

CHAPTER 1 – EMPLOYABILITY SKILLS IN THE 21st CENTURY STEM WORKFORCE (excerpt)

PURPOSE

This book addresses the problem of work force “skills gaps” and how high school career and technical education (CTE) courses can help fill those gaps by teaching students the employability skills or “soft skills” desired in the workplace. Employers complain about the “skills gap” in response to mounting concerns that today’s youth lack the 21st Century knowledge, skills, and dispositions needed for many middle wage careers. As a result, these jobs often remain unfilled (Carnevale, Smith, & Melton, 2011; Carnevale, Smith, & Strohl, 2010). *Three Educational Pathways to Good Jobs* published by the Georgetown University Center on Education and the Workforce identifies three pathways to good jobs, defined for young workers as jobs paying at \$35,000: the high school pathway, the middle-skills pathway, and the bachelor’s degree (BA) pathway. Overall, job prospects for workers with a high school diploma or below are “mixed” in that good jobs are no more prevalent for this group than decades ago and fewer workers are on this pathway. Still these pathways persist despite workers with less education being disproportionately impacted by the shift in good jobs away from manufacturing into the service sector (Carnevale et al., 2018). CTE programs offer high school students the coursework, certificates, and other sub-baccalaureate credentials that can put them on the middle-skill pathway. These students can then enroll in associate’s and bachelor’s degree programs with industry knowledge through relevant job experience. Technical skills and credentials allow young workers to adapt to a changing nature of manufacturing in which high-tech computer-based technologies (i.e. CAD/CAM) reduce the number of workers needed while increasing the skills necessary.

Research for this book was part of a larger research project funded by the National Science Foundation, titled “Successful Academic and Employment Pathways in Advanced Technologies” (DUE #1104214) on which I served as Principal Investigator. This project is heretofore referred to as PathTech Tampa Bay (PTTB). The goal of PathTech Tampa Bay was to examine pathways from high school into the workforce through engineering technology associates of science (AS) and associates of applied science (AAS) degree programs at community colleges. This study included fieldwork in high schools, community colleges, and STEM businesses in the Tampa Bay area. The resulting PathTech Tampa Bay study was a holistic examination of secondary and post-secondary pathways into what are generally considered to be “good tech jobs” that acknowledge the challenges individuals face within education and employment sectors.

This book diverges from the majority of scholarship on STEM education and employment that focuses on high school math and science coursetaking pathways into STEM degree programs at four-year universities. This book addresses three major research gaps in contemporary education research. First, research on K-12 STEM education generally focuses on *academic* STEM courses, traditional math and science courses (i.e. algebra, calculus, chemistry, physics) that center around a theoretical approach to learning core concepts (Gottfried, Bozick, & Srinivasan, 2014). There is far less research on *applied* STEM courses that focused on the practical application of academic STEM knowledge and concepts to “real world job experiences.” Applied STEM CTE courses address the stated need for “organized educational activities” that contribute to overall student development including employability skills, technical skills, and job-specific skills (Perkins IV 2006:4). From a policy perspective, we also know relatively little about how the federal Carl D. Perkins Career and Technical Education Act

(Perkins IV), recently Perkins V reauthorization, and subsequent state policies such as Florida's Career and Professional Education (CAPE) Act in prepare high school students for the workforce, particularly STEM careers (Wang, 2013). The CAPE Act required all Florida school districts in the state to establish at least one career academy with the goals of encouraging partnerships between K-12 education and industry and promoting industry-recognized certifications (Dixon, Cotner, Wilson, & Borman, 2011). Career academies deftly balance college preparatory and career readiness to cater to students who plan to work and/or attend college after high school. Career academy proponents and CTE observers believe these programs represent a hard push against the 20th century K-12 focus on College for All (Attewell, Lavin, Domina, & Levey, 2007) as opposed to career readiness.

Second, the current research focus on academic STEM courses generally presumes STEM pathways in which students transition directly from high school math and sciences into STEM bachelor's degree programs at four-year universities en route to STEM careers. Research does not account for delayed transitions from high school to higher education in which students work full-time before enrolling in a community college or university. Research also often fails to account for students' economic resources or part-time or full-time employment while enrolled in college (Bozick, 2007) or explore the potential benefits for STEM undergraduates who work part-time in STEM jobs as opposed to retail or food service jobs (Tyson, 2012). This study finds that STEM employers hire or seek to hire recent high school graduates part-time or full-time and provide tuition reimbursements to help them earn degrees.

Third, despite the growing discussion of skills gaps and employability skills frameworks, little research addresses how high school students can learn the personal and interpersonal skills necessary for the workplace as well as the strategies teachers use to teach these skills. The U.S.

Department of Education (USDOE) Office of Career, Technical, and Adult Education (OCTAE) Employability Skills Framework compiled from an inventory of 18 existing employability standards and assessments. The framework represented in Figure 1 includes skills that employers and educators believe prepare students to get a job and/or attend college right out of high school (USDOE, 2018). This study focuses on *effective relationships* and *applied knowledge*, more specifically *personal qualities*, *interpersonal skills*, and *problem solving* skills.