Non-Cognitive Skills for Large-Scale Educational Assessments

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Purposes

- Importance of non-cognitive influences on school outcomes and life outcomes.
- Urge greater balance in assessments between cognitive and non-cognitive outcome measures.
- Rationale.
- Evidence of importance.
- Next steps.
“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: 280-1).
Inkeles and Smith

- Index of Modern Attitudes
- Six countries (Argentina, Bangladesh, Chile, India, Israel, and Nigeria) \( n = \text{almost } 6,000 \)
- Explanatory variables: education, work experience, mass media, consumer goods, father’s education, urbanization, skill level, length of urban residence, modernity of workplace, home and school; and schooling.
- Explained 32-62 percent of variance in modernism.
- Education was most powerful influence—2-3 times more powerful than any other. (standard regression coefficients).
Why favor cognitive?

- Long history of cognitive testing with relatively clear constructs, measures, statistical properties.
- Widespread adoption.
- Skills assumed to be cognitive in human capital theory (e.g. Becker 1964).
Non-cognitive

- Distinction not clear—interacts with cognitive.
- Constructs and measurement are contested.
- Labels differ:
  - Social and Emotional (SEL).
  - Social and Behavioral
  - Attitudes and Values
Early non-cognitive

- Coleman (1966) included efficacy, motivation, and other non-cognitive variables—didn’t use them.

- Bowles and Gintis (1976) and Gintis (1971) argued that schools mainly emphasize non-cognitive development.
Cognitive Test Scores or Behavioral Socialization

- If cognitive skills are basis for earnings gains in human capital-based earnings functions equations, addition of test scores should deflate severely the earnings coefficient for the schooling attainment variable.

- Bowles, Gintis, Osborne synthesize 25 studies with 58 estimates over four decades that incorporate specifications with and without test scores.

- School attainment variable is only years of education or degree with no information on quality, effort, or nature of studies, so very errorful proxy for cognitive skills. Time in school.

- School attainment coefficient retains about 82 percent of its value after test scores are added to the equation.
Has effect of cognitive test score increased?


- Bowles, Gintis, Osborne (2001) reviewed 65 estimates from 24 studies over 30 years and found no rise across many studies.

- UK study for 1995-2004 also finds no increase in returns to cognitive skills.
Other evidence

- Equations of teenage cognitive skills in predicting later earnings (Murnane et al. 2000).
- Human capital equations including test scores and other variables explain no more than 17 percent of variance.
- NRC study of supervisor ratings of worker productivity found that only about 6 percent of variance was explained.
Employer Needs

- Examined Cognitive needs, but also behavioral and social.
- Conclusions:
  - Interacting in socially appropriate manner; respect for opinions, customs, and individual differences of others.
  - Handling conflict maturely; participation reaching group decisions.
NRC study continued.

- Positive attitude toward self.
- Self-discipline.
- Regular attendance, punctuality, dependability.
- Ability to set goals and allocate time to achievement of them.
- Capacity to accept responsibility.

- 4,000 employers
- Recruitment characteristics for hiring. (1-5 high)
- Applicant attitude (4.6); communication skills (4.2).
- Test scores, academic grades, reputation of applicants school (2.4 or 2.5).
Google Study of Its Management
NY Times, March 13, 2011

- Methods—data crunching of performance reviews, feedback surveys, award nominations.

- (In Order of importance): (1) be a good coach; (2) empower team and don’t micro-manage; (3) express interest in team members success and well-being; (4) Be productive and results-oriented; (5) Be good communicator and listen; (6) Help employees with career development; (7) Have clear vision and strategy; (8) Have key technical skills to advise team.
Independent Effects of non-cognitive (Perry Preschool)

- Perry preschool—initial achievement advantage over control group faded in early grades—but assessment at age 40 showed:
  - earnings advantage of one third;
  - half the crime conviction rate.
  - higher graduation rates
  - more positive attitudes towards schools.
GED--Heckman

- GED recipients had similar test results as regular high school graduates who do not enroll in college.
- Earnings well below high school graduates and even lower than dropouts with similar test scores.
- Ultimate educational attainments lower than dropouts who do not take GED.
- Something else happening—lower non-cognitive skills that affect employment.
Tennessee Class Size Experiment

- Dramatic reductions in class size for up to four years, K-3.
- Modest increases in achievement.
- Dramatic increases in high school graduation rates. (disadvantaged from 70 percent (no reduction class size to 88 percent for 4 years of early class size reductions).
- Well beyond the impact of prediction from early achievement advantage.
Can non-cognitive be taught?

- Experimental study of teaching of executive function (self-regulation)—more important than cognitive measures for school readiness.
- Experimental study of Tools of the Mind shows dramatic effects on EF. (Barnett 2011)
- Bandura cites impressive data-base that shows self-efficacy can be taught.
Early Childhood Education

Summary

- Nores and Barnett (2010)—38 studies reviewing 30 pre-school interventions in 23 countries RFT or quasi-experiments. Found both cognitive and non-cognitive benefits.

- Camilli et al (2010) meta-analysis of 123 experimental preschool studies showed effects on cognitive skills, student social skills and school progress.
Durlak (2011) Social-Emotional Learning

- 213 school based programs, experimental or quasi-experimental. 270,000 children 5-18.
- Non-cognitive (SEL) interventions.
- Effect sizes: social & emotional skills, .57; attitudes towards self and others, .23; positive social behaviors, .24; problems of conduct, .22; emotional distress, .24; and academic performance, .27, rising to .32 for longer term studies.
- Raise student achievement by 11 percentiles.
- Equivalent to closing the gap between U.S. and Canada and rise in rankings from 17th to 5th place.
Heckman and Colleagues

- Use longitudinal (NLSY) to analyze students educational investment on earnings and graduation.
- Creates battery of non-cognitive scores from anti-social construct using student anxiety, headstrongness, hyperactivity, peer conflict along with cognitive test scores.
- Models developmental path and impacts of investment in cognitive and non-cognitive skill on high school graduation and earnings. Impact of the two kinds of investments shift from cognitive at younger ages 6-9 to older ages 9-13.
Five Factor Model

- For last two decades considered as the “big five” on the basis of many studies.

1. Openness—inventive and curious as opposed to consistent and cautious.
2. Conscientiousness—efficient and organized as opposed to easy-going 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.
Examples of big five findings.

- Major study finds openness predicts SAT.
- Agreeableness and conscientiousness predicted Peer ratings of team member performance beyond controls for specific skills and general cognitive ability.
- Kyllonen and colleagues go well-beyond big five in their extensive study of noncognitive constructs and measures.
Conclusions

- Non-cognitive skills are important contributors to educational outcomes and life outcomes.
- Can be altered by educational interventions.
- Contribute to cognitive outcomes.
- Impact of test scores is overstated if noncognitive measures are omitted from analysis (omitted variable bias).
Implications

- Ignoring role of non-cognitive skills as mediating and outcome variables leads to misleading educational policies.
- NCLB with its focus on test scores only.
- Basing school and teacher evaluations only on value-added in test scores provides only limited picture of school and teacher effects.
Next Steps

- Choose most promising non-cognitive constructs and measures.
- Test these in structural models of learning outcomes and life outcomes.
- Start to incorporate these into national and international assessments of learning and impacts of educational systems.