

The Importance of Higher Education and the Role of Noncognitive Attributes in College Success

La importancia de la educación superior y el rol de los atributos no cognitivos en el éxito en dichas instituciones

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Abstract

Higher education is valuable; not everyone is ready for higher education. Although readiness has traditionally been defined as academic, “noncognitive” skills can be considered as important and sometimes more important for success. Noncognitive skills assessments can be used in admissions, also placement, self assessment, and student learning outcomes. In this paper I elaborate on the full range of student attributes that are important for success in college and that ought to be considered for college readiness. I argue that on the basis of educator and employer surveys, prediction studies, and studies focusing on 21st century skills there is now an emerging consensus on what the most important noncognitive skills are, and a variety of approaches to measuring them have been developed and evaluated.

Keywords: non cognitive skills, higher education, predictors of college success, admission to higher education

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Resumen

La educación superior es valiosa, pero no todos están listos para ella. Aunque la preparación se ha definido tradicionalmente como preparación académica, las destrezas no cognitivas son consideradas importantes y algunas veces incluso más importantes que las académicas para el éxito en la educación superior. La evaluación de destrezas no cognitivas se puede usar en la admisión a la educación superior y también para definir nivelación, auto evaluación y resultados de aprendizaje de los estudiantes. En este manuscrito se elabora en un amplio rango los atributos de los estudiantes que son importantes para el éxito en la educación superior y la preparación para ésta. Se argumenta que sobre la base de las encuestas a educadores y empleados, los estudios de predicción y las destrezas del siglo XXI, existe un consenso emergente sobre las habilidades no cognitivas más importantes y sobre los enfoques más adecuados para medirlos.

Palabras clave: destrezas no cognitivas, educación superior, predictores de éxito en la educación superior, admisión a la educación superior

Higher education is valuable for the individual and beneficial to an economy and society, but not everyone is ready for higher education. Many students who enter college are unprepared for the demands higher education places on them, and consequently perform poorly, fail to keep up with assignments and other requirements, and then end up dropping out of school altogether. This is frustrating to the individual and wasteful of precious educational resources.

Traditionally we have understood college readiness almost exclusively in academic terms. For example college placement tests designed to determine college readiness in the United States—such as the College Board’s Accuplacer, or ACT’s COMPASS— provide information solely about students’ academic skills in mathematics, English, reading, and writing. In educational policy discussions about the use of national K-12 tests for determining readiness, a recommendation was made to have the National Assessment of Educational Progress “report 12th grade students’ readiness for college credit coursework, training for employment, and entrance into the military” focusing only on “revising assessment frameworks and developing performance standards in reading and mathematics...” (National Assessment Governing Board [NAGB], 2005). But being college and career ready is not simply a matter of demonstrating sufficient content knowledge. Conley (2010) has argued that cognitive strategies and “key behaviors” are also important, including time management and study habits.

In this paper I elaborate on the full range of student attributes that are important for success in college and that ought to be considered for college readiness. I first review the importance of educational attainment on workforce, societal, and life outcomes. Next, I document the case for the importance of noncognitive attributes per se for educational attainment and workforce outcomes. I argue that on the basis of educator and employer surveys, prediction studies, and studies focusing on 21st century skills there is now an emerging consensus on what the most important noncognitive skills are and on various established and experimental ways to measure them. I also review a series of studies suggesting the importance of noncognitive attributes in higher education admissions. I argue that there is now a sufficient research basis to support a recommendation that noncognitive skill assessments be used in college admissions, as well as in placement and for self-assessment purposes. I also discuss interest in using noncognitive assessments to supplement more content-based ones for student learning outcomes.

Importance of educational attainment

Increasing educational attainment is important for a society and for individuals within that society. Higher levels of educational attainment lead to higher earnings and lower unemployment (Card, 1999), along with lower crime, better health, and greater civic participation (Lochner, 2011). Data from the U.S. Bureau of Labor Statistics (2011), for example, shows that those with less than a high school diploma experienced a 14.1% unemployment rate in 2011 and average weekly earnings of \$453; but for each increase in level of educational attainment unemployment goes down and earnings go up, so that at the highest levels earnings are 3 to 4 times greater, and unemployment is 5 to 6 times lower (see Table 1).

Table 1
Employment and earnings associated with educational attainment

| Unemployment rate (2011) | Education attained | Median weekly earnings (2011) |
|-----------------------------|---------------------------------|-------------------------------|
| 2.5% | Doctoral degree | \$1,551 |
| 2.4 | Professional degree | 1,665 |
| 3.6 | Master's degree | 1,263 |
| 4.9 | Bachelor's degree | 1,053 |
| 6.8 | Associate degree | 768 |
| 8.7 | Some college, no degree | 719 |
| 9.4 | High-school diploma | 638 |
| 14.1 | Less than a high school diploma | 453 |

Note: From Bureau of Labor Statistics, Current Population Survey. Data are for persons aged 25 and over. Earn and salary workers.

A relationship between educational attainment and labor market outcomes is not unique to the United States. Data from the Organization for Economic Cooperation and Development (OECD, 2011) show that across all OECD member and partner countries there is a strong relationship between educational attainment and earnings and employment. For example, in Latin America the relationship between education and employment is comparable to that in the United States. For 25 to 64 year old adults the difference in the percentage of adults employed with tertiary and below secondary attainment levels is 20%, 20%, and 16% in Chile, Mexico, and Brazil, respectively.

Studies using a variety of methods suggest that this relationship is likely causal (Card, 1999). More education, controlling for other factors, leads to lower unemployment and higher earnings, with a typical estimate being 10% greater lifetime earnings for each year in school (Barrow & Rouse, 2005). It is usually impossible to randomly assign people to different levels of education, but natural experiments have shown that the benefits of additional education are consistent with what are found in ordinary least squares regression studies (Card, 1999). For example, Angrist and Krueger (1991) found that students required to attend an additional year of school due to the season of their birth, compared to other students, show the same benefits of additional education as shown in other studies. Evaluations of identical twins varying in their school attainment levels arrive at the same estimates. These studies have been conducted in the United States (Ashenfelter & Krueger, 1994), Australia (Miller, Mulvey, & Martin, 1995), and the United Kingdom (Bonjour, Cherkas, Haskel, Hawkes, & Spector, 2002).¹

There are additional benefits to schooling besides employment and earnings, including greater job satisfaction, a sense of achievement, and working in higher status jobs (Oreopoulos & Salvanes, 2011). Also, more schooling is associated with greater civic participation, including staying informed and voting. A recent study by Educational Testing Service (Coley & Sum, 2012) found that the voting rate for high school dropouts (39 percent) is less than half the rate of those with advanced degrees, and also considering age and income, there is a difference by a *factor of 23* between voting participation of young, low income, high school dropouts vs. older, high income adults with a masters degree or higher. Furthermore, there has been a general decline in voting rates from 1964 to 2008, but the decline has been particularly steep for those with low education levels. Campbell (2006) points out that the relationships between education and various indicators of civic engagement and the decline in civic participation are found not just in the United States, but across OECD nations. In the United States and in OECD nations, educational attainment seems therefore not only to be important for individual rewards and national economic

¹ Estimates of the relationship between various predictor variables and job performance presented at the U.S. Office of Personnel management website, <http://apps.opm.gov/ADT/Content.aspx?page=2-02&AspxAutoDetectCookieSupport=1&JScript=1>, show a much smaller estimate of the relationship with educational attainment. However, those estimates are uncontrolled correlations and make statistical adjustments for range restriction that may be difficult to justify (Levin, 1989) and so they cannot be treated as inconsistent with the argument presented here.

success, but for democracy itself—democracy requires all citizens to participate in the affairs of a nation at least through voting, but in other forms of civic and political engagement as well. As Converse (quoted in Campbell, 2006) summarized, “The educated citizen is attentive, knowledgeable, and participatory and the uneducated citizen is not.” (p. 324).

College readiness

Because of its value to the individual and to society, promotion of higher educational attainment has been a policy goal in many countries over the past two decades. This can be seen in increased higher education participation rates over the past two to three decades across Latin American and the OECD countries (OECD, 2011). In the United States, in response to the decline in the country’s position in the number of students completing higher education (“from first to ninth”), the Obama administration (2009) proposed a goal to “once again have the highest proportion of college graduates in the world by the year 2020,” and has regularly proposed initiatives to achieve that goal, such as the recent Race to the Top for College Affordability and Completion initiative (2012).

One major challenge in achieving an attainment goal is affordability, of course, but even if that were not a consideration another is that not everyone is prepared for college. Roughly half the students who begin college fail to complete it. As seen in Figure 1 the probability of completing college after six years varies by academic preparedness (a composite of SAT scores, grades, and courses taken), income, and whether a student’s parents attended college (i.e., whether the student is from the first generation who attended college in that family). Low income, first-generation students with low academic preparedness have a less than 30% probability of completing college in six years, whereas medium-income students whose parents attended college with at least middle-high academic preparation have an 80% chance of completing within six years.

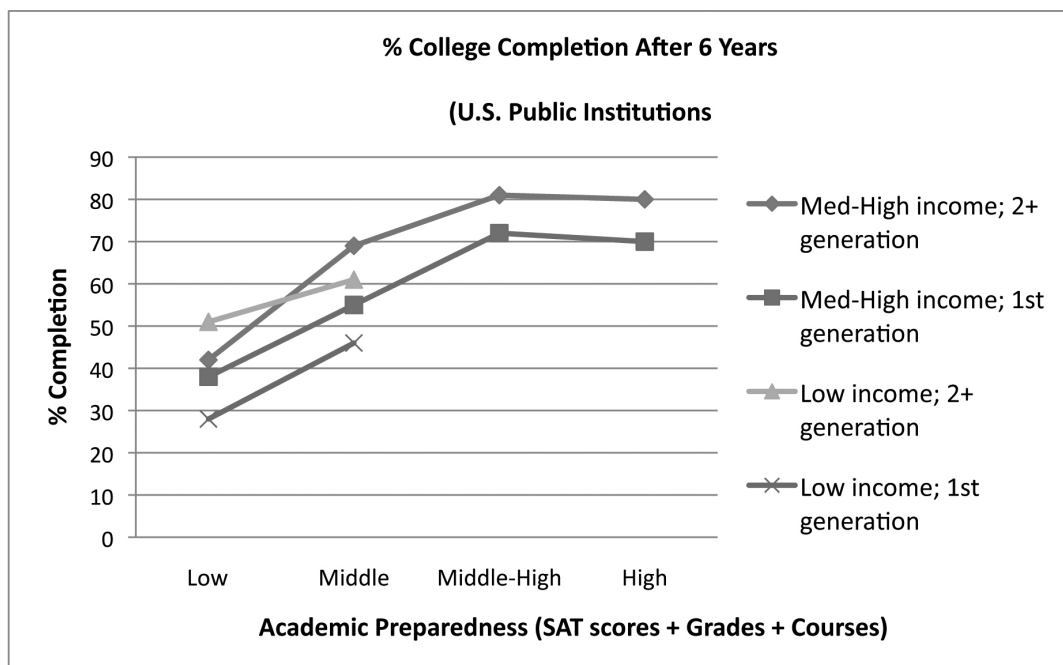


Figure 1. Percentage college completion as a function of academic preparedness, family income, and first generation status. (Data from Beginning Postsecondary Longitudinal Study); (see also Tinto, 2012 Table A5, p.140; missing data points for cells with too small numbers Appendix A).

Data such as these have dominated the discussion concerning college readiness, with income, generational status, and particularly academic preparedness being the most common variables talked about. But there have been a number of surveys and correlational studies in recent years suggesting

that elements other than academic preparedness are important factors in higher educational success and subsequent success in the workforce. These studies suggest that our focus strictly on academic readiness misses an important component of readiness that has to do with noncognitive skills, such as interpersonal and intrapersonal skills, and with cognitive skills other than those that are traditionally measured by aptitude and achievement tests.

In higher education, Walpole, Burton, Kanyi and Jackenthal (2002) found that professors and administrators stated that the most important attributes for graduate school success were academic ability (e.g., research experience, mastery of discipline, writing ability, English language ability, breadth of perspective), interpersonal skills (collegiality/networking, professional communication), and intrapersonal skills (persistence/tenacity, values/character/integrity, maturity/responsibility/work habits, initiative, commitment to field). Of these the intrapersonal skills were mentioned most frequently as important for admissions, with all three mentioned as roughly equally important for outcomes of school.

In the workplace, the Educational Quality of the Workforce (EQW) National Employer Survey conducted by the Bureau of the Census and funded by the U.S. Department of Education (The National Center on the Educational Quality of the Workforce, 1995) asked more than 4,000 employers in a national probability sample to rate various factors in importance (1 = not important; 5 = very important) with the following question: "When you consider hiring a new non-supervisory or production worker (front-line worker), how important are the following in your decision to hire? Attitude was the top-rated factor (4.6), along with communication skills (4.2) and previous work experience (4.0), while industry-based credentials (3.2), scores on tests (2.5), grades (2.5), and even reputation of applicant's school (2.4) and teacher recommendations (2.1) being rated much lower.

A more recent survey of 225 employers conducted by Millennial Branding (2012) reported similar findings. They asked two questions: "What skills are you looking for when you hire?" and "What skills are hardest to find, but most important to you?" The top four skills on both lists were communication skills (98% of employers said important or very important), positive attitude (97%), adaptable to change (92%), and teamwork skills (92%). Content skills, the kinds of skills that are measured with standardized achievement tests, did not appear at the top of the list. Content skills were reflected at least loosely, and to a much lesser extent, in that 69% of the employers said that relevant coursework was an important factor, which was about the same percentage who said a referral from a boss or professor was important. A question is why the apparent lack of interest in content skills? A clue comes in a quote provided in the article (Millennial Branding, 2012) by Jennifer Floren, CEO of Experience, Inc.: "Of all the things employers look for when hiring entry-level talent, it's the so-called 'soft skills' that are valued most: communication, teamwork, flexibility and positive attitude are by far the most sought-after skills. Employers understand that everything else can be taught, so they look for the most promising raw material to work with." (p. 2).

Other employer surveys (Casner-Lotto & Barrington, 2006) ($N = 431$ employers) mirror the results of this survey, and likely for the same reasons as suggested by the quote. Workforce training is a \$50 billion dollar industry in the United States alone (Mikelson & Smith Nightingale, 2004), and so it may be that employers value college education (100% of the employers surveyed said "that college prepares students for the workplace"), but perhaps not so much through the provision of cognitive skills as through the development of noncognitive skills.

Noncognitive correlates of school grades

If surveys suggest that noncognitive skills are desired by faculty members in admitting students into higher education, and by employers for hiring new staff for the workforce, there must be at least some evidence that noncognitive skills correlate with success. There is. In education, Poropat (2009) conducted a meta-analysis of the so-called Big 5 personality traits and found that all five factors (Extroversion, Neuroticism, Agreeableness, Openness, and Conscientiousness) predicted grades in primary school, secondary school, and college. In college, conscientiousness (the trait indicating the degree to which one works hard, persists, and is organized) was the highest correlate with grades ($r = .23$), with the strength of relationship being comparable to estimates of the correlations between grades and cognitive ability (.23) and socioeconomic status (.32). Another recent meta-analysis of 13 years of college GPA correlate studies (Richardson, Abraham, & Bond, 2012) identified 7,167 articles, 241 data sets, and 50

distinct correlates, and found that 41 of these showed significant correlations with grades. The authors categorized these as demographic factors (3), which had small correlations with grades; prior academic measures (5), which had medium correlations with grades; and non-intellective factors (42), which varied from small to large. The strongest predictor was *performance self-efficacy* (e.g., “what is the highest GPA that you feel completely certain that you can attain?”). Others with high correlations (in the $r = .45$ to $.55$ range) were *academic self-efficacy* (e.g., “I have a great deal of control over my academic performance in my courses”), *grade goal* (e.g., “What is your minimum percentage grade goal for the next test [on a scale of 0% to 100%]?”), and *effort regulation* (e.g., “I work hard to do well in this class even if I don’t like what we are doing”). These findings were consistent with a meta-analysis by Robbins, Lauver, Le, Davis, Langley, and Carlstrom (2004) who found that retention was best predicted by academic goals ($r = .34$), academic self-efficacy ($r = .36$), and academic-related skills ($r = .37$); that GPA was best predicted by academic self-efficacy ($r = .50$) and achievement motivation ($r = .30$); and that these relationships held up even after controlling for socioeconomic status, achievement test scores, and high school GPA.

Noncognitive correlates of workplace outcomes

Noncognitive factors predict workplace outcomes in addition to predicting academic success. A study by Segal (2011) based on data from the National Educational Longitudinal Study (NELS) (Ingels, 1990) examined the correlation between noncognitive factors measured in 8th grade boys and employment outcomes 20 years later. In the NELS survey, which was administered to a national probability sample, teachers were asked to provide ratings of students on a number of items. Among these were items asking whether the student (a) rarely completes homework, (b) is frequently absent, (c) is frequently tardy, (d) is consistently inattentive, or (e) is frequently disruptive, on a rating scale provided in a booklet in which the teacher simply checked “yes,” “no,” or “don’t know”. Segal created a misbehavior variable coded as 1 if either the student’s mathematics or reading teacher rated the student a “yes” on any of the five variables, and a 0 otherwise, which classified 55% of the students into the misbehavior category. With this variable, Segal (2011) found that (a) controlling for 8th grade test scores and family background, misbehavior ratings predicted lower educational attainment, (b) that controlling for test scores and educational attainment, misbehavior ratings predicted lower earnings at age 26-27, and (c) 8th grade achievement test scores predicted earnings at age 26-27, but only for degree holders.

A somewhat related study by Lindqvist and Vestman (2011) examined employment outcomes of 14,703 male military enlistees from Sweden who participated in compulsory service two decades prior. At the time of enlistment, conscripts were administered a comprehensive cognitive test battery measuring vocabulary, reasoning, spatial ability and technical knowledge, and were also given a 30 minute interview by a trained clinician designed to assess their noncognitive skills, including responsibility, independence, outgoingness, persistence, emotional stability, and initiative. Two decades later their employment records were retrieved and matched, and predictions given by the cognitive and noncognitive variable were compared. Every 1 SD increase in the cognitive variable was associated with a 5% increase in wages, a 1.1% increase in employment, and a negligible decrease (-.2%) in chronic unemployment. The comparable figures for the noncognitive variable were 9%, 3.3%, and -4.7%, indicating a much stronger prediction given by the noncognitive variable compared to the cognitive variable. The authors point out that in relation to other studies in the literature these findings show an even greater relative importance for the noncognitive variable in comparison with the cognitive variable. They attribute the difference to better measurement of the noncognitive variable (i.e., a 30-minute clinical interview) compared to typical measurement, e.g., Likert scale ratings, or yes-no ratings (Segal, 2011).

What are the most important noncognitive skills?

Various academic disciplines and research and policy traditions provide alternative perspectives on what noncognitive skills are and which ones might be the most important for academic and workplace success. For example, in psychology, noncognitive skills are identified primarily through factor analysis based on individual differences in response patterns to assessments of personality, attitudes, values, and other factors (Kyllonen, Lipnevich, Burrus, & Roberts, in press). In labor economics and analyses based on human-capital theory, noncognitive skills are identified primarily as the skills that predict earnings, but that are independent of cognitive skills (with cognitive skills being the skills measured by standardized

achievement test scores) (Bowles, Gintis, & Osborne, 2001; Levin, 2012). For the workplace survey research on employer perceptions of the importance of skills it is reasonable to trace the source back to the Secretary's Commission on Achieving Necessary Skills (SCANS) report commissioned by the U.S. Department of Labor (1991). That report proposed a "three-part foundation" of basic skills (reading, writing, mathematics, listening, speaking), thinking skills (creative thinking, decision making, problem solving, seeing things in the mind's eye, knowing how to learn, and reasoning), and personal qualities (responsibility, self esteem, sociability, self-management, and integrity/honesty). Many of the employer surveys ask employers directly about the importance of these skills in hiring and in the workplace.

In addition to these, there have been various white papers, reviews, and other kinds of committee reports from U.S. groups and from outside the United States that have systematically attempted to identify "21st century skills." Much of that research is reviewed elsewhere (Kyllonen, 2012a), but here I focus on a recent report from the U.S. National Research Council (NRC, 2012b) entitled *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*.

The report attempts to classify 21st century skills and abilities by reviewing scientific literature from differential, personality, and developmental psychology, education, and economics, along with previous workshops, panels, and reports on 21st century skills and the U.S. Department of Labor's (2012) O*NET (Occupational Network) content model. The classification was designed to consolidate what we know about what the different constructs are, and to address the "jangle fallacy," the tendency for different researchers or research traditions to use different terms for the same construct. The report suggests that 21st century competencies can be categorized into three clusters: cognitive competencies, intrapersonal (self-regulatory) competencies, and interpersonal (social) competencies. Cognitive competencies include cognitive processes and strategies (e.g., critical thinking, problem solving, reasoning, executive function), knowledge (e.g., information literacy, information and communications technology, communication skills), and creativity (e.g., idea generation, innovation). Intrapersonal (self-regulatory) competencies include intellectual openness (flexibility, adaptability, continuous learning, intellectual interest), work ethic (e.g., conscientiousness, initiative, grit, Type 1 self-regulation, citizenship, integrity), and positive core self-evaluation (e.g., Type 2 self-regulation, physical and psychological health). Interpersonal (social) competencies include teamwork and collaboration (e.g., communication, cooperation, interpersonal skills, negotiation) and leadership (e.g., responsibility, self-presentation, social influence, persuasion). This is not an exhaustive list of the factors likely to be important in higher education. In particular, there is evidence for the importance of interests, attitudes, and fit (Nye, Su, Rounds, & Drasgow, 2012). But it is a reasonably comprehensive summary.

An attractive feature of the NRC report's taxonomy is that it is grounded in empirical findings, particularly regarding what we know about how individuals differ in their knowledge and skills, developmentally, and as adults. At the same time the taxonomy reflects the diverse language and concepts used by researchers, practitioners, and policymakers across a broad spectrum of disciplines and backgrounds. The taxonomy therefore serves as a useful resource for determining the category of skills that might be useful in college and in work.

Noncognitive (or 21st century) skills in admissions

Admissions procedures in higher education in the United States and elsewhere are varied, but for many selective institutions admissions decisions consider standardized test scores along with prior academic grades, letters of recommendation, and other indications of academic achievement. In the United States, the SAT and ACT standardized achievement tests are widely used in undergraduate admissions, and the Graduate Record Examination (GRE), Law School Admissions Test (LSAT), Graduate Management Admissions Test (GMAT), and Medical College Admissions Test (MCAT) are used in graduate and professional school admissions. Test content is primarily reasoning, language and verbal skills, and mathematical skills, and other measures of cognitive competencies, particularly cognitive processes and strategies, and knowledge, to use the terminology from the NRC (2012) report. But, given the overwhelming evidence reviewed here for the importance of competencies other than traditional cognitive competencies, it is not surprising that there have been a number of calls to supplement traditional measures with alternative ones in the admissions process.

One of the first systematic studies along these lines was an experiment for an alternative assessment system for business school admissions at the University of Michigan conducted in 2000 and 2001 (Hedlund, Wilt, Nebel, Ashford, & Sternberg, 2006). Hedlund et al. (2006) developed two new measures—a situational judgment test and a case-based problem test—and administered them to business school applicants, along with the standard GMAT. Although the new tests measured cognitive ability, they did so by asking students to consider longer problems that required reflection and judgment, what Sternberg (1985) referred to as “practical intelligence.” The findings were that the new measures did not correlate as highly with business school grades as GMAT scores did, but the new measures predicted other outcomes, such as project grades and leadership positions, which GMAT scores did not predict.

A related study (Sternberg & the Rainbow Project Collaborators, 2006) was conducted in the spring of 2001, with $N = 777$ volunteers from eight 4-year colleges and five 2-year colleges using a set of “Rainbow measures” as the alternative admissions measure. Rainbow measures included the (a) Sternberg Triarchic Abilities Test (STAT), multiple-choice verbal, quantitative, and figural measures of analytic, practical, and creative thinking. In addition, students were given (b) open-ended cartoon caption and creative essay tasks also designed to measure creativity, and (c) three situational judgment tests designed to measure practical intelligence: the Everyday Situational Judgment Inventory (Movies), the Common Sense Questionnaire, and the College Life Questionnaire. One of the findings was that there was some suggestion that the alternative measures were tapping into skills not captured by the standard measures. However, the study was inconclusive due to the relatively small sample size and the selectivity of the colleges included, which makes it difficult to compare tests that are used to restrict the sample (e.g., SAT scores) with the alternative measures. Nevertheless a practical outcome emerged from the study in that Tufts University, and later Oklahoma State University—in what was known as the Kaleidoscope Project—added analytical, creative, practical and wisdom-based essays to the admissions process. Although systematic evaluations of these policies have not yet been presented, such an analysis would be useful in determining how effective they are in their impacts on college admissions, student attrition, and other outcomes.

It could be argued that the alternative measures used in the Michigan and Rainbow studies, while somewhat novel in measuring creativity and practical ability, are not a great departure from conventional cognitive tests. A more radical departure from the conventional approach was proposed in a follow-up project sponsored by the College Board (Oswald, Schmitt, Kim, Ramsay, & Gillespie, 2004; Schmitt, 2012; Schmitt et al., 2007). This project began with the premise that colleges’ mission statements reflect the student skills that colleges aspire to develop, and therefore parsing and summarizing those statements could identify the skills that colleges should be looking for in student admissions. Taking the approach of sifting through college mission statements and extracting the essential skills, the Michigan State researchers identified 12 skills, which, consistent with the NRC scheme, divide into (a) cognitive/intellectual (knowledge and mastery of general principles; continuous learning, intellectual interest, and curiosity; artistic and cultural appreciation), (b) interpersonal (appreciation for diversity, leadership, interpersonal skills); and (c) intrapersonal (social responsibility and citizenship, physical and psychological health, career orientation, adaptability and life skills, perseverance, and ethics and integrity) (Schmitt, 2012).

In the various studies (Schmitt, 2012) there have been four waves of data collection since the initial 2001-2002 study participants (current students) were given two experimental measures: a situational judgment inventory for each of the 12 performance dimensions, where participants are asked what they are most and least likely to do in a situation; and a biodata measure comprising short, multiple-choice reports of background experiences and interests. An example of a situational judgment item (Schmitt, 2012) is: You are assigned to a group to work on a particular project. When you sit down together as a group, no one says anything. What is the best/worst response to the situation: a) Look at them until someone eventually says something (rated by experts as the worst response), b) start the conversation yourself by introducing yourself, c) get to know everyone first and make sure the project’s goals are clear to everyone (rated by experts as the best response), d) try to start working on the project by asking everyone’s opinion about the nature of the project, e) you would take the leadership role by assigning people to do things or ask questions to get things rolling. The score is typically the number of times one correctly selects the best and worst responses (Zu & Kyllonen, 2012).

An example of a biodata item (Schmitt, 2012) is: “The number of high school clubs and organized activities (such as band, sports, newspapers, etc.) in which I took a leadership role was: 4 or more, 3, 2, 1, I did not take a leadership role” (p. 23) Or: “How often do you talk your friends into doing what you want to do during the evening? Most of the time, sometimes (about half the time), occasionally (about as often as others in my group), seldom or infrequently, never.” Biodata items are used in other studies, such as in a recent study evaluating a new college admissions system for universities in Chile (Santelices, Ugarte, Flotts, Radovic, & Kyllonen, 2011).

In the studies reported by Schmitt (2012), several outcome measures have been examined, including self-ratings on scales designed to reflect the 12 dimensions, class attendance, grades, and citizenship behavior. Across the four waves of data collection, the knowledge measures typically correlate highest with college grades (although not as highly as high school grades do), but for other criteria, such as class absences and self-rated performance, other predictors, such as ethics, lifelong learning, situational judgment, adaptability, career orientation, and health, turn out to be more highly correlated in a multiple regression model. Another key finding in the research is that the noncognitive measures tend to show much smaller differences between groups. Schmitt suggests that faking is a problem with noncognitive measures, in that they rely on self reports, but that there may be other ways to use them besides admissions, such as early identification of potential college leavers who might benefit from interventions designed to increase retention.

A study similar in intent to the College Board-Michigan State study was one that was initially sponsored by the Law School Admissions Council with the intention of exploring alternatives to the Law School Admissions Test (LSAT) (Shultz & Zedeck, 2011, 2012). Shultz and Zedeck conducted interviews with 2,012 practicing lawyers and partners to identify 26 key lawyering effectiveness factors. These could be clustered into (a) intellectual/cognitive (e.g., reasoning, creativity), research and information gathering (e.g., fact finding, interviewing), communications (e.g., influencing, speaking, writing), planning and organizing (e.g., strategic; managing oneself), conflict resolution (e.g., negotiation), client and business relations (e.g., networking), working with others (e.g., developing professional relationships), and character (e.g., community involvement). In addition, they gathered 700 examples of good to poor performance with respect to those factors, which were then transformed into behaviorally-anchored rating scales. In the study, they administered a battery of new predictor tests (e.g., personality, situational judgment, attitudes) to 1100 attorneys and found that the new tests were more predictive of lawyering effectiveness than the LSAT.

Almost all testing, even the newer forms of personality and situational judgment testing tend to be based on verbal material. However, for some constructs, such as communication skills or interpersonal skills, video testing may prove useful. A nice example of this was given by Lievens and Sackett (2012) who administered a video-based Situational Judgment Test (SJT) measuring interpersonal skills (social sensitivity, relationship building, working with others, listening, and communication) to 723 medical students in Belgium over several years. They tracked students for several more years into their internships (7 years) and jobs (9 years). They found that the video SJT was relatively uncorrelated with written ($r = .15$) and cognitive ($r = .03$) tests. It also did not predict grades as well as the written and cognitive tests did, but it did predict internship performance ($r = .21$) and job performance ($r = .21$) more highly than the cognitive and written tests did (r 's ranging from $-.12$ to $.13$), and the video SJT added significantly to the other cognitive measures in predicting internship and job performance in a regression analysis. Although this suggests that video SJT measures might be practically useful, Lievens and Sackett suggest that they may be susceptible to coaching, more so than conventional measures.

One way to minimize susceptibility to coaching is to rely on informant ratings of applicants. In addition to reducing threats of coaching and faking, informant ratings tend to be more reliable and have higher predictive validities than self ratings do (Connelly & Ones, 2010). For these and other reasons, an informant rating approach is taken in the ETS® Personal Potential Index (PPI) (Educational Testing Service, 2012), an online rating tool designed to supplement ETS's GRE® (the GRE is a standardized test measuring verbal and quantitative reasoning and analytic writing, used in graduate admissions, see Kuncel, Hezlett, & Ones, 2001, for a meta-analysis of its validity). The PPI is the first large-scale, quantifiable evaluation of personal attributes for use in graduate admissions, with six scales: knowledge and creativity, communication skills, teamwork, resilience, planning and organization, and ethics and integrity. Each scale is measured with several Likert scale items (24 in total), on which the evaluator rates the candidate.

A review of the research that led to the development of the PPI, including the identification of the factors measured, can be found in Kyllonen (2008; see also Kyllonen, Walters, & Kaufman, 2005). One way to view the PPI is as a standardized letter of recommendation. Prior research (Kuncel et al., 2007) suggests that letters of recommendation assigned an overall holistic score by raters add to standardized tests in predicting graduate outcomes. However, letters of recommendation are rarely assigned holistic scores and so validity studies on them are rare. The PPI enables validity studies and these are underway.

Thus far over 20,000 student ratings have been collected on the PPI. Some preliminary findings have been reported by Klieger, Holtzman, and Ezzo (2012). The six PPI scales have high reliability (Cronbach's alphas range from .87 to .94), and they are relatively independent from GRE Verbal, Quantitative, and Analytic Writing scores, with correlations ranging from $r = .00$ (Ethics and Integrity with GRE-Quantitative) to $r = .16$ (Communication skills with GRE-Analytic Writing). One of the promises of noncognitive measurement is that it yields smaller differences between demographic subgroups compared to cognitive measures (Sackett, Schmitt, Ellingson, & Kabin, 2001; Schmitt et al., 2009). Klieger et al. (2012) found that to be the case with the PPI. Effect size statistics (Cohen's d) showed the typical large differences between White students vs. African American and Hispanic students on GRE-Verbal, Quantitative, and Analytic Writing scores (ranging from $d = -.34$ to $d = -1.12$; all significant differences), but nonsignificant differences on the PPI scores.

A similar version of the PPI for use in college admissions has also been developed, called the Collegiate PPI (CPPI). It collects evaluations on the following scales:

- *Critical Thinking and Problem Solving* (Generates good ideas, Forms opinions based on logic and facts, Understands different points of view, Knows how to apply knowledge to solve problems);
- *Motivation and Work Ethic* (Works hard, Is goal-oriented, Shows initiative, Meets deadlines);
- *Ethics and Integrity* (Shows respect for classmates and teachers, Is worthy of trust from others, Is engaged in school or community citizenship activities, Treats all people fairly);
- *Persistence and Resilience* (Remains calm under pressure, Accepts feedback without getting defensive, Can overcome challenges and setbacks, Does not give up easily);
- *Leadership and Teamwork* (Is skilled in handling social situations, Has a talent for influencing people, Works well in group settings, Gives criticism/feedback to others in a helpful way);
- *Communication Skills* (Writes essays well, Expresses ideas clearly in short written text [emails, notes, memos], Expresses ideas clearly in oral presentations, Effective at getting point across in conversations and discussions).

The scales and items are similar to the graduate level PPI, but are tailored more specifically to the kinds of personal attributes more important for and expressed in the language of undergraduate admissions.

Other uses for noncognitive assessment

The argument presented in this paper has been that noncognitive attributes are important for success in higher education, and noncognitive attributes should therefore be included as part of the admissions process to supplement the cognitive measures that are currently used and that receive so much attention from students and school faculties and administrators. But using noncognitive assessments for high-stakes admissions is not the only way to take advantage of the findings on the importance of noncognitive skills in school. Following are discussions of alternatives to admissions applications for noncognitive assessments.

Self assessments

In many universities in the United States and elsewhere in the world, there is no tradition for using admissions tests to screen out applicants (in the United States, for example, almost all community colleges do not use admissions tests). Instead, all students meeting a set of minimum standards (e.g., secondary degree completion, language requirements) are admitted. High attrition rates are a predictable consequence of such policies. In Germany and Austria a strategy for mitigating high attrition rates without moving to a selection system per se has been to administer self assessments. These are batteries of cognitive and

noncognitive assessments administered to students who can then compare their performance with norms for the department they are entering. For example, in Germany a self assessment program, measuring mathematical skills, problem-solving, motivation, and interests, is used for engineering and other technical programs of study, began in 2002 led by Lutz Hornke and is currently being used operationally (Aachen University, 2012). An extensive program of research on self assessments has been conducted at the University of Vienna in Austria; a book-length review of that research is available in German (Kubinger, Weitensfelder, Frebort, & Sonnleitner, 2012), and a useful English summary is also available (Kubinger, Frebort, Khorramdel, & Weitensfelder, 2012). A self assessment research program has also been conducted in Frankfurt (Reiß, Schreiner, Schweizer, & Moosbrugger, 2009).

Placement testing

Many two-year and four-year colleges in the U.S. require students to take placement tests, typically in mathematics and English, prior to matriculation (i.e., prior to beginning to take courses). Placement test scores determine whether the student is ready to take credit-bearing mathematics and English courses, or whether remedial (non-credit-bearing) courses are required. Placement tests are sometimes considered medium- rather than high- or low-stakes tests because while performance on them does not determine whether the student is admitted, it does affect whether the student will be allowed to receive college credit for completing. Because noncognitive factors are known to add to the prediction of success in college courses (Crede & Kuncel, 2008; Nofle & Robbins, 2007; Poropat, 2009; Richardson et al., 2012; Robbins et al., 2004), readiness is partly determined by noncognitive skill. Therefore it makes sense that placement testing should include noncognitive assessments, along with content assessments, if the goal is to determine readiness.

Student development

In U.S. K-12 education, programs designed to boost students' noncognitive skills both in and outside of school, have been shown to be effective, not only in increasing social and emotional skills, attitudes, and behavior, but in raising academic skills as well (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Durlak & Weissberg, 2007). A Portuguese program for improving school retention for 13-15 year olds through a noncognitive intervention program has also met with success (Martins, 2010). The research therefore suggests that programs targeted at noncognitive skill improvement may be useful in boosting student educational attainment, perhaps even more so than having an indirect effect on boosting standardized test scores (Holmlund & Silva, 2009). A well known and highly regarded model for college retention suggests that the key factors are a student's academic and social integration at an institution (Tinto, 1975, 2012). Given therefore (a) the assumed and demonstrated importance of noncognitive factors on retention in higher education, and (b) the importance and policy attention given to promoting higher education completion, it may seem surprising that little systematic research has been conducted on programs targeting noncognitive skill development in higher education. We see this as a promising opportunity for new research.

Student learning outcomes

Higher education in the United States is experiencing rapid and potentially important changes that could have far-reaching effects on many aspects of the educational system, including assessment. One is the pressure for accountability. Politicians want and parents demand a demonstrable return on their higher education investment, and calls have increased for accountability in higher education. To stave off federal participation in higher education to parallel its participation in K-12 education through the No Child Left Behind Legislation, in 2007 colleges adopted the Voluntary System of Accountability (VSA), which requires 4-year universities to provide information on the performance of undergraduate students that can be accessed and compared through a web report called the College Portrait. A key component of the portrait is the growth in achievement and critical thinking scores based on standardized tests.

However, it is likely that such information will expand to include additional noncognitive data. For example, the Lumina Foundation for Education (2011) has provided a framework for a more

expanded definition of student outcomes in their degree qualifications profile. The profile defines broad competencies for associate's, bachelor's, and master's degrees, to assist in benchmarking, setting expectations, regional accreditation, program and course development, and assignments and assessments, among other applications. It proposes the development of competencies in five basic areas of learning: Broad, Integrative Knowledge (including "engaging diverse perspectives"); Specialized Knowledge; Intellectual Skills; Civic Learning; and Applied Learning. Regarding the latter, competency would be demonstrated in "performances in work settings, interpersonal communication, and everyday encounters with economic, social and cultural affairs." The emphasis would be on "student competence in addressing unscripted problems, in weighing up competing perspectives and in making decisions in ambiguous contexts."

In addition to accountability, and perhaps an even greater disruptive force in higher education might be related to the explosion in alternative sources for content. In the past year alone there have been several elite North American universities that have made courses available for free. Stanford's Engineering Everywhere (SEE) initiative offers free access to lecture videos, syllabi, handouts, homework, exams, and social networking with fellow students for 12 of its most popular engineering and computer science courses. Over 100,000 students registered in the fall of 2011 for two inaugural courses. Udacity emerged from the Stanford program, with private investment funding, offering 10 courses in computer science, physics, and statistics. Coursera, a consortium of Stanford, Princeton, and the universities of Michigan and Pennsylvania started up in spring 2012, and edX, a consortium of MIT and Harvard, began in the fall of 2012. These programs offer the same content and administer the same assignments and tests as matriculated students receive, but students going through the programs do not receive degree credit.

This development in the availability of high-quality course content presents several challenges and opportunities related to noncognitive assessment. The opportunity is that with hundreds of thousands of students all over the world having an opportunity to learn the same content as is taught in elite universities, assessment of what students know and can do will become increasingly important – employers will become more interested in demonstrations or proof of competencies that are developed outside formal educational degree programs. The challenge is that because we know, based on the literature reviewed earlier in this article, that content skills are only a part of the skills that are acquired in school, assessments of proficiency will have to accommodate these additional skills if they are to be treated as interchangeable with formal degree credit. There is much we do not yet know about the skills that are developed as a result of learning through courses — do Stanford students taking a SEE course learn more than online students, or does learning online without degree credit lead to the same end? Does the online student acquire intrapersonal skills by persisting with assignments in the same way the Stanford student does? Does the Stanford student have a skill acquisition advantage by having classmates, or is that advantage mitigated by the online student's access to virtual communities? These are areas where research is only at a very initial stage.

Discussion

In the United States, in Latin America, and around the world, educational attainment is important for individuals and for society. More education leads to greater earnings, lower unemployment, lower crime, greater civic participation, higher job status, and more job satisfaction. For societies, educational attainment is a leading indicator of economic growth, and consequently political leaders around the world promote policies leading to greater educational attainment. But students are often unprepared for higher education and fail to complete it. In this article I have suggested that, based on surveys of educators and employers, and based on research studies in psychology and in economics, noncognitive skills are an important part of what schooling develops and an important factor to be considered in evaluating student readiness for college and for assessing skill development in college.

Although we cannot be sure about exactly which noncognitive skills are developed in school, the National Research Council (2012) framework that organizes skills into the categories of cognitive, interpersonal, and intrapersonal is useful and encompasses much of the extant literature. There also is enough literature available now to suggest some generalizations regarding measurement issues. First, although self assessments are the most commonly used assessments of noncognitive skills, they are easy to fake, and there is considerable evidence that ratings by others provide better measurement (Connelly & Ones, 2010; Kyllonen, 2008; Lindqvist & Vestman, 2011; Segal, 2011). However, in low stakes contexts they may be quite sufficient (Kubinger et al., 2012). Second, situational judgment tests are attractive in many assessment situations because the problems they present seem close to the kinds of problems people encounter, that is, they have high content validity. This is part of the reason why they have been used extensively in employment testing, and why they have been used extensively in studies of new admissions predictors (Hedlund, et al., 2006; Oswald, Schmitt, Kim, Ramsay, & Gillespie, 2004; Schmitt, 2012; Schmitt, et al., 2007). Third, biodata measures (Oswald, et al., 2004; Santelices et al., 2012; Schmitt, 2012; Schmitt, et al, 2007) also seem promising in that the best predictor of future performance is widely thought to be past performance. Finally, there is a need for measures of noncognitive skills that are more similar to performance tests. Examples of these include collaborative problem solving tests (Woolley, Chabris, Pentland, Hashmi, & Malone, 2010) and creativity tests (Frederiksen & Ward, 1978; Mumford, Marks, Connelly, Zaccaro, & Johnson, 1998). Table 2 summarizes how different assessment methods have been used in higher education.

Table 2
Appropriateness of various assessment methods for different test uses

| Uses | Assessment Method | | | | |
|----------------------------|-------------------|----|-----|-----|----|
| | SR | OR | SJT | BDM | PT |
| Higher Education Readiness | | | | | |
| Self assessment | t | | | t | t |
| Admissions | | t | t | t | t |
| Placement | t | | | | t |
| Development | t | t | | | |
| Workforce Readiness | | | | | |
| Student learning outcomes | t | t | t | | t |

Note: SR = Self Ratings; OR = Others' ratings; SJT = Situational Judgment Tests; BDM = Biodata measures; PT = Performance Tests.

In discussions about the importance of noncognitive skills in higher education, admissions are one of the most obvious areas in which assessments can be affected. Findings to date suggest that adding noncognitive assessments to an existing cognitive assessment is likely to lead to better student performance (through higher predictive validities) and also a more diverse cohort (through less adverse impact against historically underrepresented groups) (Sackett et al., 2001; Schmitt, 2012; Shultz & Zedeck, 2011). But the admissions process is only one area in which noncognitive measures can be used. Self assessments, which are currently used in higher education in Germany and Austria, seem to be a promising method for reducing student attrition in cases where a high-stakes admissions test is not used. Placement testing is

another area in higher education where adding a noncognitive assessment is likely to lead to more accurate placement decisions. We are currently planning various tryouts of this idea in field trials in the United States. Student development is still another promising area for noncognitive assessment. Noncognitive development programs have proven to be effective in K-12 education, and it makes sense to pursue them in higher education; it seems somewhat surprising that they have not been pursued systematically thus far. Finally, the area of student learning outcomes—the measurement of the skills students have acquired as the result of studying or being in school—is likely to increase in the future due to growing concerns about accountability in higher education, and to the increasing availability of free, high-quality course content, the learning of which students and employers would like to see recognized.

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References

- Aachen University (2012). *Self assessments*. Retrieved from http://www.rwth-aachen.de/cms/root/ Studium/Vor_dem_Studium/Studienentscheidung/-eft/SelfAssessments/lidx/1/
- Angrist, J., & Krueger, A. (1991). Does compulsory school attendance affect schooling and earnings. *Quarterly Journal of Economics*, *106*, 979-1014.
- Ashenfelter, O., & Krueger, A. (1994). Estimating the returns to schooling using a new sample of twins. *American Economic Review*, *84*, 1157-1173.
- Barrow, L., & Rouse, C. E. (2005). Does college still pay? *The Economists' Voice*, *2*(4), 1-8.
- Bonjour, D., Cherkas, L., Haskel, J., Hawkes, D., & Spector, T. (2002). *Returns to education: Evidence from UK twins*. London, England: London School of Economics and Political Science, Centre for the Economics of Education.
- Bowles, S., Gintis, H., & Osborne, M. (2001). The determinants of earnings: A behavioral approach. *Journal of Economic Literature* *39*, 1137-1176.
- Campbell, D. E. (2006). What is education's impact on civic and social engagement? In R. Desjardins and T. Schuller (Eds.), *Measuring the effects of education on health and civic engagement: Proceedings of the Copenhagen symposium* (pp. 25-126). Paris, France: Office of Economic Cooperation and Development (OECD).
- Card, D. (1999). The causal effect of education on earnings. In O. Ashenfelter and D. Card, (Eds.), *Handbook of Labor Economics* (pp. 1801-1863). Amsterdam, Netherlands: Elsevier Science.
- 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 U.S. workforce*. New York, NY: The Conference Board. Retrieved from http://www.conference-board.org/pdf_free/BED-06-Workforce.pdf
- Coley, R., & Sum, A. (2012). *Fault lines in our democracy: Civic knowledge, voting behavior, and civic engagement in the United States*. Princeton, N.J.: Educational Testing Service, Center for Research on Human Capital and Education, Research and Development.
- Conley, D. T. (2010). *College and career ready: Helping all students succeed beyond high school*. San Francisco, CA: Jossey-Bass.
- 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.
- Crede, M., & Kuncel, N. R. (2008). Study habits, skills, and attitudes: The third pillar supporting collegiate academic performance. *Perspectives on Psychological Science*, *3*, 425-453.
- 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.
- Durlak, J. A., & Weissberg, R. P. (2007). *The impact of after-school programs that promote personal and social skills*. Chicago, IL: Collaborative for Academic, Social, and Emotional Learning.
- Educational Testing Service (2009). *ETS® Personal Potential Index*. Princeton, NJ.
- Frederiksen, N., & Ward, W.C. (1978). Measures for the study of creativity in scientific problem-solving. *Applied Psychological Measurement*, *2* (1), 1-24.
- Hedlund, J., Wilt, J. M., Nebel, K. R., Ashford, S. J., & Sternberg, R. J. (2006). Assessing practical intelligence in business school admissions: A supplement to the graduate management admissions test. *Learning and Individual Differences*, *16*, 101-127.
- Holmlund, H., & Silva, O. (2009). *Targeting non-cognitive skills to improve cognitive outcomes: Evidence from a remedial education intervention*. Discussion Paper No. 4476. Bonn, Germany: Institute for the Study of Labor (IZA).
- Ingels, S. J. (1990). *National education longitudinal study of 1988: base year: student component data file user's manual*. Washington, D.C.: U.S. Dept. of Education, Office of Educational Research and Improvement. Retrieved from <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2002323>
- Klieger, D. M., Holtzman, S., & Ezzo, C. (2012, August). The impact of non-cognitive assessment on diversity in graduate and professional school admissions. In P. Kyllonen (chair), *Next Generation Higher Education Admissions*. Symposium conducted at the meeting of the American Psychological Association. Orlando, FL.
- Kubinger, K. D., Frebort, M., Khorramdel, L., & Weitensfelder, L. (2012). *Self-assessment: Theorie und konzepte* [Self-assessment: Theory and concept]. Lengerich, Germany: Pabst Science Publishers.
- Kubinger, K.D., Weitensfelder, L., Frebort, M., & Sonnleitner, P. (2012, April). Noncognitive versus cognitive predictors for academic success: Opportunities and limits of self-assessments illustrated by the Viennese products. In P. Kyllonen (chair), *Factors Predicting Success in College: An International*

- Perspective*. Symposium conducted at the Meeting of the American Educational Research Association, Vancouver, Canada.
- 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. *Psychological Bulletin*, *127*, 162-181.
- Kyllonen, P. C. (2008). *The research behind the ETS Personal Potential Index (PPI)*. Princeton, NJ: Educational Testing Service.
- Kyllonen, P. C. (2012a, May). *Measurement of 21st century skills within the Common Core State Standards*. Paper presented at the K-12 Center at ETS invitational research symposium on technology enhanced assessments. Retrieved from <http://www.k12center.org/rsc/pdf/session5-kyllonen-paper-tea2012.pdf>
- Kyllonen, P. C. (2012b, January). *The role of noncognitive skills in academic success*. Paper presented at the conference of 21st century knowledge and skills: The new high school curriculum and the future of assessment, University of Southern California, Los Angeles, CA.
- Kyllonen, P. C., Lipnevich, A. A., Burrus, J., & Roberts, R. D. (in press). *Personality, motivation, and college readiness: A prospectus for assessment and development*. Princeton, NJ: Educational Testing Service.
- Kyllonen, P. C., Walters, A. M., & Kaufman, J. C. (2005). Noncognitive constructs and their assessment in graduate education. *Educational Assessment*, *10*, 153-184.
- Levin, H. (1989). Ability testing for job selection: Are the economic claims justified? In B. R. Gifford (Ed.), *Test policy and the politics of opportunity allocation: The workplace and the law* (pp. 211-232). Boston, MA: Kluwer Academic Publishers.
- Levin, H. M. (2012, May). *The importance of educational adaptability*. Paper presented at the K-12 Center at ETS invitational research symposium on technology enhanced assessments. Retrieved from <http://www.k12center.org/rsc/pdf/session5-levin-paper-tea2012.pdf>
- Lievens, F., & Sackett, P. R. (2012). The validity of interpersonal skills assessment via situational judgment tests for predicting academic success and job performance. *Journal of Applied Psychology*, *97*, 460-468.
- 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.
- Lochner, L. (2011). *Non-production benefits of education: Crime, health, and good citizenship* (Working Paper #16722). Cambridge, MA: National Bureau of Economic Research.
- Lumina Foundation for Education (2012). *The Degree Qualifications Profile*. Indianapolis, IN.
- Martins, P. S. (2010). *Can targeted, non-cognitive skills programs improve achievement? Evidence from EPIS*. Discussion Paper No. 5266. Bonn, Germany: Institute for the Study of Labor (IZA).
- Mikelson, K. S., & Smith Nightingale, D. (2004). *Estimating public and private expenditures on occupational training in the United States*. Washington, DC: United States Department of Labor.
- Millennial Branding (2012). *Millennial Branding Student Employment Gap study*. Retrieved from <http://millennialbranding.com/2012/05/millennial-branding-student-employment-gap-study/>
- Miller, P., Mulvey, C., & Martin, N. (1995). What do twins studies reveal about the economic returns to education? A comparison of Australian and U.S. findings. *American Economic Review*, *85*, 586-599.
- Mumford, M. D., Marks, M. A., Connelly, M. S., Zaccaro, S. J., & Johnson, J. F. (1998). Domain-based scoring of divergent-thinking tests: Validation evidence in an occupational sample. *Creativity Research Journal*, *11*, 151-163.
- National Assessment Governing Board (2005). *Resolution: Passed Unanimously, May 21, 2005): Reporting on Preparedness of 12th Grade Students for College-Credit Course Work, Training for Employment, and Entrance into the Military*. Washington, DC: Author. Retrieved from <http://www.nagb.org/policies/pl-index.htm#technical>
- National Research Council (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century*. Washington, DC: The National Academies Press.
- Nofle, E. E., & Robins, R. (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., Su, R., Rounds, J., & Drasgow, F. (2012). Vocational interests and performance: A quantitative summary of over 60 years of research. *Perspectives in Psychological Science*, *7*, 384-403
- Organisation for Economic Co-operation and Development (2011). *Education at a Glance 2011: Highlights*. Paris, France: OECD Publishing.
- Oreopoulos, P., & Salvanes, K. G. (2011). Priceless: The nonpecuniary benefits of schooling. *Journal of Economic Perspectives*, *25* (1), 159-184.
- 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.

- Poropat, A. E. (2009). A meta-analysis of the five factor model of personality and academic performance. *Psychological Bulletin*, *135*, 322-338.
- Race to the Top for College Affordability and Completion initiative (2012). *President Obama college affordability proposals*. Retrieved from <http://mus.edu/board/affordability/President%20Obama%20College%20Affordability%20Proposals.pdf>
- Reiß, S., Schreiner, M., Schweizer, K., & Moosbrugger, H. (2009, September). *Acquisition of studies related competencies by means of Online-Self-Assessments*. Paper presented at the 10th European Conference on Psychological Assessment. Ghent, Belgium.
- 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 skills factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, *130*, 261-288.
- Sackett, P. R., Schmitt, N., Ellingson, J. E., & Kabin, M. B. (2001). High-stakes testing in employment, credentialing, and higher education: Prospects in a post-affirmative action world. *American Psychologist*, *56*, 302-318.
- Santelices, M. V., Ugarte, J. J., Flotts, P., Radovic, D., & Kyllonen, P. (2011). *Measurements of new attributes for Chile's admission system to higher education* (Research Report 11-18). Princeton, NJ: Educational Testing Service. Retrieved from <http://www.ets.org/Media/Research/pdf/RR-11-18.pdf>
- Schmitt, N. (2012). Development of rationale and measures of noncognitive college student potential. *Educational Psychologist*, *47*(1), 18-29.
- Schmitt, N., Billington, A., Keeney, J., Oswald, F. L., Pleskac, T. J., Sinha, R., & Zorzie, M. (2009). Prediction of four-year college student performance using cognitive and noncognitive predictors and the impact on demographic status of admitted students. *Journal of Applied Psychology*, *94*, 1479-1497.
- Schmitt, N., Oswald, F. L., Kim, B. H., Imus, A., Merritt, S., Friede, A., & Shiypuri, S. (2007). The use of background and ability profiles to predict college student outcomes. *Journal of Applied Psychology*, *92*, 165-179.
- Segal, C. (2012). Misbehavior, education, and labor market outcomes. *Journal of the European Economic Association*, (1), 1-40.
- Shultz, M. M., & Zedeck, S. (2011). Predicting lawyering effectiveness: Broadening the basis for law school admissions decisions. *Law and Social Inquiry*, *36*, 620-661.
- Shultz, M. M., & Zedeck, S. (2012). Admission to law school: New measures. *Educational Psychologist*, *47*(1), 51-65.
- Sternberg, R. J. (1985). *Beyond IQ: A triarchic theory of human intelligence*. New York, NY: Cambridge University Press.
- Sternberg, R. J., & The Rainbow Project Collaborators (2006). The Rainbow Project: Enhancing the SAT through assessments of analytical, practical and creative skills. *Intelligence*, *34*, 321-350.
- The National Center on the Educational Quality of the Workforce (1995). *First findings from the EQW National Employer Survey*. Philadelphia, PA: University of Pennsylvania.
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, *45*, 89-125.
- Tinto, V. (2012). *Completing college: Rethinking institutional action*. Chicago, IL: The University of Chicago Press.
- U.S. Bureau of Labor statistics (2011). *Current Population Survey*. Retrieved from <http://www.bls.gov/cps/tables.htm>
- U.S. Department of Labor (1991). *What work requires of schools: A SCANS report for America 2000*. Washington, DC: The Secretary's Commission on Achieving Necessary Skills (SCANS), Author.
- U.S. Department of Labor (2012). *Skill assessment and the Occupational Information Network (O*NET) System*. Washington, DC: Author, Employment & Training Administration. Retrieved from http://www.doleta.gov/reports/DESA_skill.cfm
- Walpole, M. B., Burton, N. W., Kanyi, K., & Jackenthal, A. (2002). *Selecting successful graduate students: In-depth interviews with GRE users* (Graduate Record Examination Board Report 99-11R). Princeton, NJ: Educational Testing Service.
- Woolley, A.W., Chabris, C.F., Pentland, A., Hashmi, N., & Malone, T.W. (2010). *Supporting online material for a collective intelligence factor in the performance of human groups*. Retrieved from http://www.sciencemag.org/content/suppl/2010/09/29/science.1193147.DC1/Woolley_SOM_Revision_1.pdf
- Zu, J., & Kyllonen, P. C. (2012). *Scoring Situational Judgment Tests with Item Response Models*. (Report ETS-2012-0160.R1). Princeton, NJ: Educational Testing Service.