

# Skills For Our Future:

## *Vocational Education in Massachusetts*

By Colin Jones, Massachusetts Budget and Policy Center

### INTRODUCTION

Across the Commonwealth, educators prepare our young people with the skills to thrive today and in the years ahead, while fostering civic engagement, innovation, and critical thinking. Our education system also works to prepare students for college and careers, equipping them for success in the workplace over the long-term. This focus has been a growing topic in recent education debates, reflected in updated state educational standards and adoption of a uniform definition of college and career readiness.<sup>1</sup>

In 2014, 10 percent of all youth in Massachusetts aged 16-24 were neither working nor in school—representing 85,000 “disconnected youth” statewide. This figure has improved only slightly since 2011, in the aftermath of the Great Recession, when 11 percent of these youth were neither working nor in school.<sup>2</sup>

Fortunately, according to recent projections, there may be opportunities to train young people with skills needed in growing fields like advanced manufacturing, information technology, and health care.<sup>3</sup> For example, recent projections suggest that mid-level jobs in health careers such as nursing and medical assisting will have grown by 2.7 million (36 percent) nationally between 2010 and 2020.<sup>4</sup>

In response to these challenges and opportunities, several states including Massachusetts, joined together to create the Pathways to Prosperity network, collaborating to identify effective career, vocational, and technical education (CVTE) offerings that support young people in gaining employment with family-sustaining wages. Massachusetts has a broad array of existing CVTE programs to learn from and consider building upon. CVTE programs, which combine specific skills training with traditional academics, take place in a few different settings: regional vocational schools, which function as standalone districts focused on vocational education; standalone vocational high schools within traditional school districts; and smaller vocational programs that operate within larger traditional high schools. Our state budget also supports additional job training opportunities for young people such as paid internships that connect over 10,000 youth a year with hands-on work experience in out-of-school time.<sup>5</sup>

This paper reviews the academic research on effectiveness of several CVTE models, identifies opportunities for improvement, and, where appropriate, estimates what it would cost to expand vocational offerings to more students in Massachusetts.



## ROADMAP TO Expanding Opportunity

Evidence on What Works in Education

The promise of a high-quality education leading to opportunity and shared prosperity for all children is a deeply held value in Massachusetts. Despite a record of prominent successes, however, our Commonwealth has struggled to provide students from all backgrounds the supports necessary for long-term life success. To confront this challenge, the Massachusetts Budget and Policy Center and the Rennie Center for Education Research & Policy are undertaking this shared research project: the *Roadmap for Expanding Opportunity: Evidence on What Works in Education*.

This series of reports builds on progress initiated with the Education Reform Act of 1993, addressing critical areas in which progress has stalled. Ultimately, this project will provide a roadmap for bringing education reform into the 21<sup>st</sup> century. Reports will examine promising evidence-based strategies for supporting all children in achieving college, career, and life success. In particular, analyses will be grounded in a recognition that learning must extend beyond traditional school structures and offerings.

Reports will offer strategies for adapting a broad evidence base to local contexts, including cost analyses to assess the level of resources required to support district and statewide innovation. Ultimately, these briefs are designed to provide education leaders and practitioners with building blocks for driving future educational reforms across the Commonwealth.

## What Works in Career, Vocational, and Technical Education

Overall, the best current research suggests that high-quality CVTE programs can have a range of benefits for young people, including increased earnings, greater engagement in school, higher rates of college enrollment, and enhanced career skills. For example, in one rigorous study, participants in CVTE programs within larger high schools had 11 percent greater annual earnings (roughly \$2,500 more) after high school compared to a control group.<sup>6</sup> However, not all CVTE programs have achieved strong academic results, matched students with advanced work experiences, or engaged all students, including those who may have struggled in other school settings.

Effective CVTE programs share many common features, as identified by a growing body of research. Key features include:

- 1. Greater individualized attention**—where young people receive strong career advising and guidance, ensuring they are on track with an area of study that fits their interests. CVTE programs tend to have smaller class sizes that facilitate stronger relationships between students, teachers, technical instructors, workplace mentors, and advisors. This is a natural feature of some vocational programs, where facilities and safety concerns dictate that students must be under tight supervision.
- 2. State-of-the-art facilities and equipment**—to ensure that students are developing advanced skills with currency in the job market. These facilities and equipment needs are one reason why CVTE programs typically cost more than traditional high school programs.
- 3. Partnerships with outside organizations, particularly employers**—in order to provide internships and apprenticeships, as well as technical assistance for schools on curriculum and instruction. Many CVTE programs also have direct connections with local colleges and universities. In some cases, vocational tracks in high schools are directly aligned with majors in higher education, creating seamless two- or four-year postsecondary pathways.
- 4. Integration of quality academics with vocational training**—that allows students to apply mathematics, science, and literacy skills in hands-on contexts. This integration of traditional academics with vocational training can be a challenge as it requires close collaboration among teachers, support staff, and administrators to weave together a program that effectively provides two high school experiences.

These key elements of effective CVTE programs have much in common with what works well in traditional schools, including many of the strategies analyzed in earlier [Roadmap to Expanding Opportunity](#) research papers. Additional learning time, for instance, has given many traditional schools the opportunity to provide more hands-on learning and partner with outside organizations to improve enrichment offerings. When done right, these interventions have improved academic performance and enhanced the socio-emotional well-being of many students.<sup>7</sup> Small class size initiatives, particularly in the early grades, have also helped to improve student learning, expand social skills, and strengthen school culture.<sup>8</sup>

Even if they aren't offering full CVTE programs, traditional high schools can build upon many of these successful CVTE elements. According to the Rennie Center for Education Research & Policy, student input in designing their own learning experiences, individualized support from educators, and strong collaboration between community partners and schools can help boost graduation rates, improve attendance, and increase access to positive adult role models.<sup>9</sup> All of these supports can happen within CVTE or through other programs such as community-school partnerships, service-learning, and internships.

## CAREER & VOCATIONAL PROGRAMS IN MASSACHUSETTS

Enrollment in Massachusetts vocational programs has increased over the past decade, going from 42,000 in school year 2005 (14 percent of statewide enrollment) to 48,000 in school year 2016 (17 percent).<sup>10</sup>

The range of career programs available for students in Massachusetts’ vocational schools is expansive. There are 11 career clusters (see table below), and within those, over 40 individual career programs.<sup>11</sup> Several clusters have multiple programs, such as construction, which features 10 options including property management, electricity, masonry, and plumbing.<sup>12</sup> Other clusters have fewer offerings, like Information Technology, with just two tracks in technology support and computer programming.<sup>13</sup>

### Massachusetts CVTE Career Clusters

**Agriculture & Natural Resources – Arts & Communication – Business & Consumer Services**

**Construction – Education – Health Services – Hospitality & Tourism – Information Technology**

**Legal & Protective Services – Manufacturing, Engineering, & Technology – Transportation**

The following sections survey the existing CVTE landscape in Massachusetts and nationally, articulating three broad options for providing vocational programs to more students.

### CVTE Model One: Vocational Programs Within Traditional High Schools

Some high schools offer vocational programs as one offering among many others within a larger traditional high school. Somerville High School, for instance, offers a CVTE program called the Center for Career and Technical Education, which meets the same state standards (“Chapter 74”) as other standalone vocational offerings, (described later in the next two sections this paper).

Somerville’s program features an intake and guidance process that supports students in selecting a pathway in one of 13 career fields, including architecture, culinary arts, early education, and information technology.<sup>14</sup> Within these fields, students can earn opportunities for internships. They also gain experience through community programs such as a student-operated restaurant.<sup>15</sup> In line with standalone vocational schools in Massachusetts, students graduate with a career certificate in addition to a high school diploma. Somerville CVTE students also benefit from a program that is informed by the input of a local advisory board of industry leaders, community members, and representatives from higher education.<sup>16</sup>

Some career programs within traditional high schools across the country, which have similarities with the Somerville program, have been rigorously evaluated. The results have been positive in several key areas. The research firm MDRC studied CVTE programs embedded within traditional high schools—which they refer to as “career academies”—in Baltimore, San Jose, Miami, and Pittsburgh. In the mid to late 1990s, educators in these cities implemented programs focused on both college and career tracks, working with young people at heightened risk of dropping out.<sup>17</sup> Students were educated in small learning communities of roughly 175 students.<sup>18</sup> They studied career fields such as health, business, and technology, and pursued college preparatory academics.<sup>19</sup> Local

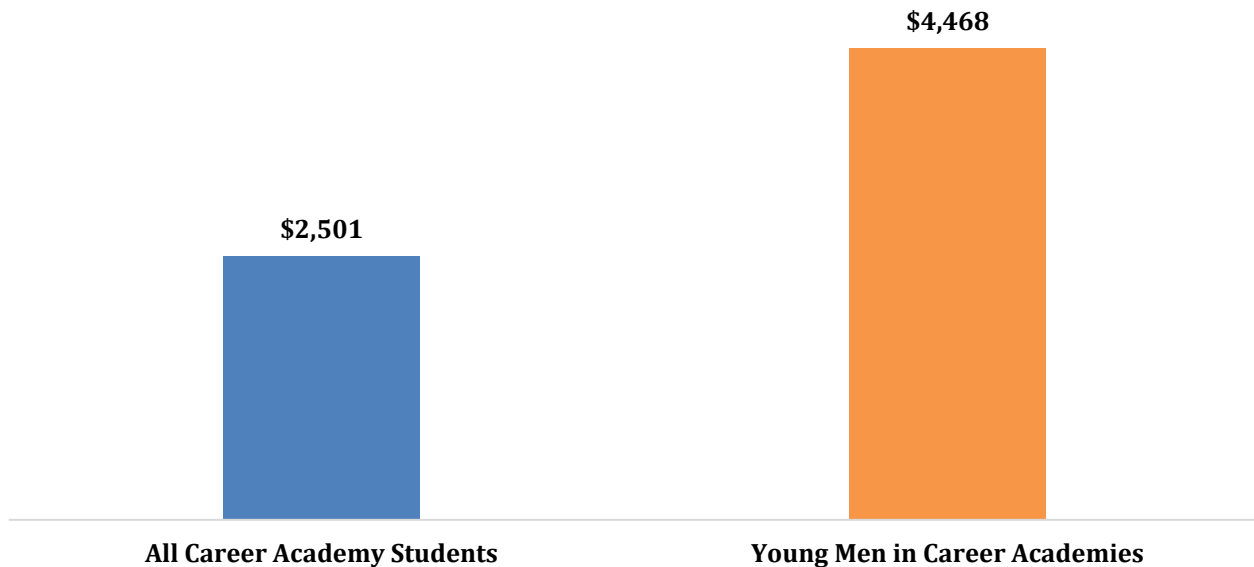
employers participated as mentors and brought students into workplaces for site visits and internships.<sup>20</sup> MDRC evaluated these career academies through a study that randomly assigned students to either participate or serve as a control group, effectively isolating the impact of the approach.

MDRC research showed both short-term and long-term benefits to career academies. While in high school, students reported that teachers had high expectations for their work, provided attention, and that classmates were highly engaged. Students were able to gain additional exposure to the world of work through job shadowing, field trips, and work-based learning. This enrichment for students translated into increased attendance, more credits earned, and higher graduation rates for students at the greatest risk of dropping out.<sup>21</sup>

Over the longer-term, participants had 11 percent higher average annual earnings during the 8 years after they were in the program (roughly \$2,500 per year in 2016 dollars).<sup>22</sup> This impact was particularly strong for young men, who gained roughly \$4,500 annually in additional earnings, 17 percent above the control group. Participants with children were also more likely to be raising them with the help of a second parent; men in the program, for instance, were 12 percentage points more likely to be custodial parents.<sup>23</sup>

### Students in Quality Career Academies Earned More, Particularly Young Men

Additional annual earnings of Career Academy students above a control group, inflation adjusted 2016 dollars



Kemple & Willner, 2008

These career academies did not, however, succeed on every measure studied by MDRC. Not all participants were sufficiently engaged, with only 55 percent completing the program. Additionally, career academies had no major impact on completion of higher education.<sup>24</sup>

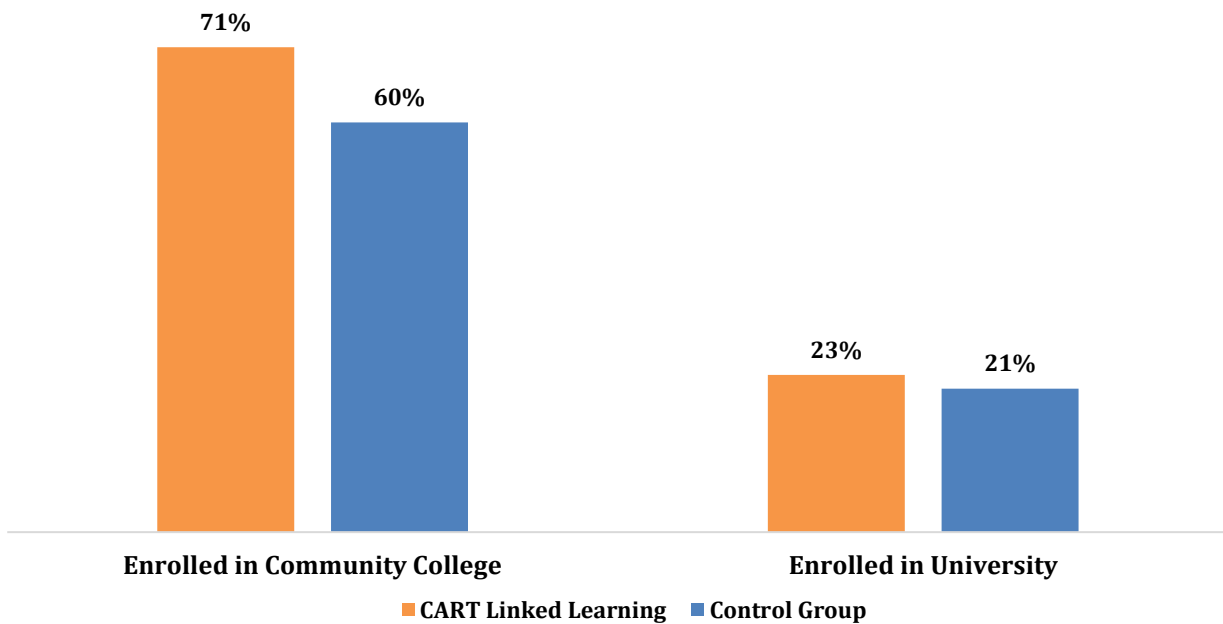
California's Linked Learning Initiative is another vocational program within traditional high schools that has been researched extensively. Linked Learning is offered in many high schools in California, wrapping career themes around a traditional high school program.<sup>25</sup> Teachers and outside partners make explicit connections between lessons and applications in specific professional fields, through hands-on projects, career mentoring, and internships.<sup>26</sup> While they aren't enrolled in a traditional CVTE program, students in Linked Learning receive additional support such as counseling and supplemental instruction to help them stay on track for future college and career opportunities.<sup>27</sup>

One site implementing this program, the Center for Advanced Research and Technology (CART) is a collaboration of two urban districts in Central California, Clovis and Fresno. CART consists of roughly 1,300 high school juniors and seniors engaged in half-day sessions taught by business and community leaders. These outside experts work with teachers to deliver hands-on lab activities in areas including marketing, psychology, and Science, Technology, Engineering, and Math (STEM).<sup>28</sup>

Studies of Linked Learning show that it has increased engagement in high school, completion of college prerequisites, and matriculation into college.<sup>29</sup> Linked Learning students were also more likely to report that their high school helped them develop perseverance, communication, and organizational skills.<sup>30</sup> A study of the CART program showed that students in the program were 11 percentage points more likely to enroll in community college than a control group, and slightly more likely to attend a four-year university (see chart below).<sup>31</sup>

### Students in Linked Learning Program More Likely to Enroll in College

Percentage of students in CART Linked Learning who enrolled in community college, university, compared to control group



Center for Advanced Research and Technology, 2011

While Linked Learning students were more likely to enroll in college, they have done no better on standardized test scores.<sup>32</sup> Additionally, while a large majority of students in Linked Learning had some exposure to career awareness and exploration, only roughly a third of students participated in internships.<sup>33</sup> This suggests that advanced opportunities in real work environments could be made available more widely, likely requiring greater partnerships with employers.

### CVTE Model Two: Regional Vocational Schools

Massachusetts regional vocational schools bring together students from multiple towns into a single vocational-focused high school. There are currently 28 regional vocational schools statewide, which function as standalone school districts, governed by regional school committees representing each sending community.<sup>34</sup> In order to help ensure that the programs being offered are in line with industry needs, regional vocational schools also have advisory committees made up of business, labor, and higher education leaders.<sup>35</sup>

Unfortunately, regional vocational schools have not been evaluated with the same rigor as the MDRC randomized control study described above. Therefore, it is hard to know how well these students are performing compared to how they would have done in a traditional high school. Additionally, because regional vocational schools select students through an application process that evaluates academic achievement, teacher recommendations, and disciplinary history, rather than serving all students, it is hard to find an appropriate control group for making comparisons.<sup>36</sup>

With these caveats in mind, regional vocational schools have shown some evidence of effectiveness, such as higher 4-year graduation rates—95 percent in 2015 compared to 87 percent statewide.<sup>37</sup> However, the proficiency rates of students in regional vocational schools on the state’s MCAS exam and their score growth against peers over time, are roughly in line with overall performance in the state.<sup>38</sup>

While we can’t be sure how much of the regional vocational schools results are due to how students are selected, we do know that they are achieving these results at the same time that students also benefit from vocational training. The vocational programs run at these regional schools are often more robust than those embedded within traditional high schools. Students benefit from an exploratory period in the beginning of ninth grade, where they evaluate their interests and select a program of study. The schools also feature small class sizes of 15 or fewer students in shop periods, which allows work in a tight-knit setting that promotes positive mentor and peer relationships.<sup>39</sup> Some regional vocational schools have extended learning time, such as a longer school year at Blackstone Valley Technical School in Upton, which adds 15 days to the traditional calendar, the longest sessions in the state.<sup>40</sup>

Regional vocational schools appear to be providing these vocational supports without compromising core academics. Vocational students are expected to meet state standards for all high schools, with limited exceptions for enrichment and language requirements.<sup>41</sup> Students at regional vocational schools spend roughly half their time on vocational training and half on core academics.<sup>42</sup> Vocational schools do both by integrating academic lessons into the vocational program, such as matching carpentry with related mathematical foundations in geometry and trigonometry.<sup>43</sup>

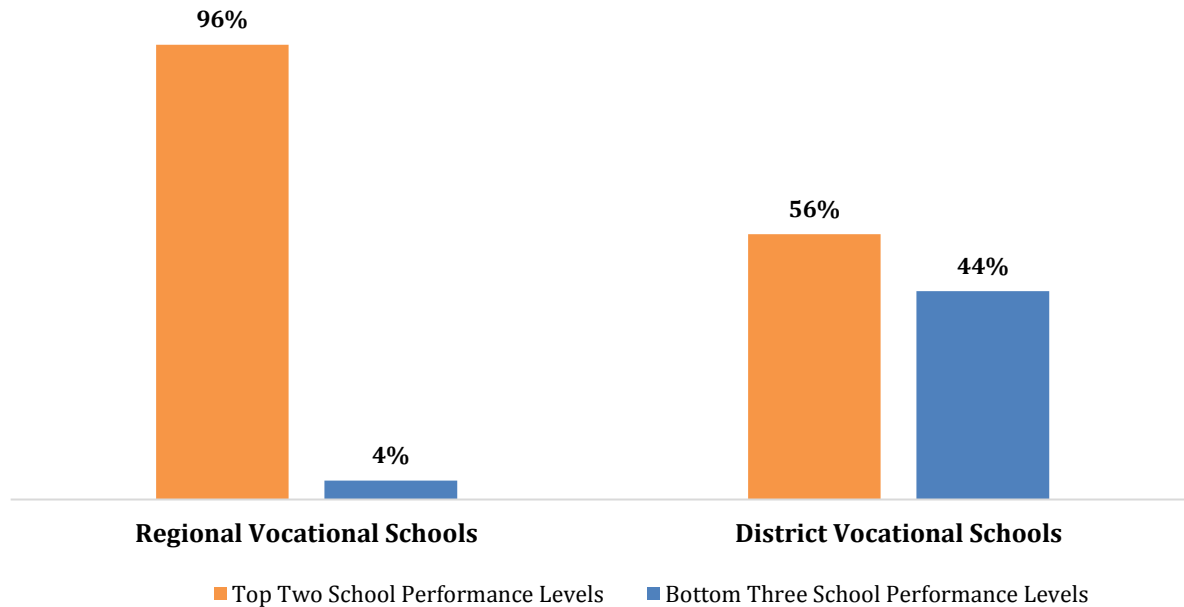
Regional vocational schools also make connections with local employers. For example, Shawsheen Valley Technical High School in Billerica recently reported that over 50 percent of its seniors were placed in internships with 155 different local employers.<sup>44</sup> When done right, these internships benefit both students and local employers by helping them develop their future workforce. As these programs take place, young people can earn wages and career credentials that set them on a path to successful employment in the future.<sup>45</sup>

## **CVTE Model Three: In-District Vocational Schools**

Nine school districts in Massachusetts, primarily in large urban communities, offer separate vocational high schools within their traditional district. Many of these schools also feature some of the best practices in vocational education, however there is significant variation in the quality of programs offered in different cities (see discussion and chart below). In 2014-2015, only 56 percent of in-district vocational schools were in one of the top two levels of the state’s five-level performance ranking, compared to 96 percent of regional vocational schools (see graph below).<sup>46</sup> Similar to other Massachusetts CVTE programs, in-district vocational schools have yet to be rigorously evaluated.

## Regional Vocational Schools Have More Consistent Quality

Percentage of regional and district vocational schools at different levels of state performance rankings, 2015



Department of Elementary and Secondary Education

Worcester Technical High School (Worcester Tech) has a particularly high-performing in-district CVTE program. It is organized into four thematic academies focusing on design and engineering, health and human services, construction, as well as information technology and business services.<sup>47</sup> Within these smaller academies, students are taught in small classes of roughly eighteen students.<sup>48</sup>

Worcester Tech has formal partnerships with local employers, including a STEM partnership with the energy company National Grid. National Grid provides paid internships, mentoring activities, and even guarantees entry level jobs with competitive salaries for some graduates who complete a higher education degree in engineering.<sup>49</sup> Articulating a clear career pathway for high school students in this way can help increase motivation and persistence.

Worcester Tech has also strengthened its emphasis on traditional academics in recent years, almost doubling the number of students taking advanced placement (AP) course work.<sup>50</sup> This increase in AP work was particularly focused on STEM courses that complement technical programs, promoting mastery across vocational and academic fields.<sup>51</sup>

These improvements have led to significant outside recognition for Worcester Tech. This includes having the former principal named National Principal of the Year, and hosting President Obama for its commencement address in 2014.<sup>52</sup>

By contrast, some other in-district vocational programs are struggling to provide the same level of quality supports. One prominent example is Boston's Madison Park High School, which has faced a variety of challenges including frequent leadership turnover, poor academic offerings, and declining enrollment.<sup>53</sup> These challenges resulted in Madison Park being designated as underperforming by the state at the end of 2015.<sup>54</sup> Analysts including the Harvard economist Edward Glaeser have attributed this situation to structural factors, such as an unclear programmatic focus, insufficient recruitment to identify and serve students with vocational interests, and a lack of high-quality partnerships with employers in Greater Boston.<sup>55</sup>

## POLICY CONSIDERATIONS

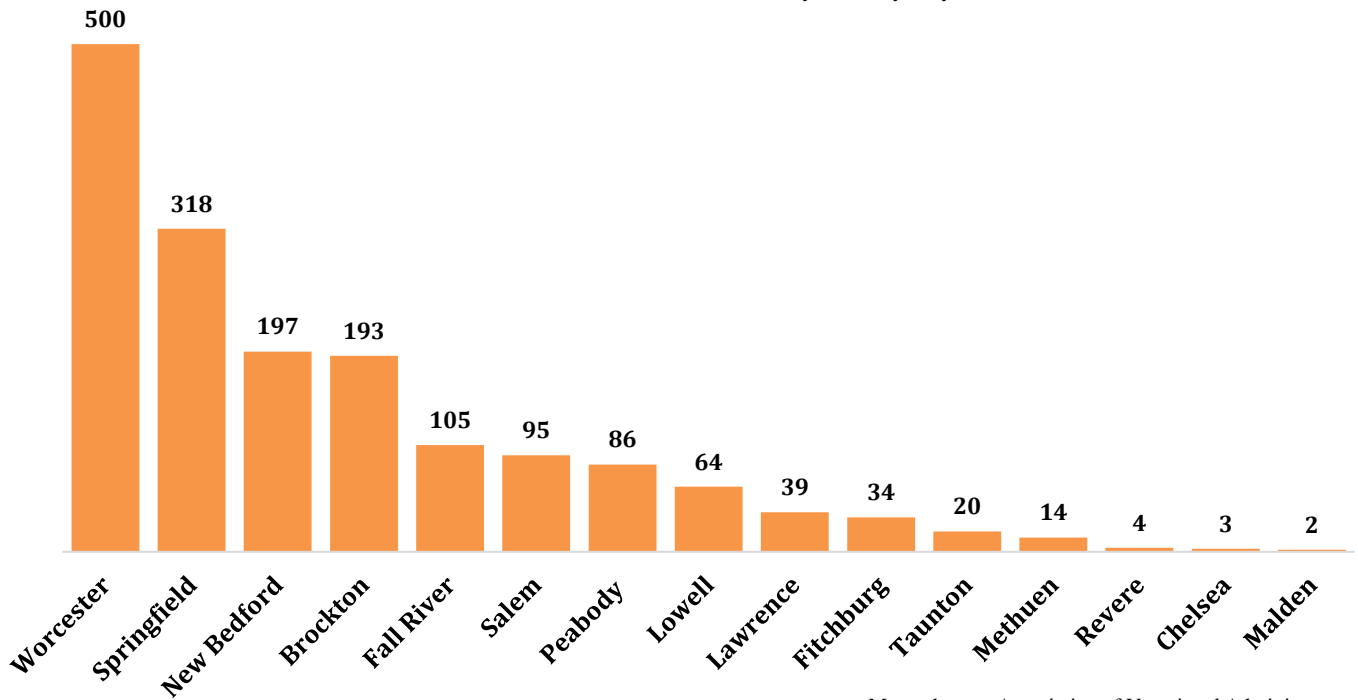
### Estimating Demand for Additional Seats in Massachusetts Vocational Schools

Career, vocational, and technical education is quite popular in Massachusetts, with more students seeking admission to CVTE programs than current capacity allows. In October of 2015, there were 3,200 students on CVTE waitlists statewide. These students actively sought admission in 2015 and met school entrance requirements, yet were unable to secure a place in the vocational school they applied to. This total does not include students from the 50 predominately rural communities with no in-district CVTE programs and that aren't members of regional vocational districts. Roughly 13,000 high school students attend school in these districts, suggesting that an additional roughly 2,200 would be enrolled in CVTE programs, if access in these communities were equal to the state average.<sup>56</sup>

Unmet demand for CVTE programs is especially pronounced in the state's Gateway Cities, home to 1,700 of the 3,200 students on the statewide waitlist (see chart below).<sup>57</sup> Gateway City students are 53 percent of the waitlist while representing only 26 percent of all students statewide.<sup>58</sup>

#### Gateway Cities Have Significant Waitlists for Vocational Education

Number of students on waitlists for vocational schools, by Gateway City, October 2015



Massachusetts Association of Vocational Administrators

### Estimating the Cost of Expanding Access

#### Operating Costs

Due to smaller class sizes, more intensive supports, and greater equipment needs, CVTE programs cost more than traditional high school programs. In fact, our state's Chapter 70 education aid formula, which [calculates a foundation budget](#) for every school district, reflects this cost difference by directing greater resources to students in CVTE programs. Specifically, the foundation budget's per-pupil vocational rate in 2015-2016 was \$13,200

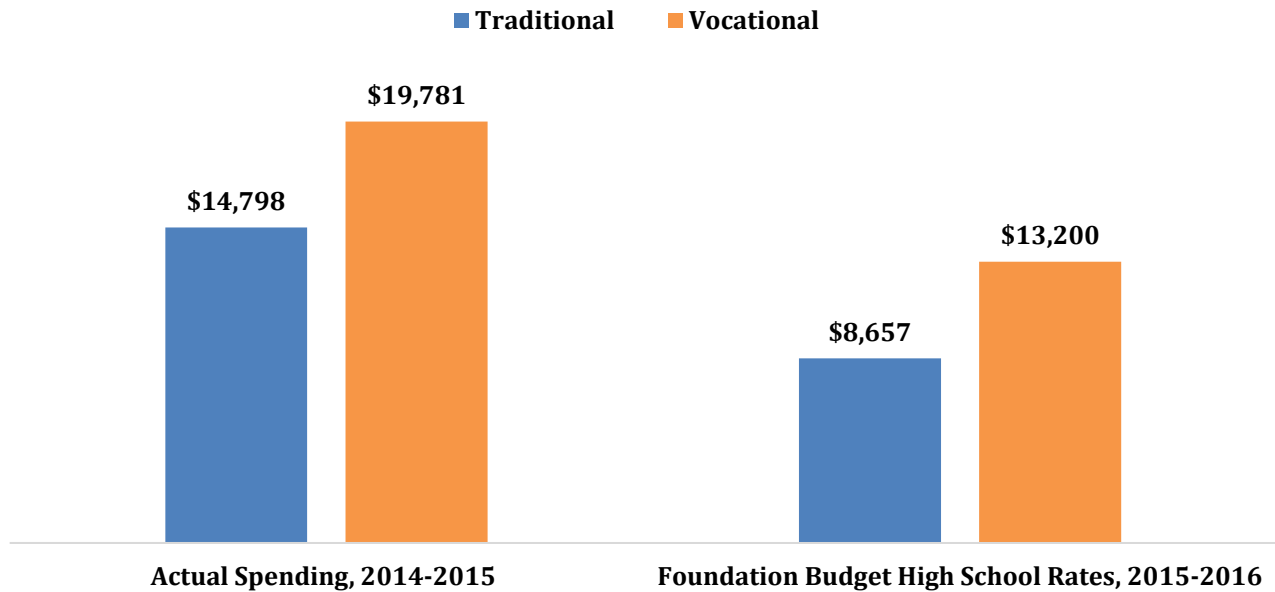


compared to \$8,700 for traditional high schools.<sup>59</sup> This reflects \$4,500 in additional funding for each student necessary to support vocational programs.

Figures within the foundation budget are estimates and not necessarily reflective of actual costs. In 2014-2015, actual per-pupil spending within regional vocational schools, inclusive of all funds at their disposal, was roughly \$19,800 on average.<sup>60</sup> This vocational spending is roughly \$5,000 higher than average per pupil spending statewide of \$14,800.<sup>61</sup> While this statewide total isn't a perfect comparison—it includes spending at the lower grades, for instance—it provides the best available statewide proxy for average spending in non-vocational programs. Using either actual spending or foundation budget rates results in a similar estimate of roughly \$5,000 for the incremental operating cost of vocational education.

## Vocational Schools Cost Roughly \$5,000 More Than Traditional Schools

Per student actual spending, and Chapter 70 foundation budget rates for different school types, 2014-2016



Department of Elementary and Secondary Education

There are considerations beyond the incremental operating cost of CVTE to account for in expanding vocational education. Regions, localities, and schools differ in how much they can utilize existing capacity or will have to bear the cost of new schools, equipment, and staff. For example, a city moving a significant percentage of their students to a vocational program could likely reallocate staff and other resources from traditional high schools more easily, incurring costs closer to the incremental \$5,000 for the addition of career programs. However, in many cases, expanding CVTE will involve significant transition costs. For example, cities and towns moving small numbers of students from various schools and classrooms to vocational programs, could face greater costs, because the sending schools would be less able to reduce their spending proportionally. These transition costs will greatly depend on local conditions, however it is possible that some programs will need to allocate additional funds up to the full \$20,000 per student operating cost for new vocational education seats while shifting to expand CVTE.

With this in mind, we estimate that it would take \$27 million annually at the very least to address the unmet demand for vocational programs—3,200 students on CVTE waitlists and 2,200 high school students in communities with very limited access who would likely enroll if they had the opportunity (see chart below). This baseline total of \$27 million reflects the minimum districts would have to spend, the \$5,000 per pupil incremental cost of vocational education (5,400 students at \$5,000 each). This cost would be shared by the state and local communities, as students moving to vocational education would often generate additional Chapter 70 aid.

However, as mentioned above, many districts expanding CVTE would face additional transition costs and some permanent costs, such as for new or renovated buildings (see discussion below). Therefore, each community considering CVTE expansion would need to undertake its own careful budget analysis in order to determine what the actual cost of expansion would be given their needs and existing infrastructure.

### Expanding Vocational Seats by 5,400 Would Cost at Least \$27 Million Statewide

Number of Seats & Description	Incremental Cost of Providing CVTE	Minimum Cost of Expanding CVTE
<p><b>3,200 students</b></p> <p>Existing waitlist at MA vocational schools</p>	<p><b>\$4,983 per student</b></p> <p>Additional operating costs at regional vocational schools compared to average per pupil spending statewide.</p> <p><i>(\$19,781 for regional vocational schools - \$14,798 statewide average of other schools, not including likely additional transition costs)</i></p>	<p><b>\$26,958,030</b></p>
<p><b>2,210 students</b></p> <p>17 percent of high schoolers in cities with no vocational offerings</p>		
<p><b>5,410 students</b></p>		

### Capital Costs

In addition to ongoing operating costs, there are also significant capital expenses associated with high-performing vocational schools. The capital costs of vocational schools should be factored in any consideration of CVTE expansion, particularly in areas without the capacity to add students at existing schools.

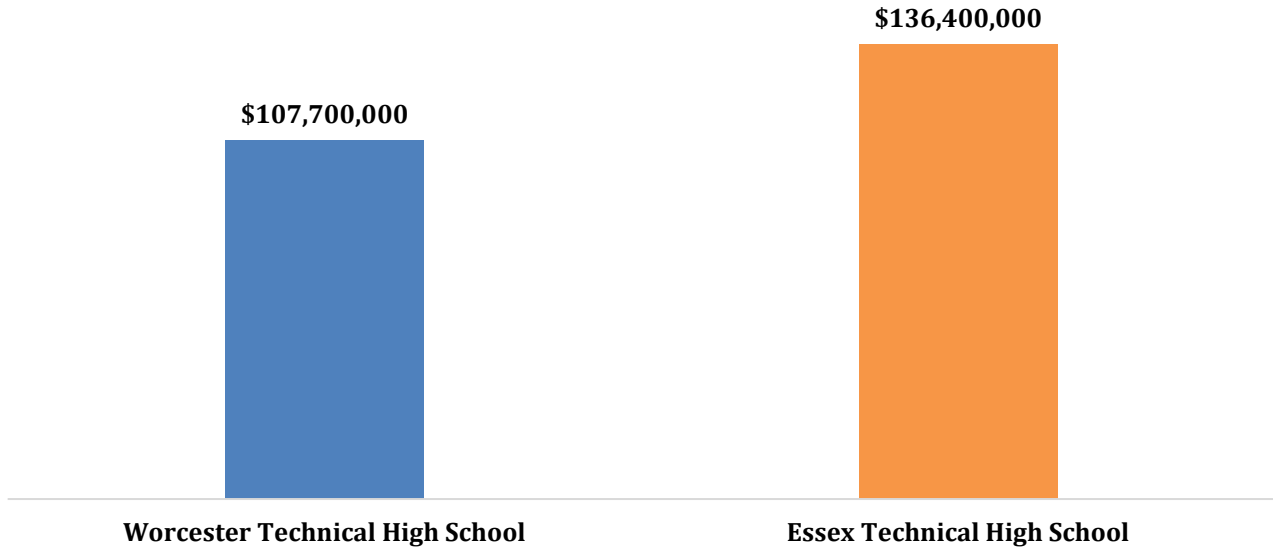
In some cases, new CVTE buildings need to be built from scratch. Central to the turnaround and improvement at Worcester Technical High School, discussed above, was the creation of a state-of-the-art facility in 2006. It cost \$90 million when it was built, roughly \$108 million in 2016 dollars.<sup>62</sup>

Additionally, several years ago, two existing vocational schools, North Shore Regional and Essex Agricultural, merged to become Essex Technical in Danvers, and as part of this merger they built a new CVTE school building. According to the Massachusetts School Building Authority, the project cost \$134.5 million as of its completion in 2014 (\$136.4 million in current dollars).<sup>63</sup> Essex Technical was roughly \$44 million (49 percent) more expensive than other non-CVTE high school construction projects in that region around the same time period.<sup>64</sup>

Though these projects provide useful context for considering the capital costs of building new CVTE schools, it is likely that CVTE could be expanded at lower cost in many cases where existing school buildings could be retrofitted for CVTE uses. While using existing buildings could reduce capital costs, some vocational programs such as manufacturing, construction, and automotive repair, have unique equipment and space needs that need to be adequately addressed for any new program to be successful. Also, it is important to consider that some of our existing vocational schools also have pressing capital needs, for renovating older school buildings and modernizing equipment.<sup>65</sup>

### New Vocational Schools Have Significant Capital Costs

Capital costs of recent stand-alone vocational construction projects, 2016 dollars



Massachusetts School Building Authority, Pioneer Institute

## CONCLUSION

Providing vocational education to 5,400 more students across Massachusetts would significantly address the current unmet demand for CVTE. Successful implementation of this type of CVTE expansion would require careful budget and building plans at the local level, along with the active participation of state partners such as the Massachusetts School Building Authority. It is also worth considering additional measures that could provide more career development options for the large majority of students remaining in traditional schools. A range of creative efforts to expand these opportunities are currently underway in Massachusetts. Examples of these efforts include:

- The Alliance for Vocational Technical Education, a coalition comprised of many non-profit, business, and education groups, has worked on expanding access to alternative career exploration models in addition to their work on expanding traditional CVTE programs.<sup>66</sup> Specifically, they have worked on developing partnerships that would allow students at traditional schools to pursue CVTE through after-school programs that take advantage of vocational school facilities while they're not typically in use.
- A working group of state officials including the Executive Offices of Labor and Workforce Development, Housing and Economic Development, and Education, which has recently proposed a series of measures that could expand access to CVTE.<sup>67</sup> This working group added its support to creating additional partnerships between traditional and vocational schools, as well as proposing greater support for successful initiatives such as [Connecting Activities](#). The Connecting Activities program placed over 10,000 students in internships supported by \$14.7 million in private sector investment in 2014-2015.<sup>68</sup>

- The Robinson-Broadhurst Career Tech Scholarship at Mount Wachusett Community College, which allows high school seniors to dual enroll in college-based CVTE programs such as computer science and health care.<sup>69</sup> This program helps students gain the credits to graduate from high school while earning a related college degree.

Regardless of the specific approach, providing more students with high-quality career, vocational, and technical education can help ensure that more young people in Massachusetts gain skills and experiences to succeed in our economy. Programs in action across the country and in the Commonwealth provide options for moving these opportunities forward in the years to come.

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