



## Comprehensive Theory of Action

### Introduction

In the interest of providing evidence that this product is built upon a solid foundation of scientific research and logic, we have developed a comprehensive theory of action for the Tessera™ Noncognitive Assessment System. Our comprehensive theory of action has three components. First, an overview of the product is provided. Second, a graphical depiction of the theory of action<sup>1</sup> is provided, which outlines the claims that we wish to make concerning the mechanisms by which the assessment can impact a number of valued societal outcomes. The third component is a description of the empirical and logical foundation supporting these claims.

### Product Overview

The Tessera™ Noncognitive Assessment System is being designed to assess the noncognitive skills of students in Middle (grades 6-8) and High School (grades 9-12). Noncognitive skills are personal characteristics that are distinct from cognitive factors, or intelligence, and are commonly referred to as dispositions, psychosocial skills, personality, personal skills, and character traits<sup>2</sup>. The use of the term “noncognitive” is somewhat controversial in the literature<sup>3</sup> yet it is the most commonly used term for these skills, thus we also adopt this nomenclature. Noncognitive skills have been shown to be predictive of success in school<sup>4</sup>, success at work<sup>5</sup>, well-being<sup>6</sup>, and several other important life outcomes<sup>7</sup>. Furthermore, emerging research evidence suggests that these constructs are more amenable to change than previously thought<sup>8</sup>.

Nearly all noncognitive skills can be crosswalked to the Big Five personality factors<sup>9</sup>. Table 1 on page 2 provides descriptions of the Big Five constructs and their corresponding Tessera™ Noncognitive Assessment System facets. Because the Big Five is supported by a large volume of compelling meta-analytic data showing its utility for education, workforce, and life across a wide array of valued outcomes, and in many countries, and because other frameworks are based on isolated studies, have limited support, and/or appear to predict only specific, rather shallow outcomes<sup>10</sup>, it is used as the organizing framework for the Tessera™ Noncognitive Assessment System.

---

1 Argyris & Schon, 1974  
2 Kyllonen, Lipnevich, Burrus, & Roberts, 2014  
3 Duckworth & Yeager, 2015  
4 Poropat, 2009  
5 Hough & Oswald, 2008  
6 Steel, Schmidt, & Shultz, 2008

7 Ozer & Benet-Martinez, 2006; Roberts, Kuncel, Shiner, et al., 2007  
8 Roberts, Walton, & Viechtbauer, 2006  
9 Roberts, Martin, & Olaru, 2015  
10 Kyllonen et al., 2014; Roberts et al., 2015

The assessments are designed to be taken online. Currently, two forms of assessment feedback are provided.

First, an **institutional report** is generated which provides schools with aggregated data. These are useful in allowing schools to compare their results with those of other schools, in comparing sub-group results within schools (e.g., males vs. females), and in tracking a school's overall assessment performance over time.

Second, students receive a **personalized feedback report**. This report can be viewed by the student, teachers, and parents. Feedback is provided at the level of the behavior. For example, "You scored lower than most of your peers on attention to detail. This is something that might be reflected in your not studying in an environment that is conducive to studying or in ...".

This feedback can also be used to inform interventions that will ultimately improve students' non-cognitive skills, thereby leading to improved outcomes, as outlined in the theory of action (see Figure 1 on page 4). Later versions of the assessment system will also include a unique teacher report and a unique parent report.

Tessera™ Construct / Facet	Big Five Construct / Facet	Definition
N/A	Conscientiousness	Scores on this dimension are a function of personal goal setting, trying to succeed at those goals, and striving to be competent in school work (and related) activities. Scores also reflect dependability, commitment to doing school work (and related activities) correctly and carefully, and being attentive to details.
Organization / Responsibility	Dependability / Attention to Detail	Facet of conscientiousness that reflects the extent that a student is reliable, responsible, and dependable, pays attention to detail, and fulfills school (and related) obligations.
Tenacity / Grit	Achievement-Effort / Persistence	Facet of conscientiousness that reflects the extent that a student expends effort, and establishes and maintains personally challenging achievement goals, in the process exerting effort towards task mastery in different subject domains.
Teamwork / Cooperation	Agreeableness	Scores on this dimension are a function of a student being pleasant, cooperative, sensitive to others, easy to get along with, and having a preference for associating with other members of the school community, broadly writ.
Composure / Resilience	Emotional Stability	Scores on this dimension are a function of a student's poise, flexibility, and able to cope with pressure, stress, criticism, setbacks, personal and school-related problems.
Curiosity / Ingenuity	Openness	Scores on this dimension are a function of being open-minded, thoughtful, enjoying the process of thinking about and solving school problems, interested in different types of students and their points of view, accepting of differences in fellow students, and being innovative and creative in one's school (and extra-curricular) work.
Leadership/ Communication Style	Extraversion	Scores on this dimension are a function of being assertive, persuasive, enthusiastic, and independent. To an extent they also reflect a student's level of sociability.

Table 1. Tessera™ Noncognitive Assessment System constructs, facets, labels, and their definitions

## Methods

Each facet will be measured with three methods:

1. Self-report items, which will be answered on Likert-type rating scales, typically from “Strongly Disagree” to “Strongly Agree.”
1. Situational judgment items that are text-based, perhaps with limited use of simple graphics, will involve presenting students with scenarios and five possible responses to those scenarios. Ratings of effectiveness for the five response options will range from “Very Ineffective” (1) to “Very Effective” (5).
1. The forced-choice items<sup>11</sup>, which involves selecting one self-report item from three of the Big Five domains (broadly writ) and forming triplets, as shown below.

Item	Most Like Me	Least Like Me
I do more than what my teachers expect of me.		
I am concerned about my fellow students' welfare.		
I cope well with tough assignments.		

Table 2. Forced-choice items

11 Brown & Maydeu-Olivares, 2011; Stark, Chernyshenko, & Drasgow, 2011

## Theory of Action

Our theory of action for the assessment is in Figure 1 below. The assessment components are listed in the table on the far left of the figure. The claims we are making are contained in the curved rectangular boxes. The process by which the use of the assessment leads to the claims is denoted by arrows. In Figure 1, these are labeled by the numbered circles. Empirical evidence and logical arguments supporting the claims are outlined below.

In summary, this comprehensive theory of action demonstrates that the Tessera™ Noncognitive Assessment System provides students and schools with actionable insights by reliably and validly measuring six important noncognitive skills and providing clear feedback on these skills. It also demonstrates that these skills are sensitive to intervention and that developing these skills has important down-stream consequences, including improved performance in high school and college, increased retention in high school and college, increased career success, and increased well-being. As such, the potential value and utility of the Tessera™ Noncognitive Assessment System is difficult to overstate.

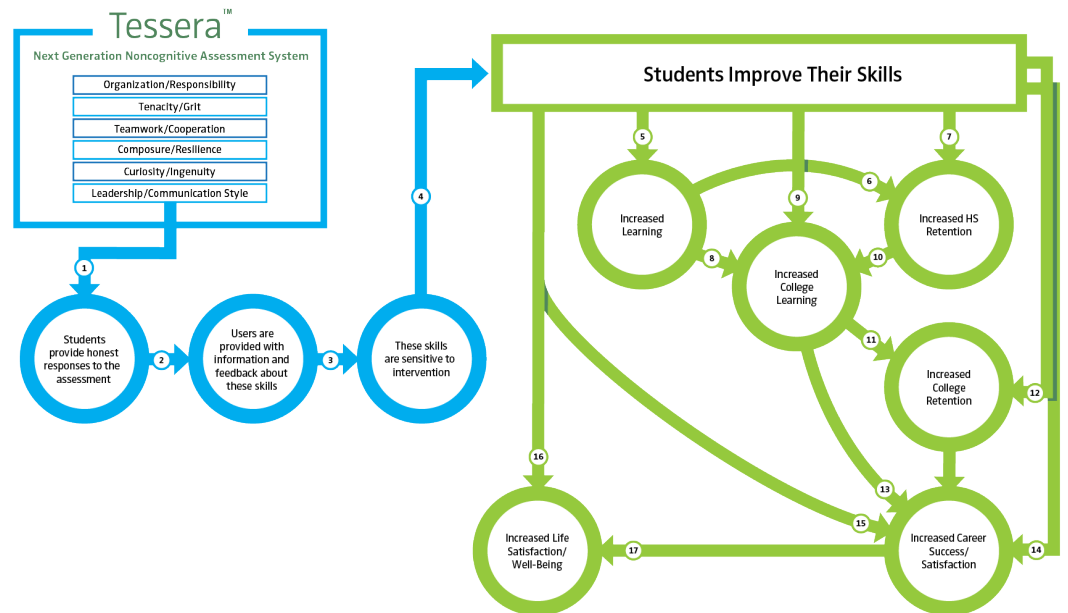


Figure 1. Theory of action for the Tessera™ Noncognitive Assessment System

## Description of Empirical and Logical Foundation

The following pages provide the empirical and logical arguments that support each claim in Figure 1. Each argument box contains three pieces of information: (1) Specific research evidence (or logical arguments) that supports how the assessment may lead to the identified claim; (2) a general statement about associated challenges in today’s schools and workplaces, and (3) how the assessment helps address both the research and the challenges.

## 1. When students take the assessment, they provide honest responses to the assessment

### RESEARCH/LOGIC ARGUMENT

We apply both logic- and research-based arguments to this claim. First, the assessment is a low-stakes assessment. That is, no decisions will be made based on the assessment results. Rather, the assessment will be used for development purposes. Thus, students should not be motivated to “fake” their assessment results. Faking to receive uninformative feedback would clearly be to the detriment of the student.

If students do for some reason decide to fake their responses, the three assessment methodologies are clearly differentially sensitive to the effects of faking (and in the same order): Self-assessments, followed by situational judgment tests (SJTs), then forced-choice assessments. Self-assessments are clearly easy to fake and much research has demonstrated that people do indeed fake self-report assessments in high-stakes situations<sup>12</sup>. While they are still suspect to faking, SJTs are more difficult to fake than self-report assessments. Hooper, Cullen, and Sackett (2006) reviewed evidence that SJTs are less prone to faking than self-report assessments, pointing to the promise of SJTs as a method of addressing faking issues in education. Finally, forced-choice assessments are very difficult to fake because the options are matched on social desirability, making it difficult to discern which of the options is “best”<sup>13</sup>.

A tangential issue that is important is the possibility that student responses will be inaccurate because of self-deception. They may feel that they are more skilled than they truly are. Note, however, that the claim is that students provide honest responses. Students can provide honest responses that are self-deceptive. Furthermore, we see evidence of self-deception as an important opportunity for intervention, as an intervention can target these inaccurate self-beliefs. Self-deception is likely a greater issue for self-report and forced-choice items than it is for SJT items because SJT items are likely more behaviorally based. Thus, larger than average discrepancies between SJT responses and self-report/forced-choice responses may indicate self-deception. Pilot testing may thus indicate that SJT responses should be considered the “most valid” of the assessment methodologies employed.

### THE CURRENT CHALLENGE

Students can fake their responses to self-report items if they so desire. To a lesser extent they might also be able to fake their responses to SJTs. It is highly unlikely that they will be able to fake their responses to forced-choice assessments. To the extent that students fake their responses, the assessment’s validity can be called into question.

### THE SOLUTION

It is unlikely that students will fake responses to the Tessera™ Noncognitive Assessment System because the intended purpose of the assessment is relatively low-stakes. In the unlikely event that they do attempt to fake, they will have difficulty faking the SJT portion of the assessment, and they should find it extremely difficult to fake the forced-choice portion.

## 2. Honest responses allow us to provide users with information and feedback about these skills

### RESEARCH/LOGIC ARGUMENT

The ability to provide accurate information and feedback about these skills hinges on the ability to measure them reliably and validly. Honest responses mean that the validity of the assessment will not be compromised by faking. Beyond that, several decades of research

12 Ziegler, MacCann, & Roberts, 2011

13 Stark, Chernyshenko, & Drasgow, 2005

in the assessment of noncognitive skills, and specifically in the assessment of personality, has demonstrated that personality can indeed be measured reliably and validly<sup>14</sup>. In fact, the decades of psychometric work on measures of the Big Five factors provide increased certainty that the various components of the Tessera™ Noncognitive Assessment System will be reliable and valid, something that cannot be said for several scales that are often used in education<sup>15</sup>. Further, several organizations have been in the practice of providing information and feedback to users on their noncognitive skills for many years.

See <https://www.act.org/workkeys/assess/pdf/TalentScoreReport.pdf> and <http://www.hoganassessments.com/sites/default/files/Basis%20-%20US%20English.pdf> for just two examples.

#### THE CURRENT CHALLENGE

The ability to provide accurate information and feedback on noncognitive skills hinges on the ability to reliably and validly assess these skills and to provide reports of these skills.

#### THE SOLUTION

Several decades of research has demonstrated that noncognitive skills can indeed be reliably and validly assessed. The previous discussion in Point 1 also demonstrates that faking is not a large concern for the Tessera™ Noncognitive Assessment System. Finally, several proofs-of-concept are available that provide examples of how information and feedback can be tailored.

### 3. Assessment feedback will inform interventions and these skills are sensitive to intervention

#### RESEARCH/LOGIC ARGUMENT

This claim has two statements. The first statement, “assessment feedback will inform interventions” requires a logical argument. Simply put, parents and teachers can know where to target interventions only if they have accurate information of where their students stand on specific noncognitive skills. Assessment feedback that is developed using reliable and valid measurement will provide an accurate picture of these skills. As stated in Point 2, personality assessment has a long history of reliable and valid measurement, and providing feedback around these measures is commonly done by several organizations.

Research evidence suggests that noncognitive skills are sensitive to intervention. It is important to note that the interventions that follow the Tessera™ Noncognitive Assessment System assessments will target behavioral manifestations of personality traits rather than the traits per se. Our view is similar to one outlined recently by Sackett and Walmsley (2014):

---

[V]arious lines of evidence support the notion that even if underlying dispositions prove quite fixed, patterns of behavior reflecting an attribute are indeed changeable. Some people may find it dispositionally quite easy to keep track of multiple work tasks and projects, whereas others may realize that they are not dispositionally detail oriented. Nonetheless, if persuaded that workplace success requires organization and order, they may learn to make use of day planners, checklists, and various other aids to behave in counter dispositional, yet effective, ways in the workplace. Thus, we do not view fixed dispositions as an impediment to making use of findings that particular attributes are important at work as the basis for interventions (p. 541).

---

14 see Boyle, Matthews, & Sokolfsky, 2008 for an extensive review

15 see Thomas, Kuncel, & Crede, 2007 for one example

The prerequisite to demonstrating sensitivity to intervention is to demonstrate the potential of malleability. In their meta-analysis of mean level personality change through the lifespan, Roberts, Walton, and Viechtbauer (2006) found that personality is not fixed, rather, people become more Agreeable, Conscientious, Emotionally Stable, Open to Experience, and socially dominant as they age. They also demonstrate lower social vitality. Individual studies of children and adolescents have also demonstrated some personality change at young ages. For example, a 3-year longitudinal study of 6-to-9-year-old children showed decreases in Extraversion and Openness, and an increase in Agreeableness<sup>16</sup>. A nationally representative study of Estonian school children uncovered some interesting 2-year developmental trends: 12-14-year-olds increased in Emotional Stability and Extraversion but decreased in Agreeableness, 14-16-year-olds increased in Emotional Stability, Extraversion, and Openness, and 16-18-year-olds increased in Openness<sup>17</sup>.

Some cross-sectional research has found that there are indeed age differences in facets of personality<sup>18</sup>. Although ideally this research would have a longitudinal design, it does provide some evidence that personality also changes at the facet level. More specifically, in general older individuals are higher than younger people in: the Conscientiousness facets of self-discipline and order, the Agreeableness facets of altruism and compliance, and the Openness facets of ideas and aesthetics. Conversely, older individuals are lower than younger people in the Emotional Stability facets of anxiety and depression, and the Extraversion facets of assertiveness and activity. It is important to note that a noticeable dip occurs between the ages of 10 and 15 years such that people become less conscientious, less agreeable, less extraverted, less open, and less emotionally stable. If this dip is found to be associated with problems in school, this may prove to be a crucial period of time in which to intervene with students.

#### THE CURRENT CHALLENGE

Assessment feedback can inform interventions only if it is based on reliable and valid scores derived from our measures. Noncognitive skills must have the potential to be malleable if they are to be sensitive to intervention.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills, and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) Importantly, research has demonstrated that these noncognitive skills are malleable.

## 4. Interventions will help students improve their skills

#### RESEARCH/LOGIC ARGUMENT

There have been many research demonstrations of purposeful noncognitive skill growth through interventions. A new meta-analysis of 187 studies of clinical interventions found that, over an average of 24 weeks, the interventions were associated with changes in personality trait measures<sup>19</sup>. There was evidence that interventions changed each of the Big Five factors, with the largest changes on average occurring for emotional stability and extraversion. Furthermore, social and emotional learning (SEL) programs have demonstrated helping students improve their ability to recognize and manage emotions (composure/resilience), set goals (tenacity/grit), and work well with others (teamwork/cooperation). A meta-analysis found that SEL programs had a positive influence on K-8 grade students' social and emotional

16 Prinzie & Deković, 2008

17 Pullmann, Raudsepp, & Allik, 2006

18 Soto, John, Gosling, & Potter, 2011

19 Roberts, Luo, Chow, et al., 2015

skills, attitudes toward self and others, prosocial behavior, and emotional distress<sup>20</sup>. Students who took part in these programs also improved their academic performance.

Importantly, De Fruyt, Wille, and John (2015) recently cited a study in which they crosswalked SEL skill to the Big Five factors. As stated on page 279:

---

Recently, Primi, Santos, John, and De Fruyt (2015) examined the underlying structure of eight instruments that are frequently used to assess social-emotional skills in childhood and adolescence in Brazil. They found a structure that showed strong parallels, but was not isomorphic, with the dimensions of the five-factor model of personality—that is, Extraversion, Agreeableness, Emotional Stability (Neuroticism), Openness to Experience, and Conscientiousness, supplemented with a sixth dimension referring to Negative Valence.

---

Furthermore, the Organization for Economic Cooperation and Development (OECD) recently published a paper in which they crosswalked SEL frameworks to the Big Five factors<sup>21</sup>. For example, a crosswalk to the Collaborative for Academic, Social, and Emotional Learning's (CASEL) framework showed the following relations: *self-awareness* (curiosity/ingenuity), *self-management* (composure/resilience), *social awareness* and *relationship skills* (leadership/communication style), and *responsible decision-making* (organization/responsibility). Note that agreeableness is not included, indicating that the Big Five encompasses a wider range of factors than the CASEL framework.

Additionally, other interventions in schools have demonstrated promise in improving non-cognitive skills. Classroom interventions designed to improve critical thinking skills (curiosity/ingenuity) have been shown to be effective in improving metacognitive awareness and monitoring of one's learning of reading passages<sup>22</sup>. A self-regulation intervention that focused on improving self-control had significant effects on delayed children's self-regulation and improved academic performance for children generally<sup>23</sup>. Finally, interventions designed to reduce the negative emotionality and worry that comes with test anxiety (composure/resilience) have been demonstrated to improve test performance<sup>24</sup>.

#### THE CURRENT CHALLENGE

Noncognitive interventions are valuable only to the extent that they can improve upon students' skills.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation (and ultimately evaluation) of interventions. These interventions can then improve students' skills.

## 5. Improved noncognitive skills lead to increased learning in K-12

#### RESEARCH/LOGIC ARGUMENT

There is substantial research evidence that noncognitive skills are related to learning in K-12, as indicated by GPA. For example, meta-analyses have found that all of the Big Five personality factors predict academic performance in primary grades<sup>25</sup>. Although most of the factors

---

20 Durlak, Weissberg, Dymnicki et al., 2011

21 John & De Fruyt, 2015

22 Burke & Williams, 2008; Haller, Child, & Walberg, 1988

23 Tominey & McClelland, 2011

24 Hembree, 1988

25 Poropat, 2008, 2014



cease to remain as significant predictors in later grades, Conscientiousness remains a significant predictor in secondary and tertiary education<sup>26</sup>. In fact, in this meta-analysis, Conscientiousness was shown to predict GPA just as well as cognitive ability in tertiary education.

Although less research on the topic is available, there is some evidence that some of the specific facets of personality are also predictive of GPA. In one study, MacCann, Roberts, and Duckworth (2009) found that industriousness (tenacity/grit), control, planning (similar to organization/responsibility), and perseverance (tenacity/grit) all significantly predicted high school grades. Furthermore, a large-scale study found that 7th and 8th grade students' scores on measures of academic discipline (tenacity/grit) and orderly conduct (related to Conscientiousness and Agreeableness) predicted their grades in 9th and 10th grade incrementally over SES, gender, race, achievement test scores, and prior grades<sup>27</sup>.

#### THE CURRENT CHALLENGE

Noncognitive skills are clearly important for learning in K-12. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions that can ultimately improve student learning.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased student learning.

## 6. Increased learning in K-12 leads to increased retention in K-12

#### RESEARCH/LOGIC ARGUMENT

Perhaps unsurprisingly, grades and academic achievement are highly predictive of whether a student will ultimately drop out of high school. For example, a detailed analysis of the Philadelphia public high school freshman class of 2000 found that each of the following factors, as measured in 8th graders, independently predicted dropping out: low attendance, poor grades in core courses, being over age for one's grade, and being male<sup>28</sup>. A student had at least a 75% chance of dropping out if he/she: 1) attended school less than 80% of the time in eighth grade, and 2) failed mathematics and/or English during the eighth grade. They also categorized 9th grade students as "at risk" who were categorized as "at risk" in 8th grade if they: 1) attended school less than 70% of the time in ninth grade, 2) earned fewer than 2 credits during the ninth grade, and 3) were not promoted to the tenth grade on time. Overall, 80% of 8th and 9th grade students who were categorized as "at risk" eventually dropped out of high school.

Longitudinal studies conducted by Allensworth (2005) and Roderick (1994) also produced similar results. For example, in a study of students in the Chicago Public Schools, Allensworth (2005) created an indicator variable designating whether 9th grade students were "on track" to graduate. Students were classified as not "on track" if they possessed two of the risk factors of attendance, GPA, credits earned, and failing grades. This indicator was 85% accurate in predicting high school graduation<sup>29</sup>. Furthermore, in research conducted in the early 1990s investigating a small school district in Massachusetts, Roderick (1994) found that students who showed the largest drop in performance in the transition from elementary school to middle school, and from middle school to high school, were the most likely to drop out.

26 Poropat, 2009

27 Casillas, Robbins, Allen, et al., 2012

28 Neild & Balfanz, 2006

29 Allensworth, 2005

### THE CURRENT CHALLENGE

As stated in Point 5, noncognitive skills are clearly important for learning in K-12. Point 6 further makes the assertion that learning is important for K-12 retention. Thus, noncognitive skills should be important for retention via learning. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions that can ultimately improve student retention.

### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback). This will aid in the effective implementation of interventions that can result in increased student retention.

## 7. Improved noncognitive skills lead to increased retention in K-12

### RESEARCH/LOGIC ARGUMENT

Research has found that noncognitive skills are important for retention in education. One longitudinal study employing a representative sample of United States citizens looked at the relationship of 9th – 12th grade students' responses to a personality assessment and their level of educational attainment 11 years later<sup>30</sup>. In this work, a 1 standard deviation increase in each Big Five personality factor was associated with increased educational attainment.

Big Five personality factor	Increase in educational attainment
Extraversion	1.8 months
Agreeableness	2 months
Conscientiousness	2.7 months
Emotional Stability	2 months
Openness	2.5 months

Table 2. Tessera™ Noncognitive Assessment System \_\_\_\_\_

By point of comparison, going up 1 standard deviation in socioeconomic status was associated with 8.3 additional months of education. Other nationally representative studies have found similar results. For instance, one nationally representative study found that, after controlling for age, gender, and ethnicity, Openness and Conscientiousness significantly and positively predicted educational attainment<sup>31</sup>. Extraversion and Agreeableness, however, slightly negatively predicted attainment, while Emotional Stability was unrelated.

Additionally, a new study looked at predicting on time high school graduation with narrower, facet-like, measures<sup>32</sup>. In this study, 4,660 middle school students were administered personality measures and whether they graduated high school on-time (or did not graduate) was examined several years later. Results revealed that orderly conduct (related to conscientiousness and teamwork/cooperation) and optimism (related to leadership/communication style) directly predicted on-time high school graduation. Academic discipline (related to conscientiousness) also predicted on-time graduation, as mediated through high school GPA.

30 Damian, Su, Shanahan, et al., 2014

31 Goldberg, Sweeney, Merenda, & Hughes, 1998

32 Moore, Way, Casillas, et al., in press

#### THE CURRENT CHALLENGE

Noncognitive skills are important for retention in K-12. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions that can ultimately improve student retention.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student noncognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased student retention in K-12.

### 8. Increased learning in K-12 leads to increased learning in college

#### RESEARCH/LOGIC ARGUMENT

Research demonstrates that prior academic achievement is a strong predictor of learning in college. In a comprehensive meta-analysis of predictors of academic performance at all levels of schooling, Poropat (2009) found that academic achievement (ACT/SAT scores) was a strong predictor of course grades at the postsecondary level (see also Richardson, Abraham, & Bond, 2012 for another recent meta-analysis). National validity studies have reached the same conclusion with results indicating that ACT and SAT scores predict GPA throughout the college career<sup>33</sup>. High school grade point average is also a strong predictor of college grades and, in fact, tends to be slightly more predictive of grades than standardized test scores<sup>34</sup>.

#### THE CURRENT CHALLENGE

Point 5 provided evidence that noncognitive skills are related to learning in K-12. Point 8 provides evidence that learning in K-12 is related to learning in college. Thus, noncognitive skills should be related to learning in college through their impact on learning in K-12 (see Point 9 for direct effects). However, most K-12 students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base K-12 interventions that can ultimately increase learning in college.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student noncognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased student learning in K-12, and thus, increased learning in college.

### 9. Improved noncognitive skills lead to increased learning in college

#### RESEARCH/LOGIC ARGUMENT

Meta-analyses and large-scale studies have found that noncognitive skills predict learning in college, as indicated by GPA. In his meta-analysis, Poropat (2009) found that Conscientiousness significantly predicted college GPA, and that it predicted GPA as strongly as did cognitive ability<sup>35</sup>. Similarly, a more recent meta-analysis demonstrated that Conscientiousness consistently predicted college GPA across a number of Big Five personality measures<sup>36</sup>.

33 Mattern & Patterson, 2011; Radunzel & Noble, 2012

34 Mattern & Patterson, 2011

35 Richardson et al., 2012

36 McAbee & Oswald, 2013

These authors also found statistically significant but weaker prediction for Agreeableness, Openness, and Emotional Stability. Another meta-analysis found that typical intellectual engagement (related to openness), openness, and test-anxiety (related to emotional stability) all predicted knowledge and achievement in college students<sup>37</sup>. Finally, a large-scale study of college students employing 4 samples found that Conscientiousness predicted grades in each of the 4 samples, and Openness predicted grades in 3 of the 4<sup>38</sup>.

Other meta-analyses have investigated how well facet-like measures predict grades in college. One extensive analysis found several significant predictors of college GPA that can be crosswalked to the Tessera™ Noncognitive Assessment System framework. These include need for cognition (curiosity/ingenuity), optimism (leadership/communication style), academic intrinsic motivation (tenacity/grit), test anxiety (composure/resilience), and time management (organization/responsibility)<sup>39</sup>. Another meta-analysis found that achievement motivation (tenacity/grit) and academic goals (tenacity/grit) both predicted college GPA<sup>40</sup>.

#### THE CURRENT CHALLENGE

Several meta-analyses have demonstrated that noncognitive skills are related to learning in college. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions that can increase learning in college.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased student learning in college.

## 10. Increased retention in K-12 leads to increased learning in college

#### RESEARCH/LOGIC ARGUMENT

Most students are not able to enroll in college unless they graduate high school or earn a GRE. People who are not in college cannot learn anything in college.

#### THE CURRENT CHALLENGE

Point 7 provides evidence that improved noncognitive skills can lead to increased retention in K-12. Thus, improved noncognitive skills should also lead to increased learning in college via the increased K-12 retention pathway (see Point 9 for direct evidence). However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions that can increase learning in college.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased student learning in college.

37 Ackerman & Heggestad, 1997

38 Nofhle & Robins, 2007

39 Richardson, et al., 2012

40 Robbins, Lauver, Le, et al., 2004

## 11. Increased learning in college leads to increased college retention

### RESEARCH/LOGIC ARGUMENT

Research shows that the single best predictor of college retention is college GPA<sup>41</sup>, and, in fact, grades predict college completion over several demographic characteristics<sup>42</sup>. Generally, researchers use freshman GPA to predict college retention<sup>43</sup>. In addition, more recent research suggests that the effects of many often-studied retention-related variables are mediated by first-year academic performance (though one might expect reciprocal relationships between motivation and performance). For example, Allen and Robbins (2010) found that the effect of student motivation, precollege educational achievement and academic performance, and family income on degree attainment was mediated by first-year academic performance for both 2- and 4-year college students.

### THE CURRENT CHALLENGE

As noted in Point 9, improved noncognitive skills can lead to increased learning in college. Thus, improved noncognitive skills can lead to increased college retention via the college learning pathway. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions that can increase college retention.

### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student noncognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased student learning in college and thus also increased college retention.

## 12. Improved noncognitive skills lead to increased college retention

### RESEARCH/LOGIC ARGUMENT

Point 7 describes the research on personality and educational attainment. This research applies to college retention as well as it does to high school retention. Additionally, meta-analysis has shown that facet-level noncognitive skills are predictive of college retention. Robbins et al. (2004) found that academic goals (tenacity/grit) are highly predictive of retention. They also found that achievement motivation (tenacity/grit) is also predictive of retention, but not as strongly as academic goals. Furthermore, a study of 23 institutions of higher education and 6,590 students found that academic discipline (organization/responsibility) was positively related to retention to the third year of college, and that relationship was mediated by first-year GPA<sup>44</sup>.

Much of the influence of noncognitive skills on college retention likely occurs through its impact on adjustment to college<sup>45</sup>. Adjustment to college includes how well one adjusts academically, socially, personally/emotionally, and how attached one feels to their institution. A meta-analysis found that each of these types of adjustment predicted retention<sup>46</sup>. Importantly, four of the five Big Five personality traits predicted adjustment. Strengths of relationships of personality traits to adjustment generally followed this order: Emotional Stability, Conscientiousness, Agreeableness, and Extraversion.

41 Pascarella & Terenzini, 2005

42 Adelman, 1999

43 Adelman, 1999; Murtaugh, Burns, & Schuster, 1999

44 Allen, Robbins, Casillas, & Oh, 2008

45 Crede & Niehorster, 2012

46 Crede & Niehorster, 2012

**THE CURRENT CHALLENGE**

Noncognitive skills are important for retention in college. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions on that can ultimately improve student retention.

**THE SOLUTION**

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased student retention.

### 13. Increased college learning leads to increased career success and satisfaction

**RESEARCH/LOGIC ARGUMENT**

Research has established that learning in college, as indicated by GPA, is predictive of career success. An oft-cited meta-analysis of the predictors of job performance found that college GPA predicted supervisor ratings of job performance, promotion on the job, and job training success<sup>47</sup>. A second meta-analysis later confirmed that college GPA is indeed a valid predictor of job performance<sup>48</sup>. Additionally, to the extent that graduate school performance can be equated to job performance, both college GPA and college achievement (as indexed by the Graduate Record Examinations) were demonstrated to be valid predictors of job performance by a meta-analysis by Kuncel, Hezlett, and Ones (2001).

Supporting these findings, a recent study of adult skills by the OECD (2013) found that many of the skills taught in college (e.g., literacy, numeracy, and problem-solving) are linked to positive work outcomes, such as employment and earnings. For workers in the United States, the study revealed about a 12% increase in an individual's wages for every standard deviation increase in skills.

Job performance is also related to job satisfaction. As one might suspect, those who are better at their jobs are also happier on their jobs. An extensive meta-analysis of this relationship found that the true correlation between job performance and job satisfaction was .30<sup>49</sup>. Thus, it can be reasoned that learning in college is also associated with job satisfaction.

**THE CURRENT CHALLENGE**

Increased learning in college is clearly related to career success and satisfaction. As stated above, improved noncognitive skills are important for learning in college. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions on that can ultimately improve career success and job satisfaction.

**THE SOLUTION**

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that will improve noncognitive skills and ultimately improve career success and job satisfaction.

47 Hunter & Hunter, 1984

48 Roth, BeVier, & Schippman, 1996

49 Judge, Thoresen, Bono, & Patton, 2001

## 14. Increased college retention leads to increased career success and satisfaction

### RESEARCH/LOGIC ARGUMENT

It follows logically from Point 13 that those who have high retention in college should have better career success and satisfaction than those who have lower college retention. The more one persists in school, the more one should learn. This learning should serve workers well on the job.

Furthermore, it is clear from research in labor economics that earning a college degree is an important key for success in the 21st century. Research shows that the majority of new jobs created in the United States by the year 2018 are projected to require at least a college degree<sup>50</sup>, but the United States will produce far too few college graduates to fill these openings. Individuals who attain a higher level of education tend to earn more over their lifetime<sup>51</sup>. Over the course of a 40-year career, those with just a high school diploma earn on average \$1 million less (in 2009 dollars) than those with a bachelor's degree and nearly \$2 million less (also in 2009 dollars) than those with a graduate degree.

### THE CURRENT CHALLENGE

Noncognitive skills are clearly important for college learning and hence for career success. However, many college students are not sufficiently prepared for their later work life. Insufficient preparation during college and a lack of knowledge about necessary noncognitive skills may lead to issues for students when entering work life.

### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student noncognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased college learning and career success.

## 15. Improved noncognitive skills lead to increased career success and satisfaction

### RESEARCH/LOGIC ARGUMENT

The influence of the Big Five on work-related outcomes and behavior has been assessed in many studies, which cumulatively account for several hundreds of thousands of persons<sup>52</sup>. Greater Conscientiousness positively predicts performance and behavior in work life, and also greater job satisfaction<sup>53</sup>. The influence of the other Big Five factors, however, should not be underestimated. In addition, integrity, which targets the tendency to behave honestly, also predicts job performance<sup>54</sup>. Importantly, both Conscientiousness and integrity provide incremental validity in the prediction of job performance beyond cognitive ability<sup>55</sup>. Agreeableness is the strongest predictor of counterproductive workplace behaviors<sup>56</sup>, which can cost the labor market millions (perhaps billions) of dollars per year. It is also substantially related to organizational citizenship behavior. The other Big Five factors have been shown to be related to more specific job performance: Managers perform better when being more extraverted, higher Emotional Stability and Agreeableness improve teamwork and interac-

50 Bureau of Labor Statistics, 2013; Carnevale, Smith, & Strohl, 2010

51 Carnevale, Rose, & Cheah, 2011

52 Barrick, Mount, & Judge, 2001; Berry, Ones, & Sackett, 2007; Judge, Rodell, Klinger, Simon, & Crawford, 2013; Sackett & Walmsley, 2014

53 Judge, Heller, & Mount, 2002; Sackett & Walmsley, 2014

54 Ones, Viswesvaran, & Schmidt, 1993; Van Iddekinge, Roth, Raymark, & Odle-Dusseau, 2012

55 Schmidt & Hunter, 1998

tion with others (e.g., clients), whereas higher Openness enhances training proficiency. In addition, job satisfaction is predicted by each of the Big Five personality traits except Openness to Experience<sup>57</sup>.

One longitudinal study employing a representative sample of United States citizens looked at the relationship of 9th – 12th grade students' responses to a personality assessment and their income and occupational prestige 11 years later<sup>58</sup>. In this work, a 1 standard deviation increase in each Big Five personality factor was associated with increased annual income and job prestige.

Big Five personality factor	Increase in annual income - exact numbers
Extraversion	\$2,419
Agreeableness	\$1,209
Conscientiousness	\$1,814
Emotional Stability	\$1,814
Openness	\$1,209

Table 3. Tessera™ Noncognitive Assessment System \_\_\_\_\_

By point of comparison, going up 1 standard deviation in socioeconomic status was associated with \$4,233 in additional annual income.

Finally, a study of a nationally representative sample of 18- and 19-year-old Swedish men found that a 25-minute interview designed to measure characteristics such as responsibility, independence, outgoingness, persistence, Emotional Stability, and initiative was a better predictor of wages and unemployment 14–21 years later than were measures of cognitive ability<sup>59</sup>.

#### THE CURRENT CHALLENGE

Noncognitive skills are clearly important for career outcomes such as performance, counter-productive workplace behavior and satisfaction. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions that can ultimately improve their work life.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student non-cognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.)

16. This will aid in the effective implementation of interventions that can result in increased work related outcomes.

## Improved noncognitive skills lead to increased life satisfaction and well-being

#### RESEARCH/LOGIC ARGUMENT

The relation between life satisfaction and noncognitive factors has been studied extensively. There is evidence of substantial effects of several of the Big Five Factors on overall life satis-

56 Berry, Ones, & Sackett, 2007; Judge, Klinger, Simon, & Yang, 2008; Nye, Rounds, & Drasgow, 2012; Ones et al., 1993; Salgado, 2002; Van Iddekinge et al., 2012

57 Judge & Bono, 2001; Judge, Heller, & Mount, 2002

58 Damian, et al., 2014

59 Lindqvist & Vestman, 2011



faction. Meta-analysis shows that all of the Big Five factors, except Openness, are substantially related to longevity or mortality<sup>60</sup>. In addition, another meta-analysis found that low Conscientiousness is predictive of a number of risky health behaviors, such as tobacco and alcohol use, risky driving, and risky sexual behavior; while high Conscientiousness is predictive of positive health behaviors, such as exercising and eating right<sup>61</sup>. Extraversion, Emotional Stability, and Conscientiousness are important predictors of happiness or overall life satisfaction<sup>62</sup>, particularly when measured at the facet level<sup>63</sup>. These relations have the same magnitude as SES and cognitive ability<sup>64</sup>. Taken together, they can account for life satisfaction variance up to 41% or 63% unattenuated<sup>65</sup>.

#### THE CURRENT CHALLENGE

Noncognitive skills are clearly important for life outcomes. However, most students are not assessed on their noncognitive skills in a reliable and valid manner. Thus, parents and teachers have little information on their students' standings on these factors. As such, they have little information on which to base interventions that can ultimately improve their life satisfaction and well-being.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student noncognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased life satisfaction and health related outcomes.

## 17. Improved job performance and satisfaction lead to increased life satisfaction and well-being

#### RESEARCH/LOGIC ARGUMENT

Based on OECD statistics, the average working time in the United States is around 1,800 hours per year in 2014. Since work life occupies a large proportion of life, the influence of job satisfaction on overall life satisfaction is non-trivial. There is substantial research evidence that job satisfaction is related to life satisfaction. A meta-analysis covering more than 350 job-satisfaction/life-satisfaction relationships reported in 23 widely varying studies<sup>66</sup> showed that for more than 90% of the cases, the direction of this relationship is positive. The other 10% of cases suffered from unreliable measurement of satisfaction. The relationship between job satisfaction and overall life satisfaction is typically modest, with correlations around .30.

#### THE CURRENT CHALLENGE

Job satisfaction plays an important role in overall life satisfaction. Job satisfaction is clearly not only dependent on monetary rewards, but also influenced by other factors. However, most of the relevant noncognitive skills are not assessed in a reliable and valid manner.

#### THE SOLUTION

The Tessera™ Noncognitive Assessment System reliably and validly assesses student noncognitive skills and provides feedback to schools and students that can be used by students, teachers, and parents. (Future iterations will include unique teacher and parent feedback.) This will aid in the effective implementation of interventions that can result in increased life satisfaction and well-being.

60 Almlund, Duckworth, Heckman, & Kautz, 2011; Borghans, Duckworth, Heckman, Weel, 2008; Roberts et al., 2007

61 Bogg & Roberts, 2004

62 Diener & Lucas, 1999; Roberts et al. 2007

63 Schimmack, Oishi, Furr, & Funder, 2004; Schimmack, Radhakrishnan, Oishi, Dzokoto, & Ahadi, 2002

64 Roberts et. al, 2007

65 Steel, Schmidt, & Schultz, 2008

66 Rice, Near, & Hunt, 1980

## Conclusion

Research has demonstrated that globally the most widely used and useful taxonomy for classifying noncognitive skills is the Big Five personality factors, and thus the creators of the Tessera™ Noncognitive Assessment System adopted this framework as its organizing taxonomy. Decades of research has demonstrated that the Big Five personality factors predict a host of important outcomes, including improved performance in high school and college, increased retention in high school and college, increased career success, and increased well-being. To mitigate potential problems related to faking and/or lack of accurate self-insight, the Tessera™ Noncognitive Assessment System utilizes three methods to assess noncognitive skills. This methodology leads to reliable and valid assessment of these noncognitive skills and the assessment, when used in conjunction with the school and student feedback reports, results in a powerful system designed to help students achieve school, career, and personal success.

## References

- Ackerman, P. L., & Heggestad, E. D. (1997). Intelligence, personality, and interests: evidence for overlapping traits. *Psychological Bulletin*, 121, 219-245.
- Adelman, C. (1999). Answers in the toolbox: Academic intensity, attendance patterns, and bachelor's degree attainment (Document # PLLI 1999-8021). Washington, DC: U.S. Department of Education.
- Allen, J. D., & Robbins, S. B. (2010). Effects of interest-major congruence, motivation, and academic performance on timely degree attainment. *Journal of Counseling Psychology*, 57, 23-35.
- Allen, J., Robbins, S. B., Casillas, A., & Oh, I. S. (2008). Third-year college retention and transfer: Effects of academic performance, motivation, and social connectedness. *Research in Higher Education*, 49, 647-664.
- Almlund, M., Duckworth, A., Heckman, J. J., & Kautz, T. (2011). Personality Psychology and Economics. In E. A. Hanushek, S. Machin & L. Woßmann (Eds.), *Handbook of the Economics of Education*. Vol. 4 (pp. 1-181). Amsterdam: Elsevier.
- Argyris, C., & Schon, D. A. (1974). *Theory in Practice: Increasing Professional Effectiveness*. Hoboken, N.J.: Jossey-Bass.
- 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.
- Berry, C. M., Ones, D. S., & Sackett, P. R. (2007). Interpersonal deviance, organizational deviance, and their common correlates: a review and meta-analysis. *Journal of Applied Psychology*, 92, 410-424.
- 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.
- Borghans, L., Duckworth, A. L., Heckman, J. J., & Weel, T. B. (2008). The economics and psychology of personality traits. *Journal of Human Resources*, 43, 972-1059.
- Boyle, G. J., Matthews, G., & Saklofske, D. H. (Eds.). (2008). *The SAGE Handbook of Personality Theory and Assessment: Personality Measurement and Testing* (Vol. 2). Los Angeles: Sage.
- Brown, A., & Maydeu-Olivares, A. (2011). Item response modeling of forced-choice questionnaires. *Educational and Psychological measurement*, 71, 460-502.
- Burke, L. A., & Williams, J. M. (2008). Developing young thinkers: An intervention aimed to enhance children's thinking skills. *Thinking Skills and Creativity*, 3, 104-124
- Casillas, A., Robbins, S., Allen, J., Kuo, Y. L., Hanson, M. A., & Schmeiser, C. (2012). Predicting early academic failure in high school from prior academic achievement, psychosocial characteristics, and behavior. *Journal of Educational Psychology*, 104, 407-420.
- Credé, M., & Kuncel, N. R. (2008). Study habits, skills, and attitudes: The third pillar supporting collegiate academic performance. *Perspectives on Psychological Science*, 3, 425-453
- Credé, M., & Niehorster, S. (2012). Adjustment to college as measured by the student adaptation to college questionnaire: a quantitative review of its structure and relationships with correlates and consequences. *Educational Psychology Review*, 24, 133-165.
- Damian, R. I., Su, R., Shanahan, M., Trautwein, U., & Roberts, B. W. (2014). Can personality traits and intelligence compensate for background disadvantage? Predicting status attainment in adulthood. *Journal of Personality and Social Psychology*, 109, 473-489.
- De Fruyt, F., Bart, W., & John, O. P. (2015). Employability in the 21st Century: Complex (interactive) problem solving and other essential skills. *Industrial and Organizational Psychology*, 8, 276-281.
- Diener, E., & Lucas, R. E. (1999). Personality and Subjective Well-Being. In D. Kahneman, E. Diener, & N. Schwarz (Eds.) *Well-being: Foundations of Hedonic Psychology* (pp. 213-229). New York: Russell Sage.
- Duckworth, A. L., & Yeager, D. S. (2015). Measurement matters: Assessing personal qualities other than cognitive ability for educational purposes. *Educational Researcher*, 44, 237-251.

- Durlak, J. A., Weissberg, R. P., & Pachan, M. (2010). A meta-analysis of After-School Programs that seek to promote personal and social skills in children and adolescents. *American Journal of Community Psychology*, 45, 294-309.
- Goldberg, L. R., Sweeney, D., Merenda, P. F., & Hughes, J. E. Jr. (1998). Demographic variables and personality: The effects of gender, age, education, and ethnic/racial status on self-descriptions of personality attributes. *Personality and Individual Differences*, 24, 393-403.
- Haller, E. P., Child, D. A., & Walberg, H. J. (1988). Can comprehension be taught? A quantitative synthesis of "metacognitive" studies. *Educational Researcher*, 17, 5-8.
- Hembree, R. (1988). Correlates, causes, effects, and treatment of test anxiety. *Review of Educational Research*, 58, 7-77.
- Hooper, A. C., Cullen, M. J., & Sackett, P. R. (2006). Operational threats to the use of Situational Judgment Tests: Faking, coaching, and retesting issues. In J. Weekley and R. Ployhart (Eds.), *Situational Judgment Tests* (pp. 205 – 323). Mahwah, NJ : Lawrence Erlbaum.
- Hough, L. M., & Oswald, F. L. (2008). Personality testing and industrial–organizational psychology: Reflections, progress, and prospects. *Industrial and Organizational Psychology*, 1, 272-290.
- Hunter, J. E., & Hunter, R. F. (1984). Validity and utility of alternative predictors of job performance. *Psychological Bulletin*, 96, 72-98.
- John, O. P., & De Fruyt, F. D. (2015). Framework for the Longitudinal Study of Social and Emotional Skills in Cities. Retrieved from [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/CERI/CD\(2015\)13&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/CERI/CD(2015)13&docLanguage=En)
- 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.
- Judge, T. A., Heller, D., & Mount, M. K. (2002). Five-factor model of personality and job satisfaction: A meta-analysis. *Journal of Applied Psychology*, 87, 530–541.
- Judge, T. A., Klinger, R., Simon, L. S., & Yang, I. W. F. (2008). The contributions of personality to organizational behavior and psychology: Findings, criticisms, and future research directions. *Social and Personality Psychology Compass*, 2, 1982–2000.
- Judge, T. A., Rodell, J. B., Klinger, R. L., Simon, L. S., & Crawford, E. R. (2013). Hierarchical representations of the five-factor model of personality in predicting job performance: integrating three organizing frameworks with two theoretical perspectives. *Journal of Applied Psychology*, 98, 875.
- Judge, T. A., Thoresen, C. J., Bono, J. E., & Patton, G. K. (2001). The job satisfaction–job performance relationship: A qualitative and quantitative review. *Psychological Bulletin*, 127, 376-407.
- Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2001). A comprehensive meta-analysis of the predictive validity of the graduate record examinations: implications for graduate student selection and performance. *Psychological Bulletin*, 127, 162-181.
- Kyllonen, P. C., Lipnevich, A. A., Burrus, J., & Roberts, R. D. (2014). Personality, motivation, and college readiness: A prospectus for assessment and development. ETS RR-14-06. Princeton, NJ: Educational Testing Service.
- Lindqvist, E., & Vestman, R. (2011). The labor market returns to cognitive and noncognitive ability: Evidence from the Swedish enlistment. *American Economic Journal: Applied Economics*, 3, 101–128.
- 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. D., & Patterson, B. F. (2011). The Validity of the SAT for Predicting Fourth-Year Grades: 2006 SAT Validity Sample. (College Board Statistical Report 2011-7). New York, NY: The College Board.
- McAbee, S. T., & Oswald, F. L. (2013). The criterion-related validity of personality measures for predicting GPA: A meta-analytic validity competition. *Psychological Assessment*, 25, 532-544.
- Moore, J. L., Way, J. D., Casillas, A., Burrus, J., Allen, J., & Hanson, M. A. (in press). Effects of psychosocial characteristics of middle school students on high school grades and on-time graduation. *European Journal of Personality Assessment*.
- Murtaugh, P. A., Burns, L. D., & Schuster, J. (1999). Predicting the retention of university students. *Research in Higher Education*, 40, 355–371.
- Neild, R. C., & Balfanz, R. (2006). Unfulfilled promise: The dimensions and characteristics of Philadelphia's dropout crisis, 2000–2005. Retrieved from [http://www.csos.jhu.edu/new/Neild\\_Balfanz\\_06.pdf](http://www.csos.jhu.edu/new/Neild_Balfanz_06.pdf).
- Noftle, E. E., & Robins, R. W. (2007). Personality predictors of academic outcomes: Big five correlates of GPA and SAT scores. *Journal of Personality and Social Psychology*, 93, 116-130.
- Nye, C. D., Su, R., Rounds, J., & Drasgow, F. (2012). Vocational interests and performance a quantitative summary of over 60 years of research. *Perspectives on Psychological Science*, 7, 384–403.
- Ones, D. S., Viswesvaran, C., & Schmidt, F. L. (1993). Comprehensive meta-analysis of integrity test validities: Findings and implications for personnel selection and theories of job performance. *Journal of Applied Psychology*, 78, 679–703.
- Oswald, F. L., & Hough, L. M. (2010). Personality and its assessment in organizations: Theoretical and empirical developments. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology: Vol. 2. Selecting and developing members for the organization* (pp. 153–184). Washington, DC: American Psychological Association

- Ozer, D. J., & Benet-Martinez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology*, 57, 401-421.
- Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research (Vol. 2)*. San Francisco, CA: Jossey-Bass.
- Poropat, A. E. (2014). A meta-analysis of adult-rated child personality and academic performance in primary education. *British Journal of Educational Psychology*, 84, 239-252.
- Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin*, 135, 322-338.
- Prinzle, P., & Deković, M. (2008). Continuity and change of childhood personality characteristics through the lens of teachers. *Personality and Individual Differences*, 45, 82-88.
- Pullmann, H., Raudsepp, L., & Allik, J. (2006). Stability and change in adolescents' personality: A longitudinal study. *European Journal of Personality*, 20, 447-459.
- Radunzel, J., & Noble, J. (2012). Predicting long-term college success through degree completion using ACT composite score, ACT benchmarks, and high school grade point average. (Research Report 2012-5). Retrieved from [http://media.act.org/documents/ACT\\_RR2012-5.pdf](http://media.act.org/documents/ACT_RR2012-5.pdf)
- Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: a systematic review and meta-analysis. *Psychological Bulletin*, 138, 353-387.
- Robbins, S.B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, 130, 261-288.
- Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., & Goldberg, L. R. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science*, 2, 313-345.
- Roberts, B.W., Luo, J., Chow, P., Su, R., & Hill, P. L. (2015). A Systematic Review of Personality Trait Change through Intervention. Unpublished manuscript.
- 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.
- Roberts, R. D., Martin, J. E., & Olaru, G. (2015). A Rosetta stone for noncognitive skills: Understanding, assessing, and enhancing noncognitive skills in primary and secondary education. Retrieved from: [http://www.proexam.org/images/resources/A\\_Rosetta\\_Stone\\_for\\_Noncognitive\\_Skills.pdf](http://www.proexam.org/images/resources/A_Rosetta_Stone_for_Noncognitive_Skills.pdf)
- Roderick, M. (1994). Grade retention and school dropout: Investigating the association. *American Education Research Journal*, 31, 729-759.
- Roth, P. L., BeVier, C. A., Switzer III, F. S., & Schippmann, J. S. (1996). Meta-analyzing the relationship between grades and job performance. *Journal of Applied Psychology*, 81, 548-556.
- Sackett, P. R., & Walmsley, P. T. (2014). Which personality attributes are most important in the workplace? *Perspectives on Psychological Science*, 9, 538-551.
- Schimmack, U., Oishi, S., Furr, R. M., & Funder, D. C. (2004). Personality and life satisfaction: A facet-level analysis. *Personality and Social Psychology Bulletin*, 30, 1062-1075.
- Schimmack, U., Radhakrishnan, P., Oishi, S., Dzokoto, V., & Ahadi, S. (2002). Culture, personality, and subjective well-being: Integrating process models of life satisfaction. *Journal of Personality and Social Psychology*, 82, 582.
- Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big Five domains and facets in a large cross-sectional sample. *Journal of Personality and Social Psychology*, 100, 330 - 348.
- Stark, S., Chernyshenko, O.S., & Drasgow, F. (2011). Constructing fake-resistant personality tests using item response theory: High stakes personality testing with multidimensional pairwise preferences. In M. Ziegler, C. MacCann, & R. D. Roberts (Eds.), *New Perspectives on Faking in Personality Assessments* (pp. 214-239). New York, NY: Oxford University Press.
- Stark, S., Chernyshenko, O. S., & Drasgow, F. (2005). An IRT approach to constructing and scoring pairwise preference items involving stimuli on different dimensions: An application to the problem of faking in personality assessment. *Applied Psychological Measurement*, 29, 184 - 201.
- Steel, P., Schmidt, J., & Shultz, J. (2008). Refining the relationship between personality and subjective well-being. *Psychological Bulletin*, 134, 138-161.
- Thomas, L. L., Kuncel, N. R., & Credé, M. (2007). Noncognitive variables in college admissions: The case of the Non-Cognitive Questionnaire. *Educational and Psychological Measurement*, 67, 635-657
- Tominey, S. L., & McClelland, M. M. (2011). Red light, purple light: Findings from a randomized trial using circle time games to improve behavioral self-regulation in preschool. *Early Education and Development*, 22, 489-519.
- Van Iddekinge, C. H., Roth, P. L., Raymark, P. H., & Odle-Dusseau (2012). The criterion-related validity of integrity tests: An updated meta-analysis. *Journal of Applied Psychology*, 97, 499-530.
- Ziegler, M., MacCann, C., & Roberts, R. D. (Eds.) (2011). *New perspectives on faking in personality assessment*. New York: Oxford University Press.