Are we creating a STEM dead end?

Amid the fast-forward distractions of our high-tech world, studying more durable subjects may be one of the best investments you can make.

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If you have been advising your children that a STEM (science, technology, engineering and math) education is a sure way to economic success, you may want to read a new study (http://www.nber.org/papers/w25065) that reveals that higher STEM wages do not depend on *what* you know, but rather on *when* you know it.

For the better part of the last 40 years, employers, educators at all levels, and workforce development authorities have campaigned successfully to increase the number of students graduating with degrees and credentials in STEM occupations. Between 1960 and 2013, the number of U.S. STEM workers grew by 3 percent compared to 2 percent growth in all other fields, with the STEM workforce enjoying a median pay roughly twice that of non-STEM workers. Most importantly, the STEM workforce skews young, suggesting that in this area youth and exuberance are more important than age and wisdom.

The hidden downside — as the study (http://www.nber.org/papers/w25065) by David Deming, a Harvard University professor of public policy, education and economics, and Kadeem Noray, a Harvard Ph.D. student, shows — is that while STEM fields pay well for recent graduates, these premiums are short-lived. They are highest at the outset of a career and decline by more than 50 percent in the first 10 years of working life. The higher the rate of technological change in a particular specialty, the flatter the rate of wage increase. This pattern is particularly true in applied STEM fields like engineering and computer science. (Other STEM majors like biology, chemistry, physics and mathematics — the pure STEM categories — do not show similar wage effects.)

The authors explain:

> Applied STEM degrees provide high-skilled vocational education, which pays off in the short run because it is at the technological frontier. However, since technological progress erodes the value of these skills over time, the long-run

> payoff to STEM majors is likely much smaller than short-run comparisons suggest.

The drop in the wage premiums associated with applied STEM jobs has a direct impact on career trajectories. Old STEM dogs have a hard time learning new STEM tricks. Fifty-eight percent of those with STEM degrees exit the field after 10 years. Some move into higher-wage STEM management careers, but most do not. This appears to be creating a career pathway in which a majority of STEM workers "age-out" of the industry in their late-30s or early-40s with decades of working life ahead forcing them to find other employment.

Further study is needed but the STEM labor shortage may turn out to be mainly a problem of cognitive processing changes associated with age (https://www.ncbi.nlm.nih.gov/books/NBK3885/) and how those changes impact learning. Data from countries with advanced apprenticeship models point toward this effect as well. These nations have lower rates of youth unemployment but higher unemployment rates later in life.

In other words, it's not that we don't have enough workers with STEM credentials, it's that many of those with STEM credentials cannot keep up with the pace of technological change.

In the STEM economy, wisdom eventually has its revenge. Deming and Noray argue that the rapid pace of technological change actually increases the value of general education relative to STEM education. Basic competencies like reading, critical thinking, and other non-cognitive and interpersonal skills are important, even for high-ability STEM majors. A more balanced portfolio of knowledge and skills makes it easier to transition to either a STEM management job, or to a new career in another field.

We owe our students considering STEM careers a dose of honesty. Yes, for those with high levels of ability, the world, in the short-term, truly is your oyster. You will have an easier time finding work and you will get paid more for it. But time, which levels mountains, also evens out wage premiums. For the long-haul, do yourself a favor: Step away from computer screens occasionally to dip into fields like history, literature, philosophy, art, and the principles of business management and effective interpersonal relationships — in short, the liberal arts. Amid the fast-forward distractions of our high-tech world, studying more durable subjects may be one of the best investments you can make.

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