unrelated constructs including extraversion, openness to new experiences, emotional stability, life satisfaction, or math anxiety. Regarding predictive validity, both indices on the ADT were associated with GPA and SAT scores along with an increased likelihood of graduating high school on time and enrolling in college full-time.

Using a similar paradigm, Masucci and Raver (2017) developed a measure of control around reading tasks relevant to academic success: the college knowledge task. Similar to the ADT, students (aged between thirteen and seventeen) were given the choice between reading and answering questions about the college application process (i.e. financial aid and application components) and playing computer games. Specific indicators of control included time on task and accuracy when answering comprehension questions about the topic. Both indicators were associated in the expected directions with measures of impulsivity, executive functioning, distress tolerance, and standardized test scores, providing initial evidence of validity.

SUMMARY OF ASSESSMENT OF SELF-MANAGEMENT

The most established and well-studied measures of self-management are either self-report or informant-report. There is increasing interest in developing more task- and performance-based assessments of self-management. We consider existing measures of self-management within an ECD framework. We identify several task models (games, simulations, and SJTs) and the evidence models that link behaviors in these tasks to the skills of persistence, control, and progress monitoring.

ASSESSING SELF-MANAGEMENT

Avenues for Future Exploration

Within clinical psychology, there is considerable interest around distress intolerance, which is defined as “the inability to tolerate distressing states or the inability to persist at goal-directed tasks when distressed” (McHugh et al., 2011, p. 266). Distress intolerance increases vulnerability for a wide range of psychological disorders (e.g., Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007; Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006).

Acceptance and Commitment Therapy (ACT) is a well-validated method for addressing distress intolerance within the context of psychotherapy (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Using techniques such as mindfulness meditation, ACT helps people become more accepting of unpleasant thoughts and emotions. Within ACT there is also an emphasis on identifying one’s values and recognizing that one often has to accept some unpleasantness to achieve one’s goals. Conceptually, ACT could directly support the self-management facet of persistence by developing individuals’ capacity to tolerate frustration. Despite this conceptual relevance, applications of ACT have typically focused on symptoms of psychological disorders as opposed to the general frustrations that many students experience when they face obstacles in their schoolwork. Future research should consider how elements of ACT can help students better persist during the emotionally frustrating or difficult situations that will ultimately help them meet their academic and career goals.

There are also several ways in which technology can support the development and assessment of self-management. As mentioned previously, researchers are considering how the self-management skill of monitoring can be supported, scaffolded, and assessed within the context of automated tutoring systems (e.g., Azevedo et al., 2012; Graesser & McNamara, 2010). Many people also use a host of technological products to support other areas of self-management. Google Calendar facilitates time management through scheduling events and reminders for events. Applications such as Todoist allow individuals to set goals and manage work tasks and projects, and Google Drive

and Evernote help individuals organize their work products. ECD can be applied to develop an assessment around these online products. Within an ECD framework, interaction with these products represents a task model. Next, researchers would need to specify what behaviors within these products function as indicators of different self-management skills. For example, what pattern of behavior within Google Calendar is indicative of good time management? Relevant behaviors could include:

- **scheduling blocks of time devoted to studying different subjects;**
- **having study time scheduled a certain number of weeks before an exam;**
- **setting reminders a certain number of days before an important project is due.**

Research would then be needed to validate these indicators and further develop and refine the evidence model. Assessing self-management within an online product also provides ample opportunity for feedback and for scaffolding these skills. Returning to the time-management example, in an online calendar tool we might determine that not scheduling time for studying at least two weeks before an exam is indicative of poor time management. If this is detected, the system could then deliver a prompt detailing the importance of scheduling time to study before an exam and offering suggestions for potential study times.



Image: Christof VanDerWalt

Conclusions and Recommendations

The research on self-management reviewed here leads to several conclusions and related recommendations for practice (see Table 3).

CONCLUSION	RECOMMENDATION
Self-management skills are important for academic and occupational success and are associated with other positive life outcomes.	Educators should integrate self-management skills instruction in their teaching.
Self-management involves the skills of planning, organization, persistence, progress monitoring, control, and attention to detail.	Educators should address each of these specific self-management skills in their instruction.
Improving self-management often involves strategy instruction and structured practice implementing these strategies. Specific strategies include: goal-setting, time management, organization, emotion regulation, and metacognitive monitoring	When teaching self-management, educators should include instruction in the following strategies: goal-setting, time management, organization, emotion regulation, and metacognitive monitoring. Educators should explain these strategies and then provide students with structured opportunities to practice them.
Implementation intentions are a particularly useful tool for supporting goal-setting and goal pursuit.	When setting goals, students should be encouraged to identify times or settings where they can act on their goals as well as the specific behaviors they can complete that will support their goals.
Control can be supported through instruction and practice in cognitive restructuring and mindfulness meditation.	Educators should consider teaching students to rethink situations that cause unhelpful and distressing emotions. Educators may also wish to incorporate brief mindfulness practice into their classrooms.
How instructors provide feedback can influence students' capacity for self-management in general and for the skill of persistence more specifically. Feedback should focus on the student's effort and behavior as opposed to ability.	When providing feedback to students, educators should avoid labeling students as "smart" or "good." Instead, praise students' effort, hard work, and behavior. This type of feedback will support a "growth mindset" which will help students work harder when they experience difficulty.
There are many self-report and informant-report questionnaires that assess skills in self-management. These questionnaires allow students to rate their own self-management skills and allow teachers to rate students' self-management skills.	Educators may consider self- and informant-report questionnaires to measure students' self-management skills.
ECD provides a useful framework for developing new assessments, particularly those that focus on self-management behaviors.	Consider utilizing ECD to develop new assessments of self-management skills.
Recent advances in technology have allowed the assessment of self-management skills through real-time performance data from game and simulations.	Specific behaviors captured in these games and simulations can provide direct evidence of different self-management skills. For example, revisiting unsolved problems multiple times suggests greater levels of persistence.

Table 3 Conclusions and recommendations.

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