NGA Center for BEST PRACTICES

Issue Brief

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Using Community Colleges to Build a STEM-Skilled Workforce

Executive Summary

Education and skills in science, technology, engineering, and mathematics (STEM) are important in a global economy increasingly focused on high-growth, technology-driven occupations. Yet, many states[1] face a shortage of STEM-skilled students and workers. A number of states have built powerful and productive STEM education and skills strategies to address these shortages. As highlighted in this Issue Brief, community colleges can play an important role in governor-led statewide STEM initiatives. These institutions provide affordable, accessible postsecondary options. They also are often less bureaucratic, which allows them to respond to rapidly changing economic and workforce needs and meet the demands of the local labor market.

Governors can exercise their leverage over community colleges to target policies and funding in ways that bolster STEM education and STEM-related workforce skill development. Specifically, governors can:

- Engage business to help ensure that community colleges meet regional STEM-skill needs,
- Use community colleges to support new models of STEM education,
- Reward community colleges and students for STEM course-completion,
- Ensure that community colleges support more effective mathematics remediation, and
- Require that community college STEM credits and credentials are transferable and stackable.

In addition to describing the need for STEM skills across states and the role community colleges can play in meeting this need, this Issue Brief highlights pockets of excellence across a number of community college STEM skill development programs. In order for states to fully maximize community colleges to increase student and worker STEM skills, they will need to address policy gaps that lead to variability across program quality and effectiveness. Specifically, states will need to address the following: lack of alignment between community college degree production and employer skill needs; lack of real-world application in community college courses and programs; low degree completion rates; ineffective mathematics remediation; and a lack of articulation agreements that ensure credits, programs and industry certificates are transferrable and stackable.

States also will need to leverage community college access to a broader array of people—adult dislocated workers, minorities, low-income populations, young adults, at-risk youth, and others—to fill the growing demand for skilled workers.

STEM Need for States

The STEM need for states is two-pronged: more STEM professionals are needed to meet employer demand in STEM-related fields and STEM instruction overall must be improved to meet the rising skill demands of the labor market. Effective STEM education at the community college level can go a long way toward meeting both of these needs.

STEM Professionals in Demand

High-level STEM occupations include professionals such as computer engineers, mathematicians, software designers, and engineers and technicians in the life and physical sciences.[2] STEM is the sixth-largest occupational cluster and will provide the sixth-largest share of job openings in the economy over the next decade. At least 8 million of the jobs available to college graduates in 2018 will be in STEM professions. Roughly half of these positions will be in entirely new occupations and the remaining positions will be in jobs vacated by retiring professionals.[3]

Going forward, all 50 states will need to fill STEM jobs to varying degrees—with **California**, **Texas**, and **New York** expected to face the most acute shortages of such workers[4]—yet efforts to build a STEM-skilled workforce currently fall short.

"Middle-Skill" Jobs Hold Steady

Today, nearly half of all jobs are in "middle-skill" occupations, which require more than a high school diploma but less than a four-year college degree. These jobs frequently pay well and are expected to remain in high demand across the U.S. labor market, but too few workers now have the skills to fill them. It is estimated that between 2008 and 2018, of the nearly 47 million anticipated "middle-skill" job openings, 63 percent will require at least some college education and strong basic skills in math, science, and other technical areas. The following table identifies just a few examples of the range of middle-skills jobs likely to require strong basic and technical skills.[5]

Examples of Middle-Skill Occupations	
Construction	**Health Care**
• Inspectors	• Dental hygienists
• Electricians	• Radiation therapists
• Plumbers	• Radiologic technicians
Law	**Manufacturing**
• Detectives/investigators	• Machinists
• Paralegals/legal assistants	• Welders, cutters, solderers

Assets of Community Colleges

Community colleges are uniquely positioned to grow the pipeline of STEM professionals and produce more STEM-skilled workers to meet the demand for middle- and high-skill jobs. The convenience of community colleges is a crucial asset: 90 percent of the U.S. population lives within 25 miles of a community college, which makes these institutions highly accessible to many people.[6]

Another asset is that community colleges already serve many ethnic and racial minorities, who are expected to grow in numbers. By 2030, people of color will make up 45 percent of the working-age population—up

from just 18 percent in 1980[7]—and so community colleges are well-equipped to extend STEM education and training to a growing segment of the labor force. In addition, community colleges are an inexpensive option for the many low-income, low-skilled adults who want and need to boost their education and training; the average annual cost to attend community college is $2,544 compared to $7,020 per year at a four-year public college.

These and other factors make community colleges attractive settings for STEM-skill development efforts. Evidence suggests that low-skilled adults who attend a community college substantially increase their long-term earnings.[8] The benefits are greatest for students who take academic courses in math and science, the health professions, and other technical fields.[9] Community colleges, in fact, are already important to the production of STEM professionals: 44 percent of students who receive bachelor's or master's degrees in STEM fields attended a community college at some point in their careers.[10] The oftentimes regional focus of two-year colleges only adds to their ability to be responsive to local needs for STEM-skilled workers. The bottom line is that public investments in these institutions generate high returns: state and local governments see a 16 percent return on every dollar they invest from the increased earnings of community college graduates.[11]

Barriers to Leveraging Community College Assets to Increase STEM Skills

While community colleges can and do play a vital role in increasing student and worker STEM skills, there is considerable variability across community colleges. The following are institutional barriers to success which will need to be addressed by states.

- Community college degree and certificate production does not match employer skill needs.
- Existing community college education models are insufficient.
- Degree- and credential-completion rates are low.
- Mathematics remediation is ineffective.
- Community college credits and degrees are not portable.

Community College Degree and Certificate Production Does Not Match Employer Skill Needs. The demand for middle- and high-skilled professionals—all of whom need a variety of STEM skills—is growing. Even amid high unemployment lingering in the wake of the 2008 recession, the health care sector added more than 500,000 jobs. At the same time, positions for registered nurses and health care technologists—typically requiring at least an associate's degree—are expected to grow by more than 1 million by 2018. The construction, manufacturing, and natural resource sectors also will provide nearly 8 million job openings by 2018, 2.7 million of which will require a postsecondary degree.[12]

Worker skills are not keeping up with this burgeoning labor market demand. This skill mismatch is evidenced in a number of ways. For example, a 2009 survey of 779 U.S.-based industrial companies found that 36 percent reported moderate to serious shortages of scientists and engineers.[13] The skill gap will continue to grow if these trends persist.

Existing Community College Models are Insufficient. The demand for students and workers who are able to think critically and solve real-world problems is increasing. At the same time, different students learn differently. Traditional community college programs generally engage students in narrow and limited ways

that do not cultivate the problem-solving abilities critical to success in a growing number of professions. Moreover, many of these institutions' degree programs lack relevance in the marketplace.

Degree- and Credential-Completion Rates are Low. Completion rates for community college courses also are woefully low. Of first-time college students who enrolled in a community college in 2003–2004, fewer than 36 percent earned a postsecondary degree within six years.[14] These low postsecondary education completion rates are an economic drain for individuals and for states. The many contributing factors include a lack of coherent curriculum, lack of guidance toward course completion, and a disconnect between programs and employment opportunities. STEM courses, in particular, tend to be undersupplied and enrollment-restricted because they are more expensive. At the same time, state funding formulas for community colleges are usually based on enrollment rather than on outcome measures such as course completion. In addition, many students struggle with navigating course-sequence requirements to obtain the necessary credits for a credential or degree. Finally, there are many competing priorities that students must balance, such as the need to earn a living while in school.

Mathematics Remediation is Ineffective. In the 2003–2004 academic year, about 29 percent of community college students had taken at least one remedial course in their first year of study, and nearly 60 percent of students had taken at least one remedial course at some point during their entire college career. Mathematics is the most common remedial course taken. Although more than half of students pass remedial writing and reading courses, less than half pass their remedial mathematics courses.[15] A recent study found only one-third of students referred to remedial math courses ever complete the recommended developmental courses. Even fewer of these students go on to pass a credit-bearing mathematics course.[16]

The increasing need for community colleges to remediate students, particularly in mathematics, is a growing concern. Certainly, policymakers must work to decrease the level of remediation needed in the first place. Over the long term, important education reform efforts such as the Common Core State Standards Initiative should reduce the need for math remediation by ensuring that all K–12 students are taught to more rigorous, coherent, and research-based math and English language arts standards. However, until these educational shortcomings are fully addressed systemwide—a multiyear prospect—students, as well as adults already in the education and workforce system, will need better math remediation options at the community college level to become qualified for STEM-related jobs.

Community College Credits and Degrees are Not Portable. Community colleges serve a growing percentage of the population—enrollment rates at these institutions increased by 16.9 percent in the last two years alone.[17] Many students attend various postsecondary institutions throughout their lifetime. As community colleges continue to serve a growing number of students, a major concern is that the credits students are earning at community colleges do not lead to a useful certificate or degree or facilitate the students' successful transfer to a four-year college. In many cases, even when credits are transferable, STEM course credits are counted as electives by four-year institutions. Variability in community college program quality and a lack of articulation agreements between two- and four-year colleges are major contributors to this problem. A similar dilemma exists regarding industry credentials: students and workers are investing time and money earning certificates or credentials that do not have college credits associated with them, are not recognized outside of local sector-specific labor markets, and cannot be applied to continued learning opportunities.

Leveraging Community College Assets to Increase STEM Skills

Whether the goal is to increase the number of STEM professionals, upskill displaced workers, increase diversity in the STEM pipeline, respond to emerging employer needs for a skilled workforce—or a combination of all of these—community colleges play a vital role. This section outlines recommendations for addressing the barriers identified in the previous section and highlights effective practices and programs that already exist across states. To better leverage community colleges to meet state STEM skill development objectives, governors and states can:

- Engage business to help ensure that community colleges meet regional STEM-skill needs,
- Use community colleges to support new models of STEM education,
- Reward community colleges and students for STEM course-completion,
- Ensure that community colleges support more effective mathematics remediation, and
- Require that community college STEM credits and credentials are transferable and stackable.

Although community colleges are important to strengthening the STEM skills of workers and ensuring that states produce an adequate number of STEM professionals, the degree of control states have over community colleges and community college systems varies. Recognizing that states' authority over community colleges differs, we suggest that states pursue all or some of the recommendations described below.

Improve Community College Alignment to Labor Market Skill Demand. Too often community colleges do not successfully base course requirements and degree production on regional labor market demand. Business and industry leaders are best positioned to understand both the kinds of jobs that will be in demand and the specific skill requirements of those jobs. States can engage these stakeholders to inform STEM credential production and curriculum development.

For example, the **North Carolina** Joining Our Businesses and Schools (JOBS) Commission—with representation from across the workforce system, economic development, and education, including community colleges—is charged with closing the gap between credential production and regional employer demand. The JOBS Commission is advising the North Carolina Education Cabinet, specifically its department of public instruction, as it develops standard instructional programs for 21st century career paths in accordance with Early College High School STEM models. It is also studying the implementation of pilot programs that will better prepare students for the increased academic demands of a global economy.

The JOBS Commission looked at available educational supports to help students meet the increased academic demands that align to the seven economic development regions of the state. A commission recommendation led to state legislation calling for an increase in the number of students earning postsecondary credentials in STEM fields and a reduction in the gap between available STEM-credentialed workers and available jobs in STEM fields by 2015. The commission also is supporting cooperative efforts between secondary schools and institutions of higher education, including community colleges, to prepare students for postsecondary study in STEM. Among other actions, the panel is devising measurements to assess the number of available STEM jobs so the state can see if enough students are earning STEM credentials from community colleges and four-year institutions of higher education.[18]

The **Virginia** Governor's Career and Technical Academies (CTAs)—partnerships among secondary schools, community colleges, and local businesses to provide students with certification and training in STEM fields—were established in 2008 with a grant from NGA Center and are good representations of STEM-focused programs of study. Seven academies serving different economic development regions of the state are boosting access to postsecondary and career pathways in STEM, increasing STEM rigor in career and technical education, and aligning STEM course requirements with regional employer needs. All participating students earn college credit and industry-recognized certification in their field. Two years after opening, four of the seven academies report that 80 student graduates had received industry credentials or nine transferable college credits.[19] Governor Bob McDonnell has committed to opening nine more CTAs by the end of his term.

To ensure consistency and rigor across STEM credentials and programs, Virginia also established engineering standards that apply to career and technical education programs across the state.[20] A portion of the state's 15 percent discretionary funding through the federal Workforce Investment Act (WIA), which funds job training and employment services, was dedicated to supporting these academies.

A powerful example of industry driving community colleges to offer flexible solutions to employer skill shortages originated out of **Kentucky**. Toyota partnered with the Kentucky Community & Technical College System to create a curriculum that would train workers to meet employer demand. Toyota originally partnered with the local community colleges because the company needed a type of technical training that other colleges did not offer. As a result of this collaboration, a special campus of Bluegrass Community & Technical College, known as the Georgetown Manufacturing Center, was built at the Toyota plant. Instruction at the campus, a small-scale replica of the surrounding factory, is integrated so that students immediately apply what they learn without spending excessive amounts of time in a classroom. Toyota workers, along with traditional students and workers employed by local manufacturers, also can attend class before or after their shifts to enhance their skills. E-learning, hands-on time in a lab, and problem-solving exercises are also provided. By providing local workers and students with access to skill development programs, Toyota is able to meet its labor demands. And, with overtime, skilled maintenance team members can earn between $70,000 and $80,000 per year.

Seeded by Toyota's training needs in Kentucky, the National Center for Excellence in Advanced Automotive Manufacturing (formerly, the Automotive Manufacturing Technical Education Collaborative) has since emerged to further opportunities for hands-on, high-tech education and training. The center is a collaboration of community and technical colleges and industries working to prepare technicians and engineers for automobile manufacturing and technology occupations.[21]

Support New Models of STEM Skill Development. Improvements to existing community college education programs are critical to meeting regional workforce demand. However, this alone will not be sufficient—new models of STEM-skill development will be needed. Recent studies show that combining academic rigor with career and technical education, work-based learning, and specific guidance or mentoring designed to move students toward postsecondary goals improves graduation rates and boosts scores in reading, mathematics, and science.[22]

The Harvard Graduate School of Education's recently released report *Pathways to Prosperity* makes the case for new and improved models of education. Many of these approaches position community colleges at the forefront of meeting labor market demand. Multiple approaches may very well be necessary to ensure

that states engage a broad range of the population in acquiring in-demand STEM skills and degrees. Described below are efforts such as programs of study, career pathways, early college high schools, earn and learn models, and STEM bridge programs—many anchored at or carried out in partnership with community colleges—that can help states align student learning and training with employer demands.

Programs of Study. Some states are supporting innovative career and technical education pathways that meet both postsecondary and career requirements. For example, **California** supports high schools, often in partnership with community colleges, by embedding engineering and other applied skills within course "pathway" structures. These pathways, also known as *Linked Learning*, bring together strong academics, demanding career and technical education, and real-world experience to help students gain an advantage in high school, postsecondary education, and careers. Students follow industry-themed pathways, choosing among fields such as engineering, arts and media, or biomedicine and health. Participation in *Linked Learning* prepares students to graduate from high school and succeed in a full range of postsecondary options, including two- or four-year colleges, certificate programs, apprenticeships, military service, or formal job training. The program operates on the premise that there is no one right way to implement a pathway.

Career Pathways. Career pathways guide students toward a specific profession by providing a defined list of courses that include expert training in a specified field. The various courses help lead students to complete certificates and/or degrees that identify them as being qualified to work in an in-demand field such as health care or engineering. Some states couple the pathway approach with wraparound supports for low-income adults. The **Arkansas** Career Pathways Initiative, for instance, is a program that enables community colleges to provide those who qualify with career training and college classes. Administered through a partnership between the Arkansas Department of Higher Education and the Arkansas Department of Workforce Services, this program offers students and adults a range of services, including assistance in obtaining a GED, and it provides support for tuition and textbooks, child care, and transportation.[23]

In **Arizona** the Governor's Office of Economic Recovery provided funds for Science Foundation Arizona to work with four rural community colleges in piloting "STEM Pathways" that can be scaled statewide. These community colleges, whose partners include local defense and national security, mining, and manufacturing employers, local high schools and universities provide students with well-defined engineering and engineering technician Pathways. Districts are putting in place core pathway blocks to excite and engage elementary and middle-school students about STEM, work directly with local high schools to support adequate student preparation for gateway math and science courses, incorporate early college options, integrate industry-driven learning and credentialing experiences, culminating with a two and/or four-year degree options specifically tailored to meet local workforce needs.

STEM Early College High Schools. Early college high schools are intensive dual-enrollment pathways that target low-income and other at-risk students. The schools provide students with the opportunity to earn one to two years of transferable college credit or an associate's degree by the time they graduate high school. In **North Carolina**, of the 71 early college high schools now operating in partnership with the North Carolina New Schools Project, six schools are STEM-focused. There are plans to expand the number to 15 early college high schools focused on one of the following areas: biotechnology and agriscience, health and life sciences, energy and sustainability, and aerospace.

There is also a virtual component to the state's early college high school model. The North Carolina School of Science and Mathematics offers a unique, tuition-free two-year program of online learning, as well as a range of advanced placement courses, all delivered via sophisticated videoconference tools.[24]

Many of the existing STEM-focused early college high schools in the state are still too new to have outcomes data, but one—Duplin Early College High School—has been around long enough to show promise, with higher participation and pass rates in Algebra I and II as well as lower dropout rates compared with state averages for the 2007–2009 school year.[25] More study will be needed to determine how effective the early college approach is at improving student outcomes in STEM areas, but clearly it is a model worth exploring.

Earn and Learn. More than 80 percent of college leavers and 60 percent of college dropouts identified financial pressures—such as the need to work—as a major challenge to completing their degrees. Earn and learn programs administered through community colleges allow students to obtain some level of employment in their field of study that complements the academic pursuit of a certificate or degree. Recent reports on student preparation for work across a range of countries show that, done well, work-based learning is the best way for young people to prepare for employment.[26] In **New York**, the registered apprenticeship program provides young adults with training that combines paid work experience with classroom-related instruction to produce workers who are skilled in specific occupations. The employer–sponsor of an apprenticeship program plans, administers, and pays for the program. A written agreement between the apprentice and the employer acknowledges their joint commitment to the training process. This agreement is approved and registered by the New York State Department of Labor.[27]

STEM Bridge Programs. Students who intend to major in a STEM field often need additional support to successfully graduate on time. Some programs are providing early support to STEM majors. In **Hawaii**, the Kapiʻolani Community College STEM Summer Bridge Program is an intensive three-week program that brings together high school students, college student peer mentors, and college faculty to help students prepare for the rigors of college math and science. The program focuses on increasing STEM skills through STEM-based projects. Research internships and scholarships are available as additional supports to students pursuing STEM degrees and careers.[28]

Reward Community Colleges and Students for STEM Course Completion. Having a range of effective options for students and workers to acquire STEM skills with value in the labor market is important. However, it will be necessary for states to pay close attention to the rate at which students are completing—not just enrolling in—programs aligned to local employer skill demand.

Traditionally, states have funded higher education based on enrollments and prior-year spending. Some states are experimenting with community college funding based on output measures such as degree completion, on-time course-sequence completion, and transfer rates to four-year institutions. At a minimum, such performance-based funding should be substantial enough to get colleges' attention and change the way they allocate resources to promote student completion of programs of study. Research indicates that at least 5 percent of base state funding—in addition to new money—could be allocated on the basis of course- and degree-completion measures.[29] Focusing these efforts on target populations and STEM is a way for states to reward community colleges for increasing STEM course-completion rates.

Indiana has gradually increased its focus on performance in higher education budgeting and funding at the direction of Governor Mitch Daniels. In 2009, the governor and legislators approved a plan to increase the share of state higher education funding allocated on the basis of performance measures—total degree completion and degree completion by low-income students—to 15 percent over the next several years. In addition, the enrollment component of the state's funding formula is now based on completed credits rather than attempted credits.[30]

States should develop accountability measures and evaluation metrics that permit community colleges to identify the reasons students do not complete courses, certificates, and/or degrees. **Florida's** accountability measures for community colleges, for example, include an evaluation of student program completion, licensure examination pass rates, and job-placement rates. The Florida Community College System's statewide accountability measures include retention of associate degree students, transfer performance, and program-completion rates of associate of science degrees and vocational certificates. These statewide accountability measures are provided to colleges on an annual basis.

Financial aid also can be used to increase course completion. States should consider supporting performance-based scholarships to increase student success in STEM courses and increase community college–completion rates. Two of **Louisiana**'s community colleges tested a program that offered a performance-based scholarship in which students received money only if they met certain academic benchmarks. Students could choose to spend the funds on nontuition expenses, a flexibility option the program was explicitly designed to test. This model is attempting to address financial needs even as it gives students the incentives to perform well in their courses.

The Louisiana program offered students up to $1,000 for each of two semesters for a total of $2,000. The scholarship was paid in three increments throughout the semester if students enrolled at least half time and maintained a "C" or better grade point average. Program counselors monitored academic performance and disbursed the scholarship checks directly to students. The scholarships were provided in addition to federal Pell Grants and other financial aid. Because the program was funded with state welfare funds, eligibility was limited to low-income parents—although they did not need to be on welfare. A follow-up evaluation showed that the program substantially improved students' academic outcomes. Students in the study's program group were more likely to attend college full time, and they earned better grades and more credits.[31]

Support More Effective Mathematics Remediation. Students requiring remedial mathematics often require a sequence of courses rather than a single remedial course, which significantly contributes to the cost and time to earn college-level credits in math. At the same time, college level math is a prerequisite for many core science courses further extending the time and cost of earning STEM course credits. Some states have started to experiment with more flexible and effective remedial options. However, policies and structures that govern traditional course design hinder innovative approaches such as contextualization—the teaching of basic skills in the context of disciplinary topic areas—and online and accelerated course options. States should support community colleges that offer innovative and effective options for math remediation by evaluating and revising requirements in areas such as college assessment and placement policies, curriculum and sequencing requirements, seat-time requirements, and student tracking policies. These options are briefly outlined below.

Assessment and Placement Policies. Although the use of community college placement exams is nearly universal, some research shows that more than one measure should be used to place students in college programs, especially when placing minority applicants.[32] Some states are already reaping the benefit of using multiple measures for deciding remediation course requirements. In **Tennessee**, students who score below college level on the ACT college entrance exam must take a secondary diagnostic exam to more precisely identify academic deficiencies. The results enable colleges to customize instruction, and, in cases when students test just below college level, they can use the data to help students avoid remedial education completely by enrolling in college-level courses that come with additional academic supports. Tennessee's focus on using these secondary diagnostic exam results has increased student success in college-level courses, reduced time to degree, and cut costs.[33]

Curriculum and Sequencing Requirements. Strict guidelines regarding course content and sequencing can undermine attempts to implement effective and innovative math remediation options. Revising state requirements to give community colleges more autonomy in defining content, sequencing, and timing of remedial math options for students could promote student success. For example, in **Washington**, community and technical colleges participating in the Integrated Basic Education and Skills Training (I-BEST) program have partnered with adult basic education providers to deliver remedial instruction to academically deficient students who are participating in career certificate program courses. Students address their deficiencies within a specific occupational program, resulting in customized instruction that has significantly increased certificate completion. The remedial courses are taught alongside the credit-bearing courses, which accelerates students' progress toward a certificate or degree.[34] Studies found that I-BEST students achieved better educational outcomes than did other basic skills students. I-BEST students were more likely to continue into credit-bearing coursework, earn credits that count toward a college credential, earn occupational certificates, and make point gains on basic skills tests. Over the two-year tracking period, the probability that I-BEST students would earn at least one college credit was 90 percent, while the probability for similar non–I-BEST students was 67 percent, a 23 percentage point difference.[35]

Seat-Time and Tracking Requirements. Inflexible student information systems are another challenge to offering students accelerated mathematics remediation options. Self-paced modules, for example, can be problematic in meeting state enrollment reporting requirements because states have to report student enrollment data based on a traditional timeframe, which often does not allow for accurate tracking of student enrollment in compressed or competency-based remedial course options. **Colorado** enables community colleges to offer tailored remedial course options in mathematics. Flexibility for course start and end dates allows students to complete self-paced courses early and to enroll in additional self-paced courses on a faster timeline. To ensure that there is correct funding for students enrolled in these types of courses, state funding is allocated to community colleges based on an estimated student enrollment and is then adjusted at the end of the year to reflect actual enrollment.

Ensure that STEM Credits and Degrees are Portable and Stackable. States need to ensure that there are policies enabling students to transfer STEM courses and programs from two to four year colleges. Some states, such as **North Carolina** and **Florida**, have statewide articulation agreements that cover all of their public community colleges and public universities. In other cases, such as **Colorado**, there are articulation agreements that cover a specific program —nursing in this case— across all public colleges. Aside from making it easier for transfer students, these statewide agreements help standardize higher education, thus improving quality across the system.

There are impressive examples of employers working with community colleges to ensure students attain transferrable STEM skills. A progressive national example of this exists via The Manufacturing Institute, a nonprofit working with manufacturers and community colleges to increase the STEM-capable workforce in high-demand fields. They are currently partnering with community colleges in 31 states to integrate the learning content leading to nationally-portable industry-recognized credentials into degree programs of study. States taking part are **Alabama**, **Arkansas**, **Arizona**, **California**, **Connecticut**, **Florida**, **Idaho**, **Illinois**, **Indiana**, **Iowa**, **Kansas**, **Kentucky**, **Louisiana**, **Maryland**, **Minnesota**, **Michigan**, **Mississippi**, **Missouri**, **Nebraska**, **Nevada**, **New Mexico**, **New York**, **North Carolina**, **Ohio**, **Pennsylvania**, **South Carolina**, **Tennessee**, **Texas**, **Virginia**, **Washington**, and **Wisconsin**. The Manufacturing Institute supports a four-year project-based STEM learning pathway with nationally portable, industry-recognized skills, competencies, and credentials that students achieve in secondary and postsecondary education.

Community colleges also play a big role in workforce training programs that offer both credit and non-credit courses leading to industry-based certification. Many of these certifications require basic and sometimes advanced STEM skills. Too often, program requirements are locally determined and thus not transferable. To ensure industry credentials have a labor market value recognized by a range of employers and applicable to continuing education and certification, states should ensure community colleges are offering nationally endorsed and portable certificates whenever possible.

Funding Options

Meeting regional employer skill demand, supporting new models of STEM education, increasing STEM course-completion rates, increasing the effectiveness of mathematics remediation, and ensuring that STEM credits and degrees are transferable will certainly enable states to better meet skilled labor demands. Although many of these options are low- or no-cost, states might consider evaluating available resources to support the expenses incurred pursuing these strategies.

There are a range of federal funding streams that states can tap to support community college STEM-skill programs. For instance, governors have discretion over 15 percent to 25 percent of their federal WIA allocation to assist dislocated workers. Unlike formula-driven WIA funds, states can use these discretionary funds to support STEM education initiatives that increase state workforce capacity. Another pot of money is the U.S. Department of Labor's (DOL) Trade Adjustment Assistance (TAA) Community College and Career Training fund—called Learn and Earn—that will provide grants to community colleges across each state totaling anywhere from $2.5 million to $25 million starting in fiscal 2011 to help at-risk populations learn new skills. DOL is slated to allocate $2.5 billion over five years —or $500 million per year— to boost the community college system's capacity to help low-income youth ages 16 to 24 acquire skills and industry certifications to meet emerging sector demands. This program will help community colleges and other eligible institutions develop, offer, or improve education and career training programs suitable for workers eligible for Trade Adjustment Assistance.

Additional social service supports can be coupled with WIA dollars and other resources to boost low-income students' and adults' academic success. In 2007, **Michigan** launched a program—"No Worker Left Behind"—that streamlines access to training and skill development programs. Any unemployed or displaced worker is eligible to receive up to two years of free tuition at any community college, university, or approved training program (up to $5,000 per year) to pursue a degree or occupational certificate in a

high-demand occupation or emerging industry. The Michigan Works! agencies and training providers draw their funding from WIA, TAA, Temporary Assistance to Needy Families, Vocational Rehabilitation Client Services, and the Food Assistance Employment and Training Program.

It is important to note that future federal funding levels for these programs are uncertain. Building the STEM skills of students and workers is a strategy that will increase workforce capacity and aid state economic recovery—it is an important investment that can, if executed well, pay dividends over many years. Regardless of the availability of federal funds, states should consider multiple avenues to continue to leverage community colleges to increase the STEM skills of students and workers – such as thoughtful reallocation of existing resources.

Conclusion

Governor-led statewide STEM-focused policy initiatives that strengthen the industry-desired skills of students and workers require planning and vision to better align education, workforce, and economic development sectors and policies. The community college system is an important—albeit not the only—component of a statewide STEM initiative. Governors and states can follow the recommendations in this Issue Brief to help community colleges become an avenue for improving student and worker STEM skills. With high-leverage, low-cost investments in community colleges, governors can generate industry-certified workers for regionally in-demand jobs and prepare an increasingly diverse segment of the population for rewarding careers in STEM professions.

Endnotes

[1] State refers to any of the fifty states and/or United States Territories.
[2] Anthony Carnevale, Nicole Smith, and Jeff Strohl, *Help Wanted: Projections of Jobs and Education Requirements Through 2018* (Washington, DC: Center on Education and the Workforce, Georgetown University, 2010), http://cew.georgetown.edu/jobs2018 (accessed June 1, 2011).
[3] Carnevale et al., 2010.
[4] Carnevale et al., 2010.
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