

A Research Agenda For Understanding the Dynamics of Skill Formation

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I American Society is Becoming Polarized and Less Productive

In the past 30 years, American society has polarized. A greater percentage of children is attending and graduating college. At the same time, a greater percentage is dropping out of secondary school producing a growing underclass, neither working nor going to school. 20% of the U.S. work force has such a low rate of literacy that it cannot understand the instructions on a vial of pills. The slowdown in the growth of the skills of the workforce is reducing U.S. productivity.

These problems are usually discussed in a piecemeal fashion. Analysts blame the public schools, rising tuition costs, or the failure of a number of other social institutions. This has produced an array of competing proposals that lack coherence or a firm grounding in science and social science. This position paper summarizes a body of research that articulates a coherent approach to addressing these problems that is rooted in the economics, psychology, and biology of human development.

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II A Coherent Approach to Skill Policy

The current state of the literature can be summarized by eighteen points.

1. Many major economic and social problems such as crime, teenage pregnancy, obesity, high school dropout rates, and adverse health conditions can be traced to low levels of skill and ability in society.
2. In analyzing ability, society needs to recognize its multiple facets.
3. Current public policy discussions focus on promoting and measuring cognitive ability through IQ and achievement tests. For example, in the U.S. the accountability standards in the No Child Left Behind Act concentrate attention on achievement test scores, not evaluating a range of other factors that promote success in school and life.
4. Cognitive abilities are important determinants of socioeconomic success.
5. So are socioemotional abilities, “soft skills,” physical and mental health, perseverance, attention, motivation, and self confidence.
6. They contribute to performance in society at large and even help determine scores on the very tests that are used to monitor cognitive achievement.
7. Ability gaps between the advantaged and disadvantaged open up early in the lives of children.
8. Family environments of young children are major predictors of cognitive and socioemotional abilities, as well as crime, health and obesity.
9. More than genetics is at work.
10. The evidence that documents a powerful role of early family influence on adult outcomes is a source of concern because family environments in the U.S. and many other countries around the world have deteriorated over the past 40 years.

11. Experimental evidence on the effectiveness of early interventions in disadvantaged families is consistent with a large body of non-experimental evidence that adverse family environments, especially adverse parenting, substantially impair child outcomes.
12. If society intervenes early enough, it can raise the cognitive and socioemotional abilities and the health of disadvantaged children.
13. Early interventions reduce inequality by promoting schooling, reducing crime, and reducing teenage pregnancy.
14. They also foster workforce productivity.
15. These interventions have high benefit-cost ratios and rates of return.
16. Early interventions have much higher economic returns than later interventions such as reduced pupil-teacher ratios, public job training, convict rehabilitation programs, adult literacy programs, tuition subsidies or expenditure on police.
17. Life cycle skill formation is dynamic in nature. Skill begets skill; motivation begets motivation. If a child is not motivated and stimulated to learn and engage early on in life, the more likely it is that when the child becomes an adult, she/he will fail in social and economic life. The longer society waits to intervene in the life cycle of a disadvantaged child, the more costly it is to remediate disadvantage. Similar dynamics appear to be at work in creating child health and mental health.
18. A major refocus of policy is required to understand the life cycle of skill and health formation and the importance of the early years in creating inequality and opportunity and in producing skills for the workforce. A fruitful direction for future research is to improve the core evidence on the dynamics of skill formation.

III The Importance of Cognitive and Noncognitive Skills

Recent research has shown that earnings, employment, labor force participation, college attendance, teenage pregnancy, participation in risky activities, compliance with health protocols and participation in crime strongly depend on cognitive abilities and noncognitive skills. By noncognitive abilities I mean socioemotional regulation, delay of gratification, personality factors and the ability to work with others—what are sometimes called “soft skills.”

Much public policy discussion focuses on cognitive test scores or “smarts.” The No Child Left Behind initiative in the US focuses on achievement on a test administered at certain grades to measure the success or failure of schools. Yet much evidence shows that, as is intuitively obvious and commonsensical, much more than smarts is required for success in a number of domains of life. Recent research documents the predictive power of motivation, sociability, the ability to work with others, attention, self-control, self-esteem, delay of gratification, and health in a variety of life outcomes.

The importance of noncognitive skills tends to be underrated in current policy discussions because they are thought to be hard to measure. Yet they have been measured and have been shown to be predictive of success.

Cognitive and noncognitive ability are important determinants of schooling and socioeconomic success. In the U.S. and many countries around the world, schooling gaps across ethnic and income groups have more to do with ability deficits than family finances in the school-going years. Those with higher cognitive and noncognitive abilities are more likely to take schooling, company job training, and to participate in civic life. They are less likely to be obese and have greater physical and mental health. Cognitive and noncognitive skills are equally predictive of success in many aspects of life.

IV Ability Gaps Are the Major Reason for the Schooling Achievement Gap

Controlling for ability measured at the school-going age, in the U.S. minorities are *more likely* to attend college than others despite their lower family incomes. Deficits in college going between minority and majority groups are not caused by high tuition costs or family income at the age children are deciding to go to college.

V Ability Gaps Open Up at Early Ages

Gaps in the abilities that play such an important role in determining diverse adult labor market and health outcomes open up at early ages across socioeconomic groups. Schooling after the second grade plays only a minor role in alleviating these gaps. Schooling quality and school resources have relatively small effects on ability deficits and only marginally account for any divergence by age in test scores across children from different socioeconomic groups.

The evidence on the early emergence of gaps leaves open the question of which aspects of families are responsible for producing ability gaps. Is it due to genes? Family environments? Family investment decisions? The evidence from intervention studies suggests an important role for investments and family environments in determining adult capacities above and beyond genes, and also in interaction with genes.

VI Family Environments

The evidence that family environments matter greatly in producing abilities is a source of concern because a greater fraction of American children is being born into disadvantaged families. This trend is occurring in many countries around the world. Measured by the quality of its parenting, American family life is under challenge. A divide is opening up in early family environments. Those born into disadvantaged environments are receiving relatively less stimulation and child development resources than those from advantaged families. The real source of child

disadvantage is the quality of parenting.

More educated women are working more, but, at the same time, are spending more time in child development. Less educated women are also working more but are not increasing their child investments. Those born into disadvantaged environments are receiving relatively less stimulation and child development resources than those from advantaged families, and the gap is growing over time. This creates persistence of inequality across generations through the mechanism of differentials in parenting.

VII Critical and Sensitive Periods

There is a large body of evidence on sensitive and critical periods in human development. Different types of abilities appear to be manipulable at different ages. IQ scores become stable by age 10 or so, suggesting a sensitive period for their formation below age 10. On average, the later remediation is given to a disadvantaged child, the less effective it is. A lot of evidence suggests that the returns to adolescent education for the most disadvantaged and less able are lower than the returns for the more advantaged. The available evidence suggests that for many skills and human capacities, later intervention for disadvantage may be possible, but that it is much more costly than early remediation to achieve a given level of adult performance.

VIII Key Policy Issues

From the point of view of social policy, the key questions are how easy is it to remediate the effect of early disadvantage? How costly is it to delay addressing the problems raised by early disadvantage? How critical is investment in the early years and for what traits? What is the optimal timing for intervention to improve abilities?

IX Enriched Early Environments Can Compensate In Part For Risk Features of Disadvantaged Environments

Experiments that enrich the early environments of disadvantaged children show that the effects of early environments on adolescent and adult outcomes are causal. Improvements in family environments enhance children's adult outcomes and operate primarily through improvements in noncognitive skills. Reliable data come from experiments that provide substantial enrichment of the early environments of children living in low-income families. Longitudinal studies of the experimental groups demonstrate substantial positive effects of early environmental enrichment on a range of cognitive and "non-cognitive" skills, schooling achievement, job performance, and social behaviors, long after the interventions end.

X Summary

Many current social problems have their roots in deficits in abilities. Ability deficits open up early in life and persist. They produce inequality and reduce productivity. Evidence from a variety of studies shows that there are critical and sensitive periods for development. Sensitive periods come earlier in life for cognitive traits. The age pattern is less pronounced for noncognitive traits. This pattern is associated with slower development of the prefrontal cortex. Noncognitive traits stimulate production of cognitive traits and are major contributors to human performance. The powerful role of noncognitive traits and the capacity of interventions to improve these traits is currently neglected in public policy discussions.

Later life investment is less productive if an adequate base has not been created in early life. The econometric evidence is consistent with the evidence from neuroscience. Later investment is more productive if early investment is made. A portfolio of childhood investment weighted toward the early years is optimal. Society currently ignores this pattern in its investment in disadvantaged children, devoting more resources to adolescent remediation than childhood prevention. Children from advantaged environments by and large receive substantial early investment. Children from disadvantaged environments typically do not.

The appropriate measure of disadvantage is the quality of parenting, not income per se. Quality of schools and tuition do not matter as much as is often thought. Late remediation is very costly. Interventions should be directed toward the malleable early years, if society is to successfully reduce inequality and promote productivity in American society. Making these arguments more precise and rooting them more firmly in data on biology and behavior will lay the groundwork for addressing the core problem of rising inequality in a rigorous and meaningful way.

Reference

Heckman, J. J. (2008, July). Schools, skills and synapses. *Economic Inquiry* 46(3), 289–324.