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Book title		The Role of International Large-Scale Assessments: Perspectives from Technology, Economy, and Educational Research
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Abstract		Most attention in large-scale assessments on educational progress and outcomes addresses cognitive measures of student proficiency. In part, this focus is due to the assumption that "skills" are cognitive in nature and have a high predictive value in terms of productivity. However, the predictive value of cognitive scores on worker productivity and earnings is more modest than commonly assumed. In fact, attempts to relate cognitive test scores from surveys to economic output, although meritorious, require substantial liberties in the interpretation of data. At the same time, there is considerable evidence that noncognitive attributes of individuals related to school experience are as important as—or even more important than—cognitive attributes in predicting both school outcomes and economic productivity. Noncognitive outcome measurement is more challenging to assess than cognitive because of its highly diverse dimensions and difficulties in sampling performance on these dimensions. This chapter addresses the highly incomplete knowledge base on the potential importance of noncognitive aspects of students and schools, issues of measurement and assessment, and their predictive value on adult outcomes.

Chapter 5
The Utility and Need for Incorporating Noncognitive Skills Into Large-Scale Educational Assessments

Henry M. Levin

Introduction

International comparisons of educational systems have become increasingly common as nations explore the potential of education for improving their citizenry and economic productivity. It is not unusual to see headlines in the news for any particular country on how it ranks on the periodic surveys of the Program of International Achievement (PISA), International Adult Literacy Survey (IALS), Trends in International Mathematics and Science Study (TIMSS), and the Progress in International Reading Literacy Study (PIRLS). Countries take their rankings very seriously, and the media either praise their country's performance or decry it, calling for major educational reforms. At the same time, national and regional assessments compare different regions and educational entities on the quality of their educational systems, primarily using the metrics of student achievement as the guide.

It is hardly surprising that the notion of a good school or good educational performance is viewed through the prism of student achievement as represented by standardized test scores. In the United States, real estate brokers use achievement results to suggest the desirability of a particular residential neighborhood. School districts feel pressed to raise their test scores as the primary indicator of their educational quality. Parents view the educational promise of their children in terms of how well they do on such tests. And, of course, governments set out accountability standards on the basis of test results as well as sanctions for poor test performance such as those of the No Child Left Behind law. Correspondingly teachers and principals seek ways to focus on raising achievement, even if it means narrowing the curriculum to the subjects being tested and teaching primarily through strategies that put instruction in the form of test formats and test practice. Clearly, there are many advantages to the use of standardized testing, whether domestically or internationally. What students learn should be assessed, and few would question that knowledge, and abilities to use that knowledge, are essential for human function.

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But, at least some of the attractiveness of cognitive test scores is due to the fact that the assessment of cognitive skills has developed to the point where they are relatively easy to measure. A relatively small sample of test performance can be obtained at low cost and with what appears to have predictive validity for individuals, at least for further academic performance and occupational placement and earnings. Of course, this type of psychological testing has a long history of development. In contrast, systematic assessment of other personality characteristics that may also predict both academic and economic productivity is far less developed in educational assessments. Such social and behavioral aspects or measures of personality, or what are commonly called noncognitive measures, are more complex in terms of their underlying definitions, structure, and measurement, and there are many more of these dimensions suggested in the literature. For these reasons, they are likely to be more difficult to measure in the streamlined way—conventional testing—that is used for cognitive outcomes. Unfortunately, even their terminologies differ among disciplines and authors. In some cases they are called noncognitive, and in others, affective, or social, behavioral, and emotional. For purposes of parsimony, I will use these terms interchangeably, even though I recognize they may have very different meanings in different contexts. My main concern will be to differentiate them from the knowledge and skills that we normally measure with the use of cognitive test scores.

This chapter argues that both domestic and international educational assessments should expand their measures of educational outcomes to take account of the development of noncognitive student attributes that are required for productive economic and democratic participation and personal development. Some would assert that the main ingredient for productive adulthood is the knowledge and abilities acquired, and that these are best measured through cognitive testing. However, that view is countered by the fact that microeconomic studies show that such tests explain only a relatively small portion of the variance in earnings and supervisory ratings and a minor portion of the statistical relation between schooling attainments and economic outcomes. This is not to argue the irrelevance of what is measured by the test scores to adult outcomes and economic results, but only that they account for much less power in molding adult outcomes than is normally assumed and should not be used exclusively as a statistical measure to evaluate the educational merit or quality of educational systems. Cognitive achievement is important and should continue to be assessed. But it is a highly incomplete category for measuring student and adult success. This chapter sounds an appeal to consider the potential importance of noncognitive skills and dimensions of human behavior as they comprise important adult competencies and the role of schools in developing them. But first we must acknowledge them, conceptualize their roles and identities, and measure them. The latter is where large-scale assessment ultimately enters the picture. What follows is designed to make the case.

Consider the following presentation by Alex Inkeles, one of the foremost social psychologists of personality, in his study of individual and societal productivity. Inkeles (1966) relied on a functionalist framework to identify the requirements of competent adulthood and the "socialization of competence":

> To perform effectively in contemporary society, one must acquire a series of qualities I believe to be developed mainly in the socialization process. Effective participation in a modern industrial and urban society requires certain levels of skill in the manipulation of language and other symbol systems, such as arithmetic and time; the ability to comprehend and complete forms; information as to when and where to go for what; skills in interpersonal relations which permit negotiation, insure protection of one's interests, and provide maintenance of stable and satisfying relations with intimates, peers, and authorities; motives to achieve, to master, to persevere; defenses to control and channel acceptably the impulses to aggression, to sexual expression, to extreme dependency, a cognitive style which permits thinking in concrete terms while still permitting reasonable handling of abstractions and general concepts; a mind which does not insist on excessively premature closure, is tolerant of diversity, and has some components of flexibility; a conative style which facilitates reasonably regular, steady, and persistent effort, relieved by rest and relaxation but not requiring long periods of total withdrawal or depressive psychic slump; and a style of expressing affect which encourages stable and enduring relationships without excessive narcissistic dependence or explosive aggression in the face of petty frustration. This is already a long list and surely much more could be added. (Inkeles 1966, pp. 280–281)

What is striking about this list is the complexity of an expert's view on what needs to be developed in the human personality for adult competence in modern life and the relatively limited role of standardized tests for shedding light on these competencies.

In subsequent work, Inkeles and Smith (1974) developed an index of modernism composed of many items, reflecting the following: informed citizenship; personal efficacy; independence and autonomy relative to traditional sources of influence in making personal decisions; and openness to new experience and ideas constructed with 19 subscales. These scales were used to measure "modernity" among almost 6,000 men in six developing countries—Argentina, Bangladesh, Chile, India, Israel, and Nigeria—using a stratified sample to obtain representation of distinct occupations and rural and urban populations. The researchers also formulated a range of socialization variables that could influence modernity attitudes: education, work experience, contact with mass media, consumer goods possessed, father's education, urbanism of residence, skill level, length of urban residence, modernity of workplace, modernity of home, and school background. This combination of variables was able to explain statistically between 32–62 % of the variance in modernity scores, considerably higher than most earnings equations among individual adults, even today. In all six countries, education was the most powerful statistical influence, at least two to three times more powerful than any other influence in standardized coefficients.

The sheer breadth of both the underlying theory and empirical findings of the Inkeles framework highlight the narrowness of the measures of educational outcome on which our international surveys are focusing. That is, schools have far more impact on important components of human formation that matter in the workplace, community, and home than just what is measured by test scores. In this chapter I will not attempt to develop new empirical information, largely because there already exists an impressive pattern of evidence that suggests: (1) schools influence personality traits that are determinants of both achievement and work productivity; and (2) by limiting attention only to the cognitive test scores dimension of educa-

tional outcomes, we are influencing the establishment of educational policies that are likely to restrict social and economic productivity.

I will recommend that large-scale assessments, both international and domestic, move beyond the focus on cognitive test scores to embrace a larger set of potential educational outcomes including student attitudes, behaviors, and other noncognitive measures that are important for explaining valuable individual and social outcomes including economic productivity. I recognize that there is no simple dividing line between so-called cognitive and noncognitive educational results or skills imparted by the educational system. Although we may refer to noncognitive attributes or skills as social and behavioral attributes, it is clear that they can be heavily bound up with cognitive knowledge. As a working distinction we can distinguish the cognitive attributes that are measured by test scores, a category limited to knowledge in particular test domains or subjects, and modes of measuring these domains or subjects as the cognitive focus of schools. In contrast this chapter refers to noncognitive skills essentially as those that are generally viewed as attitudes, behaviors, and values that contribute to adult competencies.[1] We should keep in mind that some of these interact with cognitive skills such as problem-solving ability, where modes of analytic and relational thinking must draw upon a knowledge base. While the distinctions between cognitive and noncognitive will not be sharply delineated, they will be sufficiently differentiated to understand the thrust of the arguments.

The Test Score Image and Reality

- Few college educated individuals will forget their college entrance scores (e.g., SAT) or test scores for graduate or professional school admissions, even after many decades.
- Academics have fought bitterly over the origins of IQ (phenotype or genotype), but few question the importance and social value of IQ as they take pride and ownership in their own high IQs.

Cognitive testing has an impressive history. Its development and sophistication have far outpaced assessment in noncognitive areas of performance in its precision, statistical analysis, and widespread adoption. The test score illusion is that we tend to overstate the importance of tests in accounting for human productivity. At both individual and societal levels, they carry considerable influence. But, their importance is greater in the popular imagination than the evidence supports. The advent of human capital theory in economics had important and deservingly profound effects on the thinking about the link between education and economic output. Educational investments became viewed as investments in human beings that increased

[1] The most ambitious and encyclopedic review of personality characteristics as they relate to economic outcomes is found in the comprehensive and magisterial treatment by Almlund et al. (2011). Also see Borghans et al. (2008a).

productive skills, leading to greater productivity and economic output. Little was said about the nature of such skills. In his pioneering work on human capital, Gary Becker (1964) provides almost no analysis of the skills that are encompassed by human capital. And the vacuum on precisely what skills were developed through human capital investments—and the vacuum filler of educational attainment data—combined to make the years of education attained as the standard measure of human capital. The most comprehensive and widely used sources of data such as the U.S. Census or household surveys on earnings of workers reported the amount of education attained, but not test results.

Measures of educational attainment in terms of number of years of schooling are highly errorful measures. These are self-reported and lack information on areas of study, educational quality, rigor of courses, and student effort. As a result it was logical to seek data sources that had more direct measures of academic attainment, and test results were a more direct verification of skills than the amount of time spent in schools. It seemed reasonable that most of what was learned in schools could be measured by test scores.

This perspective was first questioned by Gintis (1971) and Bowles and Gintis (1976) in the decade following the human capital revolution in their attempt to show that school organizations reflect the practices of employers in student development where many similar noncognitive demands are placed on both students and workers. More recently, Bowles et al. (2001) summarized much of the ensuing research that has addressed this phenomenon. One of their most salient findings is that only a small portion of the overall statistical impact of schooling on earnings can be explained by test scores per se. A summary of 25 studies over a period of four decades (late 1950s to early 1990s) provided 58 estimates of earnings functions where test scores were available. Starting with the conventional human capital formulation in which demographics, socioeconomic status, and schooling are used as explanatory variables for predicting earnings, they estimate the coefficient for the schooling contribution to earnings (usually measured by years of education). They then posit that if the schooling variable is a just a rough proxy for achievement, it is highly errorful relative to a direct measure of what is learned and contributes to productivity, a measure of test scores. By adding the test score to the equation, they can test "how much" of the "naïve" schooling effect indicated by monetary returns to years of schooling is reduced by a direct measure of cognitive skill created through education. Across the 58 estimates they find that the schooling coefficient retains about 82 % of its "naïve" value, suggesting that most of the effect of schooling on earnings is due to factors other than those measured by standardized tests (Bowles et al. 2001, pp. 1147–1150)

It is almost an article of faith among policymakers and the general public that the impact of cognitive skills in labor markets is rising. Much of the support for this view comes from the evidence of one well-constructed study that compares test score impacts on earnings between 1978 and 1986 and finds that there was a rise in hourly wage over those years based on returns to mathematic scores (Murnane et al. 1995). But an analysis of a wider range of studies finds no such trend among 65 estimates from 24 studies reflecting a 30-year period (Bowles et al. 2001,

pp. 1154–1156). This study not only found no rising trend, but relatively small estimated impacts of mathematics achievement on wages. A standard deviation in test score was associated with a 10 % increase in wages, equal to about one year of schooling. Of special pertinence is that no existing educational intervention has shown effects even close to one standard deviation. Of the relatively few that seem to improve mathematics achievement, it is rare to find results that exceed one-fifth of a standard deviation. A study for the United finds no increase in the returns to cognitive skills for the period 1995–2004, the most recent period found for these studies (Vignoles et al. 2011). The overall support for the rising effect of cognitive skills is absent or mixed in other research studies and is beset with methodological issues (Cawley et al. 2001), which should at least raise a caution flag in asserting rising returns.

The exaggeration of cognitive impacts of workers on worker productivity has also been a feature of the literature on using test scores directly for worker selection. The most important public use was that by the U.S. Employment Service, which used the General Ability Test Battery (GATB) to rank workers for referral to employer requests for candidates. The GATB includes subtests of intelligence, verbal aptitude and numerical aptitude as well as a range of other measures. State employment services informed prospective employers that they would refer the most productive applicants for consideration on the basis of the GATB rankings. However, there was considerable controversy over the practice of norming the rankings separately within race so that two individuals of different races with different raw scores might have the same percentile ranking. Because blacks had considerably lower scores on the GATB, the normalized rankings for blacks had a much lower GATB score than a white with the same ranking. The National Research Council of the National Academy of Sciences and National Academy of Engineering formed a panel that was asked to focus especially on the validity claims for GATB and other employee tests that were asserted to have predictive validities of .6–.7 on supervisory ratings of worker productivity according to leading advocates (Hartigan and Wigdor 1989). The study panel found that the estimated predictive validities were vastly inflated by questionable procedures, so the best estimate of validity was about .25, a dramatic reduction from the claims. Thus, the tests used to refer workers to employers accounted for only about 6 % of the variance in performance, leaving 94 % to be explained by *other* characteristics of workers. More recent summaries of the empirical literature across many different studies and measures support this modest finding (Sackett et al. 2001).

Even well-specified earnings functions that include more than one direct measure of cognitive skill and many other covariates show low total explained variance, typically one third or less (Murnane et al. 2001). And the cognitive measures in themselves show "modest" relations to earnings (Murnane et al. 2000). Clearly cognitive abilities are important for many important dimensions of adult performance, including economic, civic, and personal demands upon individuals. But they are far from dominant in explaining economic and social outcomes and are probably considerably less important than commonly believed. Yet the domestic and international comparisons of educational achievement focus almost exclusively on these.

In the next section we address what is known about noncognitive aspects of schooling and work performance.

Multiple Sources of Support for Noncognitive Measures

When one reviews many different sources of information, the importance of social and behavioral competencies beyond cognitive skills is apparent. In this section, I will provide brief glimpses of a number of these sources.

Employer Needs

It is common for employers to explain that they seek workers both with good cognitive skills and social/behavioral competencies to qualify for employment. This is not a new phenomenon. Almost three decades ago, the National Research Council convened a panel to set out the competencies that employers desired (National Research Council 1984). The panel, composed almost entirely of employers from a large range of business sectors and a few government agencies, was charged with studying and formulating the set of core competencies that they would want among the high school graduates they employ.[2] The motivation of the NRC for forming the panel was to recognize the knowledge needs of the changing workplace for high school graduates. Panel members were asked to work closely with supervisors in their human resources departments to get a ground-level view of worker requirements.

The panel developed a comprehensive list that was heavy on cognitive requirements such as command of the English language, reasoning, reading, writing, computation, and knowledge of basic science and technology. But the panel found the same level of concern by human resource supervisors for a substantial list of behavioral and social worker characteristics on "Interpersonal Relationships" and "Personal Work Habits and Attitudes." These included such attributes as interacting in a socially appropriate manner; demonstrating respect for the opinions, customs, and individual differences of others; handling conflict maturely; and participation in reaching group decisions. They also included a realistic positive attitude toward one's self; self-discipline, including regular and punctual attendance and dependability; ability to set goals and allocate time to achievement of them; and capacity to accept responsibility (National Research Council 1984). To the degree that national testing such as the National Assessment of Educational Progress (NAEP) and the international comparisons of educational achievement are motivated by preparation for the workplace and economic productivity, their results largely ignore these perspectives in providing information on educational preparation.

[2] In the spirit of full disclosure, I was the "token academic" on this panel.

The Employer Employment Survey in the early 1990s, sponsored by the US Department of Education, surveyed more than 4,000 employers "to identify employers' practices and expectations in their search for a skilled and proficient work force." When asked to identify the recruitment characteristics that they used to make hiring decisions on a scale of 1–5 (with 5 being the highest), applicant's attitude was 4.6 and communication skills were 4.2, the two highest in the survey. Tests administered by the firm, academic grades in school, and reputation of applicant's school were at 2.5 or 2.4, at the bottom of the list (Zemsky and Iannozzi 1995).

The latest National Employer Skills Survey for England 2009 (Shury et al. 2010) is notable for its lack of discussion of academic skills. The survey finds that about one fifth of the enterprises are affected by a skills gap, but for 71 % of these, the "main cause" is lack of experience and recent recruitment. Thus, it is no surprise to find that 64 % of employers were concerned with a lack of technical, practical, or job-specific skills. A third of employers implicated a lack of motivation on the part of workers. Employers also were concerned about such skills as customer-handling (41 %), problem-solving (38 %), and team-working (37 %), with literacy and numeracy further down the list. That is, social and behavioral skills were important challenges for UK employers in this recent study.

It seems obvious that from the perspective of employer concerns, both in the past and more recently, there is at least as much concern for the noncognitive attributes of workers as for the cognitive ones. Indeed, the former may even be a stronger source of concern.

Cognitive or Noncognitive Effects

The Perry Preschool is best known for its role as the earliest study showing substantial long-term effects of preschool. The study followed the lives of 123 persons who had been randomly assigned as 3–4-year-olds to experimental treatment and control groups where the experimental group was enrolled in the preschool program. The subjects were black inner-city children from poverty families. Study participants were followed up to the age of 40 for their educational results and life experiences. The experimental students showed initial intellectual and literacy gains over the students in the control group, but the differences faded out in the early elementary years. Yet when comparisons were made of life accomplishments, the Perry Preschool participants did substantially better than the control group in terms of educational attainments, reduction in crime, earnings, employment, and welfare costs (Schweinhart 2010, p. 161). For example, 28 % of the Perry participants had been convicted of a crime by age 40, relative to 52 % of the control group, and earnings were about one third higher. High school graduation rates were higher for the Perry group, and their attitudes toward school were more positive. Evaluations of the investments in Perry Preschool show a high return (Heckman et al. 2010). These types of outcomes are important to both the individuals who benefited and society, even though they do not seem to be attributable to the early test results. One interpreta-

tion is that Perry mainly had an influence on school readiness and other noncognitive behaviors that contributed to the increase in school and life success.

A different challenge is the puzzle of the findings on the economic success and social experience of students who acquire the General Education Development (GED) credential in lieu of graduating from high school. The purpose of the GED is to credential dropouts as equivalent to high school graduates if they succeed on the GED examination. Heckman and Rubinstein (2001) found that they do about as well on a cognitive test as high school graduates who do not enroll in college. But their earnings patterns are considerably below high school graduates, and when adjusted for their cognitive performance, are even lower than those of high school dropouts who do not take the GED. In addition, their ultimate education attainment also lags behind that of dropouts who did not take the GED. The authors conclude that the GED recipients have lower noncognitive skills that count in employment, and this interpretation is buttressed by a measure of illicit activity that is higher for the GED students than for the non-GED dropouts or high school graduates.

A third potential example is that of the Tennessee Class Size or Star experiment in which students in grades from kindergarten to grade three were assigned to large classes (23–25 students) or small classes (13–17 students) at random in the schools chosen for the experiment. Students could receive from one to four years of the small-class treatment or none. In his review of the study, distinguished statistician Fred Mosteller called the study "…one of the most important education investigations ever carried out" (Mosteller 1995). Test results showed moderate achievement advantages in reading, word study, and mathematics that increased with the duration of the treatment. But perhaps what is most surprising is the substantial difference in graduation rates almost a decade later. This was particularly so for the disadvantaged students—those eligible for a free or reduced cost lunch. Disadvantaged students with smaller classes for four years had graduation rates 18 % points higher than similar students who had attended only regular size classes, 88–70 %. This was found to be well beyond the predictive effect of the early academic achievement that was experienced, suggesting that noncognitive effects accounted for at least a portion, and perhaps a large portion, of the higher graduation performance (Finn et al. 2005). Insights into a mechanism for explaining this noncognitive effect is found in a recent study that linked class size reduction to improving student learning behaviors (Dee and West 2011).

An intriguing study (Lindqvist and Vestman 2011) from Sweden evaluated cognitive and noncognitive dimensions of military enlistees (enlistment is a mandatory requirement for all Swedish males). All enlistees filled out an extensive questionnaire with 70–80 questions. A certified psychologist was provided with this information as well as measures of cognitive ability and other attributes. Following a specified set of procedures, the enlistee was interviewed by the psychologist and evaluated according to the perceived ability of the conscript to cope with the psychological requirements of military service. Each conscript was given a score according to the same distribution used for the cognitive ability score. Using a random sample of men born between 1965–1984, the authors evaluated the impact of cognitive and noncognitive measures on wages, unemployment, and annual earnings.

They found that men who do poorly in the labor market lack noncognitive abilities. In contrast, cognitive ability is a stronger predictor of wages and earnings for workers with earnings above the median.

Schools and Noncognitive Outcomes

One question that might arise is whether schools can actually change noncognitive outcomes. Relatively little attention has been devoted to systematic consideration of this question and its measurement because there is not the body of rigorous research available that exists for cognitive measures. However, considerable attention has been devoted to this subject in early childhood education, where attempts have been made to see if students are "school ready".

Cognitive control, self-regulation, or executive function (EF) is the focus of a study testing directly whether a noncognitive skill can be taught effectively. Diamond et al. (2007) evaluated The Tools of the Mind curriculum, a framework that contains 40 EF-promoting activities. Students and teachers were assigned randomly to The Tools of the Mind curriculum and an alternative. The Tools of the Mind curriculum not only had significant effects in promoting greater EF, but the higher EF in itself was associated with higher standardized measures of reading. The importance of this finding is magnified by the fact that EF has been more strongly linked to school readiness than cognitive measures (Blair and Razza 2007). A more extensive, recent randomization study confirms the findings on the educational effects of The Tools of the Mind curriculum, and particularly its impact on social development of the child and improvement of classroom experience (Barnett et al. 2011). Distinguished psychologist Albert Bandura (1997) has also maintained that there is an impressive knowledge base showing that self-efficacy (the belief that one can influence a personal outcome) can be conditioned in the young in his extensive lifelong study of self-efficacy.

Clearly, not all prekindergarten experiences contribute to children's school readiness, as evidenced by a more general study that focused on prekindergarten impacts on school cognitive outcomes and behavior problems without examining the program specifics (Magnuson et al. 2007). In contrast, The Tools of the Mind studies highlight that the specific goals of the preschool program are central in determining whether they improve noncognitive functioning in the school environment as applied to preschool experiences of any type. Program design matters in exploring the impacts of educational programs.

Overall summaries of the literature also confirm the importance of early childhood interventions on behavioral or socioemotional change. Nores and Barnett (2010) reviewed a total of 38 studies reviewing 30 interventions in 23 countries that had applied quasiexperimental or random assignment designs. They took into consideration the type of intervention, sample size, study design and duration, country, target group, subpopulations, and dosage of interventions. They found both cognitive benefits and behavioral benefits. Camilli et al. (2010) undertook a meta-anal-

ysis of 123 comparative studies of early childhood interventions. The evaluation of all programs in the review had been designed using experimental principles. Although the largest effects were found for cognitive outcomes, preschool experience was also found to be associated with student's social skills and school progress.

Duncan and associates (2007) used six longitudinal data sets to estimate the links between academic, attention, and socioemotional skills at school entry and subsequent school reading and math achievement. Attention-related skills refer to task persistence and self-regulation or EF. We do not know the content of the preschool experience, so these measures are recorded at school entry. They found math skills to show the greatest predictive power, followed by reading and attention skills. As with the Magnuson et al. (2007) study, the focus was on participation in preschool, but not on specific programs that focus on noncognitive skill development, as did The Tools of the Mind curriculum. Duncan and Magnuson (2011) also find important relations between both early childhood cognitive scores and social behavior on later educational outcomes and criminal involvement.

The most extensive evaluation of the direct study of the teaching of social and emotional skills and their impact is found in Durlak et al. (2011). This work is based upon a meta-analysis of 213 school-based social and emotional learning (SEL) programs from kindergarten through high school, studies encompassing 270,000 children overall from ages 5–18. Only intervention studies that had control groups were included. Outcomes included six criteria:

- *Social and emotional skills*—includes evaluations of different types of cognitive, affective, and social skills related to such areas as identifying emotions from social cues, goal setting, perspective taking, interpersonal problem solving, conflict resolution, and decision making.
- *Attitudes toward self and others*—includes positive attitudes about the self, school, and social topics, including self-perceptions (e.g., self-esteem, self-concept, and self-efficacy), school bonding (e.g., attitudes toward school and teachers), and conventional (i.e., prosocial) beliefs about violence, helping others, social justice, and drug use.
- *Positive social behavior*—includes outcomes such as getting along with others derived from the student, teacher, parent, or an independent observer on the basis of daily behavior as opposed to hypothetical situations.
- *Conduct problems*—includes measures of different types of behavior problems, such as disruptive class behavior, noncompliance, aggression, bullying, school suspensions, and delinquent acts.
- *Emotional distress*—includes internalized mental health issues. These included reports of depression, anxiety, stress, or social withdrawal, which could be provided by students, teachers, or parents.
- *Academic performance*—includes standardized reading or math achievement test scores from such measures as the Stanford Achievement Test or the Iowa Test of Basic Skills, and school grades in the form of students' overall grade point average (GPA) or their grades in specific subjects (usually reading or math). Only data drawn from school records were included.

Meaningful effect sizes were found for all six criteria: social and emotional skills, 0.57; attitudes, 0.23; positive social behavior, 0.24; student conduct problems, 0.22; emotional distress, 0.24; and academic performance, 0.27. Thirty-three of the academic performance studies had follow-up evaluations of at least six months after the intervention ended, with a median follow-up time of about one calendar year. All effect sizes continued at statistically significant levels, with the effect size for academic performance at 0.32 for the subgroup, suggesting that development of social and emotional skills have particular salience for improving student achievement.

A reasonable summary of this literature is that noncognitive skills can be taught through purposive interventions and that they can make a difference for many valuable social/behavioral outcomes and for student achievement. The latter is an important conclusion because not only are these outcomes important in themselves, but they also appear to have a positive impact on achievement. In the Durlak et al. (2011) study, the average effect size among studies is adequate to raise standardized student achievement scores by 11 percentiles. This is equivalent to an increase of PISA scores by about 30 points—the difference between the United States and higher-scoring Canada, and a rise in rankings from 17th to 5th place, or from 14th to 3rd place if we exclude cities or city-states Shanghai, Hong Kong, and Singapore. While this may not be a simple matter of policy, it does provide a framework for considering the potential of noncognitive interventions.

Schooling and Labor Market Effects

Without question, the scholar who has done the most to develop an understanding of the role of noncognitive skills in educational and economic outcomes is James Heckman of the University of Chicago, aided by his colleagues.[3] Heckman has not only called attention to the importance of noncognitive skills, but has worked with psychologists and neurologists to estimate optimal time patterns of investment between development of the different types of skills and their impact on labor market returns (Knudsen et al. 2006). His masterful article with Flavio Cunha is considered to be the most ambitious and sophisticated attempt to both formulate a theory of optimal investment between cognitive and noncognitive skills from birth to the labor force, but also to apply the model to a specific longitudinal data set to measure the impact of cognitive and noncognitive skill development on earnings (Cunha and Heckman 2008). The authors create a battery of noncognitive scores

[3] Heckman has produced most of the important scholarship on this subject and has continued his program to deepen understanding of the role of noncognitive skills. It would take pages to list all of his contributions. However, it would be helpful to review the citations to Heckman and colleagues in the bibliography of the masterful article by Borghans et al. (2008a). Heckman's role is central to the content of the symposium on "The Noncognitive Determination of Labor Market and Behavioral Outcomes," XVII (4).

from their data set focused on an antisocial construct using student anxiety, headstrongness, hyperactivity, and peer conflict to go along with cognitive test scores in this analysis. Based upon the psychological, neurological, social, and other aspects of child development, they model the developmental path and estimate the impact of investments in cognitive skill and noncognitive skill on high school graduation and earnings (at age 23) at three different periods during the span from age 6–13. As the child ages, the impact of investment returns shifts markedly from cognitive skills at the earlier ages (6–9) to noncognitive skills during the later period.

Clearly, this analysis, if it stands up to replication, has profound implications for school policy and the construction of educational programs. The work of Heckman and his students stands as a milestone in considering the optimal mix of interventions and policy implications for enhancing human development through a combination of appropriate strategies of both cognitive and noncognitive skills. This work also seems to correspond in many of its assumptions with the attempt to create a unified theory of child development by Sameroff (2010), suggesting that the leading edge of this research is moving in similar directions. As with the program of Heckman, Sameroff has developed a conceptual approach that interconnects the individual and context in a dynamic manner.

Perhaps the best single source on the role of noncognitive skills and the economy is the symposium on "The Noncognitive Determinants of Labor Market and Behavioral Outcomes" (2008).[4] This unusually focused volume contains an article by Borghans et al. (2008b) that analyzes tradeoffs in roles of caring and directness in jobs that have different interpersonal requirements. Caring requires cooperation, whereas directness requires clear communication. The returns to these attributes depend upon relative supply and demand. The authors find that returns to these roles, which are held in different combinations by different individuals, match their assignment models. Articles by Fortin (2008), Krueger and Schkade (2008), Segal (2008), and Urzua (2008) address other labor market consequences related to noncognitive skills and roles of workers as well as impacts of noncognitive skills of students.

Noncognitive Variables

There exist so many concepts, constructs, and names for the personality and social and behavioral characteristics that are referred to as noncognitive that I will not allocate much space to attempting to list them or categorize them. The most comprehensive analysis of personality and its roles in labor markets, health, crime, and civic behavior is that of Almlund et al. (2004).[5] However, it is important to provide

[4] Also see the papers presented at the recent IZA Workshop: Cognitive and Non-Cognitive Skills, January 25–27, Bonn, Germany. Available at: http://www.iza.org/link/CoNoCoSk2011.

[5] This is an overwhelmingly ambitious exercise to map personality traits into economic modelling.

at least a glimpse of how they have been referred to and used in the psychological literature.

The Five-Factor Model

For at least the last two decades, the five-factor model of personality has been used to relate noncognitive skills to academic achievement, educational attainment, and other outcomes. The history is one in which an accumulation of different hypotheses and empirical studies were used to create statistical factor analytic dimensions by independent researchers (Digman 1990). The consolidation of many different dimensions of personality into the five-factor model was an attempt to find a basic structure for what was a highly disorganized and idiosyncratic set of measures and constructs. Accordingly, these have been considered to be the basic structure underlying all personality traits and have been used to integrate a variety of findings in personality psychology.

The Big Five factors are:

1. *Openness*—inventive and curious as opposed to consistent and cautious
2. *Conscientiousness*—efficient and organized as opposed to easygoing and careless
3. *Extraversion*—outgoing and energetic as opposed to solitary and reserved
4. *Agreeableness*—friendly and compassionate as opposed to cold and unkind
5. *Neuroticism*—sensitive and nervous as opposed to secure and confident

These categories have been used in many studies to predict behavior and are prominent in the massive review by Almlund et al. (2011). An example of a study that explores the relation between the Big Five and academic outcomes is Noftle and Robins (2007). Four different university student samples were used in the study. After controlling for high school GPA and SAT scores, the Big Five were tested, but only the dimension of "conscientiousness" was found to predict college GPA. SAT verbal score was predicted by "openness." The researchers also found that academic effort and perceived academic ability served to mediate the conscientiousness-SAT relationship, independent of academic achievement.[6] An example of the use of the Big Five for a measure of workplace productivity is the study of Neuman and Wright (1999). These authors studied the relation between personality characteristics of 316 full-time human resource representatives at local stores of a large wholesale department store enterprise. They found that "agreeableness" and "conscientiousness" predicted peer ratings of team member performance beyond controls for job-specific skills and general cognitive ability.

Promising work on the further development of noncognitive constructs and measures is being undertaken by the Research Division of Educational Testing Ser-

[6] From an economist's perspective, there would be concern for problems of endogeneity in use of some of the explanatory variables.

vice (Kyllonen et al. 2008) in Princeton, NJ. This work focuses on both personality characteristics and motivation, reviewing studies that link them to educational outcomes. Their work considers various measurement approaches and also documents particular interventions in developing certain personality facets that lead to higher achievement. The report develops an approach to implement a comprehensive psychosocial skills assessment at middle school and high school levels. At this time, this report is protected as proprietary and its specific contents and findings cannot be cited, although I expect that it might be released in modified form in the near future.

Summary and Implications for Educational Assessments

Modern societies demand much of their members, and fostering competence in meeting these demands must be a high social priority. Among all of the vehicles for socializing the young, schools are a very powerful one because of the considerable time spent there and the peculiar functions of schools to prepare the young in many ways for adulthood. Clearly knowledge and cognitive functioning are an important goal of schools and provide crucial skills for creating productive workers and citizens. But noncognitive or behavioral/social skills and attitudes are also crucial and of at least the same level of importance. Even with the same cognitive achievement, differences in effort, self-discipline, cooperation, self-presentation, tolerance, respect, time management, and other noncognitive dimensions form both healthy character and contribute to productive relations in workplaces, communities, families, and politics.

To a large degree, the almost singular focus on test score performance in educational assessments at both domestic and international levels is not without foundation. The cognitive domains tested are important determinants of both educational outcomes and life chances, the measurement technologies are well developed, and the process of assessment of cognitive skills is parsimonious in that a valid sample of cognitive knowledge and behavior can be obtained and evaluated at low cost. But I have emphasized that the assumptions that cognitive skills are all that counts, and that they have singular influence on producing healthy and productive adult personalities, goes well beyond the evidence. Although they are important determinants of productivity and income at both individual and societal levels, empirical studies show that their measurable influence is far more modest than generally assumed. Moreover, their impact does not seem to be rising despite the conventional wisdom. Employers who indicate skill shortages place as much or more emphasis on getting workers with proper attitudes and social behaviors as cognitive competencies. The studies of Heckman and colleagues show that the connections between noncognitive skills and workplace productivity are of comparable importance overall and of even greater importance than cognitive skills in the productive development and influence on wages and graduation of older children.

Cunha and Heckman (2010, p. 401) conclude that the noncognitive variables contribute to the impact of cognitive variables on earnings, but there is weak evidence of the reverse.[7] Thus, there are at least three reasons that the singular use of academic achievement measures to predict economic productivity and growth are overstated when noncognitive measures are omitted. The first is that academic achievement is correlated with noncognitive attributes and serves as a proxy for them when predicting economic outcomes, overstating purely cognitive effects when noncognitive variables are omitted. The second is that noncognitive attributes are not merely correlated with cognitive attributes, but contribute to cognitive outcomes. The third is that aggregated attempts to connect academic test scores with economic growth at the country level suffer the same kind of upward bias that Hanushek et al. (1996) stress when criticizing upward bias in aggregate estimates of educational production functions. On this basis it appears that the dramatic and highly publicized extrapolations by Hanushek and Woessman (2008) of contributions to economic growth of international achievement results among countries overstate the impact of the tests on economic output, possibly by a large magnitude.[8] Unfortunately, the promise of massive gains in economic output of even modest gains in test scores have been disseminated widely and taken seriously; even though those administering policy are not aware or knowledgeable about the degree to which upward bias is present in the reported results and their policy extrapolations.

Far from being harmless, the obsessive focus on test scores and the omission of the noncognitive impact of schools can provide far-reaching damage. In recent years, in the United States and other countries, there is an attempt to marshal evidence-based policies. But the evidence that is presented is limited to test score comparisons with the explicit or tacit implication that test scores are the crucial determinant of labor force quality. This message places pressure on schools by citizens and government to focus exclusively on raising test scores. In particular, pressures are placed on the schools through accountability sanctions to raise test scores in the limited domains and measures used in the national and international assessments, usually test scores in reading, mathematics, or sciences. Schools are pressed to use their time and resources to improve scores on these subjects at the expense of other activities and subjects including noncognitive goals. Yet other goals may be as important or more important in the long run in terms of creating productive, equitable, and socially cohesive societies and economic growth (Gradstein and Justman 2002).

The "evidence-based" arguments have led to a singular focus on a cognitive achievement gap in the No Child Left Behind legislation, leading schools to nar-

[7] As a more general proposition I would leave this as an open question. Some four decades ago I used the Coleman data to estimate the determinants of multiple school outcomes in a model that allowed for simultaneous equations estimation (Levin 1970). The results of that model estimation suggested reciprocal relationships where motivation and sense of efficacy influence student achievement and are also influenced by student achievement.

[8] Hanushek has responded that even if this is true, the magnitude of the gains in income are so large that even enormous biases still leave very large unrealized gains.

row their curriculum and focus on test preparation as a major instructional strategy (Rothstein et al. 2008). It is difficult for an evidence-based policy to embrace noncognitive measures when the assessment practices exclude them from national and international studies. Even the obsession with the test score gap among races obscures the potential noncognitive impacts of schooling. For example, Fortin (2008) found the effects of noncognitive ability to be stronger for blacks than whites on labor market outcomes and a particularly strong predictor of the black-white gap for males in their incarceration rates.

Singular focus on the cognitive test scores can also introduce teacher policies that ignore the importance of noncognitive skills and fail to value roles of teachers and schools in the noncognitive domain. For example, many states and local school districts in the United States have adopted a value-added approach for teacher policy where student test score gains associated with individual teachers are the basis for hiring, retaining, and remunerating teachers. With the recent cuts in public funding, school districts are considering layoffs of teachers based upon the value-added metric. But in addition to the serious methodological issues surrounding the calculation of value-added for each teacher (Corcoran 2010; Harris 2009), there is an even more fundamental question. Why has the purpose of schooling and teacher productivity been reduced to the gains on narrowly construed math and verbal tests if there are so many other results that we expect of schools, including noncognitive outcomes? Even if there is a tradeoff between teacher effectiveness on cognitive and noncognitive skill production, both must be taken account of in educational policy. That is the case for incorporating noncognitive skill measurement in both large-scale and small-scale assessments.[9]

Next Steps

To incorporate noncognitive skills into assessments is a major challenge. As Heckman and Rubinstein (2001) concluded in their study of the GED 10 years ago:

> We have established the quantitative importance of noncognitive skills without identifying any specific noncognitive skill. Research in the field is in its infancy. Too little is understood about the formation of these skills or about the separate effects of all of these diverse traits currently subsumed under the rubric of noncognitive skills (p. 149).

Fortunately, the research has exploded on this topic. Just seven years after the publication of this bleak statement, Cunha and Heckman (2008) were able to identify and employ specific noncognitive measures in existing data sets that could be used for analysis followed by an exceedingly productive exploration emerging from Almlund et al. (2011) and Borghans et al. (2008). As mentioned above, Kyllonen et al. (2008) have developed rich literature reviews of noncognitive skills, including their

[9] This has been recognized increasingly on both sides of the Atlantic. See Brunello and Schlotter (2010) for a report prepared for the European Commission.

measurement and predictive values, and linked these to specific school interventions that might raise noncognitive performance in key areas.

My recommendation is to build on these efforts by selecting a few noncognitive skill areas and measures that can be incorporated into research on academic achievement, school graduation, postsecondary attainments, labor market outcomes, health status, and reduced involvement in the criminal justice system in conjunction with the standard academic performance measures. The Big Five are certainly leading candidates, with guidelines already suggested in the review by Almlund et al. (2011). Structural models and quasiexperimental designs might be used to understand the interplay of cognitive and noncognitive skills in explaining particular outcomes for specific demographic groups. At some point, we should learn enough to incorporate specific noncognitive measures into both small-scale and large-scale assessments that can lead to a deeper understanding of school effects and school policy.

AQ3

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