

BRAC RESEARCH PAPER

Taking Advantage of the Boom: A Strategic Plan for Cultivating a STEM Workforce in the Capital Region

With contribution from Kim Fossey

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Baton Rouge Area Chamber®

*Leading Economic Development
in the Baton Rouge Area*

Executive Summary

The nine-parish Baton Rouge Area is on the verge of an economic boom propelled by industries as far-ranging as petrochemicals, health care, and digital media. These industries share a need for workers with advanced knowledge and skills in science, technology, engineering, and math (STEM). They, and others like them, are creating jobs at a much greater rate than are non-STEM industries, not only in the Capital Region, but across Louisiana and throughout the United States.

The coming economic boom holds the promise of thousands of new well-paying jobs for communities around the region. However, in order for the Capital Region to be a place where the supply of STEM-skilled workers can meet the demand, a collaborative and concentrated effort must take place to prepare students for their future careers. This will require the effort of a variety of stakeholders, including primary, secondary, and post-secondary educators and administrators, students, parents, business leaders, and economic development professionals.

STEM-skilled workers are those whose jobs require an “understanding of scientific and technological knowledge, engineering principles, and quantitative research methods” (Hess and Meeks 2011). But STEM education does not solely involve competency in science, technology, engineering, and mathematics. Rather, it involves applying those competencies to solve complex problems through innovative methods. An effective STEM education benefits all students, regardless of their eventual career choice, because it requires creativity and critical thinking skills that are in high demand for all jobs in the Capital Region.

While the Capital Region is home to pockets of STEM education excellence (described throughout this report in highlight boxes), it is fair to say that many of the region’s public school students are not ready for the STEM workforce of tomorrow. Eighth-grade math scores are overwhelmingly low, the percentage of students awarded STEM-degrees is unimpressive, and an encompassing disconnection between academic education and real-world skills persists. This report includes background data on current STEM performance, including these key metrics:

- over a third of public school teachers in the Capital Region say STEM has not been a topic of conversation at their schools;
- on average in 2013, Capital Region high school students scored 18 in math and 17.9 in science on the ACT, below the national benchmarks of 22 and 23, respectively;
- in the five public universities and colleges in the Capital Region, 21 percent of both the 2013 total student enrollment and the 2013 total degrees awarded are in STEM fields;
- in 2013, the Capital Region experienced the creation of approximately 3,420 new STEM jobs, while the area’s colleges and universities produced 2,140 STEM graduates and certificate holders;
- STEM jobs in the Capital Region pay an average salary that is \$26,000 more than the average salary for non-STEM jobs – equaling 76 percent higher wages;
- the Baton Rouge Area had 10,220 construction jobs in 2011, a number that is projected to reach 20,285 by 2016;
- to meet the demand for STEM-skilled workers with industry certificates and two year college degrees, the Louisiana Community and Technical College System will need to increase certificate and degree completions by 217 percent;

- to meet the demand for STEM-skilled workers with four-year college degrees, the university systems in Louisiana must increase degree completions by 45 percent; and,
- based on a conservative BRAC analysis of Brookings Institute data and Louisiana Workforce Commission projections, the Capital Region will need to fill approximately 5,600 STEM jobs in 2015 – a number that cannot be met based on current completion numbers from the regional public colleges and universities.

To address these issues, the leadership team for this report, comprised of members of the Education and Workforce Issue Councils of the Baton Rouge Area Chamber, believes that a regional vision is needed, and that it must be informed by a plan that guides education innovation and economic alignment in a collaborative and comprehensive effort. Implementation of this strategic plan must result in a strong and sustainable pipeline of STEM-skilled talent throughout the Capital Region.

This straightforward regional vision is that:

All students will successfully gain STEM skills and earn postsecondary credentials that lead to meaningful careers.

This goal includes all students because of the understanding that STEM skills, at their core, focus on problem-solving and critical thinking, which are valuable no matter a student's eventual career choice.

The strategies for reaching the goal require that stakeholders in the nine-parish Capital Region engage as a collaborative network to increase STEM achievement and expand the STEM-skilled workforce in pace with the region's economic development by:

- increasing student interest, participation, and achievement in STEM;
- increasing the number of effective STEM teachers and leaders;
- increasing meaningful business and community STEM engagement; and,
- increasing STEM education awareness and workforce alignment.

The report makes recommendations for a variety of stakeholder groups, but focuses on kindergarten through high school (K-12) education, post-secondary education, and business and industry. Taking meaningful steps toward a collaborative STEM effort is necessary for continued economic growth, and requires several measurable goals for the region. Long-term success will significantly increase the number of students in the nine-parish region who achieve post-secondary credentials in STEM fields.

The Baton Rouge Area Chamber (BRAC) is a non-profit, investor-driven association of over 1,300 businesses, civic associations, and education institutions, representing the voice of business for the nine-parish Capital Region. As the region's economic development organization, BRAC serves as a leader for securing public policy victories related to recruiting and retaining businesses in the region. As regional education and workforce needs in the high-growth areas of STEM increase, BRAC seeks to catalyze its investors and community stakeholders to raise awareness and build partnerships for collective action that will lead to regional success in educational excellence and workforce preparedness.

Introduction and Background

The Capital Region has had great success in attracting and retaining business. In recent years, job growth in the nine-parish area has been significant with low unemployment rates. Currently, the region sits on the cusp of an economic boom, spurred by more than \$55 billion in announced statewide projects, with an accompanying 83,000 new direct and indirect jobs, driving an unprecedented growth in the STEM-skilled job market.

Although demand is already strong for STEM competencies in professional industries such as engineering, health care and information services, evolving technology has lengthened the STEM continuum to include skilled craft workers in the manufacturing and construction sectors as well. Louisiana Economic Development (LED) reports that every in-demand job will require some type of postsecondary education (anything from a certificate to a doctoral designation), with the most valuable degrees being in the STEM fields of engineering, finance, accounting, computer science, and data analytics. Further, LED notes that STEM occupations, which have median annual salaries of \$66,000, account for one out of every ten jobs in Louisiana and are the fastest growing across the state (National Alliance for Partnerships in Equity 2014).

The growing demand for STEM talent is already creating stress on the region's employee pipeline, with business leaders citing shortages of STEM-skilled workers at all levels, but particularly those whose jobs require basic numeracy, analytical problem-solving, and familiarity with science and technology.

The Capital Region's knowledge-based economy is dependent upon a high-quality workforce for long-term growth. As such, BRAC's board of directors (a sixty-three member-group representing businesses in the Capital Region), is seeking a more concentrated and sustainable approach to tackling the STEM workforce challenge.

HIGHLIGHT

STEM-Themed School

Kenilworth Science and Technology Charter School in East Baton Rouge Parish is a public middle school that is successfully utilizing a STEM focus - making school relevant by using STEM careers as the context for learning. Throughout the curriculum and well beyond the traditional school day, students participate in a range of STEM-focused learning activities and after-school clubs that involve higher education and the business community. In 2012, Kenilworth hosted Baton Rouge's first- STEM Expo, which has grown into a very popular weekend event for local families.

Before its conversion to a STEM charter school, only 40 percent of Kenilworth students were performing at grade level. Transitioned to a state-sanctioned charter school in 2009, leaders at Kenilworth seized the opportunity to transform the failing middle school by using a STEM school model as its lever. As a result of their firm commitment to STEM college and career readiness, the culture of the school has completely changed – delivering gains in both student performance and attendance. As a result of their close connection with STEM postsecondary programs and industries, Kenilworth students enjoy participating in academic competitions and collaborating with scientists in projects that have led to national publications and a recent international science fair award.

To achieve this objective, BRAC’s Education and Workforce Issue Councils initiated a six-month strategic assessment process, obtaining the assistance of a local STEM education consultant, to review the current condition of STEM education, training, and workforce, which ultimately led to the development of this strategic plan. A subcommittee met on four occasions to review and set goals, review data and information, and gain awareness of research conclusions and best practices in high-impact STEM education and training.

Specifically, this subcommittee determined that the “theory of change” for this effort would be the creation of a report that:

Guides education innovation and economic alignment in a collaborative and comprehensive effort that results in a strong and sustainable pipeline of STEM talent throughout the Capital Region.

The data collection process for this plan included several methods to ensure that all relevant stakeholder groups were included. Interviews, online surveys, and group discussions were utilized in conjunction with quantitative data collection from governmental and academic sources. A varied and diverse set of groups and individuals, representing voices throughout the nine-parish area, provided information, experience, and feedback to inform this plan. They include:

- K-12 school principals, instructional leaders, career and technical education (CTE) supervisors, teachers, and administrators;
- STEM-focused higher education leaders, professors, and administrators;
- non-profit after-school program providers;
- students at STEM-focused middle and high schools;
- regional economic development organizations; and,
- businesses (both STEM and non-STEM industries).

As with every effort to improve education and workforce development outcomes, there is no single solution. This plan offers several strategic recommendations for regional stakeholders in expectation that collective effort will achieve measurable results.

Defining STEM and STEM Literacy

The term STEM first appeared in 2001 and was coined by the National Science Foundation. STEM occupations, nonetheless, were not classified until 2011, when the White House’s Office of Management and Budget asked the Bureau of Labor Statistics Occupation Classification Policy Committee (SOCPC) to formally define them. The occupations were coded based on the work performed, and in some cases the skills, education, and training needed to perform the work competently.

Nonetheless, some disagreements with this classification arose and still exist. The STEM occupations, according to the SOCP, are generally those at a professional level, requiring in most cases a bachelor's degree or more. Further, they include some occupations typically considered to be "soft sciences." Recently, the Brookings Institution redefined these occupations in its report, *The Hidden STEM Economy*, and concluded that the existing classifications of STEM occupations overlooks "a strong potential workforce of those with less education but substantial STEM skills" (Rothwell 2013).

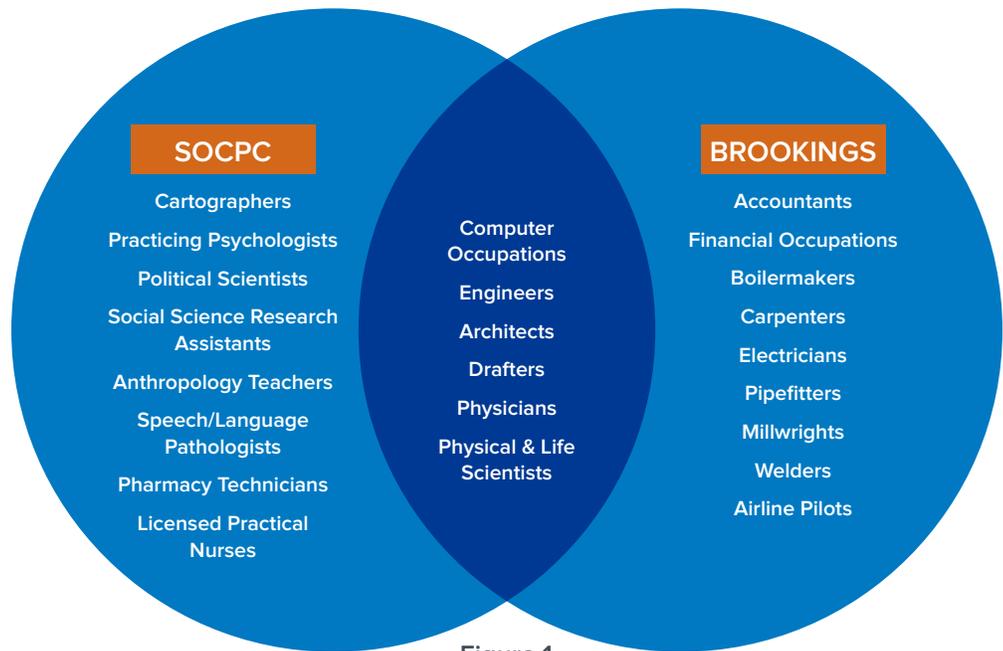


Figure 1.

HIGHLIGHT

Career Readiness Model High School

Walker High School, located in Livingston Parish, is a school that excels in both the academic and the career-technical tracks. Walker High's cohort graduation rate stands at 81 percent. Forty-five percent of the students have scored 20 and above on the ACT and over 191 students are enrolled in either advanced placement or early college credits. In addition to the traditional academic scene, Walker students are also gaining relevant workplace skills provided by businesses eager to prepare students for careers. Adding rich experiential and entrepreneurial learning to the curriculum, students are staying in school and taking advantage of early career-building opportunities, whether they intend to attend a four-year university or certification program or go straight to work.

In 2012, Walker High awarded eleven different industry-based certificates (IBC) to a total of 345 students. The certificates, most in high-demand STEM skilled areas, such as information technology, welding, and health care, were offered through thirteen major industry partners and three higher education partners – Southeastern Louisiana University, LSU, and North Shore Technical and Community College. Several of the programs operate as businesses generating revenue for the school, such as a digital TV and media program that designs and delivers live broadcasting and advertising for local events and companies. Walker's leadership team works diligently to nurture mutually beneficial relationships with industry partners, many of which provide equipment and supplies, curriculum, instructors, certification fees, scholarships, and/or internships. Partners see a return on their investment – a strong supply of job market-ready employees, opportunities to expand their businesses, and greater visibility.

While the ultimate goal of a STEM-focused education is readiness for college and career, it is worth discussing the more academic aim of such an education, which is STEM literacy. STEM literacy is achieved when students are able to apply their understanding of how the world works within and across the four interrelated STEM disciplines (science, technology, engineering, and math) to improve the social, economic, and environmental conditions of their local and global community (Washington STEM Network).

STEM literacy has a positive impact on all students, not only those who ultimately pursue a STEM field in college or career, when it is viewed as a core component of any comprehensive school model. STEM literacy is not simply achieving competency in science, technology, engineering, or mathematics, but the ability to apply and integrate concepts to understand and innovate to solve complex problems, which is also a skill critical to success in college and career.

Strategic Assessment

BRAC's role as an economic development agency gives the organization a first-hand look at the need for middle-skilled workers and STEM professionals. But in order to truly understand this need, BRAC undertook a strategic assessment process to answer two questions.

- What is the regional workforce demand for STEM skills and knowledge?
- Are students, at all levels, gaining those skills and knowledge?

Regional Workforce Demand

The rapid acceleration of business growth throughout Louisiana presents both opportunities and challenges, as revealed by the U.S. Chamber of Commerce Foundation in its *Enterprising States Report*. Louisiana ranks number one in the United States for exports and in the top twenty in categories such as business climate and economic performance, but ranks seventh from the bottom in talent development. Interviews and surveys with business owners and leaders resulted in firm assertions that finding STEM talent in the area is a challenge, both because the need for such talent is growing exponentially and because the existing workforce pipeline, in many cases, lacks basic STEM skills.

In *The Hidden STEM Economy*, the Brookings Institution ranked the largest one hundred U.S. metropolitan areas for STEM job share. At 20 percent, the Baton Rouge Area ranked 38th. These 70,250 Capital Region jobs require specialized knowledge in science, computers, engineering, and math and have an average annual salary that is nearly \$26,000 more (at \$59,860) than the average annual salary for non-STEM jobs. The Baton Rouge Area is further ranked number one in terms of wages for STEM workers who have educational attainment of less than a bachelor's degree. These workers make up 13 percent of available STEM jobs and earn, on average, \$49,764 annually. The largest percentage of STEM jobs lay in construction trades, a trend that is projected to continue for some time (Rothwell 2013).

The Brookings report used data collected via the Department of Labor's O*NET (Occupational Information Network Data Collection Program), which uses detailed surveys of workers in every occupation to fully illuminate their required knowledge, skills, and abilities. It ultimately classified each occupation as non-STEM, high-STEM, or super-STEM. High STEM jobs require a high level of knowledge in one of the STEM fields, while super-STEM jobs require a higher composite score across the four fields (Rothwell 2013).

In aligning the high-STEM and super-STEM occupations in the Brookings report to the short-term occupation projections for the Baton Rouge Area from the Louisiana Workforce Commission, one finds 131 STEM occupations. This number is very conservative, and does not include every job for which STEM skills are needed.

In total, these 131 occupations will grow by 6,810 jobs between 2013 and 2015. Annually, that is 3,420 new jobs created in the Capital Region. The number is even higher when one factors in replacement demand (job openings due to current worker retirement and turnover), and comes to 5,600 STEM-skilled workers needed annually, with a wide range of education attainment levels (BRAC analysis of Louisiana Workforce Commission Projections). It should be noted that more than 50 percent of these jobs require less than a bachelor's degree.

Figure 2. High / Super STEM Jobs

	Growth, 2013-2015	Annual New Growth	Annual Replacement	Annual Total Openings	Total Requiring a Bachelor's Degree or More
Total	6,810	3,420	2,050	5,600	49%

Within the next few years, Louisiana will be home to the largest manufacturing investment boom in America, with more than 55 billion in projects announced or at various stages of development. This translates into an immediate job growth in construction craft trades. Between 2013 and 2016, the total number of needed construction trade workers in the Baton Rouge Area is expanding exponentially and is projected by the Louisiana Workforce Commission to number approximately 20,000 (Craft Workforce Development Taskforce 2013).

Figure 3. Total Additional Skilled Craft Workers Needed Due to Growth and Attrition

	2013	2014	2015	2016	Total
Baton Rouge MSA	6,165	7,448	4,352	2,100	20,065
Louisiana	22,301	26,727	22,600	14,700	86,328

Because the Brookings-identified STEM occupations rely on self-reporting for their classification, some jobs that may require STEM skills may not be classified as STEM jobs. Therefore, while the Brookings report recognizes that Construction Trades Workers have the largest share of STEM jobs in the Baton Rouge Area, the O*NET classification that was used to identify such construction trades does not include as many individual occupations as does that of the Louisiana Workforce Commission.

Figure 4. Top Five STEM Jobs in the Baton Rouge MSA, 2011

Construction Trades (Skilled Craft) Workers	10,220
Health Diagnosing and Treating Practitioners	9,400
Engineers	5,090
Computer Occupations	4,700
Financial Specialists	3,680

The jobs increase caused by this boom will focus on construction, manufacturing, and professional, scientific, and technical services (engineering and computer science). But health care will also see a significant jobs

increase in the short-term, rounding out the immediate STEM job picture (Louisiana Workforce Commission).

The effects of the manufacturing boom will continue as the state sees thousands of new manufacturing jobs through 2022, creating an increased demand for machine operators, welders, process technology technicians, and supervisors – jobs that mostly require more than a high school diploma, but less than a four-year degree. In 2013, Baton Rouge was ranked first out of the top one hundred U.S. metro areas for such jobs in STEM fields (Boone 2013). This places a burden on the community and technical college system to increase completion rates of both certificates and associate degrees by 217 percent to keep up with demand, particularly in the construction and health care trades (National Alliance for Partnerships in Equity 2014).

Further, economic development and expansion in key target sectors will create demand for professionals with degrees in engineering, finance, accounting, computer science, and data analytics – all STEM careers. The state will have to increase bachelor’s degree completion rates by 45 percent (National Alliance for Partnerships in Equity 2014).

All projections point to a dramatic increase in the number of STEM jobs required in the Capital Region. Those projections were coupled with additional data provided exclusively to BRAC. First is that collected via

Figure 5. Employment Change 2013 – 2015

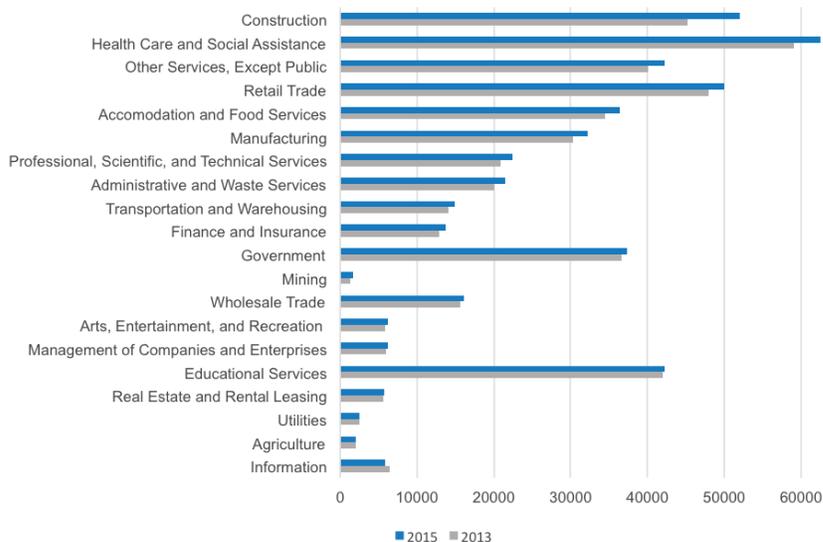


Figure 6. Two-Year Projections for STEM Jobs Requiring a Certificate or Two-year Degree

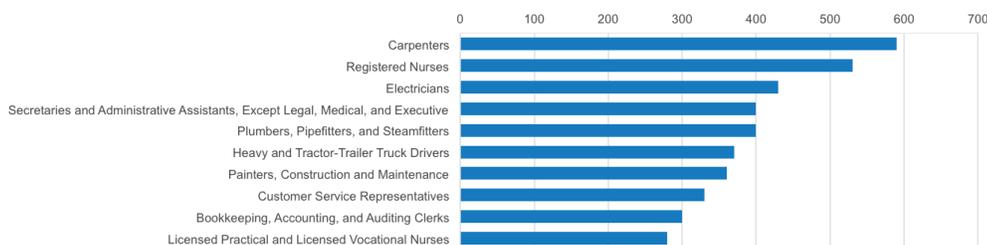
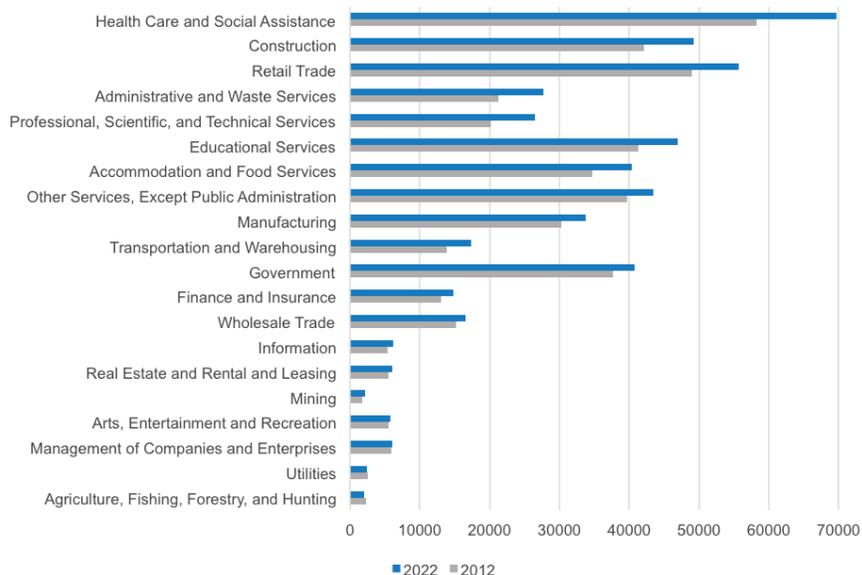


Figure 7. Employment Change 2012 – 2022



BRAC's Workforce Skills Gap Survey, which consists of more than 150 executive interviews conducted each year. Among responses collected between 2012 and 2013, the occupations most commonly listed as those for which companies have trouble recruiting include the following STEM jobs.

1. Skilled craftsmen, including welders, pipefitters, machinists, carpenters, equipment operators, etc.
2. Engineers, particularly electrical engineers
3. IT professionals

The second set of data is the results of a study by the Economic Strategies Group of Newmark, Knight, Frank, a global corporate service firm. This study assessed employment growth, industry output, and industry concentration in the nine-parish Baton Rouge Area to develop a matrix of the top five target growth industries for the area. Developing these target industries will continue the diversification and strengthening of the Capital Region economy.

These five industries are: 1) chemicals and new energy production; 2) fabricated structural materials; 3) software design – enterprise, industrial, and gaming applications; 4) technical research and consulting; and, 5) advanced shared services. Each of these target industries is extremely reliant upon availability of STEM-skilled workers.

Figure 8. Job Growth by Industry

Industry	Total Job Growth 2008 – 2018	Occupation Examples
Chemicals and New Energy Production	Chemicals: 9.8% Petroleum: 2.9%	Petroleum Pump System Operators, Refinery Operators, Industrial Machinery Mechanics, First-Line Supervisors
Fabricated Structural Materials	1.2%	Welders, Cutters, Structural Metal Fabricators, Team Assemblers, Management Occupations
Software Design	7.8%	Software Developers, Computer Systems Analysts, Computer Support Specialists, Computer Programmers
Technical Research and Consulting	Engineering: 7.8% Consulting: 7.8%	Civil Engineers, Architects, Mechanical Engineers, Business Operations Specialists
Advanced Shared Services	Telecom: 3.7% Insurance: 13.2% Health Care: 15.5%	Registered Nurses, Claims Adjusters, Sales Representatives, Computer Systems Analysts

It is clear from the data above that the availability of STEM-skilled jobs will continue to grow in the Capital Region, and that employers are already feeling the strain of recruiting qualified workers to fill these positions. The question that remains is whether Capital Region public school students are being taught and trained in the skills necessary to fill these existing and soon-to-be jobs.

Regional Workforce Preparation

In 2014, BRAC commissioned a report from Pathfinders, a for-profit market research and workforce analysis firm. This report features a detailed profile of existing workers in the Capital Region, based upon interviews with over two hundred human resources officers and senior management in area businesses. Among many employee

characteristics rated by respondents of the Pathfinders’ study is that of basic skills. Area employers report that just fewer than 60 percent of employees have “good” or “excellent” computer skills, while less than 50 percent of employees have “good” or “excellent” math skills.

Figure 9. Employee Basic Skills



K- 12 Education

The workforce data above is not surprising, given the achievement levels of Louisiana and Baton Rouge Area public school students. This begins in the primary school level, where the number of Louisiana students who performed at or above the proficient level on the 2013 National Assessment of Educational Progress (NAEP) lagged the nation across all subject areas. The National Assessment of Educational Progress is the nation’s largest representative assessment of students’ knowledge and abilities at various grade levels.

On the most recent tests for which data is available, Louisiana’s fourth graders achieved an average score of 231 out of 500, which falls ten points below the national average. In science, Louisiana fourth-graders fared a little better, scoring 141 of 300, or eight points below the national average. Eighth graders tend to score a little higher in both Louisiana and across the country, but in 2013 only 21 percent of Louisiana eighth graders scored at or above proficient in math and in 2011, just 22 percent scored at or above proficient in science (National Center for Education Statistics).

Figure 10. Math and Science NAEP Results for Louisiana

Subject	Grade / Year	Louisiana	Nation	At or above basic	At or above proficient	At advanced
Math	4 / 2013	231	241	75%	26%	3%
	8 / 2013	273	284	64%	21%	3%
Science	4 / 2009	141	149	63%	25%	0%
	8 / 2011	143	151	55%	22%	1%

HIGHLIGHT

Technology Integration

Iberville Parish’s K-12 Math, Science, and Arts Academy opened in 2008 and has grown steadily since then. It is a college-preparatory program that integrates technology and student-centered learning. The school places great importance on providing students with constant access to technology. Each student is issued a Macbook, thanks to a collaboration with Apple. Technology is infused into daily classroom instruction, and teachers are regularly provided with professional development aimed at improving their technology skills.

This trend continues when drilling down to the regional level. Although NAEP data is not available for most school districts, the Louisiana Education Assessment Program, or LEAP test, is used to measure public school fourth and eighth grade students' proficiency in the core subjects of English/language arts, math, science, and social studies. The test is also utilized to determine whether a student is prepared to achieve in the next level of schooling, with a Basic score (three on a five-point scale) required to progress. The Basic score is a minimum proficiency level, and is considered a low level by national standards. The Mastery level is similar to the national proficiency, and Mastery level understanding is critically important for success in college and career.

In the 2013 – 2014 school year, 38 percent of Capital Region fourth graders and just 12 percent of Capital Region eighth graders scored at or above the Mastery level on the math section of the LEAP test (a four on a five-point scale). In science, that level of achievement was reached by only 18 percent of fourth graders and 19 percent of eighth graders (Louisiana Department of Education 2014).

Figure 11.	2014 Math LEAP Scores Students Scoring Mastery and Above		2014 Science LEAP Scores Students Scoring Mastery and Above	
	4th Grade	8th Grade	4th Grade	8th Grade
Louisiana	40%	12%	20%	21%
Capital Region	38%	12%	18%	19%
Ascension	53%	24%	29%	35%
Baker	29%	2%	6%	5%
Central	53%	22%	32%	25%
East Baton Rouge	33%	12%	15%	16%
East Baton Rouge - RSD	13%	2%	2%	4%
East Feliciana	38%	11%	14%	10%
Iberville	47%	7%	16%	14%
Livingston	48%	13%	27%	35%
Pointe Coupee	37%	5%	12%	7%
St. Helena	11%	0%	7%	0%
West Baton Rouge	25%	15%	11%	24%
West Feliciana	44%	17%	24%	34%
Zachary	63%	32%	35%	39%

At the high school level, public school students are assessed via end of course tests and, ultimately, the American College Test (ACT). The ACT is a college readiness assessment in the subjects of English, mathematics, reading, and science (a writing test is optional). The test also includes a career exploration component. The test is used for college admissions and placement, measuring the skills and knowledge needed for success in the first year of higher education (American College Test).

Nationally, the average ACT composite score is 20.9 out of 36 possible points. In Louisiana, the average composite score for public school students was 19.5 in 2013, the first year that the ACT was mandatory for all high school juniors. The Capital Region fared worse than the state average, at 18.1 (Louisiana Department of Education 2013).

Figure 12. ACT Composite Score Averages (2009 through 2013 District ACT Results)

District Name	2009	2010	2011	2012	2013
Nation	21.1	21.0	21.1	21.1	20.9
Louisiana	20.1	20.1	20.2	20.3	19.5
Capital Region	18.6	19.0	19.1	19.3	18.1
Ascension	20.3	20.5	20.6	20.6	20.1
Baker	17.4	17.0	17.2	17.5	16.3
Central	20.1	21.0	21.8	21.1	20.3
East Baton Rouge	19.7	19.4	19.2	19.4	18.3
East Baton Rouge - RSD	-	-	-	-	15.0
East Feliciana	15.6	16.5	17.0	18.6	16.5
Iberville	17.1	16.9	17.2	18.1	17.0
Livingston	20.3	20.7	20.9	20.5	19.6
Pointe Coupee	17.7	17.8	18.6	18.0	17.6
St. Helena	14.7	16.1	16.6	15.3	15.6
West Baton Rouge	19.5	19.4	19.0	19.7	18.5
West Feliciana	21.2	21.9	20.6	21.5	20.1
Zachary	20.3	20.9	20.3	21.0	20.2

The ACT determines whether students are college-ready through benchmark scores representing a level of achievement that predicts the likelihood of success in freshman college courses. Students who achieve the benchmark scores have a 50 percent chance of obtaining a B or higher, or a 75 percent chance of obtaining a C or higher, in corresponding credit-bearing first year college courses. The national benchmarks for mathematics and science are 22, and 23, respectively (American College Test 2013). In the Capital Region, the average mathematics score in 2013 was 18, while the average science score was 17.9 (Louisiana Department of Education 2013). Not a single Capital Region district achieved average scores at or above the benchmark level.

It is clear, then, that Capital Region K-12 student performance in science and math is lagging, on average, both the nation and the state. Unfortunately, that appears to correspond with

Figure 13. ACT Math and Science Score Averages (2013 District ACT Results)

District Name	Math	Science
Nation	20.9	20.7
Louisiana	19.2	19.2
Capital Region	18	17.9
Ascension	20.2	20
Baker	16.6	16.6
Central	20.2	19.8
East Baton Rouge	18.4	17.9
East Baton Rouge - RSD	15.7	14.4
East Feliciana	16	15.7
Iberville	16.8	17.3
Livingston	19.3	19.2
Pointe Coupee	17.0	16.7
St. Helena	15.5	16.4
West Baton Rouge	18.3	18.3
West Feliciana	20.0	20.2
Zachary	19.9	20.2

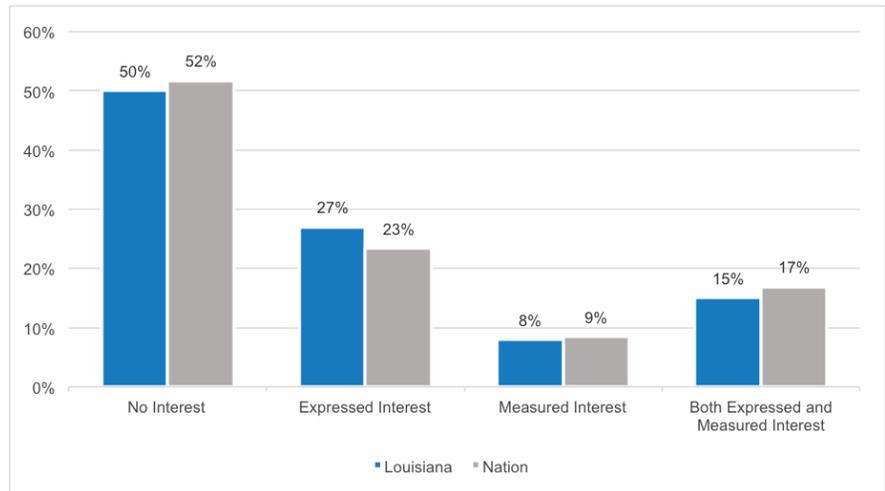
student interest in STEM, as well.

In addition to reporting scores on its test, which gives a sense of capability in STEM subjects, the ACT also provides deeper levels of data in various reports. In 2013 it released a report for each state on *The Condition of STEM 2013*. The report uses subject-level tests and the ACT Interest Inventory to break down the graduating class into four STEM-related cohorts: 1) those who have an expressed and measured interest in STEM; 2) those who have an expressed interest in STEM; 3) those who have a measured interest in STEM; and 4) those who have neither expressed nor measured interest in STEM. Louisiana's student interest in STEM is very similar to that of the nation's students overall.

The Condition of STEM 2013 report finds that a student has an expressed interest in STEM when he or she chooses a major or occupation (out of 294 possible responses) that corresponds with a STEM field. It finds that a student has a measured, or inherent, interest in STEM via its proprietary Interest Inventory. Both measurements are taken as part of administration of the ACT. In Louisiana, a full half of students have neither an expressed nor measured interest in pursuing STEM for college or career. Only a scant 15 percent have both a measured and expressed interest (American College Test 2013).

That half of students in Louisiana are uninterested in STEM is unsurprising. Although group interviews with administrators from school districts throughout the nine-parish region revealed several innovative and excellent STEM programs on offer, 35 percent of Capital Region teachers surveyed by BRAC reported that STEM

Figure 14. Student Interest in STEM



HIGHLIGHT

STEM-Focused Philanthropy

The Foundation for East Baton Rouge School System (FEBRSS) is an independent, non-profit organization dedicated to enhancing the quality of education in Baton Rouge. Early on, the foundation adopted STEAM (STEM with an arts focus) as its signature program, and established a funding record for middle and high-school STEM initiatives such as robotics, pre-engineering, and chess. As a result, robotics clubs and courses are thriving across the parish and Baton Rouge youth are now competitors in the United States Chess Federation.

Key business and school partners have made substantial in-kind contributions to the foundation thus far. Besides fundraising, FEBRSS is committed to leveraging available community assets to achieve three major goals: 1) integrating STEAM learning opportunities into classrooms; 2) strengthening teacher and leadership effectiveness in STEAM education; and, 3) creating opportunities for private businesses and organizations to meaningfully engage with schools. FEBRSS is a staunch advocate for policies and standards that increase underrepresented student interest and achievement in STEM..

education has not even been a topic of discussion at their schools. Further, only 23 percent of teachers report that a majority of students at their schools participate in experiential STEM learning (including career days, career counseling, academic competitions, field trips, job shadowing, internships, mentorships, and more).

Although the majority of teachers surveyed do incorporate discussions about STEM careers into their class time, 31 percent do not, and 35 percent do so only on a monthly basis. Of greatest concern, perhaps, are two teacher-reported items. First, that only 31 percent of teachers feel “very comfortable” making clear and up-to-date STEM career connections with their curriculum, and second, that the top two barriers to engaging in STEM-related professional development are: 1) lack of such professional development, and 2) lack of awareness of such professional development.

On the positive side, Capital Region teachers do show a commitment to improving and increasing STEM education in their schools. They report that the top three things their administration (both central office and school level) can do to assist them in this are: 1) facilitate career information across all content areas and job roles; 2) develop and adopt a district-wide STEM plan and strategy; and 3) provide a continuously updated list of potential guest speakers and profiles of STEM-related businesses and employees.

Teachers also were asked what both business and higher education can do to support STEM at their schools. The top three answers for both entities were: 1) provide educators with timely STEM-related job definitions; 2) provide teachers with opportunities for job shadowing, internships, and work experiences, and 3) providing or funding professional development activities.

HIGHLIGHT

High-Impact STEM Mentoring

EnvironMentors is a proven college access program involving at-risk high school youth and volunteer Louisiana State University STEM student mentors. The program pairs K-12 students with university student mentors at a one-to-two ratio for weekly environmental science-related activities over the course of the school year, culminating in a national science competition in Washington, D.C., and an overnight trip to conduct field research in the coastal waters of South Louisiana at Louisiana Universities Marine Consortium (LUMCON), a marine research center uniquely situated in the heart of the region’s wetlands.

This award-winning LSU program was recently named the 2013 chapter of the year and mentee Pernell Glover, a high school junior, was awarded the Patrick Lalley Memorial Award for Excellence in Wildlife and Biodiversity Conservation Research. The primary goal of the after-school program is to mentor and motivate high school students who are underrepresented in the sciences and to increase environmental literacy and awareness by focusing on authentic environmental issues facing Louisiana and the Gulf Coast. The three-year-old EnvironMentors program, averaging forty-five participants per year, and representing approximately fifteen high school students and thirty university STEM majors, provides relevant STEM experiences for the students and leadership opportunities for the mentors. The LSU chapter is sponsored by the School of the Coast and Environment and is partners with LSU College of Human Sciences & Education’s Louisiana State Youth Opportunities Unlimited (LSYOU) program and Louisiana Sea Grant.

Post-Secondary Education

In the Capital Region, 57 percent of 2012 high school graduates enrolled in college (either two-year or four-year) in the fall of 2012. By a year later, or sixteen months after graduation, that number rose to 68 percent (National Student Clearinghouse 2012).

Figure 15. College Going / Enrollment Data for 2011-2012 Public High School Graduates

Site Name	Total 2011-12 HS Grads.	Enrolled in College 1st Fall After HS Grad.	Of Those HS Grads. Entering College the 1st Fall (2012-13) After HS Grad.			Enrolled in College 2nd Fall semester (2013-14) after HS Grad.	Of Those HS Grads. Entering College by the 2nd Fall Semester (2013-14) After HS Grad.			En-rolled in College within 16 Months after HS Grad.
			%	% 2 Year	% 4 Year		% In State	%	% 2 Year	
Louisiana	36,705	56%	29%	71%	92%	66%	36%	64%	91%	66%
Capital Region	5,872	57%	32%	68%	92%	68%	39%	61%	92%	68%
Ascension	1,267	65%	35%	65%	94%	73%	40%	60%	93%	73%
East Baton Rouge	1,980	62%	36%	64%	90%	73%	41%	59%	89%	73%
East Feliciana	83	41%	35%	65%	85%	54%	40%	60%	80%	54%
Iberville	208	66%	33%	67%	96%	75%	35%	65%	96%	75%
Livingston	1,227	57%	18%	82%	96%	66%	25%	75%	95%	66%
Pointe Coupee	91	46%	48%	52%	95%	55%	52%	48%	94%	55%
St. Helena	53	45%	12%	88%	88%	70%	41%	59%	89%	70%
West Baton Rouge	183	60%	44%	56%	95%	68%	47%	53%	94%	67%
West Feliciana	124	50%	24%	76%	92%	59%	30%	70%	92%	59%
Zachary	323	72%	25%	75%	91%	79%	29%	70%	91%	79%
Baker	105	53%	36%	64%	88%	63%	41%	59%	88%	63%
Central	228	69%	39%	61%	97%	77%	45%	55%	97%	77%

HIGHLIGHT

College and Career Options

The Ascension Parish School System is dedicated to providing a rigorous PK-12 program that prepares students for a range of postsecondary experiences and promising career success. Starting with setting standards for early childhood education, Ascension is devoted to providing experiences and guidance that allow students options for traditional diplomas, early college credit and/or relevant career pathways. Regardless of the pathway, achievement is the focus, as evidenced by their 2012-13 statistics: 280 academic diploma endorsements, 840 advanced placement credits earned, 12,667 postsecondary credits earned, 205 career/technical diploma endorsements, and 586 industry-based certifications. This past year thirty-five juniors split their day between their home campus and Associated Builders and Contractors, earning advanced certifications for high-demand, high-wage jobs, and the number of students interested in starting the program has more than doubled.

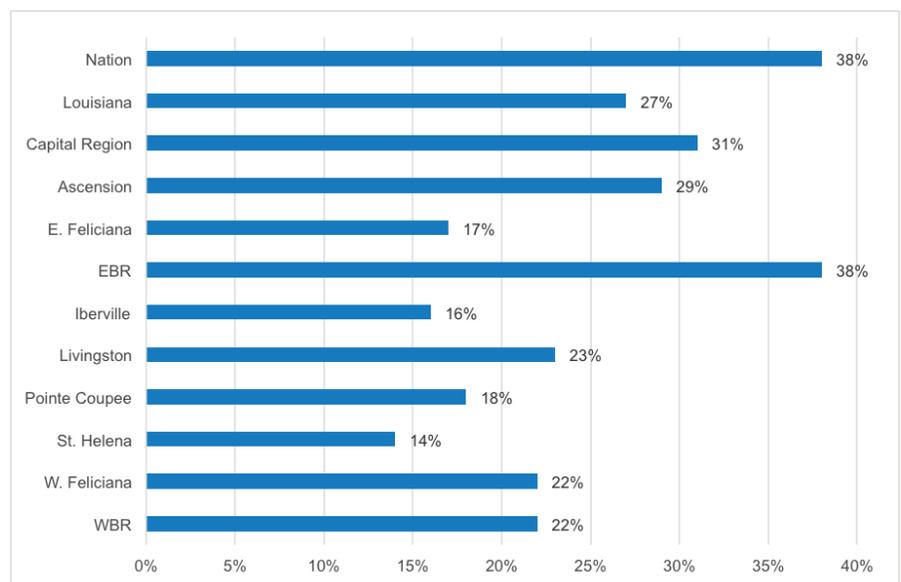
College enrollment does not necessarily translate to college preparedness. In Louisiana in 2010, 66 percent of two-year college freshmen and 21 percent of four-year college freshmen took at least one developmental or remedial course. These courses are taken when students do not score high enough on their college entrance exams to indicate competency in a subject. Students were more likely to need remediation in math than in English, with 33 percent of two-year freshmen and 17 percent of four-year freshmen taking only remedial math courses, as opposed to 4 percent and 3 percent, respectively, requiring only English remediation (Louisiana Board of Regents).

Fall of 2014 will begin the application of a new rule regarding remedial coursework in Louisiana four-year colleges. The Board of Regents has been phasing out the provision of remedial education at four-year colleges since fall of 2012. This year will be the first that remedial coursework will only be offered at two-year universities. In terms of STEM, this will mean that a score of 19 or better on the ACT math section will be required for entry into a four-year university (Louisiana Board of Regents).

One effect of the new rules on remedial education will be the driving of more students into two-year universities. This will hopefully lead to a greater number of students pursuing either a two-year college degree or a career certification. As shown, the number of jobs requiring those levels of post-secondary education is growing dramatically, and individuals in those occupations earn very respectable wages.

Throughout Louisiana, just 27 percent of residents over age twenty-five have attained an associate's degree or higher, of which those who have attained only an associate's degree comprise only five percent. The Baton Rouge Area fares better, where 31 percent of residents over age twenty-five having attained an associate's degree or higher. This compares to 38 percent of the U.S. population over the age of twenty-five (U.S. Census Bureau).

Figure 16. Residents Over Age 25 with Associate's Degree +



The region gets a boost from East Baton Rouge, primarily because the parish is home to three public institutions of higher education, significant manufacturing and engineering businesses, and the seat of Louisiana state government, all of which act as a magnet for degreed adults. Located throughout the Capital Region as a whole are four public universities. They are Louisiana State University (LSU), Southern University (SU), Baton Rouge Community College (BRCC), and River Parishes Community College (RPCC). LSU is Louisiana's flagship university, and several of its STEM graduate school pathways rank in the top one hundred nationally, including engineering, chemistry, geology and geophysics, math, and physics and astronomy (*U.S. News and World Report 2014*).

In these four universities, there are just over 44,000 enrolled undergraduate students. Of that total, only 21 percent are enrolled in STEM majors (Board of Regents 2014). That number is even smaller for females and minorities – both classes of people traditionally under-participating in STEM fields – as 64 percent of students enrolled in STEM majors are male, and 65 percent are Caucasian.

Figure 17. 2013 – 2014 Full-Time Undergraduate Enrollment in STEM Majors

	Total	Total STEM		Caucasian	African American	Other Ethnicities	Males	Females
LSU	24,931	7,957	32%	75%	9%	17%	64%	36%
SU	5,612	1,024	18%	2%	94%	4%	59%	41%
BRCC	10,266	406	4%	42%	35%	22%	82%	18%
RPCC	3,238	45	1%	87%	9%	4%	91%	9%
Total	44,047	9,432	21%	65%	19%	16%	64%	36%

Similarly, just 21 percent of total awarded degrees, whether at the associate, baccalaureate, or graduate level, are in STEM fields. In addition to awarded STEM degrees, the two community colleges in the nine-parish area award diplomas, validations, and other documents indicating competencies in technical skills, which are not reflected in the degrees and certificates awarded.

Figure 18. 2013 – 2014 Math and Science Degrees and Certificates Awarded by Race, Gender, and Degree Type

	Caucasian	African American	Other	Male	Female	STEM		Non-STEM
LSU	68%	6%	26%	61%	39%	1,844	30%	70%
SUBR	3%	88%	9%	57%	43%	175	17%	83%
BRCC	60%	19%	5%	84%	16%	75	3%	97%
RPCC	96%	4%	0%	91%	9%	46	11%	89%
Total	63%	13%	10%	63%	38%	2,140	21%	79%

HIGHLIGHT

Teacher Training

LaTeach is a Louisiana teacher residency model utilized in West Feliciana Parish Public Schools, funded through a Louisiana Department of Education Believe and Prepare grant. This collaboration with LSU is an innovative and replicable model designed to prepare STEM teachers to be “classroom-ready,” meaning they are armed with both the pedagogical and content skills necessary to prepare students for success in a rigorous academic environment. The goal of LaTeach is to improve student achievement and aspirations by improving the way West Feliciana teachers are prepared and retained. They will undergo an induction process and a continuing residency, during which they will learn through practical teaching experiences and a master’s level curriculum in science at LSU. Teachers will also work with teacher advisors, who offer strengthening of content knowledge and continued support of new educators.

Figure 19. 2013 – 2014 Technical Competency Area Completions

Figure 19. 2013 – 2014 Technical Competency Area Completions	
Capital Area Technical College (pre-BRCC merger)	342
Applied Horticulture / Horticulture Operations, General	6
Auto-body / Collision and Repair Technology / Technician	4
Automobile / Automotive Mechanics Technology / Technician	84
Child Care Provider / Assistant	30
Computer Systems Networking and Telecommunications	6
Drafting and Design Technology / Technician, General	4
Health Aide	35
Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology / Technician	18
Licensed Practical/Vocational Nurse Training	49
Machine Tool Technology / Machinist	19
Network and System Administration / Administrator	50
Nursing Assistant / Aide and Patient Care Assistant / Aide	29
Prepress / Desktop Publishing and Digital Imaging Design	8
RPCC	115
Drafting and Design Technology / Technician, General	2
Instrumentation Technology / Technician	30
Nursing Assistant / Aide and Patient Care Assistant / Aide	19
Welding Technology / Welder	64

HIGHLIGHT

Expanding Gender Equity in STEM

Although female representation in STEM K-12 extracurricular activities, postsecondary degree programs, and the workplace lags male representation, initiatives such as Louisiana Women in IT (LA-WIT) are aimed at combatting that trend. LA-WIT got its start as a networking group for women in the Baton Rouge Area working in STEM careers. Recognizing the unique challenges women face in their professional careers, the organization has expanded and now provides a broad range of support and resources required to introduce STEM fields to young women. LA-WIT recently leveraged expertise and resources from several IT partners to sponsor the region's first all-girl creative computer coding event for middle school girls and teachers. A cross-sector collaboration, partners included: IBM, Geocent, Louisiana Technology Park, and Sparkhound as well as the Foundation for East Baton Rouge School System and Lee High STEM and Visual Performing Arts Magnet.

Louisiana STEM Equity Pipeline, led by Baton Rouge Community College, was formed last year in collaboration with the National Alliance for Partnerships in Equity (NAPE) to increase awareness of and commitment to STEM equity issues and increase underrepresented group participation and retention in STEM-related programs of study. Funded by the National Science Foundation, NAPE will assist regional efforts to engage teams of administrators, teachers, and counselors in understanding and using data to increase student participation in STEM learning activities and degree programs.

Focusing on the skilled craft workforce needs, BRCC has also awarded a number of National Center for Construction Education and Research (NCCER) level certificates. NCCER offers a nationally-recognized standardized curricula in skilled craft trades. In the 2013-2014 year, BRCC awarded more than 2,000 such certificates.

LSU leads the area universities with 30 percent of degrees awarded in STEM fields. That number is lowest at BRCC, where only 3 percent of awarded degrees and certificates are in STEM (Board of Regents 2014). It is imperative that the community colleges in the Capital Region increase their output of STEM-degreed and certificated students.

All four universities award the majority of STEM degrees to males, and with the exception of SU, a historically black college/university (HBCU), each award the majority of STEM degrees to Caucasian students. This is an important note for the community to consider, as the demographic breakdown among students earning a STEM degree does not match the demographic breakdown of the Capital Region. The Baton Rouge metropolitan statistical area (MSA) has a total population of approximately 820,000 people, of which 36 percent are African American, 60 percent are Caucasian, and 4 percent are another ethnicity. Based on this data, STEM businesses that value a diversified workforce will struggle to find qualified employees.

The Capital Region's STEM industries need growing numbers of STEM-skilled workers. But the area's public schools, both at the K-12 and higher education levels, are not producing enough individuals to fill the need. Increasing both STEM competencies and education attainment, at all completion levels, must be a focus of the STEM workforce pipeline.

Figure 20. 2013 – 2014 Baton Rouge Community College NCCER Certificates

Certificates	Awarded
AWS Entry Level Welder Phase One	1
Basic Rigger	1
Carpentry 2 Residential Framing and Finishing	39
Carpentry Fundamentals	40
Construction Site Safety Tech (CSST)	230
Construction Site Safety Supervisor (CSSS)	230
Core Curriculum	525
Drywall Level One	6
Electrical Level One	25
Electrical Level Two	23
Field Safety	230
HVAC Level One	34
HVAC Level Two	18
Industrial Maintenance Mechanic Level One	54
Industrial Maintenance Mechanic Level Two	6
Industrial Maintenance Mechanic Level Three	3
Industrial Maintenance Mechanic Level Four	4
Masonry Level One	2
Pipefitting Level One	24
Pipefitting Level Two	26
Plumbing Level One	5
Plumbing Level Two	1
Power Gen Maintenance Mechanic Level Two	3
Power Industry Fundamentals	3
Residential Construction Methods	38
Safety Technology	230
Welding Level 1: AWS-SENSE EG2.0 Compliant	218
Welding Level One	230
Welding Level Two	54
Total	2303

STEM Education Collaborative Vision + Action

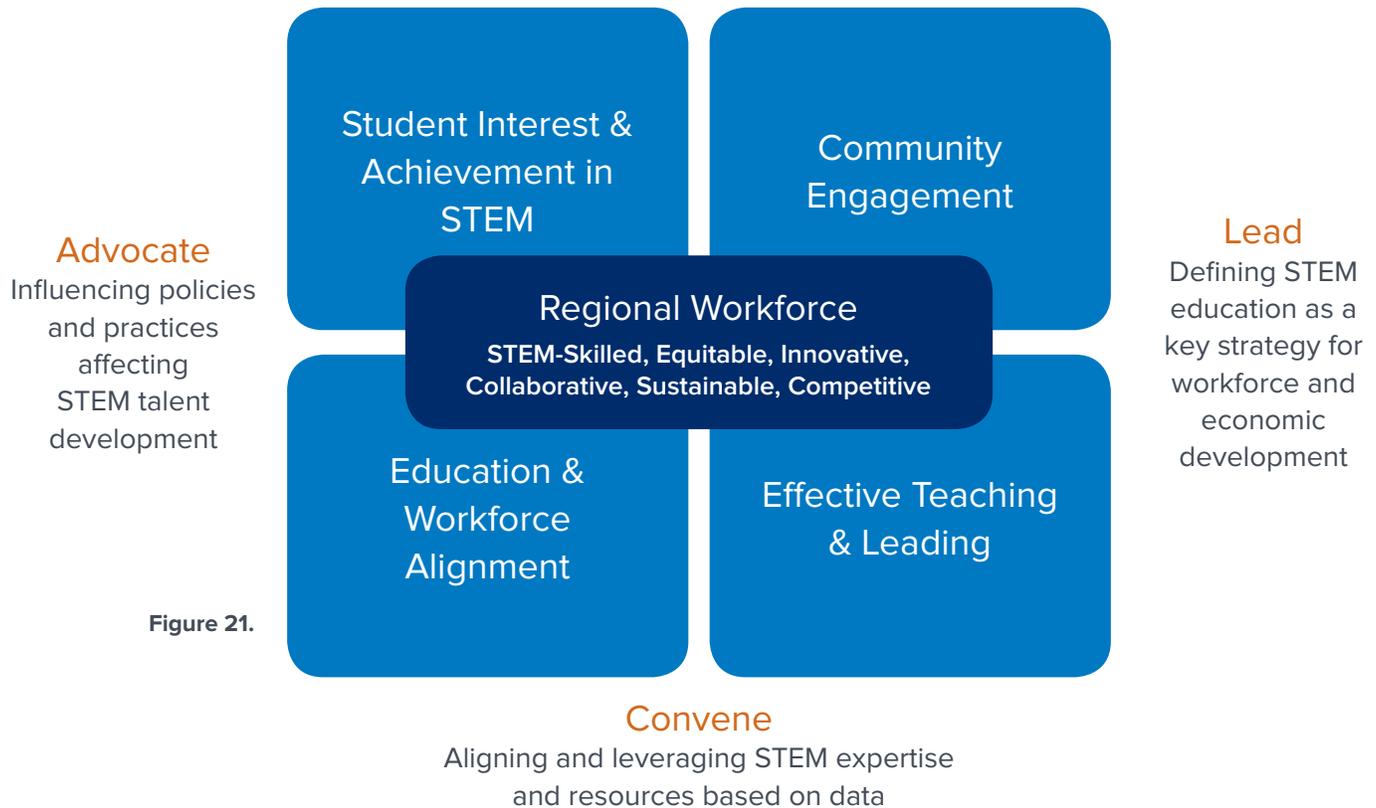


Figure 21.

HIGHLIGHT

Industry-Based Advisory Board

East Baton Rouge Parish Public School’s Scotlandville Magnet High School’s Engineering Academy is a school-within-a school STEM program that involves collaboration with the National Academy Foundation, the National Action Council for Minorities in Engineering, and Project Lead the Way. By bridging school and the workplace in a way that leads to academic achievement, the Engineering Academy has been very successful in steering students toward a career or postsecondary learning in STEM.

Scotlandville’s Academy of Engineering features a rigorous college preparation and engineering curriculum that is project-based and well supported by a small learning community of teachers and career counselors. Key to the academy’s success is the early formation of an industry-rich advisory council. The advisory council, comprised of volunteers from major chemical and refinery corporations, architectural and engineering companies, universities, and municipal government in and around Baton Rouge, provides curricular advice and fundraising, but also supports authentic problem-solving and engineering design projects throughout the program. In addition, the council promotes active relationships with local industry that has generated meaningful STEM work-based experiences including internships, job shadowing, and project mentoring. Students also have opportunities to earn up to thirty hours of college credit before graduating from high school.

Recommendations

A comprehensive, collaborative, and sustained effort will be required in order to better prepare Baton Rouge Area students for the region's STEM economy. Tremendous opportunity exists, now and in the years to come, for those students who gain the right skills and knowledge. It is incumbent upon the entire spectrum of stakeholders to take action enabling students to take advantage of the economic opportunities presented. To deliver a sustainable and competitive STEM-skilled workforce, education and business expertise and resources must be leveraged to create, influence, change, guide, and support key and innovative priorities.

BRAC recommends a regional vision for STEM education, in which all students successfully gain STEM skills and earn postsecondary credentials that lead to a meaningful career. The following strategies and tactics represent those that BRAC's extensive interview process has revealed will have the most impact on STEM education achievement and attainment.

GOAL 1: Increase student interest, participation, and achievement in STEM

Recommendations for K-12 and post-secondary educators, administrators, advocates, and policymakers

According to the National Research Council's 2011 report on successful STEM education, "Science, mathematics, engineering, and technology are cultural achievements that reflect people's humanity, power the economy, and constitute fundamental aspects of our lives as citizens, workers, consumers, and parents" (National Research Council 2011).

Although what constitutes successful STEM education has not been definitively articulated, policy makers across the U.S. focus on four key elements: adoption of a rigorous set of standards and curriculum; a supportive system of assessment and accountability; adequate

HIGHLIGHT

Revisiting Teacher Preparation and Development

There is a desperate shortage of qualified math and science teachers in the Capital Region and across Louisiana. The LSU GeauxTeach program takes an innovative approach to this shortage by encouraging students to earn a secondary teaching certification while pursuing their undergraduate degree in biology, chemistry, mathematics, or physics. GeauxTeach is one of several National Math and Science Institute (NMSI) sites that were chosen to replicate the successful University of Texas' UTeach model. Highly recruited by school systems upon graduation, GeauxTeach participants graduate with a content degree in four years, and are both certified and highly-qualified to teach upon graduation.

Besides hosting the GeauxTeach program, the LSU Cain Center for STEM Literacy serves as a premier education research and outreach hub for the university. The center promotes the STEM teaching profession through a variety of professional development activities, research, and outreach programs. Examples of additional innovative teacher preparation programs sponsored by the center include Transition to Teaching, a seven week program available to recent college graduates and mid-career changers possessing strong content knowledge in math and science; Master of Natural Science program; and Teacher Residency programs. The Teacher Residency program has been extremely successful in attracting highly qualified STEM teachers to West Feliciana Parish, thanks to funding through the Louisiana Department of Education's Believe and Prepare Grant.

instructional time; and, equal access to high-quality year-round learning opportunities. Each of the elements is associated with better student outcomes and college readiness, regardless of STEM focus. Beyond these tenets however, the context – a school’s culture and conditions – matter just as much as any other factors.

Strategy 1.1: National Standards and High-Quality Instruction

Increase opportunities to meet state and national science and mathematics standards

Tactics:

- a. Increase courses, resources, and relevant assessments aligned to nationally recognized science and math standards in early and middle grades.
- b. Require frequent real-world application of problem-solving skills, appropriate technology, engineering design processes, and mathematics during instructional time.
- c. Implement rigorous standards, such as Common Core State Standards and Next Generation Science Standards, which enhance STEM achievement and increase the chances of success in college courses and workforce training programs.

Strategy 1.2: Rigorous STEM Courses and Programs of Study

Increase access to advanced STEM-related academic and career and technical education (CTE) programs

Tactics:

- a. Increase offerings of rigorous courses such as trigonometry, calculus, physics, and computer science to improve chances of enrollment in a STEM postsecondary program.
- b. Increase the number of STEM-focused schools or pathways that specialize in collaborative problem/project based learning, use of technology, and involve industry partners in learning inside and outside the classroom.
- c. Champion policies that incentivize courses and pathways resulting in early postsecondary STEM credit and/or credentials obtained during high school.
- d. Endorse the use of industry-themed academic pathways, such as engineering, computer science, or information technology, that offer opportunities for students to gain both academic and technical skills while transitioning into work-based learning experiences.
- e. Develop partnerships between K-12 districts and community/technical colleges that provide high school students with access to nationally-recognized career and technical credentials.

Strategy 1.3: Out-of-School STEM Experiences

Increase access to a wide-range of STEM-related learning experiences

Tactics:

- a. Increase participation in after-school and curriculum-based learning activities that boost STEM literacy and leadership skills and reinforce college and career readiness, such as STEM contests, clubs, competitions, camps, service learning, and others.
- b. Drive student exploration of industry-cluster careers, and existing workforce development tools via experiential learning practices such as externships, internships, job shadowing, and mentoring.
- c. Coordinate with school districts to disseminate opportunities for K-12 students to engage in STEM-related lectures, open-houses, tours, and other relevant activities on college and university campuses.

Strategy 1.4: Counseling, Tutoring, and Other Academic and Career Support

Increase academic and career guidance for students and their families, driving greater enrollment in STEM courses and activities that prepare students for successful STEM-related education at every level

Tactics:

- a. Provide access to extra academic support in STEM-related courses, particularly in mathematics, science, and computer science.
- b. Engage families in academic and career guidance to ensure student enrollment in appropriate courses and STEM learning opportunities that increase chances of successful participation in postsecondary education pathways.
- c. Increase use of evidenced-based models, policies, and best practices that focus on reducing opportunity gaps for groups traditionally underrepresented in STEM fields, such as women and minorities.
- d. Encourage students to participate in STEM network-building opportunities, such as membership in clubs or other affinity groups.
- e. Build partnerships that provide students with technology-rich classrooms.

GOAL 2: Increase the Number of Effective STEM Teachers and Leaders

Recommendations for teacher preparation programs, K-12 administrators, advocates, and policymakers

Preparing and recruiting teachers who exhibit high levels of achievement and experience in STEM disciplines is a major challenge in improving and fostering student interest and achievement in STEM. Existing recruiting strategies such as performance-based compensation, sign-on incentive packages, and loan forgiveness programs have proven effective, but greater use of innovative recruiting methods is still needed to fill the gaps in human capital.

HIGHLIGHT

Statewide Career and Technical Education

A new Louisiana Department of Education initiative called Jump Start is guiding high school courses and workplace experiences that will certify students for careers in thirty-five regionally-relevant industries. Many of those job areas are in STEM, and span the gamut from construction and industrial maintenance to web and fashion design for costume in film. Jump Start will be offered as an elective path for students planning to go to college and a required path for students planning to get a career diploma. Due to their early success in building career pathways, Ascension Parish is helping guide the Capital Area Jump Start Region that includes the school districts of St. James, St. John the Baptist, Iberville, West Baton Rouge, East Baton Rouge, West Feliciana, East Feliciana, Central, and Zachary.

Jump Start teams can submit additional regional pathways for consideration by the state Board of Elementary and Secondary Education. West Baton Rouge Parish, as part of the Capital Region Jump Start Team, submitted a STEM pathway. This pathway will include career exploration and credentials in STEM-rich competencies. Courses will include robotics, engineering, and other college-level academic and hands-on craft construction coursework, site-based internships, and mentoring of students by area STEM professionals.

Preparing STEM teachers will require “more than simply tinkering with today’s schools of education and licensure systems” (Hess 2011). The state must carve new paths for teacher education, redefine the “full-time” teaching position, and provide improved school conditions and leadership to attract high-quality teachers.

Strategy 2.1: Teacher Preparation

Increase the number of highly-competent STEM-experienced instructors graduating from teacher preparation programs

Tactics:

- a. Instruct education students in STEM education teaching practices and enhance STEM preparation programs.
- b. Endorse programs and policies that increase the number of teachers that hold degrees in STEM content areas.
- c. Increase the number of teachers that can teach dual credit STEM courses.

Strategy 2.2: Teacher Recruitment and Retention

Increase recruitment, support, and retention of highly STEM-skilled teachers and STEM professionals transitioning into the education sector

Tactics:

- a. Adopt and endorse policies that provide for and incentivize individuals enrolled in STEM majors and/or industry professionals to become instructors.
- b. Increase support systems for teachers that include STEM coaching, professional learning communities, and industry-based internships.
- c. Improve institutional conditions that promote retention of high-quality teachers, such as classroom autonomy, mutual consent hiring, school leadership feedback, availability of resources, and leadership opportunities.

HIGHLIGHT

Changing the Conversation on the Technical Workforce

The Louisiana Workforce Education Initiative (LWEI) was created to provide the public messaging campaigns and communications support necessary to begin changing outdated public perceptions regarding high-wage, high-demand careers such as industrial and commercial construction (skilled crafts, process technology), health care, advanced manufacturing, automotive maintenance, and information technology. The multi-million dollar campaign will include mass media through television and radio, plus social media, internet marketing, public relations, and outreach.

Supported by key industry, business, and government leaders, LWEI’s goal is to increase the number of students who choose to participate in Louisiana’s exciting new Jump Start program – a program that will increase the link between career and technical education and high-growth, high-wage jobs. Guided by data and best practice research, collaborators in the project include the Louisiana Department of Education (DOE), the Louisiana Workforce Commission (LWC), and Louisiana’s Workforce Investment Council (WIC). The collaborative vision is to effectively increase the number of career-ready graduates to 25,000 by the year 2020.

Strategy 2.3: Teacher Professional Development

Provide high-quality, job-embedded professional development that builds capacity in both content and pedagogy for STEM learning experiences

Tactics:

- a. Focus professional development on both continuing education in content areas and real-world and applied learning, including inquiry-based strategies, project/problem based learning, and cultural competency.
- b. Provide high-quality STEM industry-based and research experiences for teachers.
- c. Engage teachers in professional development activities that provide insight into and strategies for building STEM workplace skills and motivating students for STEM careers.

Strategy 2.4: Principal and School Leader Development

Provide district and school-level leaders with professional development that will help them plan, implement, monitor, and improve student learning in STEM and to close the opportunity gap

Tactics:

- a. Increase professional development that results in school conditions that support student recruitment, retention, and achievement in STEM courses and activities.
- b. Provide professional development regarding identification, training, selection, and retention of highly effective teachers.
- c. Train educators to use student data in the modification of STEM instructional practices designed to close the opportunity gap that exists between students of different backgrounds.
- d. Increase business/education partnerships that provide teacher internships and field study opportunities.
- e. Engage principals and school leaders in professional development regarding the benefits of quality STEM education to all students, regardless of eventual career or college choice.

HIGHLIGHT

STEM Internships for Students and Teachers

Knowing the value of work-based learning for encouraging STEM careers (particularly in information technology), Sparkhound, a successful and growing Baton Rouge Area IT services solution company, launched “Spark-IT”, a summer-based internship program for high school students.

The goal of “Spark-IT” was to provide an opportunity for a teacher-led team to develop a real-world product for Toastmasters International. The project, called the Club Traveler Program, requires the building of a web-based application that would encourage members to travel between Toastmaster clubs and to essentially “game-ify” the experience. The four-week experience allows the team (six students from Baton Rouge High and Lee High STEM and Visual and Performing Arts Academy) to use a range of product development tools, and the latest technology while learning basic business skills. In addition to IT skills gained (JavaScript, SharePoint, and Azure) as a result of the internship, students gained experience in working as a development team and useful skills in the engineering design process, project management, collaboration, and public speaking.

Goal 3: Increase Meaningful Business and Community Engagement in STEM

Recommendations for K-12 and post-secondary educators and administrators, regional economic development organizations, business leaders, advocates, and policymakers

Companies employing STEM workers rely on a talent pipeline continuum that includes parents, K-12 schools, postsecondary institutions, after-school programs, and training providers. Greater cohesion among the stakeholders along this pipeline can lead to better outcomes. Business and industry can highlight the skills needed in the workplace to both educators and informal education providers, develop bridge and enrichment programs to reduce the number of students who get diverted from the STEM pipeline, and provide meaningful professional development for educators by including engineers and other employed professionals as part of learning and development teams. Businesses can also create clearer pathways for valuable internships, project-based learning challenges, career awareness, and mentors (STEMconnector, University of Phoenix, and *U.S. News and World Report* 2013).

Although there are many ways business leaders can contribute to increased STEM achievement in all levels of education, their energies can best be utilized by “helping educators, policymakers, and reformers reimagine American schools to match the opportunities and challenges of a 21st century STEM education” (Hess 2011). Business advocacy, expertise, and partnerships promote both school improvement and meaningful STEM education.

Strategy 3.1: Industry / Education Exchanges

Form collaborative exchanges between business leaders and educators to integrate and apply STEM content

Tactics:

- a. Establish regular exchanges between industry and education to advise on curriculum, inform career guidance and preparation, and report up-to-date skill and job demand needs.
- b. Develop and maintain a database of STEM occupations and correlating skills and provide access to educators.
- c. Increase expertise sharing in the design of STEM-specific curricular programs, linking STEM education to careers, and use of data-driven decision making.

Strategy 3.2: Partnering for Expansion of STEM Learning Opportunities

Increase access to STEM-focused learning opportunities, both during the school day and beyond, extending classroom learning and growing career awareness

Tactics:

- a. Develop a toolkit that provides examples and tools to aid businesses in building meaningful opportunities for students and educators, particularly for effective mentoring, internships, externships, career fairs, and other activities that link learning to work.
- b. Establish a scorecard or reporting process for mapping STEM learning opportunities throughout the region and a system for shared measurement of outcomes.
- c. Increase the number of formalized partnerships between schools/programs and STEM-oriented businesses that include student internships and externships.

HIGHLIGHTS

Corporate Neighbors for STEM

ExxonMobil's Ambassadors Committed to Education Program (ACE) members are employees of the ExxonMobil Baton Rouge Refinery and the Chemical Plant who are committed to increasing student interest in STEM. Annually, members contribute over 40,000 hours of volunteer time that reach nine neighboring public schools located near the refinery and the chemical plant. Partnering activities include everything from classroom demonstrations, tutoring, science fair preparation and judging, and a speaker bureau to serving as reading partners for elementary school students. The refinery also hosts job fairs and career days and partners with valued informal science providers such as the Louisiana Art and Science Museum (LASM) to host LASM Science Days and Engineering Day. Through the annual "Introduce a Girl to Engineering Day" ACE volunteers facilitate real-world engineering team projects with female middle school students.

Since the 1980's, ExxonMobil has been engaged in community STEM education efforts - sharing technical expertise with students as well as teachers. In fact, recently ExxonMobil awarded funds particularly dedicated to enhancing teacher preparation and development. Due to this essential funding, the LSU Cain Center will be able to expand teacher professional development to address integration of rigorous Common Core standards to neighborhood schools.

Strategy 3.3: Best Practice Sharing

Work as a collaborative and regional STEM network to scale and expand success, and share information and resources

Tactics:

- a. Host annual local and regional forums to showcase meaningful business engagement in education, teacher effectiveness, and STEM integration into schools and after-school programs.
- b. Disseminate and scale solutions for stimulating STEM achievement and bolstering career exploration by all students, particularly those underrepresented in STEM fields.
- c. Continuously broker new partnerships that lead to both greater STEM enrichment in schools and increased supply of highly qualified teachers and instructors.

GOAL 4: Increased STEM Education Awareness and Workforce Alignment

Recommendations for K-12 and post-secondary educators and administrators, regional economic development organizations, business leaders, advocates, and policymakers

Effective STEM education that supports workforce development requires sustained and broad community understanding and support for education innovation (such as technology integration and project-based learning). It also requires that more students choose STEM fields as a direction for their college and career. This will require a shift in the community's perception of STEM to include all types of careers and all types of individuals.

For education to fuel productivity, regional stakeholders must have a solid understanding of the job skills that employers require, particularly in the emerging job market. It is vital that educators, parents, and community members understand the opportunities created by STEM competencies, and actively engage students in their attainment.

Strategy 4.1: Regional Vision for STEM Education

Articulate a common vision for STEM education that promotes equal access for all and the direct link between STEM skills and regional economic growth

Tactics:

- a. Engage the community in the adoption of a regional vision for STEM education.
- b. Develop an advocacy campaign that incorporates the vision using a variety of media at selected events.
- c. Articulate the benefits of STEM literacy to the broader regional community.

HIGHLIGHTS

Out-of-School-Time STEM

Camps and after-school programs sponsored by engineering colleges at Southern University and LSU offer valuable out-of-school time for STEM enrichment activities. These opportunities expose students to career opportunities in a range of STEM fields from engineering to computer science by integrating mathematics and science in relevant projects and activities. Of particular focus for Southern University is a four-week computer science camp for area high school students. Seeking to impart a broader vision of computer science to students, classes are taught in hands-on, holistic ways that connect computer science to other sciences like physics and real world automation and robotics. Held on campus, the camp also provides an opportunity for first generation students to experience learning in a college setting. The Southern University computer science camp and programs have, until recently, targeted middle and high school students, but are being expanded to include Baker elementary schools.

The LSU College of Engineering's Diversity Program offers several STEM-rich programs that both enhance academic access for underrepresented students as well as increase recruitment and retention of students. Program examples include: Project N'Jneer, which is a one-week summer program that introduces rising fifth through eighth grade students to the various fields of engineering such as aerospace, chemical, civil, and electrical. The Recruitment into Engineering High Ability Multicultural Scholars (REHAMS) is an on-campus residential program that introduces high school students to LSU engineering student leaders, faculty, and engineering professionals participating in hands-on activities, lectures, and industry tours while learning about the different fields of engineering. eXploration Camp for Inspiring Tomorrow's Engineers (XCITE) is a summer residential experience for ninth and tenth grade female high school students. The focus of the program is to introduce the students to the fields of engineering at LSU through hands-on demonstrations, collaborative projects, field trips, and contact with industry professionals.

Strategy 4.2: STEM Education Model

Develop and promote a comprehensive roadmap for STEM education that endorses innovative programs and links high school and postsecondary curricula aligned to labor market requirements

Tactics:

- a. Develop and adopt a STEM education model, based on recognized best practices, to provide a meaningful framework to educators, reasonable expectations to business and industry, and increased understanding of STEM education to parents and community members.
- b. Grow the number of schools, programs, and districts that endorse the STEM education model.
- c. Support the scaling of existing schools, programs, policies, and practices that feature early and sustained career information and student advising aligned with the workforce, and employer engagement.

Strategy 4.3: STEM Business Advocacy

Serve as effective advocates for STEM education efforts

Tactics:

- a. Advocate for statewide policies that support STEM education, such as a statewide definition of STEM occupations and regular STEM occupation projections.
- b. Motivate educators to seize opportunities for STEM education innovation.
- c. Increase the amount of resources and incentives that support effective STEM education.
- d. Promote collaborations among the business community and education sector.
- e. Engage philanthropic/non-profit organizations to share strategy implementation.
- f. Offer educators opportunities to review and understand economic growth targets, industries, and occupations.

HIGHLIGHT

Cutting Edge STEM in Our Own Backyard

The Laser Interferometer Gravitational-Wave Observatory, better known as LIGO, is a scientific collaboration of the California Institute of Technology (Caltech) and the Massachusetts Institute of Technology (MIT) that serves as a national resource for both physics and astrophysics. The observatory, in Livingston Parish, makes science concepts, such as the use of gravitational waves to sense the presence of matter, and groundbreaking physics research much more accessible to the public through the LIGO Science Education Center.

Year-round, the center provides opportunities for public exploration and engagement with over forty professionally-produced hands-on exhibits demonstrating the science of LIGO. The center hosts field trips for students and teacher training programs that allow rare opportunities to explore concepts such as light, gravity, waves, and interference. These first-hand learning opportunities include LIGO's search for gravitational waves, and interactions with internationally-known scientists and engineers in a STEM research facility. LIGO scientists make regular appearances at summer science camps and encourage the public to explore the observatory the third Saturday of each month.

Strategy 4.4: Accountability

Promote accountability of education outcomes for greater economic growth and workforce readiness, particularly as regards high school graduation rates and postsecondary credential / degree attainment

Tactics:

- a. Use labor market data to confirm opportunities, inform programming and policies, redesign curriculum, and track progress.
- b. Use data to determine progress towards closing both achievement and opportunity gaps.
- c. Engage stakeholders in development of an annual scorecard with targets to measure STEM talent development and better align supply with workforce demand.

Implementation

BRAC envisions a “collaborative action” approach to ensure that a cross-sector coordination strategy is used to achieve the region’s goals. This approach calls for an initial leadership process that leads to a common vision and roadmap for STEM which will be supported with continuous strategic advocacy and ongoing conversations among all participants. This approach, combined with established guiding principles for building a STEM education movement, will be the driving force of the strengthened academic pathways and partnerships required to change the current workforce supply/demand dilemma facing the region.

BRAC believes that it is uniquely positioned to play its part through three roles that will help define the effort ahead and leverage the work of all sectors.

1. *Lead: Declare STEM education a key strategy for workforce development and economic growth.*
2. *Advocate: Influence political and other leaders in adopting policies and practices that positively drive STEM talent development.*
3. *Convene: Create opportunities for stakeholders to align and leverage STEM expertise and resources.*

The needed change in STEM education will require a collaborative effort, and all these strategies were developed with that intention. BRAC is optimistic that education and community-based affinity groups will share in the implementation of the strategies contained in this plan. Each group must participate in the implementation, adopting as a goal the strategies most aligned to their mission and vision.

Conclusion

Preparing a STEM-skilled regional workforce requires that the education sector and the business community work in tandem to maintain high standards and a tight exchange of regional workforce data. Several promising efforts are underway at state, regional, and local levels to close high-demand workforce gaps. However, low levels of achievement and educational attainment, a lack of awareness of workforce needs in the education sector, and the lack of a common vision between education leaders and the business community are barriers to success.

Educators are aware of the pending job boom, but according to surveys and interviews, they need help effectively addressing it. Educators need both pedagogical assistance and information, so that they may successfully implement instruction that mimics the workplace, integrate STEM skills in lessons, and convey the competencies necessary for success in STEM careers. Timely STEM-related job definitions, coupled with opportunities for job shadowing, mentoring, internships and professional development from businesses, will tremendously assist teachers in linking academia to the workplace. Teachers especially desire STEM-focused training and a set of quality STEM-focused standards to assist them in increasing student participation and learning.

Businesses, on the other hand, report that the talent pipeline is the number one issue affecting their business growth today. Although the desire to engage in STEM education exists, many businesses leaders do not know where to begin. Most business leaders are willing to provide work experiences, mentoring, guest speaking, classroom resources, and career advice, but in exchange they are calling for common standards for STEM education, direct links to workforce development, and a playbook for creating meaningful engagement programs with their employees.

Parents and guardians also have a key role. In order to properly engage students, it is imperative that stakeholders recognize the role of families in driving children toward areas of study or work. The incredible opportunities brought on by Capital Region economic growth must be communicated to parents, as well as the steps and actions that will position their children to take advantage of the STEM prospects on the horizon.

The role of colleges and universities cannot be overemphasized. Particularly that of the community and technical colleges. A great number of the new STEM jobs coming to the Capital Region will require less than a four-year degree, but more than a high school diploma.

Successful efforts by all stakeholders to expand student enrollment in and completion of STEM degree and certificate programs have the potential to ensure a prosperous future for thousands of Capital Region residents. Increased STEM output from all area colleges and universities will spur innovation, entrepreneurialism, and continued economic growth.

Currently the region is facing both a job-skills gap, an achievement gap among socioeconomic and racial groups, and a lack of STEM interest among all students that threatens the readiness level for full participation in the economic boom. Increasing educational attainment and STEM skills are key to providing access to high-growth, high-wage jobs and play a significant role in accelerating job preparation and economic growth. Through these strategies, the Capital Region can become the place where STEM-skill supply meets STEM-job demand.

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