The Case for Improving U.S. Computer Science Education

by Adams Nager and Robert Atkinson, Ph.D.

Despite the growing use of computers and software in every facet of our economy, not until recently has computer science education begun to gain traction in American school systems. The current focus on improving science, technology, engineering, and mathematics (STEM) education in the U.S. school system has disregarded differences within STEM fields. Indeed, the most important STEM field for a modern economy is not only one that is not represented by its own initial in "STEM" but also the field with the fewest number of high school students taking its classes and by far has the most room for improvement—computer science.

Among the key findings in this report:

- Only around a quarter of high schools offer computer science, and often these course lack rigor or focus on computer use or just coding instead of delving into computer science principles.
- Only 18 percent of schools accredited to offer Advanced Placement exams offer the computer science AP exam.
- Access to computer science is concentrated in affluent schools.
- Only 22 percent of students who take the AP exam in computer science are female, the largest gender disparity of any AP exam.
- Less than 10 percent of students who take the AP computer science exam are Hispanic, and less than 4 percent are black.
- Access to computer science is also limited at universities, where institutions limit enrollment through restrictions, higher admission standards, or introductory "weed-out" courses designed to keep students out of the major. In many cases, universities have few incentives to incur the cost of expanding computer science programs in response to student demand. These artificial constraints disproportionally impact women and minorities, diminishing attempts to promote inclusivity.

Since computer science became an academic discipline in the late 1960s, the level of interest in the field and the number of students taking courses has grown in fits and starts. Currently in an upswing, computer science education in the United States looks poised for steady growth. However, there is the possibility that interest in the field could again wane like it did in 2003 following the burst of the tech bubble.

To maintain the field's current momentum, the perception of computer science needs to shift from its being considered a fringe, elective offering or a skills-based course designed to teach basic computer literacy or coding alone. Instead, it is time for computer science to be seen as a core science on par with more traditional high school offerings such as biology, chemistry and physics, which have been the focus since the 1890s. Furthermore, universities should capitalize on the growing interest in computer science and expand their offerings to accommodate the growing demand for courses in the field.

Not only is computer science a powerful educational tool for fostering critical thinking, problem solving, and creativity, computer skills and competencies are in high demand among employers in

a wide range of industries, not just the tech industry. Therefore, policy and program reforms are needed to support and maintain the groundswell of interest in computer science.

This report offers a series of policy recommendations to improve computer science education in the United States. In particular:

- Policymakers should reform curricula for existing technology classes to focus on core concepts of computer science in primary and secondary schools and provide resources to train and recruit high-quality computer science teachers.
- All states should allow computer science to count as either a math or science requirement, and more STEM-intensive public high schools that give students in-depth exposure to computer science should be established to allow students with the aptitude and interest in computer science to more deeply explore the subject.
- Universities should be incentivized to expand their offerings in computer science and prioritize retaining students interested in majoring, minoring, or taking courses in computer science.

Editor's note: The full text of this ITIF executive summary is accessible at: https://itif.org/publications/2016/05/31/case-improving-us-computer-science-education.

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