

CONTEMPORARY APPROACHES TO RESEARCH IN LEARNING INNOVATIONS

Non-cognitive Skills and Factors in Educational Attainment

Myint Swe Khine and
Shaljan Areepattamannil (Eds.)



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Rationale

Learning today is no longer confined to schools and classrooms. Modern information and communication technologies make the learning possible anywhere, any time. The emerging and evolving technologies are creating a knowledge era, changing the educational landscape, and facilitating the learning innovations. In recent years educators find ways to cultivate curiosity, nurture creativity and engage the mind of the learners by using innovative approaches.

Contemporary Approaches to Research in Learning Innovations explores approaches to research in learning innovations from the learning sciences view. Learning sciences is an interdisciplinary field that draws on multiple theoretical perspectives and research with the goal of advancing knowledge about how people learn. The field includes cognitive science, educational psychology, anthropology, computer and information science and explore pedagogical, technological, sociological and psychological aspects of human learning. Research in these approaches examines the social, organizational and cultural dynamics of learning environments, construct scientific models of cognitive development, and conduct design-based experiments.

Contemporary Approaches to Research in Learning Innovations covers research in developed and developing countries and scalable projects which will benefit everyday learning and universal education. Recent research includes improving social presence and interaction in collaborative learning, using epistemic games to foster new learning, and pedagogy and praxis of ICT integration in school curricula.

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Myint Swe Khine and Shaljan Areepattamannil

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PART I
INTRODUCTION

MYINT SWE KHINE

1. NON-COGNITIVE SKILLS AND FACTORS IN EDUCATIONAL SUCCESS AND ACADEMIC ACHIEVEMENT

INTRODUCTION

In the past decades the prediction of academic success has been considered dependent to cognitive factors such as intelligence and academic abilities. However, in recent years researchers in education and social sciences have recognized that non-cognitive factors and skills play a critical role in educational success and achievement (Stankov & Lee, 2014). Researchers firmly believe that non-cognitive factors and skills are equally or even more important than cognitive aspects in educative process and employment potential. When identifying the personal qualities that require to functioning well in the 21st century, the role of non-cognitive factors are often highlighted in the discourse. Increasing attempts are made to investigate the role of non-cognitive factors and how it associates with academic and life success. Barrett (2014) noted that non-cognitive factors should be taken seriously. The notion of ‘non-cognitive’ has many phraseological collocations. Among frequently used collocators are constructs, traits, skills, factors, abilities, variables, outcomes, attributes, and predictors. In addition myriad of other specific factors have been identified as non-cognitive. To name a few, grit, tenacity, curiosity, attitudes, self-concept, self-efficacy, anxiety, coping strategies, motivation, perseverance, confidence are among those frequently referred to in the literature. In some instances non-cognitive factors are considered multifaceted. Some refer to as soft skills and personal characteristics that fall into the affective domain.

The chapters in this book attempt to address in defining non-cognitive traits, ways to measure them, impact of non-cognitive factors and skills and how they can affect the positive outcomes in academic achievement, influence in employability, and success in social life. Some intervention strategies in improving non-cognitive skills are also described. The book is organized into three parts. After the introduction in the first part, the chapters in the second part address conceptual and theoretical foundations on non-cognitive factors. The third part consists of evidence from empirical studies including correlational and longitudinal analyses that signify the relationship between specific non-cognitive factors and educational attainment.

CONCEPTUAL AND THEORETICAL UNDERPINNINGS

This chapter in Part I portrays the synopsis of the chapters in the book. The chapters in Part II describe the conceptual and theoretical underpinnings of non-cognitive factors and skills. Chapter 2 on the importance of non-cognitive skills to educational pipeline is presented by Petway II, Brenneman and Kyllonen. The authors noted that the concept of educational pipeline that includes a series of important transitions from high school to graduation and entry to the workforce. They discussed that non-cognitive skills such as social awareness, resilience, self-confidence, self-management and motivation are important for successful transition through the educational pipeline. They suggested that the development of such skills early, starting from childhood to adolescence could help in their success in schools and beyond.

In Chapter 3, Emma Garcia reiterated the need to address non-cognitive skills in the educational process. The chapter reviewed what is known about the non-cognitive skills, what they are, why they are important and how these affect the educational process. Some of the skills listed are critical thinking, problem solving, social, and emotional health. Other skills include self-control, self-regulation, persistence, academic confidence, team work, organizational and communication skills. It is also important to note that the list may grow or shrink and specific definitions of each skill may vary on age and other relevant factors. The chapter proposed some guidelines for how to design educational policy that can nurture the non-cognitive skills in classrooms. The notion of educated person was highlighted and suggested that educational policies must establish the strategies to help individuals to become fully educated.

Sanchez-Ruiz and her colleagues from Lebanese American University noted that variables such as conscientiousness, academic motivation, emotional intelligence and self-efficacy are recognized as non-cognitive factors that can affect academic performance. In their chapter (Chapter 4) the authors focused on self-efficacy constructs such as academic and emotional self-efficacy, highlight the relationship between self-efficacy and academic performance, and discuss the issues related to measurement of variables, research designs and statistical methods. The authors pointed out the lack of cross-cultural research in this area and divergence effects of cultural differences and academic systems that might inhibit in generalizing the results.

In Chapter 5, McIntyre and Vecchione described that “Non-cognitive factors affect learning; they are not its effect”. The authors examined the three particular non-cognitive factors, namely grit, persistence and resilience and their relationship to teacher effectiveness. Their study attempts to examine the following issues – (i) nature of cognitive vs. non-cognitive factors in teaching and learning, (ii) evidence of non-cognitive factors – grit, persistence and resilience in schools, (iii) non-cognitive factors and teacher preparation and development and (iv) non-cognitive factors and selection and retention of teachers.

Lipnevich, Gjicali and Krumm introduced the taxonomy of non-cognitive constructs that includes attitudes and beliefs, social and emotional qualities, habits and processes and personality traits in Chapter 6. Among these constructs, attitudes and beliefs were selected and more detail definition and conceptualization of attitudes across several subject domains were presented.

Chapter 7 by Anghelache aims to highlight the influence of non-cognitive factors on learning process and students' outcome. In her chapter, a literature review about non-cognitive factors on learning and academic performance was first described. The review covers the effects of non-cognitive factors such as motivation, self-efficacy, self-trust, attitudes, and emotional intelligence. After drawing examples from the studies found in the literature, the author proposed the learning model in Romanian education.

EVIDENCE FROM EMPIRICAL RESEARCH STUDIES

The chapters in Part III cover evidence from empirical research studies related to non-cognitive factors and skills in academic achievement and educational success. Chapter 8 by Lee and Stankov summarizes the empirical findings on non-cognitive influences on academic achievement based on the international data from Program for International Student Achievement (PISA) and Trends in International Mathematics and Science Study (TIMSS). The authors noted that over 200 non-cognitive constructs were measured in these international benchmarking tests and examined the strength of their correlations with achievement. They found that one of the non-cognitive measures, confidence proved to be the best predictor of achievement at both individual level and country level. The authors cautioned that the emphasis on non-cognitive variables does not challenge the evidence showing that cognitive performance is important for individual level outcomes, but some of the non-cognitive variables may augment the cognitive performance of the students. The chapter concluded with the suggestion to identify non-cognitive variables that has strong cross-national relevance and applicability in these large-scale assessment regimes.

In Chapter 9 Leslie Gutman and Ingrid Schoon from Institute of Education, University College London synthesized the causal evidence linking non-cognitive skills to later outcomes in children and adolescents. The authors noted that non-cognitive skills is an umbrella term and generally refer to attitudes, behaviors and strategies that can lead to success in school and at work. These skills include motivation, perseverance and self-control. They examined the experimental evidence on set of non-cognitive skills including self-perception and self-concept of ability, motivation, perseverance, engagement, grit, and self-control. The authors concluded that many of the non-cognitive skills are interlinked and the enhancement of one of the skills without improvement of the others may not lead to lasting changes in students' lives.

Gray, McGuinness and Owende explored fifteen non-cognitive factors of learning related to personality, motivation, self-regulation and learning approach

and their relationship with academic performance. Chapter 10 presents the study that involved 1207 students in three years period (2010–2012) with the aim of profiling the students during their first year in tertiary education. The study measured personality factor (conscientiousness and openness), motivation (self-efficacy, intrinsic and extrinsic goal orientation), self-regulated learning (metacognitive self-regulation, study effort and study time), learning style (deep, shallow and strategic learner) and preferred channel of learning (visual, auditory, kinesthetic and group work). The chapter then presented the detail analysis of the data and findings. The authors concluded that non-cognitive factors such as motivation, self-regulation and approaches to learning are malleable and important for effective learning.

The measurement of social and emotional skills and their association with academic attainment in British cohort studies is the topic of research presented by Joshi, Nasim and Goodman in Chapter 11. The British Birth Cohort Studies are multi-purpose longitudinal studies with a range of potential applications that allows comparison with each other and cohort studies in other countries. The chapter reviews some of the existing attempts to measure non-cognitive skills and the outcomes and describes how social and emotional skills at age 10 can be traced into the academic attainments of cohort born in 1970. The measurement of non-cognitive skills includes self-perception and self-awareness, self-control and self-regulation and emotional health. The chapter reports the findings from the study and authors have concluded that educational attainment does not solely depend on cognitive skills alone and that there are some non-cognitive skills that contribute in educational success. It is reported that among the non-cognitive variables conscientiousness, internal locus of control, and good conduct have substantial association at different educational levels.

In Chapter 12 Nadirova and Burger define non-cognitive factors as “acquirable personal qualities, attitudes and beliefs”. In their chapter the authors described development of non-cognitive assessment instrument and constructs with the use of Student Orientation to School Questionnaire (SOS-Q). The constructs included safe and caring school, peers, external resilience, internal resilience, self-confidence, utility of school and extracurricular activities. The questionnaire was administered to grade 7, 8 and 9 students in Canadian suburban/rural school district. The relationship between student achievement and the SOS-Q constructs were computed using multiple linear regression model. The chapter reports the detail findings from the analysis and concluded that there is a strong link between aspects of student orientation to school, such as self-confidence and extracurricular constructs and academic achievement. The authors have a view that introducing non-cognitive assessment can help strategic planning, evidence-based decision making, and school improvement.

The study on multi-dimensionality of non-cognitive factors in higher education was presented by Thom and Finkelsten in Chapter 13. In order to investigate the multi-dimensional ways that non-cognitive factors influenced academic preparedness, areas such as educational factors, personal factors, affective factors and non-cognitive

skills factors were explored in the literature review section of the chapter. Using the phenomenological approach, the data were collected from 16 college students through semi-structured interviews. Participants were asked about their lived experience related to non-cognitive factors. The open-ended interview allows the researchers to understand how the student's experiences with non-cognitive factors influenced their academic preparedness. The authors reported that the analysis of the interview transcripts reveal four cognitive/non-cognitive distinctions. These are classified as cognitively prepared/non-cognitively prepared, cognitively prepared/non-cognitively underprepared, cognitively underprepared/non-cognitively prepared, and cognitively underprepared/non-cognitively underprepared. The authors concluded the chapter with several recommendations for further research.

In studying the non-cognitive attributes in education, Clough, Oaks, Dagnall, St Clare-Thompson and McGeown proposed the mental toughness framework in Chapter 14. The study utilized 4C's mental toughness model which comprises Challenge, Confidence, Commitment and Control. The study involved the use of mental toughness questionnaire and the mental toughness intervention training lessons. The results showed the statistically significant changes between pre and posttests among the students. Some positive correlations between the mental toughness score and achievements were also found. The chapter concludes that mental toughness is one of the non-cognitive factors that have impact on educational effectiveness.

In complementing Chapter 14, St Clare-Thompson and McGeown report another study using mental toughness as a theoretical framework in Chapter 15. The authors indicated the conceptual similarities and the links between mental toughness and other non-cognitive factors such as resilience, buoyancy, perseverance, self-efficacy, confidence, motivation and personality. The chapter presents some of the studies recently conducted among undergraduate students, children and adolescents. Findings suggested that interventions aimed at enhancing mental toughness have potential effects on attendance, attainment and psychological well-being among students. The authors proposed some research possibilities on mental toughness and the link to academic attainment, test anxiety, academic stress and peer relationships.

Chapter 16 by Carter, Dasson and Kanakis reports the findings from a mixed method study on the practices of educators, principals and teachers in promoting non-cognitive values in preschools in Singapore. In this chapter, non-cognitive elements of learning are considered social norms in a school context. The study attempted to find out the instructional role of educators as change agent and principals' leadership in promoting non-cognitive factors including core values and social conventions with the use of survey and focus group interviews. The results indicated that preschool teachers are "very conscious of teaching non-cognitive schools such as social behavior and rules to the children". The authors concluded that learning social conventions and moral values will provide strong foundations for children to become good citizens.

In Suh-Ruu Ou and Arthur Reynolds' chapter (Chapter 17), the authors presented their findings from their investigation on pathways to college attendance and degree attainment for economically disadvantaged minority youth. The study involved 1379 drawn from Chicago Longitudinal Study. The non-cognitive factors considered in this study were parent involvement, grade retention and classroom adjustment. The study found that the above mentioned factors have direct effects in college attendance and BA degree completion. The authors suggested that their findings have implications for school, educators and policy makers.

The chapter by Areepattamannil and Welch reports the non-cognitive correlates of Emirati adolescents' mathematics performance using a multilevel structural equation modeling. The authors in Chapter 18 highlighted the growing evidence that relationship exists between non-cognitive factors and educational performance, and the degree of their intensity vary from one culture to another. Although research studies that examined the relations of non-cognitive factors with the educational performance of school children in Western countries are prevalent, a few has been conducted in the Middle Eastern countries. The chapter reports the findings from the analysis of relations between non-cognitive factors such as academic motivation, academic self-concept, and academic regulation to mathematics performance among 5116 native adolescents in the United Arab Emirates. The chapter also discusses the implications of the findings for educational policy and practice. The authors in Chapter 19 reviewed the literature on non-cognitive skills and provided evidence that cultural aspect play a role in formation of such skills. The study involved comparing adult education, employment and health outcomes of immigrant groups in the US with different cultural heritage. The chapter reports findings including that the fact that individuals whose cultural heritage places a higher value on qualities are positively associated with conscientiousness and perseverance.

The Part III of the book concludes with the chapter by Afari and Khine. Although several studies have indicated that there is a relationship between non-cognitive variables such as attitudes towards mathematics and achievement in mathematics, few studies have explored the nature of this relationship in the Gulf States. The chapter reports the findings from their study to examine the relationships among enjoyment of mathematics, self-perceptions about students' mathematics ability, and academic achievement in mathematics with the use of Math and Me survey developed by Adelson and McCoach (2011). The results suggest a positive relationship between enjoyment of mathematics and self-perceptions about students' mathematical ability.

The studies on constituents of non-cognitive and skills and how these affect on educational attainment and career and life success are prevalent in the literature (Sparkman, Maulding, & Roberts, 2012; Kautz, Heckman, Diris, Weel, & Borghans, 2014). The concept of non-cognitive factors and skills constitute myriad of variables. The research on the importance and the role of non-cognitive factors and skills has been studied and will continue to be studied in the future. It is hoped that the information contained in this book will provide knowledge, growth and

current thinking about non-cognitive factors and skills and educational and training strategies that can nurture the well-being of individuals.

REFERENCES

- Barrett, L. (2014). What counts as (non) cognitive? A comment on Rowe and Healy. *Behavioral Ecology*, 25(6), 1293–1294.
- Kautz, T., Heckman, J. J., Diris, R., Ter Weel, B., & Borghans, L. (2014). *Fostering and measuring skills: Improving cognitive and non-cognitive skills to promote lifetime success* (No. w20749). Bonn, Germany: National Bureau of Economic Research.
- Sparkman, L., Maulding, W., & Roberts, J. (2012). Non-cognitive predictors of student success in college. *College Student Journal*, 46(3), 642–652.
- Stankov, L., & Lee, J. (2014). Quest for the best non-cognitive predictor of academic achievement. *Educational Psychology*, 34(1), 1–8.

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PART II
CONCEPTUAL AND THEORETICAL
UNDERPINNINGS

KEVIN T. PETWAY II, MEGHAN W. BRENNEMAN
AND PATRICK C. KYLLONEN

2. CONNECTING NONCOGNITIVE DEVELOPMENT TO THE EDUCATIONAL PIPELINE

INTRODUCTION

Understanding the educational pipeline has been of great importance to educators and policymakers as both groups seek ways to help students navigate it successfully. The broadest description of the educational pipeline includes a series of important transitions: persistence through high school, graduation from high school, entry into postsecondary education, persistence through postsecondary education, completion of postsecondary education, and entry into the workforce (Ewell, Jones, & Kelly, 2003; Gándara, 2006). It should be noted that the use of the term *pipeline* as a way to describe this trajectory implies rigidity and linearity that may not accurately represent the fluidity of many of these stages. For example, a high school dropout can proceed into the workforce and then obtain a high-school equivalent degree at a later time. Similarly, a student who graduated from a vocational school and enters the workforce may choose to complete a bachelor's degree in another field after 15 years of work related to their vocational education. Though we continue to reference the *educational pipeline* throughout this chapter, it is important to be cognizant of the limitations of the term.

Traditional K-12 curriculum focuses on the cognitive skills and abilities considered necessary for academic achievement. Consequently, most past research on student transition through the pipeline has limited itself to traditional indicators of academic success such as mathematics performance. However, noncognitive constructs have been more widely endorsed recently as growing evidence suggests that the development of constructs like social awareness, resilience, self-confidence, self-management, and motivation may be just as important as traditional cognitive constructs to student success in school, the workforce, and life in general (e.g., Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Greenberg et al., 2003). In the present chapter, we identify the noncognitive constructs currently considered important for effective transition through the educational pipeline, emphasizing those that link K-12 noncognitive development to college readiness and the workforce. Following, we provide a brief overview of research on the development of noncognitive constructs in K-12 and discuss why it is so important to address the development of these constructs as early as possible.

WHAT ARE NONCOGNITIVE CONSTRUCTS?

A conversation about noncognitive constructs requires at least a brief attempt at defining the term *noncognitive*. The most basic interpretation of the term can be derived from what it negates – those attributes that are measured in typical cognitive or achievement tests. Unfortunately, the literature has not settled on a stable definition of the term (Camfield, 2015). To add confusion, this collection of skills, traits, behaviors, mindsets, and attitudes is often categorized using other terms: psychosocial factors (likely from Erikson’s theory; see Erikson, Paul, Heider, & Gardner, 1959), social-emotional learning skills (Elias et al., 1997), soft skills (e.g., Heckman & Kautz, 2012), 21st century skills (Partnership for 21st Century Learning, 2015), personality (e.g., McDougall, 1932), character skills (e.g., Tough, 2012), and grit (Duckworth, Peterson, Matthews, & Kelly, 2007).

There have been extensive discussions between many over the appropriateness of the myriad terms used to encapsulate these personal attributes. The term *noncognitive* is quite prominent but it has also been a source of controversy for those invested in the study and development of these constructs. Those who consider the term inappropriate often stress its inaccuracy – cognitive processes underlie every thought a person has and every behavior that person exhibits. Relegating non-academic personal attributes to “noncognitive” ignores how fundamental cognition is to them. Unfortunately, comparable general terms such as *soft skills* have their own semantic limitations. To many, “soft” undermines the importance of these attributes, presenting them as less valuable or even less real. Potentially less offensive terms such as *social-emotional skills* come up short in adequately describing the full gamut of attributes many believe constitute noncognitive constructs (e.g., problem solving). Despite reservations about the term *noncognitive*, our chapter proceeds with its use because it can be thought of as the most omnibus term for these attributes as compared to other terms that are more focused or narrowly defined.

WHICH NONCOGNITIVE CONSTRUCTS ARE MOST IMPORTANT?

Though it is useful to examine and dissect the meaning of *noncognitive*, its definition does not provide much utility to policymakers and practitioners. Instead, identifying the constructs that have greater perceived importance might be of more practical use. The benefits of such a task are manifold: It provides researchers with a manageable set of constructs to investigate; it helps educators and other practitioners focus on a key set of developable constructs; it gives policymakers a clear set of constructs to integrate into future education programs and policy decisions; and it presents employers with a larger pool of potential employees that exhibit the types of skills they want.

The last benefit is a key motivator of much of the research on noncognitive constructs. There is a perceived mismatch between what students are learning at school and what people need to succeed in the workforce (and the world;

Greenberg & Nilssen, 2015), which grows more evident over time as the demands of employers shift to accommodate changes in technology and the markets. More explicitly than ever before, employers are voicing their desires for innovators, problem solvers, team players, and a host of other categories of people, highlighting just how important employers consider certain noncognitive constructs to economic stability and growth. This assertion is supported by a 2006 report summarizing findings from a comprehensive study of 21st century skills that employers believed would increase in importance five years later. In the report, Casner-Lotto and Benner (2006) revealed that 11 of the 12 factors that at least 50% of employers indicated would be more important in the future were noncognitive constructs. This list included critical thinking and problem solving skills, teamwork and collaboration, and creativity and innovation. Employers also felt that these skills were important for high school, vocational school, and four-year college graduates, suggesting that these constructs have consistent value regardless of the level of education a student chooses to pursue.

Other researchers have developed similar lists. For example, Kautz, Heckman, Diris, Weel, and Borghans (2014) identified an almost identical set of noncognitive constructs that they considered necessary for lifetime success. Garcia (2014), whose approach to the selection of constructs involved examining the research, understanding the goals of public education, and identifying the factors that affect the relationship between students and teachers, created a list of constructs that she called the *education policy list of noncognitive skills*. This included constructs such as persistence, teamwork, creativity, and communication skills. Despite arriving at her list a different way, many of the constructs that she identified as important from an educational policy perspective align with those that employers are looking for in potential employees. Finally, the University of Chicago (UC) Consortium on Chicago School Research (CCSR) developed a broad framework that encapsulates a large number of noncognitive constructs. The five components of the framework described by Farrington et al. (2012) are: academic behaviors, academic perseverance, academic mindsets, learning strategies, and social skills. Of these, the components that the authors believed best align with college-related outcomes are academic mindsets, social skills, and learning strategies. Figure 1 highlights some of the overlap in noncognitive constructs between several references sources.

The most endorsed constructs in Figure 1 are core self-evaluation, critical thinking, communication skills, work ethic, integrity, and teamwork. For clarity, core self-evaluation is a broad term that encompasses locus of control, self-esteem, emotional stability, and self-efficacy (Judge & Bono, 2001). Surprisingly, creativity was not endorsed as often despite growing demand in the workforce; however, the two sources that did highlight it were those that identified constructs based on their relevance to success in the workforce and life in general.

Unfortunately, this list may still be incomplete. Sedlacek (2011), in his examination of what noncognitive constructs were important for college readiness

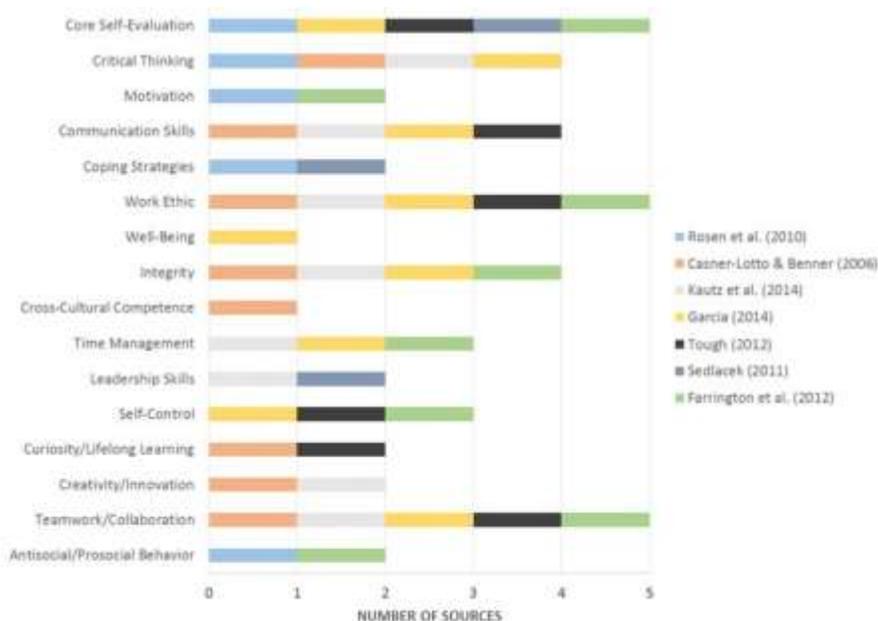


Figure 1. Constructs endorsed by each surveyed source

assessments, argued that the education systems in the United States were designed for *traditional students*, which Sedlacek described as young, White, heterosexual, cisgender males of European origin who do not have disabilities. Those outside of these classifications (in one or many ways) endure certain experiences that may be specific to their identification as “others” in systems that are not tailored to them. For example, Sedlacek highlights the importance of one’s ability to understand and handle racism, and considers this one of the eight noncognitive constructs that any assessment of college readiness should include. As an experience that is more acutely felt by people of color, there is often a need to navigate a given system with potential skin-color or racial discrimination overlain, something that would not be felt by those that fall within the traditional group. The report by Farrington et al. (2012) supports this, summarizing research by others that suggests racial minorities, particularly black Americans, have to actively combat negative impressions and stereotypes that can lead to intellectual inferiority (Palmer, Davis, Moore, & Hilton, 2010). Sedlacek notes too that the use of “racism” here does not to exclude other types of “isms” like sexism. A cisgender or transgender women may have experiences unique to their gender identity that can impact their ability to navigate a particular system. While concepts like integrity or cross-cultural competence may suggest a person’s ability to deal with any type of discrimination, explicit assessments of concepts like navigating sexism may be more useful from

a sociocultural perspective, and knowledge of this information could help improve development of other noncognitive constructs such as teamwork and communication skills.

WHY ARE NONCOGNITIVE CONSTRUCTS IMPORTANT?

In an ideal world, a desire to develop the whole person would be its own reward. Noncognitive constructs are simply another part of each and every person, and as such should be nurtured and developed for their own sake. However, this type of argument would not resonate with a policymaker or investor. Instead, tangible evidence of the importance of noncognitive constructs is required to demonstrate that these constructs are worth an investment of time, money, and other resources. Fortunately, a host of researchers have investigated this and found a number of meaningful relationships between noncognitive constructs and other factors that we already consider important (e.g., job performance, well-being, and later life success). This section summarizes some of the extensive research in this area.

Academic performance is considered a key indicator of student success, and is one of the most common outcomes explored by researchers interested in noncognitive constructs. Though many practitioners have argued that success in school is driven by more than strict content knowledge, until relatively recently, there were few studies to support this empirically. Several notable cross-sectional and longitudinal studies have been conducted over the last decade that provide clearer linkages between noncognitive constructs and academic performance. For example, an assortment of studies linked the Big Five personality factors, particularly conscientiousness, to academic performance at all levels of schooling (e.g., MacCann, Duckworth, & Roberts, 2009; Poropat, 2009). Related constructs like time management were predictive of achievement in 7th grade students (Liu, Rijmen, MacCann, & Roberts, 2009). Data from several large-scale domestic and international assessments revealed that both self-efficacy and self-concept predicted reading, science, and math achievement for middle school students, even after adjusting for demographics, school attendance, and home educational material (e.g., Lee, Redman, Goodman, & Bauer, 2007). Reeves, Venator and Howard (2014) related student drive and prudence (e.g., self-control) to several outcomes and found that higher levels of these constructs were indicative of higher high school graduation rates. Finally, Wang, MacCann, Zhuang, Liu and Roberts (2009) found meaningful relationships between teamwork skills and grades in both science and math for high school students.

One very comprehensive investigation of in-school intervention efforts was conducted by Durlak et al. (2011), who examined over 200 studies addressing school-based social and emotional learning (SEL) programs for children from kindergarten through high school (ages 5–18). The studies incorporated into their meta-analytic review described research that took place at any point from 1955 through 2007, included a control group, stressed the development of one or more

SEL skills, and excluded studies targeting special populations (e.g., pre-existing behavioral, emotional, or academic problems) and interventions focused on physical health outcomes (e.g., drug use, pregnancy). The results of their meta-analysis suggest that SEL programs not only improve SEL constructs, but also improved academic performance as measured using test scores and grades. In fact, the benefit to academic performance was quite substantial – relative to the control group, students that participated in an SEL program demonstrated an 11 percentile gain in achievement on average.

Outside of school, noncognitive constructs have been found to predict job performance (Barrick, Mount, & Judge, 2001), health behaviors (Ajzen, Albarracín, & Hornik, 2007; Bogg & Roberts, 2004), life satisfaction (Diener & Lucas, 1999), marital satisfaction (Watson, Hubbard, & Weise, 2000), peer relationships (Jensen-Campbell et al., 2002), and several other important outcomes. Others, such as Cohen (2006), as well as Ross, Powell, and Elias (2002), linked noncognitive constructs to successful professional development, decision making, and well-being. Finally, Heckman, Stixrud and Urzua (2006) found associations between increased levels of noncognitive constructs and a number of outcomes: lower teenage pregnancy, less participation in crime, less illegal activity, increased wages, increased work experience, and higher levels of education. Even more intriguing, they noted that noncognitive constructs were usually as predictive of these behaviors as cognitive skills. In some cases, noncognitive constructs were even more predictive than cognitive skills. These relationships were generally nonlinear, with noncognitives often exhibiting steeper slopes than cognitive skills, though the authors notes some variation by gender.

Using data from several past employer surveys, Kautz et al. (2014) revealed that employers tended to rank several noncognitive constructs (e.g., self-management, communication skills) ahead of basic skills (e.g., reading), reinforcing Casner-Lotto and Benner’s (2006) findings. They also reported that the difficulty employers have finding candidates is heavily linked to inadequate noncognitive constructs. Job candidates often exhibited basic academic skills, but lacked sufficiently developed noncognitive constructs like problem solving, teamwork, communication, and adaptability. Similarly, employers seeking entry level or hourly workers tended to reject candidates who lacked skills related to time management and work ethic.

HOW DO WE MEASURE NONCOGNITIVE CONSTRUCTS?

There are numerous approaches to measuring noncognitive constructs, and each one comes with a hosts of strengths and weaknesses. It is important to evaluate and understand each approach because the way in which a construct is measured may impact conclusions that can be made about an individual’s standing on the construct. This section describes a number of these, including some promising approaches that are not commonly used in K-12 research. Duckworth and Yeager (2015) recommend adopting multiple methods of assessment to measure noncognitive

constructs. Such an approach can greatly improve reliability and validity. Of course, assessment methods demand variable amounts of time, effort, and money. These considerations should be taken into account when making decisions about which methods to use.

Self-Report Likert

This type of measure is by far the most common approach to measuring noncognitive constructs. In fact, many of the findings discussed in this chapter are based on assessments that incorporated Likert-type rating scales. Their appeal is easily understood. They are easy to develop, simple to administer, straightforward to score, and typically succinct. Collectively, this means these measures often “get the job done” with minimal time, money, and effort. However, they are susceptible to socially desirable responding, which is a type of falsification or faking behavior where respondents try to present themselves in the most favorable light (Zerbe & Paulhus, 1987). By design, Likert scales are transparent, where each response point aligns with a hypothesized level of the measured construct. As a result, if respondents recognize what a statement is trying to assess (and they often do), the straightforwardness of the response scale makes it easy to choose the response that provides the most positive impression. This is a major limitation as there is nothing to reliably reduce or prevent such responding. However, despite this limitation, there is evidence to suggest socially desirable responding may not actually affect the relationships between noncognitive constructs and certain criterion variables. Specifically, relationships with personnel selection and job performance seem unaffected when social desirability is assessed using scales of social desirability (e.g., Ones & Viswesvaran, 1998; Schmitt & Oswald, 2006). In a related effort, Hogan, Barrett, and Hogan (2007) found only negligible changes in personality scores for applicants who were rejected for a job but later reapplied. To the researchers, this suggested limited desire to inflate responses despite being rejected after the previous application attempt. How well these findings generalize to other types of criterion variables and other populations has not been examined enough.

A more unintentional form of misrepresentation manifests as differences in response style (e.g., the tendency to choose the extreme categories; Clarke, 2000). These are considered unintentional because they are related to interpretations of the response scale and not to true differences between individuals or groups. Reference bias is a related phenomenon where respondents rely on different frames of reference to judge their level of a particular construct (King, Murray, Salomon, & Tandon, 2004). This is often observed at the group level, particularly in cross-cultural research, as can be seen from recent analyses of data from the Program for International Student Assessment (PISA). Kyllonen and Bertling (2013) found a discrepancy between within-country and between-country correlations between self-reported conscientiousness and academic performance. Within-country correlations showed a positive relationship while between-country correlations suggested a

negative relationship. They used anchoring vignettes (King & Wand, 2007) to address what they believed to be issues of reference bias.

Self-Report Biographical

These measures allow respondents to provide information about the occurrence of past events. Items in these types of measures generally focus on the frequency of behaviors (e.g., tardiness) or gather information about previous experiences (e.g., “have you ever smoked?”). Since the response scales for these items tend to have less subjectivity than the scales associated with Likert-type items, response style differences are not a problem. However, the items themselves are still quite transparent, which makes them vulnerable to socially desirable responding. In addition, reliable responses can only be obtained if a respondent is able to accurately recall information. This may be more difficult for events or behaviors that are not common, occurred well into the past, or are spread out over a wide range of time.

Self-Report Situational Judgments

This type of item typically presents (via text, audio, or video) a scenario describing a problem, which is followed by a series of possible solutions that respondents can choose to indicate how they would address the problem (Mattern et al., 2014). Situational judgment tests (SJTs) have been used to predict success in college (Oswald, Schmitt, Kim, Ramsay, & Gillespie, 2004) and the workforce (McDaniel, Morgeson, Finnegan, & Campion, 2001), as well as professional schools such as medical school (Lievens & Sackett, 2006) and dental school (Buyse & Lievens, 2011). Oswald et al. (2004) administered a collection of SJTs measuring constructs such as interpersonal skills and adaptability to undergraduate freshmen students. They found that the SJTs added incremental predictive validity to GPA and absenteeism, among other outcomes. Buyse and Lievens (2011) obtained similar results when they used SJTs measuring interpersonal skills to predict academic performance in dental school.

SJTs have demonstrated a resistance to socially desirable responding (McDaniel & Nguyen, 2001; Nguyen, Biderman, & McDaniel, 2005), a reduced tendency to produce disparities by race/ethnicity or gender that have been observed with other types of measures (e.g., cognitive tests; Oswald et al., 2004; Sternberg, 2006; Wang et al., 2009; Whetzel, McDaniel, & Nguyen, 2008), and greater appeal to test takers than traditional Likert-type measures. All of these factors combined suggest that SJTs would be another useful tool to measure noncognitive constructs in K-12. With a couple of exceptions (e.g., Grigorenko et al., 2009; Sternberg, 2006; Wang, MacCann, Zhuang, Liu, & Roberts, 2009), SJTs have not been utilized nearly as much in K-12 as they have been in the workforce or higher education. This may be a product of their limitations. They are often lengthy, quite costly to develop, and require longer tests to achieve acceptable reliability (Oswald et al., 2004). Due

to their (potentially) high reading load and the nature of their design, the intended construct(s) can become muddled and confounded by extraneous or unsolicited constructs (Wang et al., 2009; Whetzel, McDaniel, & Nguyen, 2008). They are also not immune to socially desirable responding, as the best response options may be very obvious.

Self-Report Forced-Choice

Like SJTs, forced-choice items are not often used to measure noncognitive constructs in K-12. However, they have been used in other contexts (see Drasgow et al., 2012; Naemi, Seybert, Robbins, & Kyllonen, 2014) as researchers seek to address the issue of socially desirable responding that plagues other types of self-report measures. To accomplish this, forced-choice items present multiple (usually two or three) competing statements that appear to be equally desirable. A respondent is then asked to choose the statement that is most like them. In the case of three statements, the respondent may also be asked to choose the statement that is least like them, though it is also possible that the respondent may be asked to rank the statements instead of making explicit choices about most and least. A meta-analysis by Salgado and Tauriz (2012) revealed that forced-choice measures exhibited higher correlations with relevant academic and workforce outcomes than self-report Likert-type measures, a finding that may be related to increased difficulty responding in a way that presents oneself favorably. Keep in mind, forced-choice assessments can still be *faked* because a respondent can easily misrepresent themselves by lying. This could be due to disinterest in the assessment, a general desire to “cheat,” or a more targeted goal of presenting oneself favorably on certain constructs if the respondent is aware of those constructs that are considered more important to the evaluator (e.g., the employer or school). With forced-choice measures, there is also a risk that requiring respondents to compare equally desirable statements may prove difficult and frustrating, especially for youth who may not be familiar with making such judgments.

Other-Report

Like self-reports, other-reports can vary in a number of ways. The “other” here could refer to a teacher, counselor, parent, peer, coach, employer, subordinate, sibling, or numerous other people. Generally, the goal of other-reports is to gather information from people who may have insight into the attitudes, beliefs, behaviors, and performance of the student. Any of the aforementioned methods *could* be utilized for this purpose, but Likert-type and biographical measures tend to be used almost exclusively. The strengths and limitations of both are the same as those attributed to their use in self-report contexts. While students cannot misrepresent themselves, the other rater *can*, and might even feel incentivized to do so given the right conditions (e.g., if the student’s other-reported performance impacts the rater

as well). Biases can also motivate a rater to evaluate a student differently, though whether this is intentional or not may depend on whether the biases are implicit or explicit. Despite these weaknesses, there is evidence to suggest other-reports provide better judgments of actual student skill levels than traditional self-report, and they may also be better predictors of future behaviors (Connelley & Ones, 2010). Aside from Likert-type and biographical assessments, other approaches utilize observations or interview sessions (especially with younger children), where the observer or interviewer is ultimately asked to rate and report on a number of different characteristics about the student (Secondary School Admissions Test Board, 2014). These approaches can incorporate a performance component as well (particularly those that are tied to communication and teamwork), but any resultant score or evaluations rely on the judgments of the observer(s) or interviewer(s). It is important to note that while obtaining input from others is a useful endeavor, this type of assessment can be difficult to accommodate because of the amount of time, money, and/or effort that is needed to secure adequate samples and coordinate the process of gathering ratings.

Performance Tasks

This type of assessment can range in complexity from very simple examinations of the Stroop effect¹ (via the Stroop test; Stroop, 1935) to complex games. Performance tasks can be very appealing to researchers in K-12 because they are often more interactive, which makes them more enjoyable, and they are not as demanding of verbal skills as many of the other assessment methods discussed up to this point. As with self-report Likert and forced-choice measures, they can assess several skills, abilities, or competencies in a relatively short period of time. Finally, one of the key benefits of performance tasks, when designed to account for it, is there resistance to social desirability. Much like a cognitive test, noncognitive performance tasks can be nearly impossible to cheat, which minimizes the risk of socially desirable responding. As with any other type of assessment, faking can still occur if the goal is simply to deceive – that is, a respondent could choose to answer incorrectly or disengage from the task at certain points at their will.

HOW, WHEN, AND WHERE ARE NONCOGNITIVE CONSTRUCTS DEVELOPED?

Noncognitive constructs have traditionally been considered fixed, a product of genetics and early childhood socialization. However, a notable amount of recent research suggests these factors are actually pliable (Kyllonen, Roberts, & Stankov, 2008). For example, a meta-analysis by Roberts, Walton, and Viechtbauer (2006) found that personal qualities like social vitality, social dominance, agreeableness, conscientiousness, emotional stability, and openness to experience all change throughout the lifespan. Similarly, interventions targeting specific attitudes and skills, such as test anxiety, communication, resilience, and self-efficacy, can

positively affect the levels of these in students (e.g., Greenberg et al., 2003; Hembree, 1988; Matthews, Zeidner, & Roberts, 2012). Finally, Durlak et al. (2011) found that students in school-sponsored social and emotional (SEL) programs consistently experienced more noncognitive *and* academic achievement growth than students who did not participate in these programs.

In their review, Kautz et al. (2014) observed two important factors that affected the efficacy of noncognitive interventions: (a) those programs targeting early childhood and elementary school were more effective than those targeting adolescents; and (b) those (often remedial) programs designed for adolescents or children who grew up in disadvantaged communities functioned best when other resources such as mentoring and guidance were provided alongside any skills training. These discoveries make sense for a number of reasons. Early acquisition of critical skills that promote better learning habits and greater school engagement provide students with more time to use and further develop these skills. Some outcomes are better utilization of time in school and a drive towards more self-motivated learning. Development of these skills in adolescence or even after limits their scope of use because they are not present to as notable a degree during critical developmental periods (early childhood and pre-adolescence). However, as Kautz and colleagues suggest, with sustained intervention, guidance, and mentorship, students can still reap benefits from later-life enhancement of noncognitive constructs.

Another finding from the Casner-Lotto and Benner (2006) and Greenberg and Nilssen (2015) reports was that K-12 schools and four-year colleges carry the brunt of workforce readiness, as over two-thirds of surveyed employers felt that these institutions were responsible for the development of relevant skills. The focus on schools is understandable because they are relatively controlled environments, but Kautz et al. (2014) argued that the expectation for schools to supplement learning that should take place at home impacts the ability of schools to develop basic academic skills in students. From their perspective, many of the learning deficits in noncognitive constructs occur well before schooling begins, and K-12 education can only play catchup. As a result, the ideal period for interventions or training is before any formal schooling takes place. These programs influence youth when their brains are most malleable and have the potential for the most long-lasting effects. Kautz et al. (2014) also observed that the most effective of these programs included parents, supporting the notion that environmental factors are just as critical to development as formal training or education. Parenting quality is one of the most important factors influencing child development, so it makes sense that programs also targeting parents led to the most positive benefits for children. This observation holds for programs focused on early childhood education (i.e., kindergarten and early elementary). In their review of many of the early childhood programs evaluated by Durlak et al. (2011), Kautz et al. (2014) found that those with parental involvement tended to show more promising long-term results than those without this involvement.

Many researchers have pushed for research and practice that more actively incorporates knowledge of environmental and sociological factors (e.g., Durlak et al., 2011). Shonkoff and Phillips (2000) assert that these factors have pervasive and cumulative impacts that can start from conception and continue prominently through early childhood. This can lead to notable gaps between groups of students, as can be seen from research that relates proxies for these factors to noncognitive constructs. For example, Garcia (2014) found that there were large gaps in several noncognitive constructs by socioeconomic status (SES). Students in the bottom two SES quintiles (and even those in the middle quintile) tended to be below students in the top quintile by a quarter of a standard deviation or more on self-control, approaches to learning, rule following, persistence, and curiosity. The presence of such a gap in noncognitive constructs may be disheartening; however, given research that suggests these constructs are more malleable, Garcia's findings support the need to first close the gap in noncognitive constructs before attempting to tackle what is often called the *achievement gap*.

HOW DO NONCOGNITIVE CONSTRUCTS RELATE TO THE ACHIEVEMENT GAP?

In the United States, the achievement gap phenomenon expresses itself primarily in three ways. The first is by gender. Girls consistently outperform boys in literacy, but gender differences in mathematics performance vary based on the context that is considered. Research suggests that girls also outperform boys when classroom mathematics performance (i.e., mathematics GPA) is examined (Dee, 2007). However, a 2015 report by the College Board reveals that boys have consistently scored higher on the SAT mathematics test (on average) than girls by at least 30 points between 1972 and 2015 (The College Board, 2015). Further muddling our understanding of mathematics differences by gender, national metrics like the National Assessment of Educational Progress (NAEP) have not observed any notable differences between boys and girls on 4th or 8th grade mathematics performance.

The second form of the gap is associated with race/ethnicity. Black and Hispanic/Latino students tend to exhibit lower levels of academic performance than white students based on a variety of measures, including the NAEP assessment. Further supporting Shonkoff and Phillips' (2000) belief, as well as Kautz et al.'s (2014) findings, research shows that this form of the achievement gap actually occurs well before formal schooling (Gándara, 2006). Finally, the achievement gap manifests itself by SES, which behaves similarly here to Garcia's (2014) findings on noncognitive skills. Students from lower SES families perform worse academically and persist through high school and college at lower rates. Of course, it is possible that the actual problem here may be access, as Kirsch, Braun, Yamamoto, and Sum (2007) suggest. Many individuals from low-income families in particular lack access to proper skill development (e.g., education) that is afforded to others

raised in more financially secure or stable home environments. Therefore, much of the observed gap in achievement by SES, and possibly race/ethnicity, could be tied to what is more accurately considered a gap in opportunity.

So what can noncognitive constructs do about these gaps? Though there is evidence to suggest noncognitive constructs *can* positively impact cognitive skills, a comprehensive review of the literature by Farrington et al. (2012) revealed that much of the present research on noncognitive constructs has yet to adequately support their ability to close the achievement gap. They surveyed the literature to find support for the relationships between the achievement gap and the five noncognitive factor groups that comprise their noncognitive framework. The most promising findings were related to academic mindsets. The reported interventions that targeted mindsets (e.g., stereotype threats) produced positive changes to outcomes like grades for certain subgroups (e.g., black Americans). However, they noted limitations due to how late these interventions occurred (high school) and the extent to which negative mindsets drive the achievement gap. The authors concluded that extensive research is still needed to truly understand how the noncognitive constructs in their framework contribute to achievement gaps.

CONCLUSION

Over the last two decades, researchers have expanded the literature on noncognitive constructs, associating them with a number of important outcomes as well as to effective transition through the educational pipeline. Interest in developing noncognitive constructs as part of the established K-12 curriculum is steadily increasing. In the United States, the Common Core State Standards (CCSS) were, for a time, the basis for curriculum development in K-12. However, the CCSS included no explicit mention of or recommendation for noncognitive constructs. The Every Student Succeeds Act (ESSA), which was signed into law on December 10, 2015 and includes many changes separating it from CCSS, encourages states to use alternative indicators of student success besides standardized measures to evaluate school accountability. Given this shift, it is possible that constructs like grit and growth mindset may join traditional academic skills such as reading, writing, and arithmetic in the next few years.

Though many people involved in education and policy no longer deny the significance of noncognitive constructs, there is much work that needs to be done to develop programs and interventions that can be scaled nationwide and even worldwide. Expanding programs could provide opportunities for more robust longitudinal and randomized control studies, both of which would improve the claims that can be made about the efficacy of these programs. In addition, subsequent research needs to explore the use of a variety of measurement approaches (e.g., forced-choice assessments) to better understand the development of noncognitive constructs in K-12 and beyond.

NOTE

- ¹ One approach to demonstrating how mismatched information can lead to slower reaction times and increased errors. The original Stroop test used colors to show this by presenting participants with a series of color names, each presented in a particular color. Participants had to name the color of the word, not read the word itself. The Stroop effect is the finding that participants react slower and make more errors when the name of the color and the color of the word do not match (e.g., the word “red” is colored purple).

REFERENCES

- Ajzen, I., Albarracín, D., & Hornik, R. C. (Eds.). (2007). *Prediction and change of health behavior: Applying the reasoned action approach*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and performance at the beginning of the new millennium: What do we know and where do we go next? *International Journal of Selection and Assessment*, 9, 9–30.
- Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin*, 130, 887–919.
- Buyse, T., & Lievens, F. (2011). Situational judgment tests as a new tool for dental student selection. *Journal of Dental Education*, 75, 743–749.
- Camfield, L. (2015). Character matters: How do measures of non-cognitive skills shape understandings of social mobility in the global North and South? *Social Anthropology*, 23, 68–79.
- Casner-Lotto, J., & Barrington, L. (2006). *Are they really ready to work? Employers' perspectives on the basic knowledge and applied skills of new entrants to the 21st century US workforce*. Washington, DC: Partnership for 21st Century Skills. Retrieved from http://www.p21.org/storage/documents/FINAL_REPORT_PDF09-29-06.pdf
- Clarke III, I. (2000). Extreme response style in cross-cultural research: An empirical investigation. *Journal of Social Behavior & Personality*, 15, 137–152.
- Cohen, J. (2006). Social, emotional, ethical, and academic education: Creating a climate for learning, participation in democracy, and well-being. *Harvard Educational Review*, 76, 201–237.
- Connelly, B. S., & Ones, D. S. (2010). Another perspective on personality: Meta-analytic integration of observers' accuracy and predictive validity. *Psychological Bulletin*, 136, 1092–1122.
- Dee, T. S. (2007). Teachers and the gender gaps in student achievement. *Journal of Human Resources*, 42, 528–554. doi:10.3368/jhr.XLII.3.528
- Diener, E., & Lucas, R. E. (1999). Personality and subjective well-being. In D. Kahneman, E. Diener, & N. Schwartz (Eds.), *Well-being: The foundations of hedonic psychology* (pp. 213–229). New York, NY: Russell Sage Foundation.
- Dragow, F., Stark, S., Chernyshenko, O. S., Nye, C. D., Hulin, C. L., & White, L. A. (2012). *Development of the Tailored Adaptive Personality Assessment System (TAPAS) to support army selection and classification decisions* (Technical Report 1311). Fort Belvoir, VA: U.S. Army Research Institute for the Behavioral and Social Science.
- Duckworth, A. L., & Yeager, D. S. (2015). Measurement matters: Assessing personal qualities other than cognitive ability for educational purposes. *Educational Researcher*, 44, 236–251. doi:10.3102/0013189X15584327
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, 92, 1087–1101.
- Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child development*, 82, 405–432.
- Elias, M. J., Zins, J. E., Weissberg, R. P., Frey, K. S., Greenberg, M. T., Haynes, N. M., Kessler, R., Schwab-Stone, M. E., & Shriver, T. P. (1997). *Promoting social and emotional learning: Guidelines for educators*. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).

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- Erikson, E. H., Paul, I. H., Heider, F., & Gardner, R. W. (1959). *Psychological issues* (Vol. 1). New York, NY: International Universities Press.
- Ewell, P. T., Jones, D. P., & Kelly, P. J. (2003). *Conceptualizing and researching the educational pipeline*. Boulder, CO: The National Information Center for Higher Education Policymaking and Analysis.
- Farrington, C. A., Roderick, M., Allensworth, E., Nagaoka, J., Keyes, T. S., Johnson, D. W., & Beechum, N. O. (2012). *Teaching adolescents to become learners. The role of noncognitive factors in shaping school performance: A critical literature review*. Chicago, IL: University of Chicago Consortium on Chicago School Research.
- Gándara, P. (2006). Strengthening the academic pipeline leading to careers in math, science, and technology for Latino students. *Journal of Hispanic Higher Education*, 5(3), 222–237.
- García, E. (2014). *The need to address noncognitive skills in the education policy agenda* (Briefing Paper No. 386). Washington, DC: Economic Policy Institute.
- Greenberg, A. D., & Nilssen, A. H. (2015). *The role of education in building soft skills: Putting into perspective the priorities and opportunities for teaching collaboration and other soft skills in education* (White Paper). Duxbury, MA: Wainhouse Research, LLC.
- Greenberg, M. T., Weissberg, R. P., O'Brien, M. U., Zins, J. E., Fredericks, L., Resnik, H., & Elias, M. J. (2003). Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. *American psychologist*, 58, 466–474.
- Grigorenko, E. L., Jarvin, L., Diffley III, R., Goodyear, J., Shanahan, E. J., & Sternberg, R. J. (2009). Are SSATS and GPA enough? A theory-based approach to predicting academic success in secondary school. *Journal of Educational Psychology*, 101, 964–981.
- Gutman, L. M., & Schoon, I. (2013). *The impact of non-cognitive skills on outcomes for young people*. London: Education Endowment Foundation. Retrieved from https://educationendowmentfoundation.org.uk/uploads/pdf/Non-cognitive_skills_literature_review_1.pdf
- Heckman, J. J., & Kautz, T. (2012). Hard evidence on soft skills. *Labour Economics*, 19, 451–464.
- Heckman, J. J., Stixrud, J., & Urzua, S. (2006). *The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior* (No. w12006). Retrieved from <http://www.nber.org/papers/w12006>
- Hembree, R. (1988). Correlates, causes, effects, and treatment of test anxiety. *Review of Educational Research*, 58, 47–77.
- Hogan, J., Barrett, P., & Hogan, R. (2007). Personality measurement, faking, and employment selection. *Journal of Applied Psychology*, 92, 1270–1285.
- Jensen-Campbell, L. A., Rosselli, M., Workman, K. A., Santisi, M., Rios, J. D., & Bojan, D. (2002). Agreeableness, conscientiousness, and effortful control processes. *Journal of Research in Personality*, 36, 476–489.
- Judge, T. A., & Bono, J. E. (2001). Relationship of core self-evaluations traits—Self-esteem, generalized self-efficacy, locus of control, and emotional stability—with job satisfaction and job performance: A meta-analysis. *Journal of Applied Psychology*, 86, 80–92.
- Kautz, T., Heckman, J. J., Diris, R., ter Weel, B., & Borghans, L. (2014). *Fostering and measuring skills: Improving cognitive and non-cognitive skills to promote lifetime success* (No. w20749). Cambridge, MA: National Bureau of Economic Research. doi:10.3386/w20749
- King, G., & Wand, J. (2007). Comparing incomparable survey responses: Evaluating and selecting anchoring vignettes. *Political Analysis*, 15, 46–66.
- King, G., Murray, C. J. L., Salomon, J. A., & Tandon, A. (2004). Enhancing the validity and cross-cultural comparability of measurement in survey research. *American Political Science Review*, 98, 191–207.
- Kirsch, I., Braun, H., Yamamoto, K., & Sum, A. (2007). *America's perfect storm: Three forces changing our nation's future*. Princeton, NJ: Educational Testing Service.
- Kyllonen, P. C., & Berling, J. (2013). Innovative questionnaire assessment methods to increase cross-country comparability. In L. Rutkowski, M. von Davier, & D. Rutkowski (Eds.), *Handbook of international large-scale assessment: Background, technical issues, and methods of data analysis* (pp. 277–285). London, UK: Chapman & Hall/CRC Press.

- Kyllonen, P. C., Roberts, R. D., & Stankov, L. (Eds.). (2008). *Extending intelligence: Enhancement and new constructs*. New York, NY: Taylor & Francis.
- Lee, J., Redman, M., Goodman, M., & Bauer, M. (2007). *Enhance: Noncognitive assessments for K-12*. Presentation in annual conference of the National Council of Measurement in Education, Chicago, IL.
- Lievens, F., & Sackett, P. (2006). Video-based versus written situational judgment tests: A comparison in terms of predictive validity. *Journal of Applied Psychology, 91*, 1181–1188.
- Liu, O. L., Rijmen, F., MacCann, C., & Roberts, R. (2009). The assessment of time management in middle-school students. *Personality and Individual Differences, 47*(3), 174–179.
- MacCann, C., Duckworth, A. L., & Roberts, R. D. (2009). Empirical identification of the major facets of conscientiousness. *Learning and Individual Differences, 19*, 451–458.
- Mattern, K., Burrus, J., Camara, W., O'Connor, R., Hansen, M. A., Grambrell, J., Casillas, A., & Bobek, B. (2014). *Broadening the definition of college and career readiness: A holistic approach* (ACT Research Report 2014-5). Iowa City, IA: ACT.
- Matthews, G., Zeidner, M., & Roberts, R. D. (2012). Emotional intelligence: A promise unfulfilled? *Japanese Psychological Research, 54*(2), 105–127.
- McDaniel, M. A., & Nguyen, N. T. (2001). Situational judgment tests: A review of practice and constructs assessed. *International Journal of Selection and Assessment, 9*, 103–113.
- McDaniel, M. A., Morgeson, F. P., Finnegan, E. B., & Campion, M. A. (2001). Use of situational judgment tests to predict job performance: A clarification of the literature. *American Psychological Association, 86*, 730–740.
- McDougall, W. (1932). Of the words character and personality. *Journal of Personality, 1*, 3–16.
- Naemi, B., Seybert, J., Robbins, S., & Kyllonen, P. (2014). *Examining the WorkFORCE assessment for job fit and core capabilities of the FACETS engine* (ETS Research Report No. RR-14-32). Princeton, NJ: Educational Testing Service.
- Nguyen, N. T., Biderman, N. D., & McDaniel, M. A. (2005). Effect of response instructions on faking a situational judgment test. *International Journal of Selection and Assessment, 13*, 250–260.
- Ones, D. S., & Viswesvaran, C. (1998). The effects of social desirability and faking on personality and integrity assessment for personnel selection. *Human Performance, 11*, 245–269.
- Oswald, F. L., Schmitt, N., Kim, B. H., Ramsay, L. J., & Gillespie, M. A. (2004). Developing a biodata measure and situational judgment inventory as predictors of college student performance. *Journal of Applied Psychology, 89*, 187–207.
- Palmer, R. T., Davis, R. J., Moore III, J. L., & Hilton, A. A. (2010). A nation at risk: Increasing college participation and persistence among African American males to stimulate U.S. global competitiveness. *Journal of African American Males in Education, 1*, 105–124.
- Partnership for 21st Century Learning. (2015). *Frameworks for 21st century learning*. Retrieved from <http://www.p21.org/our-work/p21-framework>
- Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin, 135*, 322–338.
- Reeves, R. V., Venator, J., & Howard, K. (2014). *The character factor: Measures and impact of drive and prudence*. Washington, DC: Brookings.
- Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: A meta-analysis of longitudinal studies. *Psychological Bulletin, 132*, 1–25.
- Rosen, J. A., Glennie, E. J., Dalton, B. W., Lennon, J. M., & Bozick, R. N. (2010). *Noncognitive skills in the classroom: New perspectives on educational research* (No. BK-0004-1009). Research Triangle Park, NC: RTI International.
- Ross, M. R., Powell, S. R., & Elias, M. (2002). New roles for school psychologists: Addressing the social and emotional learning needs of students. *School Psychology Review, 31*, 43–52.
- Salgado, J. F., & Táuriz, G. (2012). The Five-Factor Model, forced-choice personality inventories and performance: A comprehensive meta-analysis of academic and occupational validity studies. *European Journal of Work and Organizational Psychology, 23*, 3–30. doi:10.1080/1359432X.2012.716198
- Schmitt, N., & Oswald, F. L. (2006). The impact of corrections for faking on the validity of noncognitive measures in selection settings. *Journal of Applied Psychology, 91*, 613–621.

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- Secondary School Admissions Test Board. (2014). *Think tank on the future of assessment*. Princeton, NJ: SSATB.
- Sedlacek, W. E. (2011). Using noncognitive variables in assessing readiness for higher education. *Readings on Equal Education*, 25, 187–205.
- Shonkoff, J. P., & Phillips, D. A. (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academies Press.
- Sternberg, R. L. (2006). The rainbow project: Enhancing the SAT through assessments of analytical, practical, and creative skills. *Intelligence*, 34, 321–350.
- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643–662.
- The College Board. (2015). *Total group profile report: 2015 college-bound seniors*. Retrieved from <https://secure-media.collegeboard.org/digitalServices/pdf/sat/total-group-2015.pdf>
- Tough, P. (2013). *How children succeed: Grit, curiosity, and the hidden power of character*. New York, NY: Houghton Mifflin Harcourt.
- Wang, L., MacCann, C., Zhuang, X., Liu, O. L., & Roberts, R. D. (2009). Assessing teamwork and collaboration in high school students: A multimethod approach. *Canadian Journal of School Psychology*, 24, 108–124.
- Watson, D., Hubbard, B., & Wiese, D. (2000). General traits of personality and affectivity as predictors of satisfaction in intimate relationships: Evidence from self-and partner-ratings. *Journal of Personality*, 68, 413–449.
- Whetzel, D. L., & McDaniel, M. A. (2009). Situational judgment tests: An overview of current research. *Human Resources Management Review*, 19, 188–202.
- Zerbe, W. J., & Paulhus, D. L. (1987). Socially desirable responding in organizational behavior: A reconception. *Academy of Management Review*, 12, 250–264.

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