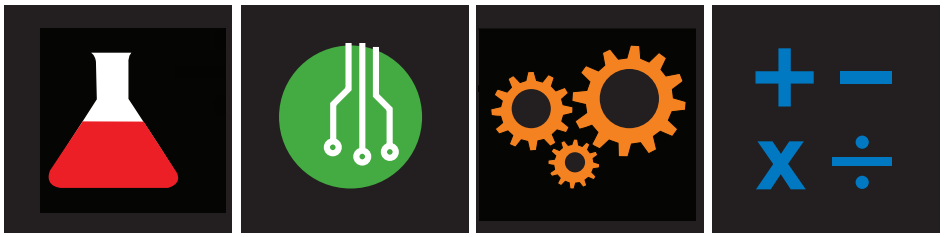
Shaping Tennessee's Future

Workforce Challenges and Opportunities



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Mind2Marketplace

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Mind2Marketplace (M2M) is an organization dedicated to bringing the brightest and best ideas in middle Tennessee to reality. M2M strategically links people and organizations to bring innovation and technology to the marketplace. In addition to working with our partners to produce studies like the 2015 STEM Dynamics Report, M2M also hosts events such as touring of the Nissan Battery Plant where discussions centered around the federal initiative- Investing in Manufacturing Communities Partnership (IMCP); session on Unmanned Aerial Systems held at the Smyrna/ Rutherford County Airport –discussions about drone emergence and its legal, research, development and entrepreneurial considerations; and a review of Entrepreneurial Spaces held at the Rutherford County Chamber of Commerce.

For over 30 years, the Tennessee Small Business Development Center (TSBDC) network, headquartered at Middle Tennessee State University, has been empowering small business owners, entrepreneurs, and individuals with a business idea to innovate new products and services that compete in the global marketplace. The TSBDC provides unbiased business advice to those seeking answers to business related questions, or looking for training courses to improve their workforce. The TSBDC is a network of certified professional business counselors conveniently located with 20 locations statewide.

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Shaping Tennessee's Future:

STEM Workforce Challenges and Opportunities

Executive Summary

The Business and Economic Research Center (BERC), at Middle Tennessee State University, under a partnership with Mind2Marketplace assessed critical challenges and opportunities in the STEM (science, technology, engineering, mathematics) fields across Tennessee. A survey of businesses, mayors, local economic development officials, and school principals suggests that Tennessee faces significant challenges in the STEM workforce supply, pipeline, and infrastructure.

Key Findings:

Employment and Skill Gap

- As of 2013, the size of the STEM workforce in Tennessee is around 324,328.
- The STEM workforce in Tennessee is characterized as an oversupply of a low skilled STEM workforce relative to the U.S. average.
- To catch up with the rest of the U.S. in the relative share of the STEM workforce, 36,000 new STEM jobs are needed in Tennessee.
    - Creating these new jobs and addressing skill issues would generate an economic impact of nearly $4.5 billion.

STEM Workforce Challenges

- Challenges associated with the factors affecting the supply of STEM workforce include:
    - Perceived lack of rigor in Tennessee's K12 education system
    - Lack of knowledge about programs
    - Lack of interest and ability
    - Lack of emphasis on the necessity of difficult subjects

- Challenges associated with the STEM pipeline include:

    - More than 88 percent of community stakeholders indicated that the Tennessee education system does not produce enough quality/competitive individuals.

    - About 78 percent of community stakeholders did not think that students are graduating with the proper skills for STEM-related jobs.
    - About 73 percent of community stakeholders argued that the workforce in Tennessee is not going to meet the demands of advanced technology.
    - Community stakeholders rank math proficiency as the number-one, and connecting education with employment as the number-two critical challenge for Tennessee.

- Challenges associated with the government and infrastructure include:
    - Community stakeholders indicated that the role of government in promoting the STEM workforce should be in the areas of funding, promotion, incentives, and awareness.
    - Among the nearly 50 recommendations, making connections between educational institutions and workforce needs tops the rankings as potential ways to engage business, industry, and other community partners in advancing STEM.
    - About 82 percent of community stakeholders indicated that there is potential for aligning and coordinating STEM resources across the state.

- Challenges to businesses include:
    - Businesses suggested that technology advancement affect their businesses in many ways: efficiency, continuous improvement, new opportunities, and product development, among others.
    - Inability to fill STEM-related jobs creates significant problems for businesses, and their growth will be impacted.
    - Businesses indicated that the shortage of a local STEM workforce will increase their costs through training programs, non-local recruiting, and relocation.
    - Businesses face the following challenges in recruiting a STEM workforce: skilled labor force, financial challenges, location challenges, and STEM awareness.

STEM Workforce Demand and Supply Gap

- Annual average STEM degree production is estimated at around 11,195.
- Annual average demand (new and replacement) for STEM workers is estimated at 18,897.
- According to supply-and-demand estimates as well as replacement numbers, the supply-to-demand ratio is estimated at around 0.59, suggesting that 41 percent of demand will be unmet locally.

Conclusion

Addressing the STEM workforce challenge is critically important for Tennessee for two major reasons:

- Building the capacity for innovation and creativity: A STEM workforce is highly educated relative to all other occupations in an economy. For Tennessee, the advanced manufacturing and healthcare industries have become major drivers of economic growth. To build sustainable economic growth, Tennessee should build the capacity of its workforce.
- Fueling the economy with additional household income: Addressing the low-skill problem and moving Tennessee's STEM concentration to the national level alone would create an economic impact of nearly $4.5 billion and create an additional 16,000 new jobs in the economy.

Chapter 1

Understanding STEM Workforce Dynamics in Tennessee

What is the STEM workforce? What role does it play in an economy? What are its major characteristics? The key to understanding STEM (science, technology, engineering, and math) workforce dynamics lies in the answers to these three basic questions. A review of several studies shows there is no consensus on what the STEM workforce should include.[1]

In terms of the meaning of the STEM workforce, two general definitions emerge:

1. Individuals holding a STEM occupation or
2. Individuals holding a STEM degree.

Although a hybrid approach combining both definitions may provide a better understanding of the STEM workforce, the former is easily quantifiable for research purposes.

Which occupations should be considered STEM occupations? The following options are widely used by individual researchers and agencies:

1. STEM occupations,
2. STEM-related occupations, and
3. (Sometimes) social science occupations.

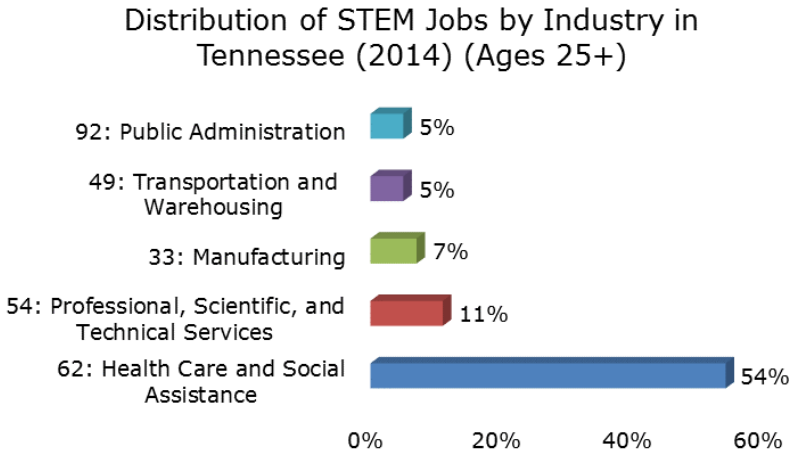
This report uses an occupational definition of the STEM workforce. Consistent with the definition of the U.S. Census Bureau, this approach includes both STEM and STEM-related occupations, including several social science occupations. A total of 98 occupations (63 STEM and 35 STEM-related) are included in the analysis.

Why is the STEM and STEM-related workforce important to an economy?

Since the early 1990s, fast-paced economic transformations within the United States and across the globe have dramatically reduced industry and product life cycles. This in turn has created tremendous challenges and opportunities. For example, Tennessee when it lost its traditional manufacturing base throughout the 1990s and 2000s. Only during the past

[1] See multiple reports and crosswalks developed by the National Science Foundation (www.nsf.gov), U.S. Census Bureau (www.census.gov), and Bureau of Labor Statistics (www.bls.gov).

decade has the state started rebuilding its manufacturing base, not in traditional sectors such as textiles and furniture, but in the advanced manufacturing and automotive sectors. In this transformed manufacturing space, the STEM workforce plays a critical role as a driver of innovation and competitiveness.



Source: Census Bureau

In Tennessee, the main sectors driving the economy are advanced manufacturing; automotive; professional and business services; health care; transportation; and logistics. These are the major industries employing a substantial percentage of the STEM and STEM-related workforce. Because of the state's heavy reliance on these industries for job growth and economic prosperity, it is important to understand STEM workforce dynamics in Tennessee.

What are some characteristics of STEM occupations? One important aspect of the STEM workforce is that individuals holding these occupations are highly educated. The percent of STEM bachelor's degree-holders is twice as many as percent of bachelor's degree holders in all other occupations in Tennessee. This has two implications for the state's economy:

(1) Wages and salaries are closely related to educational attainment levels. The higher the educational attainment level of the workforce, the higher the purchasing power of individuals in the economy.
(2) A highly educated workforce is a major source of innovation and entrepreneurial activity.

However, in terms of STEM workforce characteristics, two issues require further elaboration:

(1) Not all workers in STEM occupations have a bachelor's degree or above. Many "technical" occupations that play a critical role in highly competitive industries require only specific training after high school.
(2) Not all individuals in STEM occupations have STEM degrees. As will be highlighted in the following chapters, the STEM survey indicates that about 65 percent of STEM workers in Tennessee have STEM degrees. The remaining 35 percent have degrees in other fields or no degree beyond high school. This means either companies are facing difficulty hiring employees with the right credentials, or STEM degree holders are not seeking opportunities in their areas of expertise.

Understanding and analyzing the STEM workforce within a state context requires an understanding of supply and demand dynamics and pipeline issues.[2] The Business and Economic Research Center (BERC) invited businesses, mayors, school administrators, and economic development professionals across Tennessee to assess STEM workforce challenges and opportunities in shaping Tennessee's future.

The rest of the report is organized as follows. Chapter 2 looks at STEM workforce indicators from a comparative perspective. Chapters 3-5 address the outlook of community stakeholders on STEM workforce supply, pipeline issues, infrastructure, and government as related to the STEM workforce. Chapter 6 focuses on current demand conditions, future expectations and strategies, and supply-and-demand conditions expected in the next 10 years. Chapter 7 presents selected occupational dynamics. Chapter 8 concludes with an index of STEM concentrations across Tennessee.

[2] The concept of "STEM workforce" will be used throughout the report to include both STEM and STEM-related occupations.

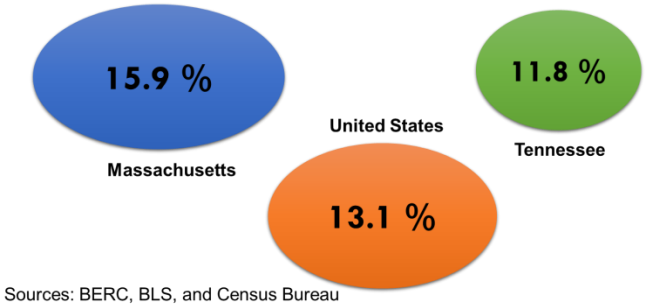
Chapter 2

STEM Workforce by the Numbers

How many STEM and STEM-related jobs does Tennessee have? What are their characteristics? According to BERC estimates using American Community Survey data (2011–2013), Tennessee has 324,328 STEM and STEM-related jobs. What does this number mean for Tennessee? It means that in 2013, nearly 12 percent of all jobs were STEM and STEM-related occupations. The size of Tennessee's STEM workforce is smaller compared with the national average and well behind some of the states such as Massachusetts. In the same year, according to BERC estimates, 13.1 percent of all jobs in the U.S. and 15.9 percent in Massachusetts were in STEM and STEM-related occupations. Increasing Tennessee's STEM workforce to the U.S. average would mean adding 36,000 STEM and STEM-related jobs to the economy.

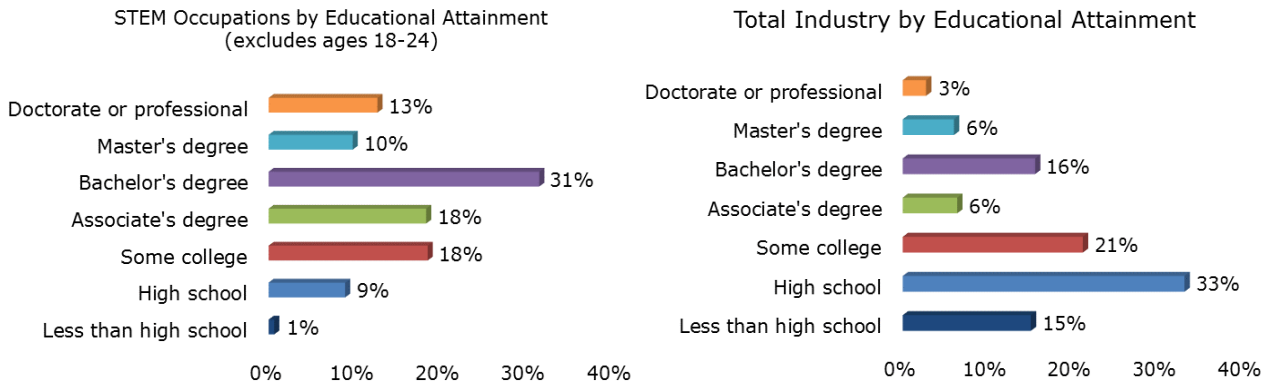
STEM Occupations
124,752 jobs

STEM-Related Occupations
199,576 jobs



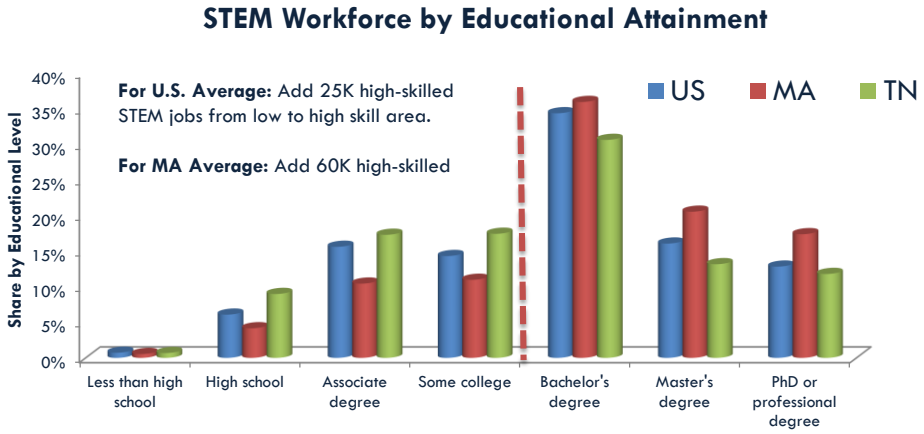
Sources: BERC, BLS, and Census Bureau

What is the educational attainment level of the STEM workforce compared with all industries? Overall, the STEM workforce has a higher educational attainment level than the average in Tennessee. The share of graduate degree-holders in all occupations in Tennessee is nine percent, significantly lower than that of STEM occupations (23%). At the bachelor's degree level, the difference is equally striking: 31 percent of STEM employees have a bachelor's degree, compared with 16 percent of employees in all industries combined. A similar pattern is visible in the category of "some college or associate's degree": 36 percent of STEM employees have either some college or an associate's degree, compared with 27 percent of employees in all industries. The trend continues for the last two categories: 10 percent of STEM employees have only a high school education or less, compared with nearly half (48 percent) of all workers in Tennessee.



Source: Census Bureau

The STEM workforce in Tennessee also can be characterized as having an oversupply of low-skilled workers. In all areas beyond some college, there is a non-trivial gap between Tennessee and the United States or the state of Massachusetts. The gap suggests that to catch up with the U.S. average, Tennessee should shift 25,000 low-skilled jobs to high-skilled jobs either through lifelong learning or replacement of retiring workers. This number increases to 60,000 jobs in order for Tennessee to reach the education attainment level of the STEM workforce in Massachusetts.



Sources: BERC and American Community Survey (ACS) 2012 through IPUMS.org

For example: 22.11 percent of computer-network architects in Tennessee have a bachelor's degree or above, compared to 55.41 percent of individuals in this occupation in the U.S. (a gap of 33.31 percentage points.) For miscellaneous social scientists and related workers, the educational attainment gap is 31 percent.

SOC	Occupations	U.S. Bachelor's & Above	TN Bachelor's and Above	Skill GAP (Percentage Point)
172121	Marine engineers and naval architects	68.69%	34.18%	34.51%
151143	Computer network architects	55.41%	22.11%	33.31%
1930XX	Miscellaneous social scientists and related workers	88.64%	57.64%	31.00%
194031	Chemical technicians	39.53%	17.49%	22.04%
1721XX	Enginers, all other	78.57%	56.75%	21.83%
15113X	Software developers, applications and systems software	84.01%	70.19%	13.82%
1910XX	Life scientists, all other	98.52%	85.72%	12.80%
292050	Health practitioner support technologists and technicians	19.17%	6.56%	12.60%
172110	Industrial engineers, including health and safety	72.90%	60.67%	12.23%
172070	Electrical and electronics engineers	77.82%	65.65%	12.18%
191020	Biological scientists	95.88%	84.14%	11.74%
292071	Medical records and health information technicians	17.55%	6.46%	11.10%

Sources: BERC and American Community Survey (ACS) 2012 through IPUMS.org

Such a large gap across several STEM occupations may affect long-term Tennessee's long-term competitiveness unless new generations make up the difference. Are new generations helping to close the educational attainment gap in STEM occupations in Tennessee? A look at the educational attainment level by age cohort in STEM occupations suggests intergenerational differences are closing the educational attainment gap between Tennessee and the U.S. However, educational attainment gaps by age cohort are larger than for Tennessee as a whole, which suggests that the educational attainment level of the Tennessee STEM workforce may not catch up with the nation in the short run. The next section summarizes further differences between Tennessee and selected states from a comparative perspective.

US				MA				TN			
Age	<College	College+	**GAP**	Age	<College	College+	**GAP**	Age	<College	College+	**GAP**
25-34	33.86%	66.14%	**32.27%**	25-34	20.19%	79.81%	**59.62%**	25-34	41.18%	58.82%	**17.64%**
35-44	35.05%	64.95%	**29.90%**	35-44	23.04%	76.96%	**53.92%**	35-44	43.43%	56.57%	**13.13%**
45-54	38.80%	61.20%	**22.40%**	45-54	27.73%	72.27%	**44.55%**	45-54	44.20%	55.80%	**11.60%**
55-64	40.19%	59.81%	**19.63%**	55-64	35.20%	64.80%	**29.60%**	55-64	29.19%	50.81%	**16.20%**
65-74	36.58%	63.42%	**26.84%**	65-74	29.09%	70.91%	**41.81%**	65-74	45.83%	54.17%	**83.30%**
75-84	34.93%	65.07%	**30.15%**	75-84	30.18%	69.82%	**39.64%**	75-84	53.26%	46.74%	**-6.51%**
85+	34.80%	65.20%	**30.40%**	85+	23.37%	76.63%	**53.27%**	85+	41.22%	58.78%	**17.56%**

Keys:
Age: age cohort
<College: Less than college education
College+: Bachelor's and above
Gap: "College+" minus "<College"
Sources: BERC and American Community Survey (ACS) 2012 through IPUMS.org

How does Tennessee compare with other selected states on STEM-related indicators? To present a balanced perspective, this report includes a set of STEM-related indicators that allow for state-by-state comparison. A total of nine states are compared with each other in the areas of STEM pipeline, higher-education dynamics, workforce, R&D and innovation, high-tech, venture capital, and entrepreneurship.

Pipeline. Among nine states, Tennessee and Mississippi have the lowest expenditure per-student for elementary and secondary public schools spending only $8,117 and $8,104, respectively. Massachusetts and Virginia have the highest with $14,699 and $10,594, respectively. The per-student annual spending gap between Tennessee and Massachusetts is $6,582. Tennessee is one of the states with the lowest percent of public-school students taking Advanced Placement exams (17.8 percent). The gap between Tennessee and Virginia, for example, is 24 percentage points in this category.

Pipeline	Expenditure per student for elementary and secondry public school (2010, $)	Public school students taking Advanced Placement exams (2012, %)	Eighth-Grade math proficiency (2011, %)	Eighth-Grade science proficiency (2011, %)
Tennessee	**$8,117**	**17.8**	24	31
Alabama	$8,907	22.2	**20**	**19**
Georgia	$9,432	39.7	28	30
Kentucky	$8,957	29.8	31	34
Massachusetts	**$14,699**	35.8	**51**	**44**
Mississippi	**$8,104**	**14.0**	**19**	**19**
North Carolina	$8,225	30.1	37	26
Texas	$8,788	34.4	**40**	32
Virginia	**$10,594**	**41.8**	**40**	**40**

National Science Board 2014. Science and Engineering Indicators 2014. Arlington, VA: National Science Foundation (NSB 14-01)

In the areas of math and science proficiency in eighth grade, results are mixed: While Tennessee has one of the lowest scores in math proficiency, its standing in science among nine states is average. The math proficiency gap between Tennessee and Massachusetts is 27 percentage points. *The data suggest that students in Tennessee are not succeeding in rigorous math education and Advanced Placement tests.*

Higher education. All higher-education indicators reported here suggest both challenges and opportunities for Tennessee. The main challenge will be to increase the number of graduates holding science and engineering degrees and the overall number of people with a postsecondary education. For example, the gap between Tennessee and Massachusetts in those holding a postsecondary degree is 19.2 percentage points. On a per-capita basis, Tennessee has fewer individuals with a bachelor's degree in science and engineering compared with Alabama, North Carolina, Virginia, and Massachusetts.

Higher Education (Connectors)	Bachelor's degrees in science and engineering conferred per 1,000 individuals 18-24 years old (2011)	Science and engineering degrees as a percentage of higher education degrees conferred (2011, %)	Average undergraduate charge as percent of disposable personal income (2011, %)	State expenditures on student aid per full-time undergraduate student (2011, %)	Postsecondary degree-holders among individuals 25-44 years old (2011, %)
Tennessee	$13.6	23.6	40.5	**$1,836**	34.3
Alabama	$15.4	25.0	**45.3**	**$109**	33.6
Georgia	$13.4	27.0	43.2	**$2,383**	27.7
Kentucky	$12.6	**23.0**	**48.8**	$1,323	**33.2**
Massachusetts	**$29.2**	**32.1**	41.7	$328	**53.5**
Mississippi	**$10.3**	**23.3**	40.8	**$295**	**31.8**
North Carolina	$17.3	31.4	**39.6**	$1,456	39.8
Texas	**$11.6**	27.7	**39.8**	$1,098	34.6
Virginia	**$21.6**	**32.8**	44.6	$661	**47.4**

National Science Board 2014. Science and Engineering Indicators 2014. Arlington, VA: National Science Foundation (NSB 14-01)

College education is a lot more affordable in Tennessee than in the other eight states compared here. The lottery scholarship is making it even more affordable. It is important to mention Tennessee's recent Drive to 55 effort to increase its postsecondary participation rate. It is too early to assess the effort's impact; however, it is likely that this policy may change the higher-education dynamics over the next four to five years.

Workforce (marketplace). Tennessee has an oversupply of low-skilled STEM workers. Tennessee has the third-lowest percentage of science and engineering occupations among all occupations compared with eight other states. Tennessee is performing better than Kentucky and Mississippi but lagging far behind North Carolina and Texas. In the four other categories, Tennessee is either one of the worst performers or has the lowest-third score among nine states.

Workforce	Individuals in science and engineering occupations as a percentage of all occupations (2012, %)	Engineers as a percentage of all occupations (2012, %)	Computer specialists as a percentage of all occupations (2012, %)	Technical workers as a percentage of all occupations (2012, %)	Life and physical scientists as a percentage of all occupations (2012, %)
Tennessee	3.00	0.99	**1.56**	1.13	**0.32**
Alabama	3.99	**1.60**	2.04	1.3	0.35
Georgia	3.90	**0.95**	2.65	1.28	**0.29**
Kentucky	**2.94**	0.83	1.55	0.98	**0.32**
Massachusetts	**7.16**	**1.64**	**4.17**	**1.98**	N/A
Mississippi	**2.19**	N/A	0.88	0.98	0.44
North Carolina	4.33	**0.95**	2.58	1.31	**0.60**
Texas	4.67	1.44	2.7	1.55	**0.45**
Virginia	**7.63**	1.50	**5.35**	**1.70**	0.43

National Science Board 2014. Science and Engineering Indicators 2014. Arlington, VA: National Science Foundation (NSB 14-01)

R&D and Innovation. Is Tennessee on par with other states in terms of research and development (R&D) spending and creativity? A review of four major indicators implies state agencies and businesses are not spending enough relative to eight other states. In patents per capita, Tennessee is as competitive as other reference states. Tennessee and Massachusetts still see a difference of 13.40 patents per capita in science and engineering occupations.

R&D and Innovation

	R&d as a percentage of gross domestic product (2010, %)	Business-performed R&D as a percentage of private-industry output (2011, &)	State agency R&D expenditures per employed worker (2011, $)	Patents awarded per 1,000 individuals in science and engineering occupations (2012)
Tennessee	1.56	**0.62**	**1.28**	11.6
Alabama	2.16	1.27	**9.88**	**5.7**
Georgia	1.36	1.07	2.72	14.3
Kentucky	**0.93**	0.91	**10.9**	10.5
Massachusetts	**5.36**	**4.46**	**1.52**	**25.0**
Mississippi	**0.89**	**0.30**	6.2	**5.9**
North Carolina	2.05	**1.66**	7.08	**17.7**
Texas	1.59	1.30	4.12	16.9
Virginia	**2.38**	1.57	4.39	6.20

National Science Board 2014. Science and Engineering Indicators 2014. Arlington, VA: National Science Foundation (NSB 14-01)

High-tech, entrepreneurship, and venture capital. Tennessee has experienced significant growth over recent years in high-technology sectors. However, (1) the growth is uneven across Tennessee, and (2) the economic impact has yet to show up in the trend data. Both establishment and employment shares of high-tech industries in the overall economy show relatively low performance for Tennessee compared with eight other states. Likewise, in venture capital amounts and deals, there is still room to grow.

High Tech, Entrepreneurship and Venture Capital

	High-Technology establishments as a percentage of all business and establishments (2010 %)	Employment in high-technology establishments as a percentage of total employment (2010, %)	Venture capital disbursed per $1,000 of gross domestic product (2012, %)	Venture capital deals as a percentage of high-technology business establishments (2010, %)	Venture captial disbursed per venture capital deal (2012, $millions)
Tennessee	6.63	9.66	0.31	0.21	**2.72**
Alabama	6.85	10.52	**0.13**	**0.03**	3.83
Georgia	9.88	13.49	0.6	**0.29**	4.94
Kentucky	**6.52**	**8.44**	**0.14**	0.24	3.43
Massachusetts	**10.12**	**15.11**	**7.74**	**2.05**	**7.46**
Mississippi	**5.91**	**7.20**	**0.1**	**0.00**	**2.50**
North Carolina	8.25	10.76	0.43	0.32	**5.32**
Texas	9.63	13.36	0.67	0.28	5.84
Virginia	**12.25**	**17.67**	**0.83**	0.22	4.59

National Science Board 2014. Science and Engineering Indicators 2014. Arlington, VA: National Science Foundation (NSB 14-01)

Key takeaways. Tennessee has several major challenges related to its STEM workforce. Some of these major challenges, as data suggests, include:

(1) addressing gaps and issues in the K12 system;

(2) increasing degree production and encouraging lifelong learning through continuing education to eliminate skill gaps in the market;

(3) hiring the right person for STEM jobs, which will pull some STEM degree-holders from other occupations into STEM occupations; and

(4) addressing critical gaps in R&D spending.

If addressed carefully, these challenges may turn into opportunities for Tennessee to increase its competitive. For example, aligning the educational attainment level of the STEM workforce in Tennessee with the United States produces two major benefits to Tennessee:

- This alignment increases the capabilities of the STEM workforce, which is key to sustainable competitive advantage.
- Addressing the skill gap and training additional individuals will generate an additional $2.328 billion in household income in wages and salaries. This will further impact the economy through multipliers, creating an additional $2.102 billion in economic activity and 16,100 new jobs. In summary, addressing these gaps will contribute $4.432 billion to the state economy and create 16,100 new jobs.

Chapter 3

Business Perceptions of STEM Dynamics in Tennessee

Who are the critical players in the STEM workforce debate? The key players are businesses, mayors, local economic development officials, and school administrators. Their insights into the opportunities and challenges of the STEM workforce have important policy implications for future economic directions in Tennessee.

To get these stakeholders' feedback, BERC designed and administered a comprehensive STEM survey in 2014. Online and mail-in surveys resulted in 210 responses across Tennessee, 65 percent directly from businesses. All nine regions of Tennessee responded, although northern middle Tennessee (27 percent), east Tennessee (17 percent), southeast Tennessee (12 percent), and southern middle Tennessee (12 percent) were represented more than other regions. In terms of industry affiliation, 45 percent of responses were from professional and business services and 33 percent from health care. The remaining 22 percent were from government, advanced manufacturing, automotive, transportation and logistics, energy technologies, and the chemical products and plastics sectors.

Some of the major characteristics of respondents:

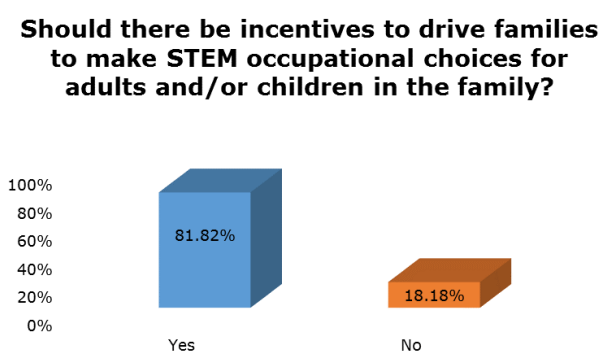
- Average employment of companies reported was 142 staff.
- Of these companies' employment, an average of 26 percent of jobs were STEM or STEM-related.
- Average spending for R&D activities of respondents was $81,000.
- An average of 19 percent of respondents indicate they participated in innovative activities such as research and development or the commercialization of patents.
- Total STEM-related R&D expenditures were nearly $10 million.
- Approximately 16 percent of respondents participated in the import and export of goods and services.

This section primarily focuses on three major areas: STEM supply, STEM pipeline, and infrastructure and government.

STEM Supply

What factors affect STEM supply? What roles do families play in increasing the number of people interested in STEM fields? How about educators? What are the major challenges affecting the supply of STEM workers? Answers to these questions are organized by addressing the role of families and educators, as well as other factors affecting the STEM workforce supply. A detailed review of associated challenges follows.

What roles should families play? Should parents be given incentives to make STEM occupational choices for adults or children in the family? Nearly 82 percent of respondents said yes to this question.

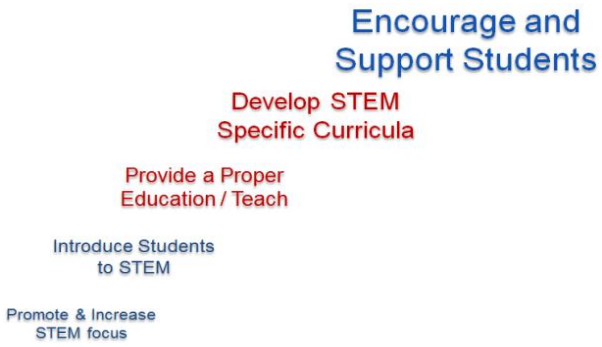


What specific role should parents play? BERC received over 100 comments from community leaders. They are listed in order of importance below (see appendix for details). Many respondents suggested parents should encourage children to steer toward STEM careers and studies in the STEM curricula. A review of comments suggests many forms of encouragement highlighted by community, including encouraging children (1) to be curious about STEM fields, (2) to excel academically, and (3) to explore STEM career paths.

The second highly discussed keyword is educate. Under this sub-topic, parents were given an important role in educating children about STEM career opportunities. This includes actively educating both themselves and their children about opportunities.

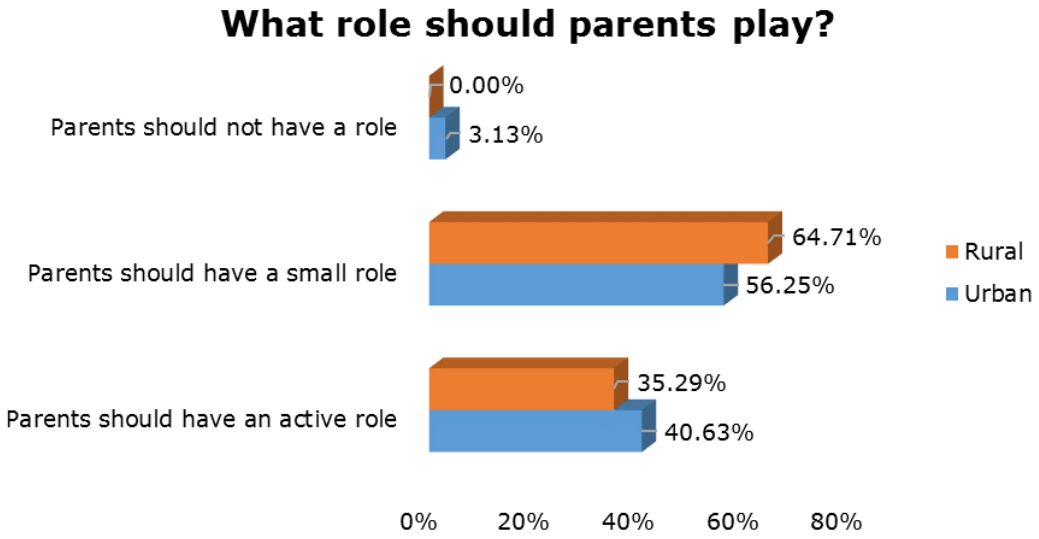
What kind of active roles can parents play? The comments varied widely from an advocacy role in promoting STEM occupations and curricula in the

community and schools to carefully directing, mentoring, and partnering with students as positive role models.



The fourth discussion topic centers around allowing children to explore their own interests. This is somewhat similar to the encouragement discussed above.

The fifth discussion is related to promoting STEM jobs and related career opportunities to children.

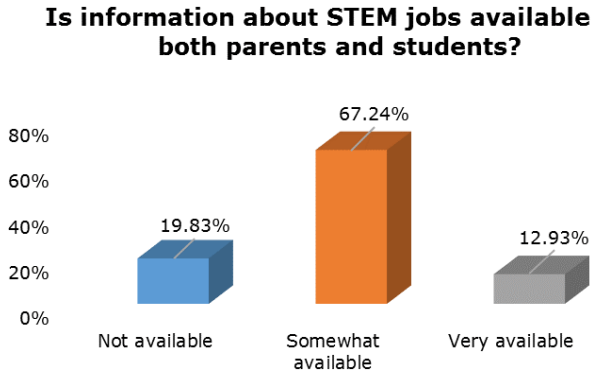


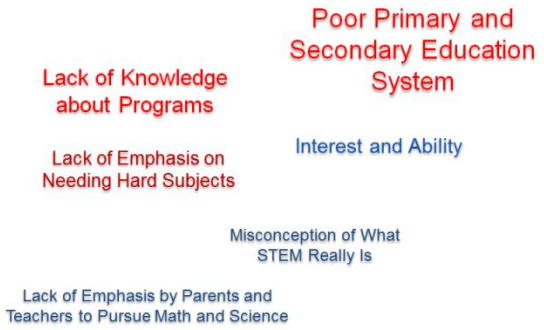
Reducing the 100 comments to three major categories in terms of what parents should do with regard to STEM occupations and careers, the following rural/urban differences emerge. Overall, 41 percent of respondents from urban areas assign an active role to parents in directing their students, compared with 35 percent of respondents from rural areas. Regions considered urban include the greater Memphis area, northern middle Tennessee, east Tennessee, and southeast Tennessee. The other five regions are reclassified as rural.

What roles should educators play? BERC received more than 100 comments on the role educators should play in addressing STEM workforce supply issues. The top five discussions center around encouraging and supporting students, developing STEM-specific curricula, providing a proper education, introducing students to STEM, and increasing STEM focus. The

rural/urban difference with regard to the role of educators in the supply of STEM workers is significant, with 50 percent of respondents from urban areas assigning educators a large role in the supply of STEM workers. Is the educational system encouraging students to pursue a STEM degree? Only seven percent of respondents indicated there is strong encouragement. One in five respondents sees no encouragement at all, while 70 percent see some encouragement. How much of an emphasis is put on educators to teach STEM skills? Only 20 percent see strong emphasis, while 35 percent indicate either weak or very weak emphasis on educators to teach STEM skills.

Information about STEM jobs. Do we have knowledge about STEM occupations? According to respondents, information about STEM jobs is not readily available to parents and students. Only 13 percent argued otherwise.

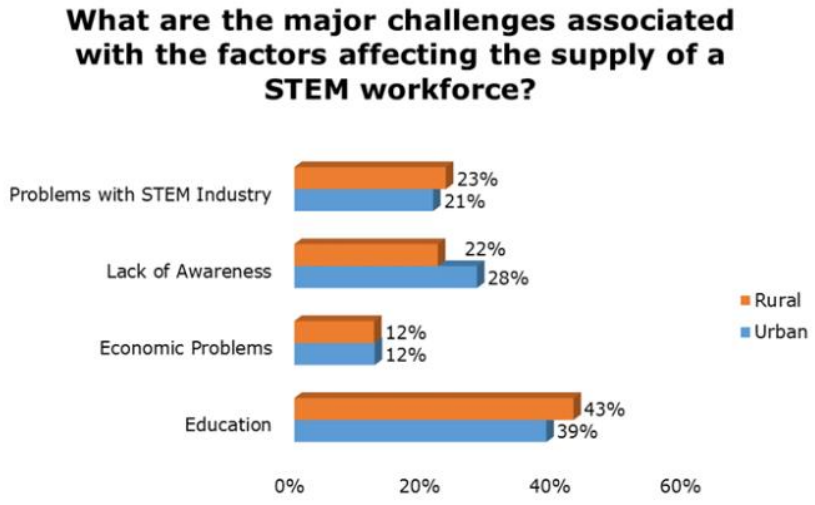




Major challenges associated with the supply of STEM workforce. The final question regarding the supply of STEM workforce was about the challenges Tennessee faces. Survey respondents generously contributed to this section with more than 200 comments. Of these comments, the following six stand out: poor primary and secondary education systems; lack of knowledge about programs; lack of interest and ability; lack of emphasis on the necessity of difficult subjects; misconception of what STEM is; and lack of parents' and teachers' emphasis on pursuit of math and science.

Is there a rural/urban difference on this issue? BERC identified four major themes from the comments. Community stakeholders from both urban and rural regions identified the education system as a primary challenge in the supply of STEM workers. This problem is more of an issue in the rural regions. The second reason Tennessee has challenges in STEM workforce supply is lack of awareness. Urban regions consider this a reason more often

than rural areas. The third critical issue is related to problems with the STEM industry itself. According to community stakeholders, the primary reason for STEM workforce supply challenges is the lack of coordination between industry and educators. Furthermore, because of the movement of high-tech jobs overseas, there is a lack of opportunities in many areas.



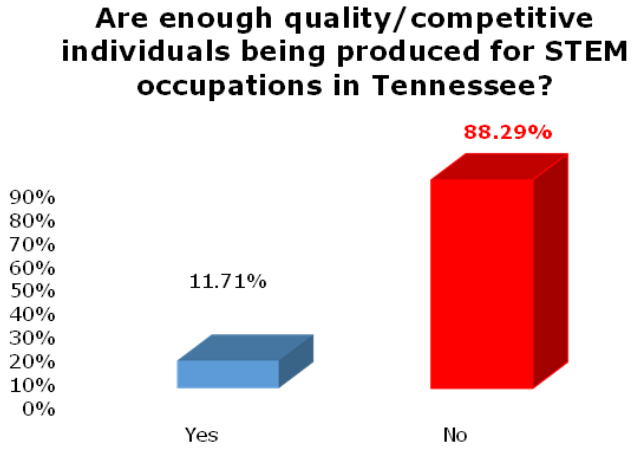
"Tennessee's economic future requires a workforce capable of meeting the expectations of employers. Those expectations include more employees with skills in science, technology, engineering, and math (STEM) in order to be competitive in the global economy. The research conducted by Dr. Murat Arik, professor and director of Middle Tennessee State University's Business and Economic Research Center, points to the need for STEM-related skills required by employers. The demand for these skills will grow exponentially in the years to come. Therefore, it becomes imperative that we all work together to assure more of our workers are STEM skilled."

—Patrick Geho, Mind2Marketplace board member and state executive director of the Tennessee Small Business Development Center at Middle Tennessee State University

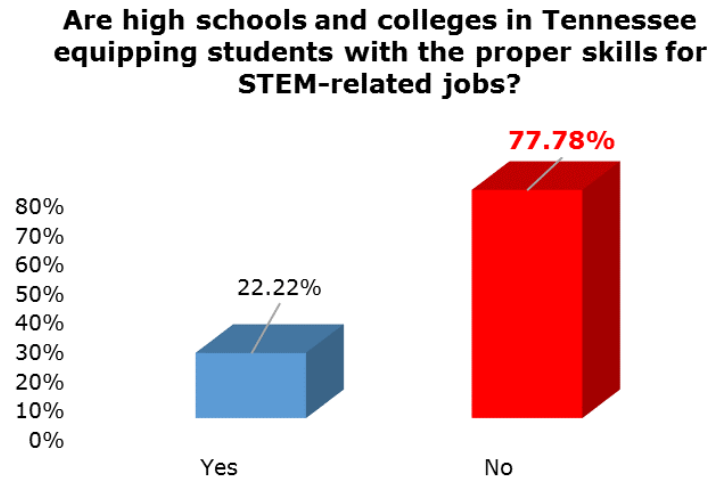
Chapter 4

STEM Pipeline and Challenges

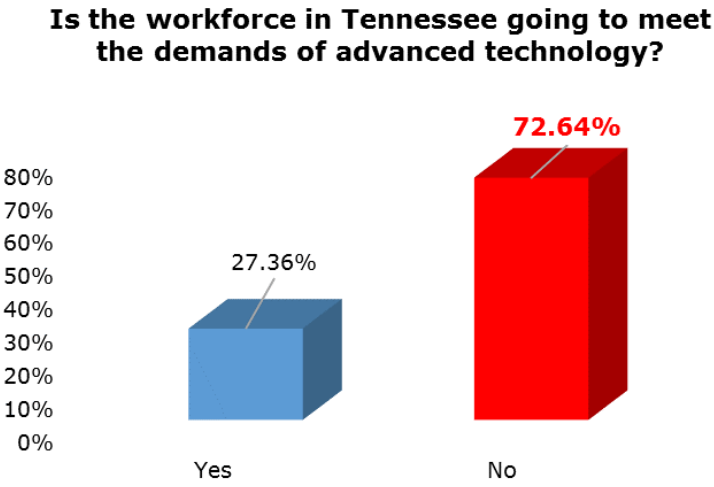
This chapter focuses on the supply side of STEM workforce challenges. It primarily looks at whether the educational system produces the necessary number and quality of graduates to meet the demand in the market. Are enough quality/competitive individuals produced for STEM occupations in Tennessee? An overwhelming percent of community stakeholders (nearly 90 percent) indicated that the Tennessee education system does not produce enough quality/competitive individuals. Only 12 percent suggested otherwise.



Are high schools and colleges in Tennessee equipping students with the proper skills for STEM-related jobs? This is a more targeted question assessing the performance of high schools and colleges in Tennessee. The answer is similar to that of the previous question: nearly 78 percent of community stakeholders said no. About 22 percent of respondents indicated the school system is producing enough high-quality graduates in Tennessee.



Is the workforce in Tennessee going to meet the demands of advanced technology? This question goes to the heart of efforts in Tennessee to promote the advanced manufacturing and healthcare information technology sectors. Does Tennessee have the necessary infrastructure to produce a skilled workforce to meet the technology challenge? Three out of four community stakeholders think the Tennessee workforce is not ready to meet advanced technology demands.



How many employees in STEM occupations have STEM degrees? In previous chapters this report discussed the implications of degree mismatch in STEM occupations and the oversupply of low-skilled STEM workers in Tennessee. The survey included a question regarding the degrees of current STEM

employees. According to survey results, about 65 percent of STEM workers have a STEM degree.

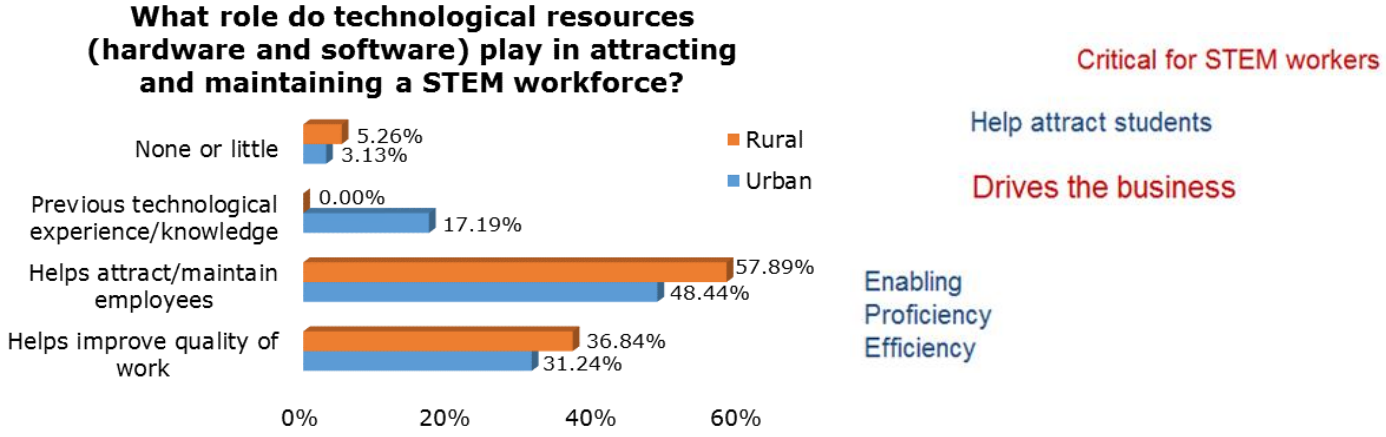
STEM pipeline–related challenges. What challenges are related to the STEM pipeline? Why should we care? Chapter 2 presented a host of indicators regarding the STEM pipeline in Tennessee. The STEM pipeline faces a series of challenges including math proficiency. Community stakeholders see other, similar challenges. There is the issue of getting students interested in STEM fields. The second critical challenge is transition—the lack of connection between education and employment. The lack of communication between business and higher education is closely associated with this transition challenge, which affects the STEM pipeline and, in turn, Tennessee's sustainable economic competitiveness. Other critical challenges include the lack of funding for STEM training, lack of cultural awareness, demand exceeding the supply, and the subsequent adjustment problem, lack of available information about existing STEM programs, and lack of knowledge and skill among workers, trainers, and educators.

How do some of these challenges appear across the rural/urban divide? For the sake of simplicity, we collapsed all comments into four major categories across the rural/urban divide: market problems, education problems, lack of knowledge/interest, and community problems. The largest rural/urban divide is in the area of lack of knowledge/interest, with nearly a 15 percentage-point difference. Urban respondents are more likely to suggest that lack of student interest in STEM fields is a major issue. The second category is market problems which is more pronounced in rural areas. Finally, the quality of the educational system is a challenge prevalent in both rural and urban segments.

Chapter 5

Infrastructure and Government Challenges

What role do infrastructure and government play in addressing challenges facing the STEM workforce in Tennessee? The survey included several open-ended questions on resources, incentives, programs, funding, partnerships, and overall challenges. What role do technological resources (hardware and software) play in attracting and maintaining a STEM workforce? Not surprisingly, answers to this question centered on the following: these resources (1) are critical for STEM workers, (2) help attract students to STEM fields, (3) virtually drive business competitiveness and profitability, and (4) improve proficiency and efficiency among both businesses and individuals.



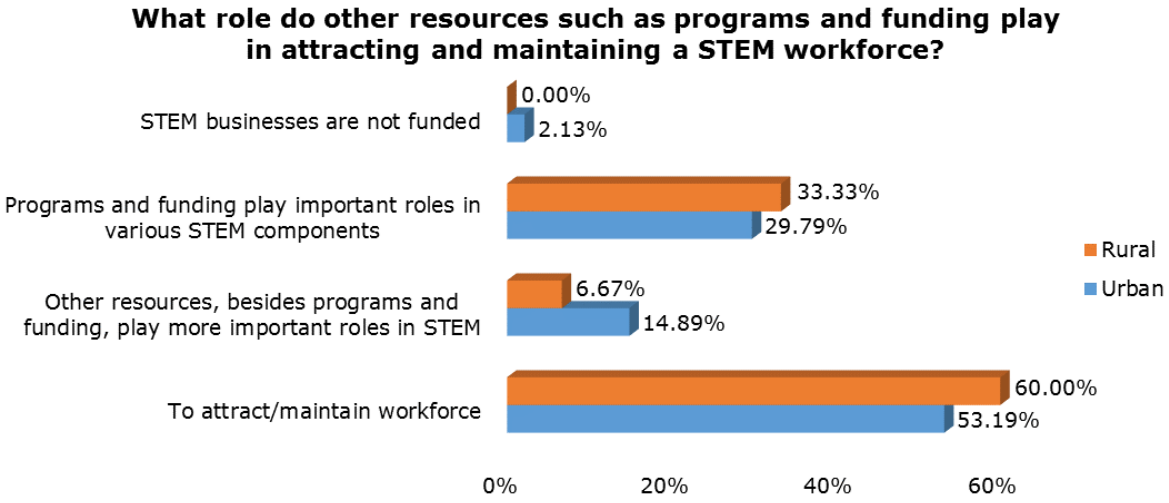
There is no doubt about the role technological resources play in attracting professionals to rural areas. Similarly, in rural areas, such resources improve STEM workers' quality of life. What is strikingly different between rural and urban areas is the role of STEM workforce experience and knowledge. Previous technology experience trumps up-to-date technology and resources in importance for maintaining a STEM workforce in urban areas.

What role do other resources such as programs and funding play in attracting and maintaining a STEM workforce? In response to this question, 31 percent of comments indicated that funding and programming are critical for maintaining a STEM workforce, 11 percent highlighted the importance of these resources in attracting and retaining students, and 10 percent

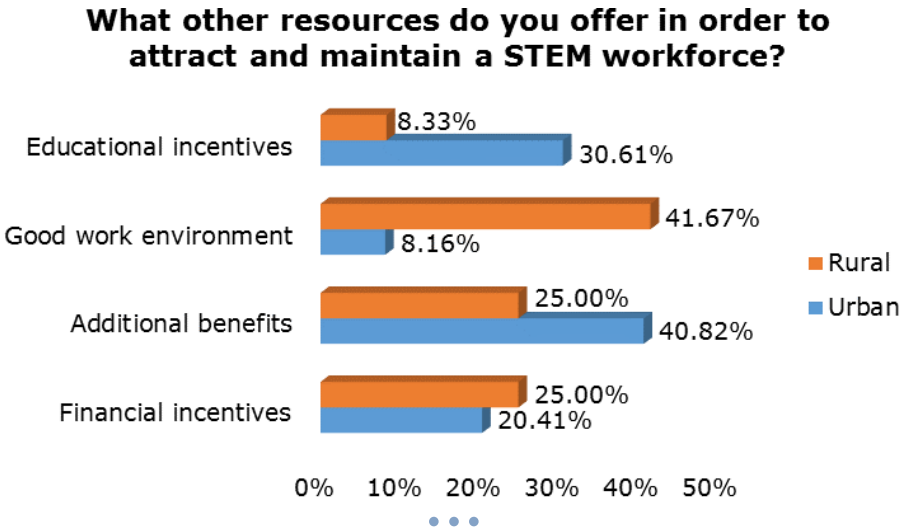
mentioned the role of these programs in ensuring a steady supply of skilled workers.

Why are these programs so critical for a STEM workforce? Respondents explained that these programs and funding:

- provide early exposure to STEM,
- build the STEM workforce,
- make education more affordable,
- enable potential STEM candidates, and
- encourage STEM engagement.



Does the impact of these programs and funding sources differ across the urban/rural divide? In rural regions, such programs and funding sources are particularly important in attracting and retaining a STEM workforce.

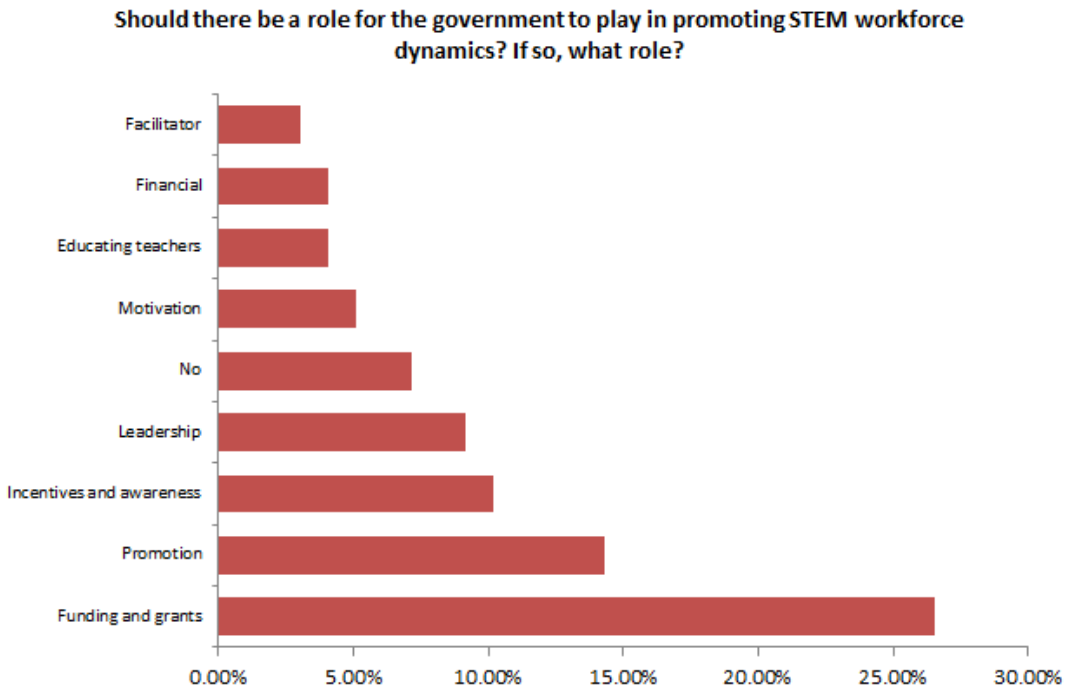


What resources do companies offer in order to attract and maintain a STEM workforce? Companies offer many resources and incentives to attract and maintain a STEM workforce, including (1) platform for success including continuing education, (2) good wages and salaries, (3) flexible work schedule, (4) promotion, (5) tuition assistance, and (6) workshops.

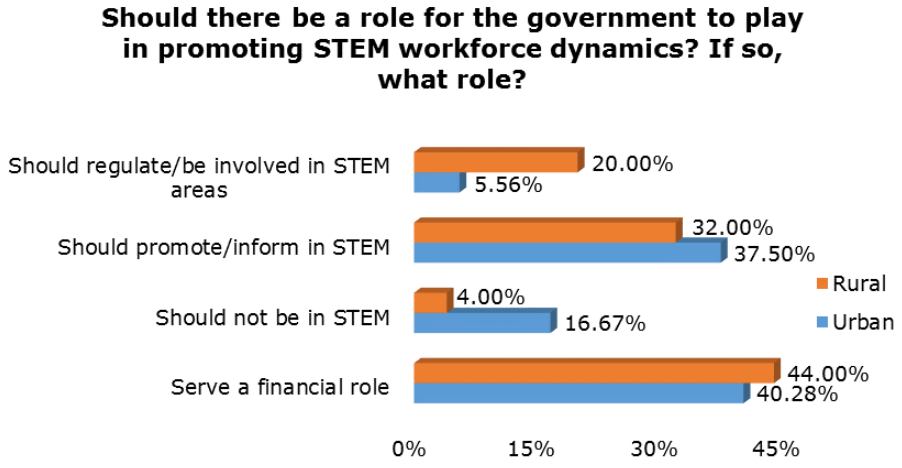
Is there a rural/urban difference in what companies offer to attract and retain a STEM workforce? Yes. The critical rural/urban difference is that in rural areas, companies overwhelmingly offer a good work environment and financial incentives. In the urban environment, the incentive structure is different: companies primarily offer educational incentives and additional benefits.

What do you think about the technology infrastructure? Nearly 65 percent of respondents rated Tennessee's technologically trained work environment as average. Only 16 percent suggested it is weak or very weak. Nearly 20 percent rate it as strong or very strong.

Role of government. What role should government play in promoting STEM workforce dynamics? This question received somewhat mixed responses from stakeholders. Nearly one-third of the comments assigned a funding and grant agency role to the government. Nearly 10 percent indicated government should have no role in the STEM workforce area. Other major roles of government in promoting STEM workforce dynamics cited were providing leadership, providing incentives, and promoting awareness.



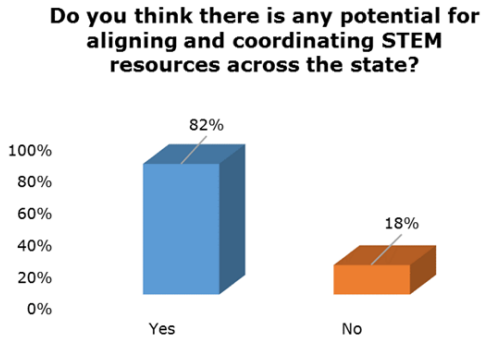
The desired role of government varies greatly across the urban/rural divide. For example, about 20 percent of comments from rural areas suggest government should regulate or be involved in the STEM workforce area. Relatively few comments from urban areas suggested similar government roles. Comments from urban areas expressed the opposite of rural responses: 17 percent do not recognize a role for government in STEM workforce areas. The major emphasis of businesses in urban regions believe government should create awareness about STEM dynamics and be a source of information.



What are potential ways to engage business, industry, and other community partners in advancing STEM? All respondents believe in engaging different stakeholders in advancing STEM. Out of 50 recommendations, the following rank highest in order of importance: making connections between educational institutions and workforce needs, visibility, mentorships, business-education partnerships, career connections, incentives for collaboration, industry presence in schools, regional skill panels, and STEM tax incentives.

Responses	Total	Percent
Making connections between educational institutions and workforce needs	7	14.29%
Visibility	6	12.24%
Mentorships	3	6.12%
Business-education partnerships	2	4.08%
Career connections	2	4.08%
Incentives for collaboration	2	4.08%
Industry presence in schools	2	4.08%
Regional skill panels	2	4.08%
STEM tax incentives	2	4.08%

Do you think there is potential for aligning and coordinating STEM resources across the state? About 82 percent of respondents indicated there is potential for coordination of STEM resources across the state.



Responses	Frequency	Percent
Government itself	9	11.25%
Funding	6	7.50%
Lack of awareness	4	5.00%
Budget cuts	3	3.75%
Lack of buy-in by educators and politicians	3	3.75%
Personal agenda and greed	3	3.75%
Qualified faculty	3	3.75%
Accountability in schools	2	2.50%
Fragmented efforts	2	2.50%
Lack of vision	2	2.50%
Limited government role	2	2.50%
Waste of money on non-productive areas	2	2.50%

What major challenges are associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics? This question received about 80 different comments, each highlighting a particular aspect of government, STEM industries, financial resources, and educational systems. The comments were often critical of the role of government in advancing

STEM dynamics. For example, many comments highlighted the lack of clear governmental vision and leadership in STEM areas.

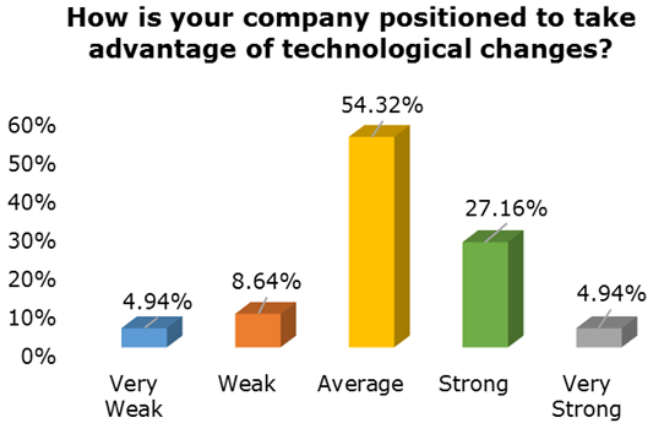
> *"As we work together to build a prosperous future in Tennessee, we know that innovation is crucial for our long-term economic success. The work of Dr. Arik and his team helps us frame both opportunities and challenges statewide as we seek to grow the science, technology, engineering, and math economy so crucial to nurturing innovation. The facts and opinions documented in the report offer encouragement and motivation to continue this important work."*
>
> —Charles E. Shoopman Jr., Mind2Marketplace board member and assistant vice president of the University of Tennessee Institute for Public Service

Chapter 6

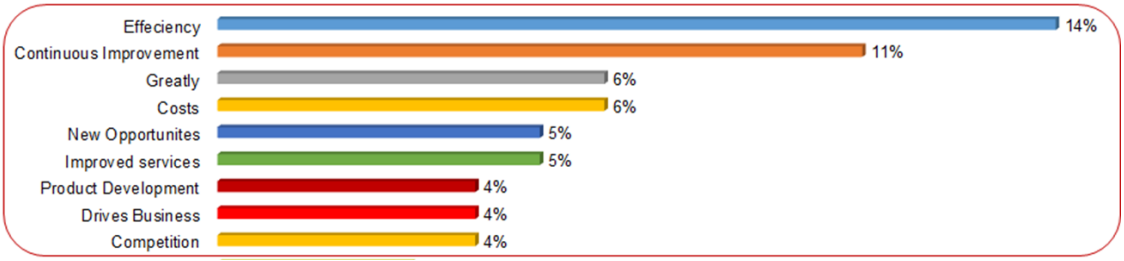
Challenges to Businesses, Future Expectations, and STEM Supply and Demand

Challenges to Businesses

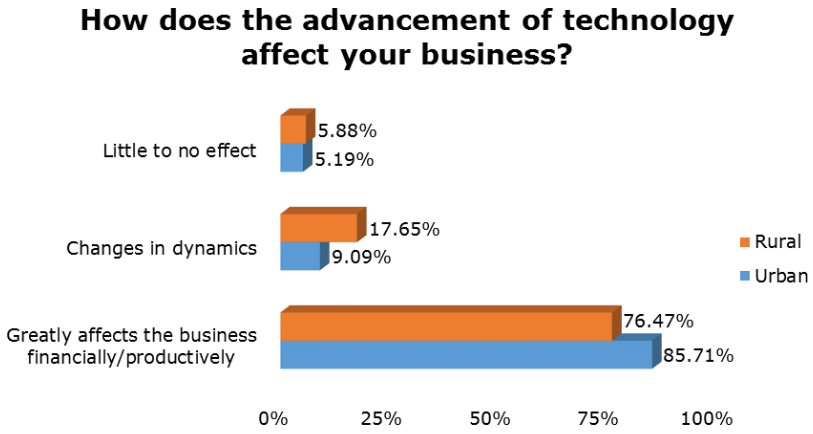
Are businesses in Tennessee positioned to take advantage of technological changes? The STEM survey fielded several questions about businesses associated with STEM-related issues. Many businesses (about 54 percent) rate themselves as average in taking advantage of technological changes. Nearly 15 percent rate themselves as weak or very weak. Combined, more than two in every three companies are not strongly positioned to take advantage of technological changes.



How does the advancement of technology affect your business? Community stakeholders indicated efficiency was most affected by the advancement of technology. Continuous improvement was also cited as a significant effect, followed by lower costs, new opportunities, improved services, and product development.

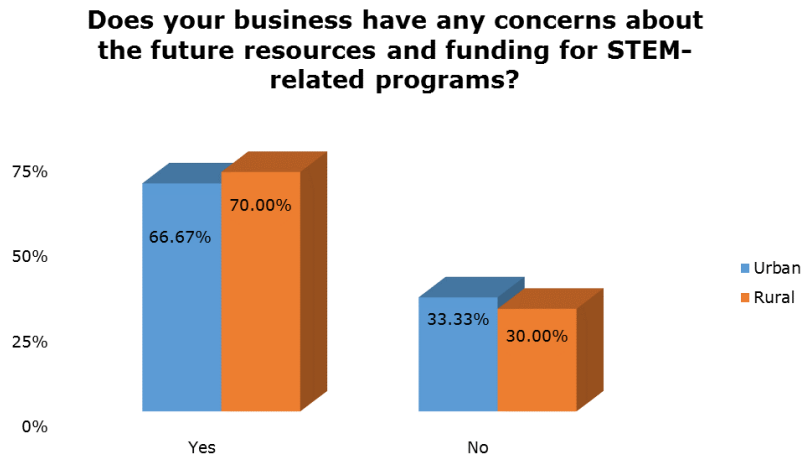


Both urban and rural respondents agree that the advancement of technology greatly affects their business either financially or in terms of productivity. More rural than urban respondents indicated technology would change the dynamics of their business. A small percentage of both urban and rural respondents argued technology would have little to no effect on their business.

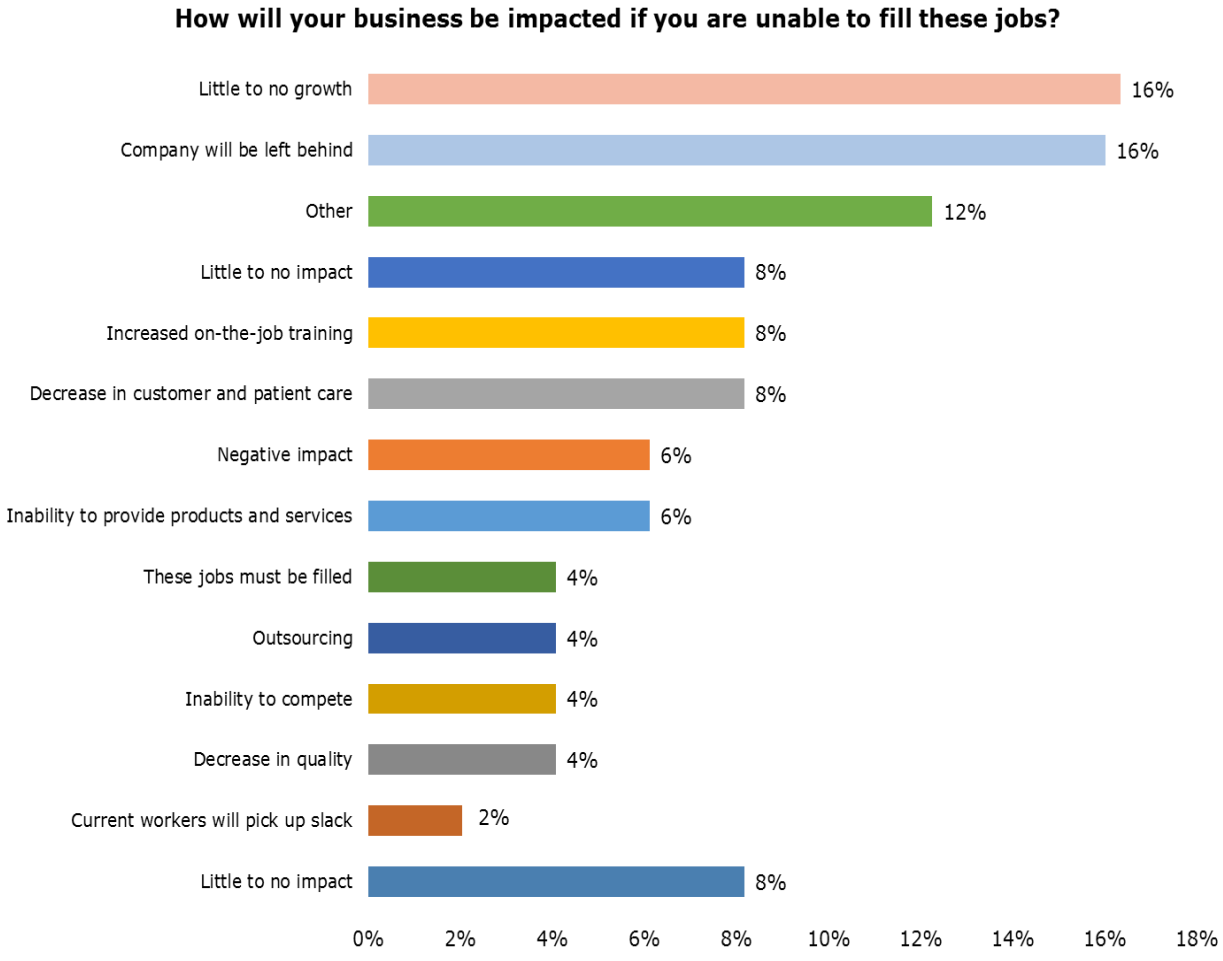


Does your business have any concerns about future resources and funding for STEM-related programs? Community stakeholders responded that they had several concerns about future resources and funding for STEM-related programs. Eighteen percent indicated funding was a concern, while 15 percent were concerned about the absence of a properly trained workforce. Eight percent cited the lack of cost-effective infrastructure, and five percent were concerned about keeping up with technological advancements. The negative outlook for STEM workforce dynamics and increasing tuition costs were both mentioned by three percent of respondents as possible concerns for the future. On the other hand, 30 percent of respondents said they had no concerns about future resources and funding for STEM-related programs.

Looking at this issue in a regional context reveals no significant difference in the perceptions of urban and rural respondents. Though more rural than urban respondents indicated future concerns and more urban than rural respondents had no future concerns, differences were not significant.

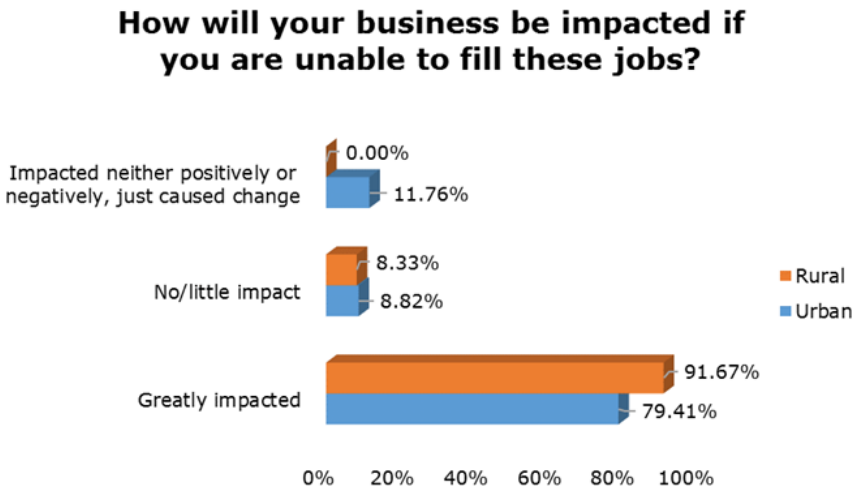


Survey respondents indicated they expect to see about a three-percent growth in STEM-related jobs at their companies over the next six to ten years.

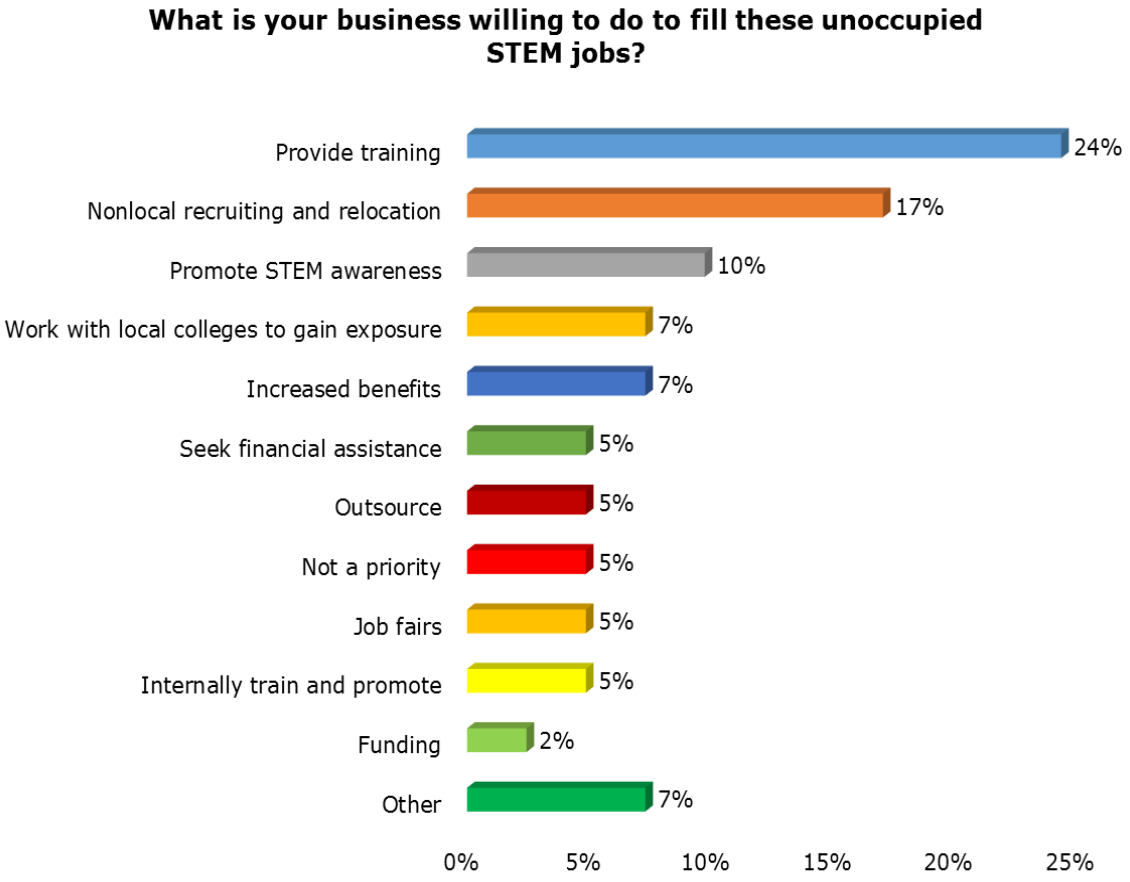


What happens if these businesses cannot fill these STEM-related positions? Top answers to this question include "little to no growth," "company will be left behind," "little to no impact," "increase in job training," and "decrease in customer and patient care." Other less frequent comments are similar.

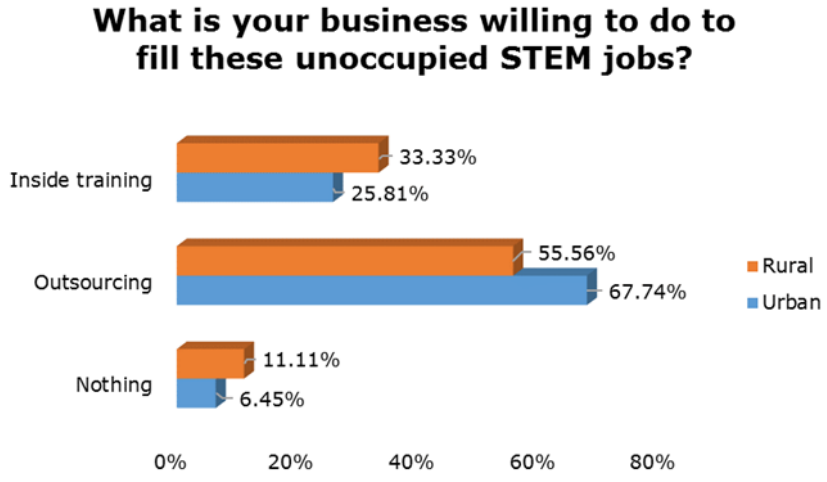
What is the rural/urban difference on this question? Nearly 92 percent of rural businesses and 80 percent of urban businesses indicated their businesses will be greatly impacted if these STEM positions go unfilled—a nearly 12 percentage-point difference.



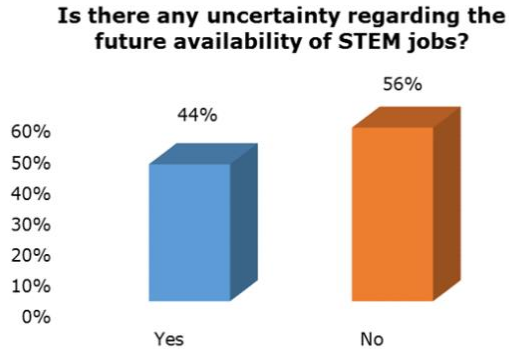
A subsequent question on the subject was "What is your business willing to do to fill these unoccupied positions?" The top five answers include "provide training," "non-local recruiting and relocation," "promote STEM awareness," "work with local colleges to gain exposure," and "increased benefits."



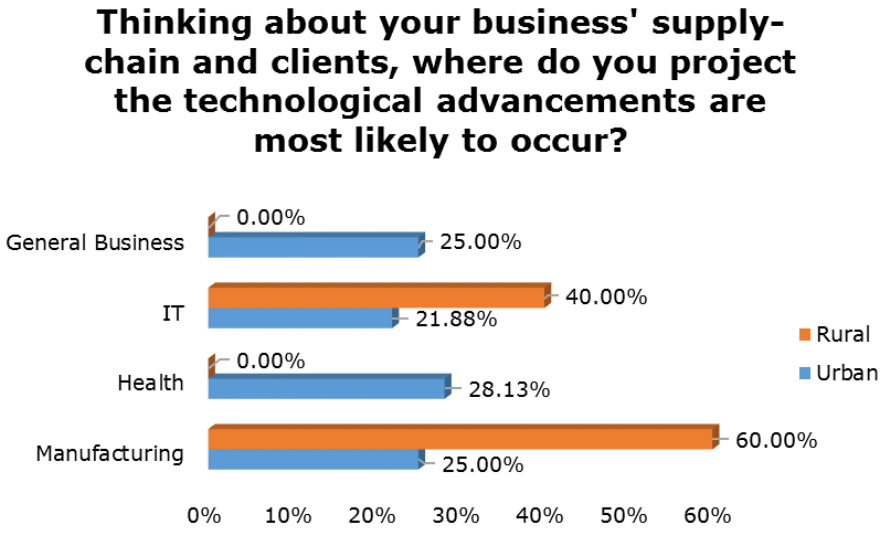
What is the rural/urban divide on this question? A significant percent of businesses in both rural and urban areas suggests outsourcing with more than a 12 percentage-point difference between rural and urban businesses. One in every three businesses in rural regions indicated they would conduct inside training; this ratio is one in every four businesses in urban areas.

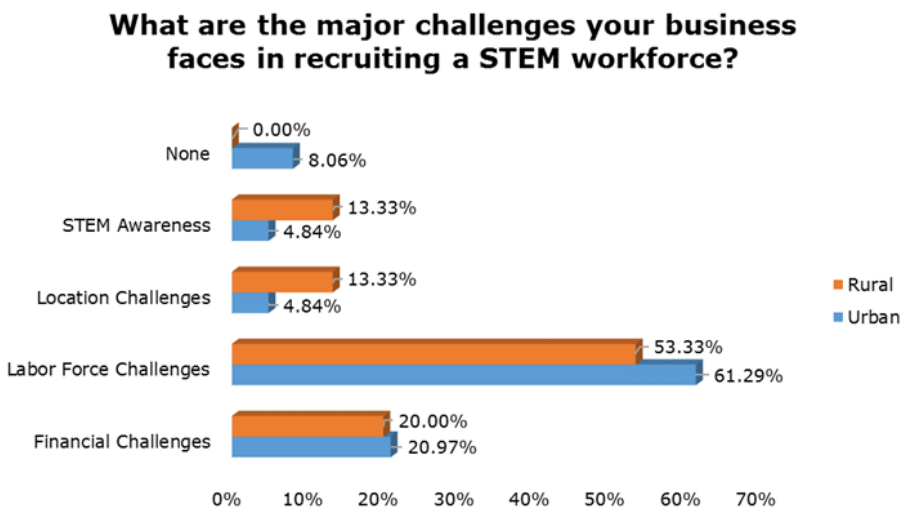


Is there any concern regarding the future availability of STEM jobs? The majority of businesses do not see any uncertainty, but 44 percent think otherwise.



Where do businesses see technological development in their supply chain? A glance at responses suggests four major areas: manufacturing, IT (information technology), health, and general business. There is a striking rural/urban difference across these categories. For example, 60 percent of rural responses indicated manufacturing will the major sector experiencing technological shift, while only 25 percent of businesses from urban regions think similarly. The health and general business areas exhibit a reversed trend. An overwhelming percent of urban respondents foresee the greatest advancement in the health and general business sectors.

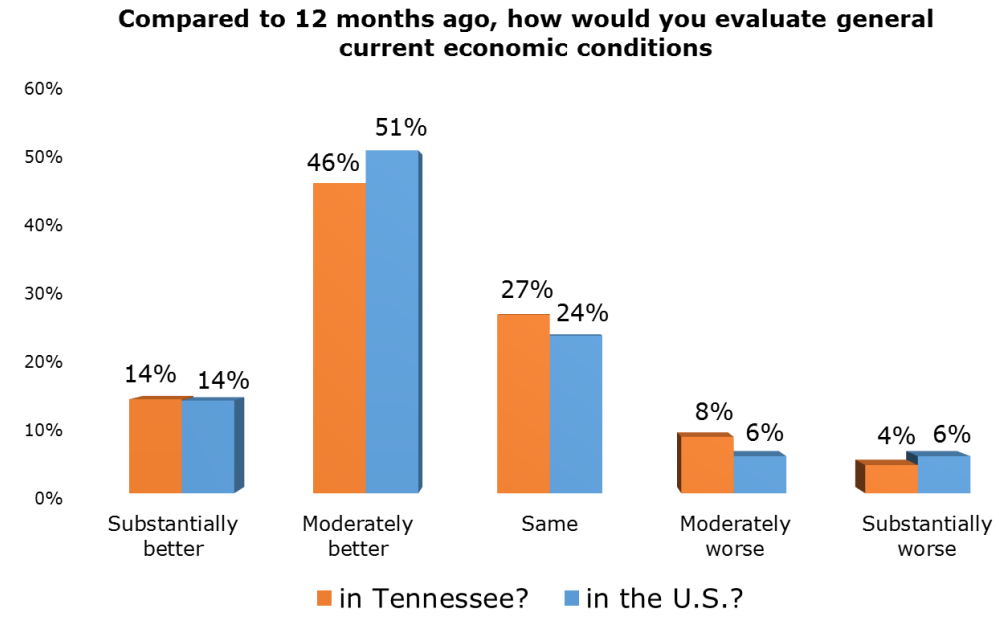




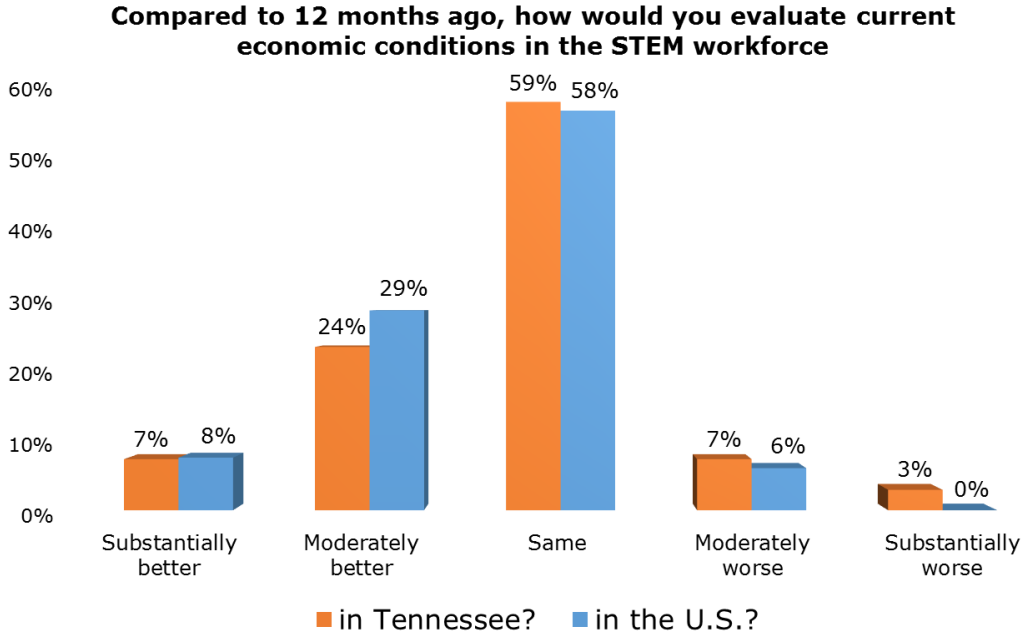
Finally, the survey asked about major challenges community stakeholders face in recruiting a STEM workforce. Critical "labor force challenges" are more pronounced in urban than in rural areas. Rural businesses face more challenges associated with STEM awareness and with location.

Future Expectations

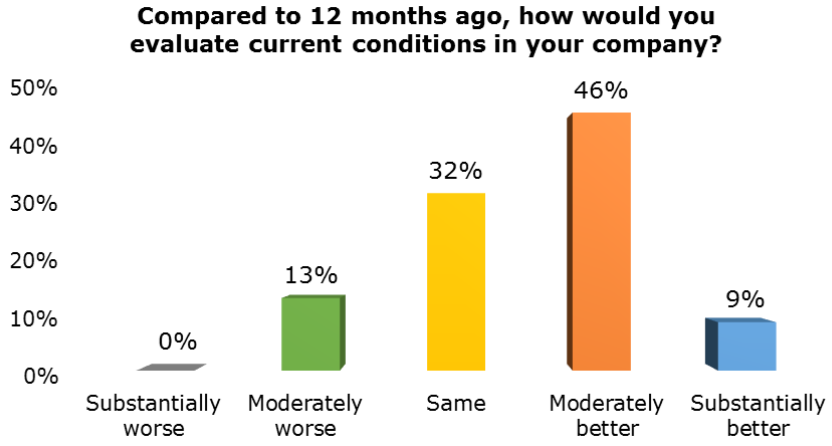
BERC surveyed community stakeholders in 2014 regarding their perspective on past, current, and future economic conditions in general, and national and local STEM-related industries in particular. A total of 210 stakeholders from the state responded to the survey. Compared to 12 months ago, how would you evaluate current economic conditions? According to community stakeholders, Tennessee and the United States in general are performing moderately better than a year ago. Current economic conditions are better for Tennessee for 60 percent of respondents versus 65 percent for the nation. Of the 72 respondents, nine believed that economic conditions in Tennessee were moderately or substantially worse than they were a year ago.



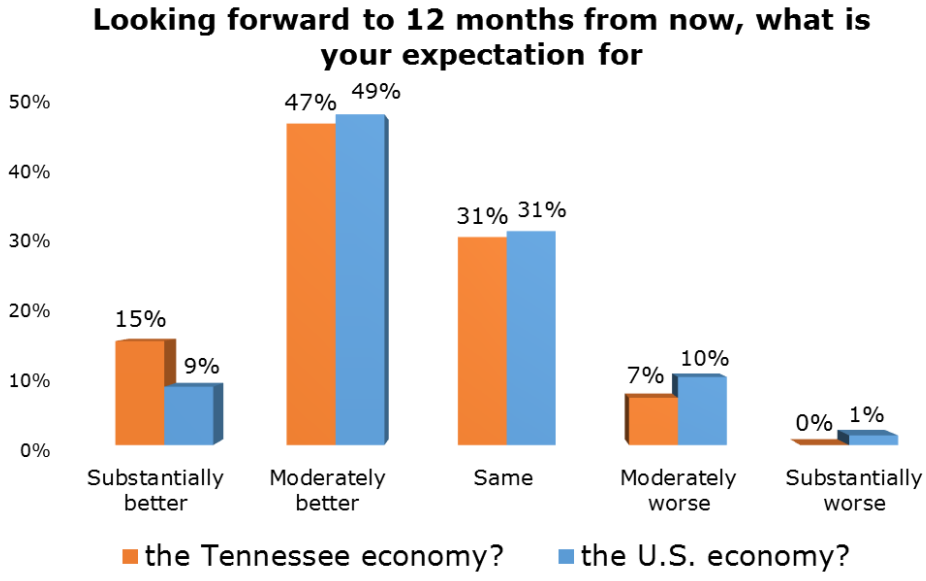
Compared to 12 months ago, how would you evaluate current economic conditions in the STEM workforce? Community stakeholders see current economic conditions in the STEM workforce as the same as last year in both the state and the nation. About 59 percent see Tennessee STEM economic conditions as the same, and 58 percent see the United States as the same in this regard.



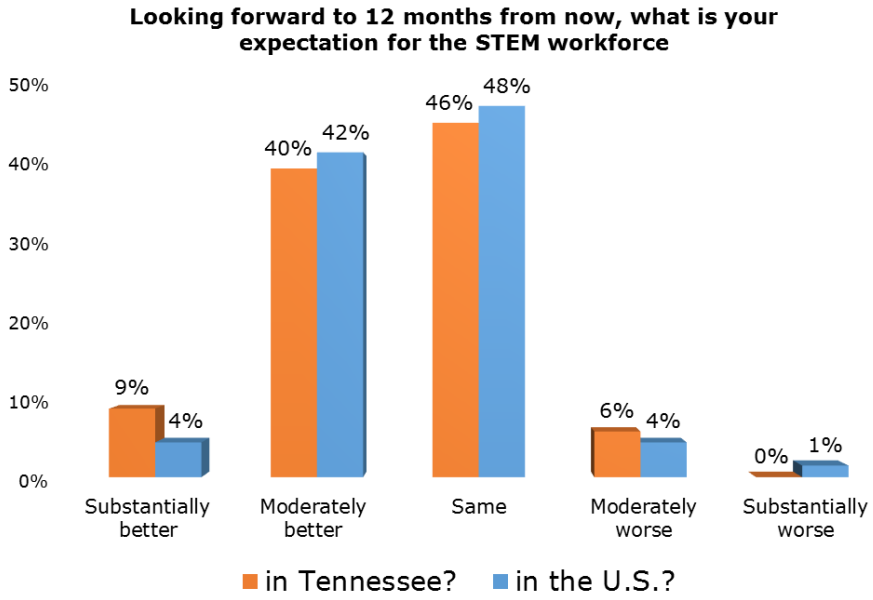
Compared to 12 months ago, how would you evaluate current conditions in your company? Of the community stakeholders, 46 percent responded that their company was performing moderately better than a year ago, and 9 percent said substantially better. This shows that overall 55 percent of respondents believed their company's conditions had improved from a year earlier. None believed their company was substantially worse than the year before.



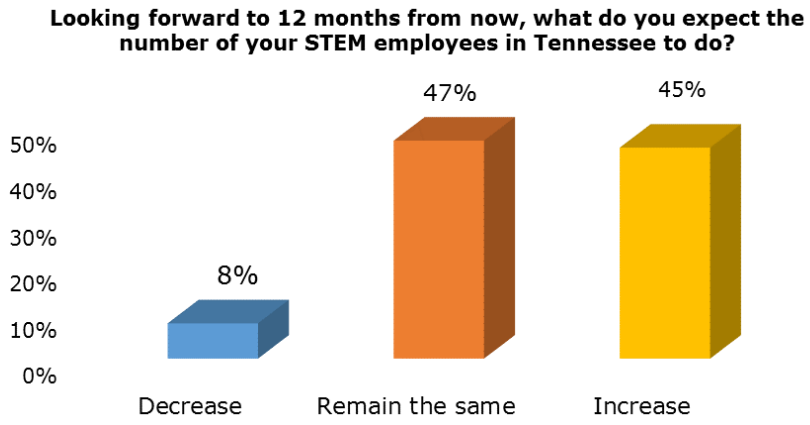
Looking forward to 12 months from now, what are your expectations for the U.S. economy and the Tennessee economy? According to respondents, 63 percent saw the Tennessee economy improving in the next year and 57 percent saw the U.S. economy improving. Fifteen percent foresaw that the Tennessee economy would improve substantially.



Looking forward to 12 months from now, what are your expectations for the STEM workforce in the U.S. and Tennessee? Community stakeholders were more reserved regarding their expectations for the future of the STEM workforce in both the U.S. and Tennessee. Ninety percent predicted the U.S. STEM workforce would stay the same or moderately improve, and 85 percent expected the Tennessee STEM workforce to stay the same or moderately improve.



Looking forward to 12 months from now, how do you expect the number of your STEM employees in Tennessee to change? Community stakeholders believed the number of their STEM employees would increase or remain the same in the next year. Forty-seven percent said it would remain the same, and 45 percent responded that it would increase.

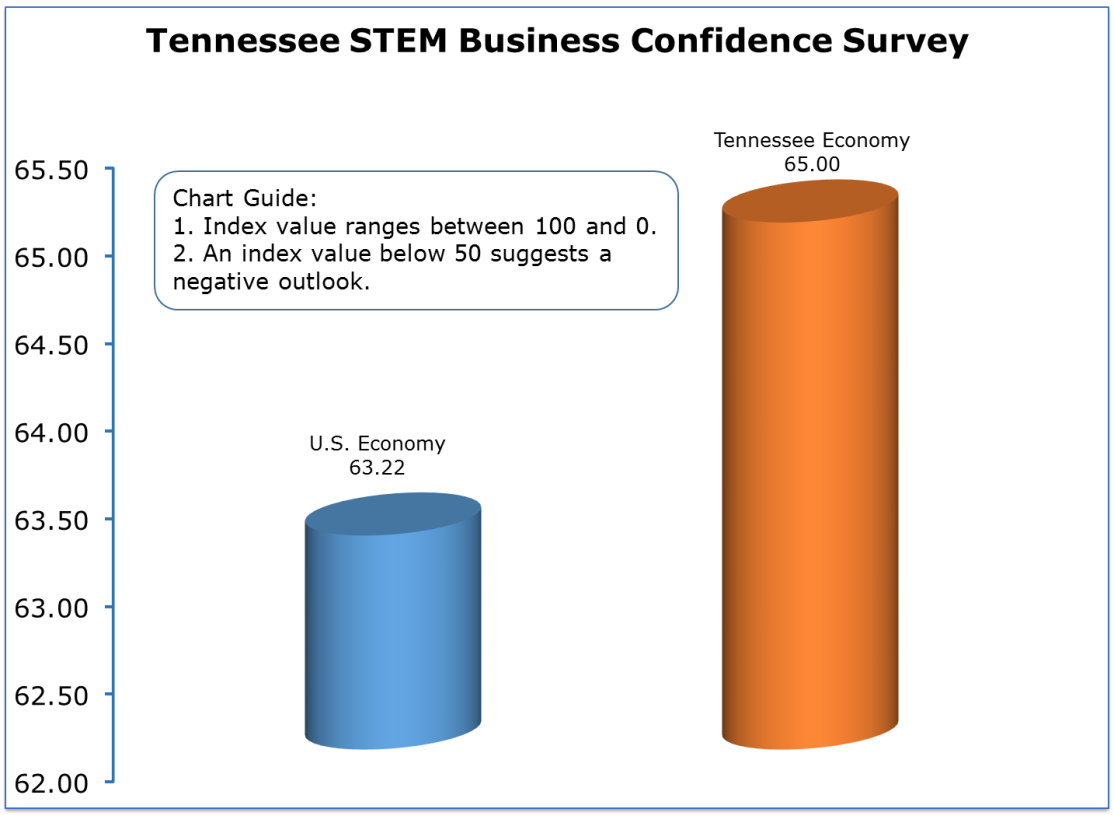


What are your firm's profit expectations from STEM-related occupations in Tennessee for the next 12 months? A majority of community stakeholders believed their profit expectations would remain the same in the next year.

STEM Business Confidence Survey. The *STEM Business Confidence Survey* is the average value of standardized scores for the three survey questions highlighted above. These are (1) current general economic conditions compared to a year ago, (2) future expectations for the overall economy, and (3) future expectations for the STEM workforce.

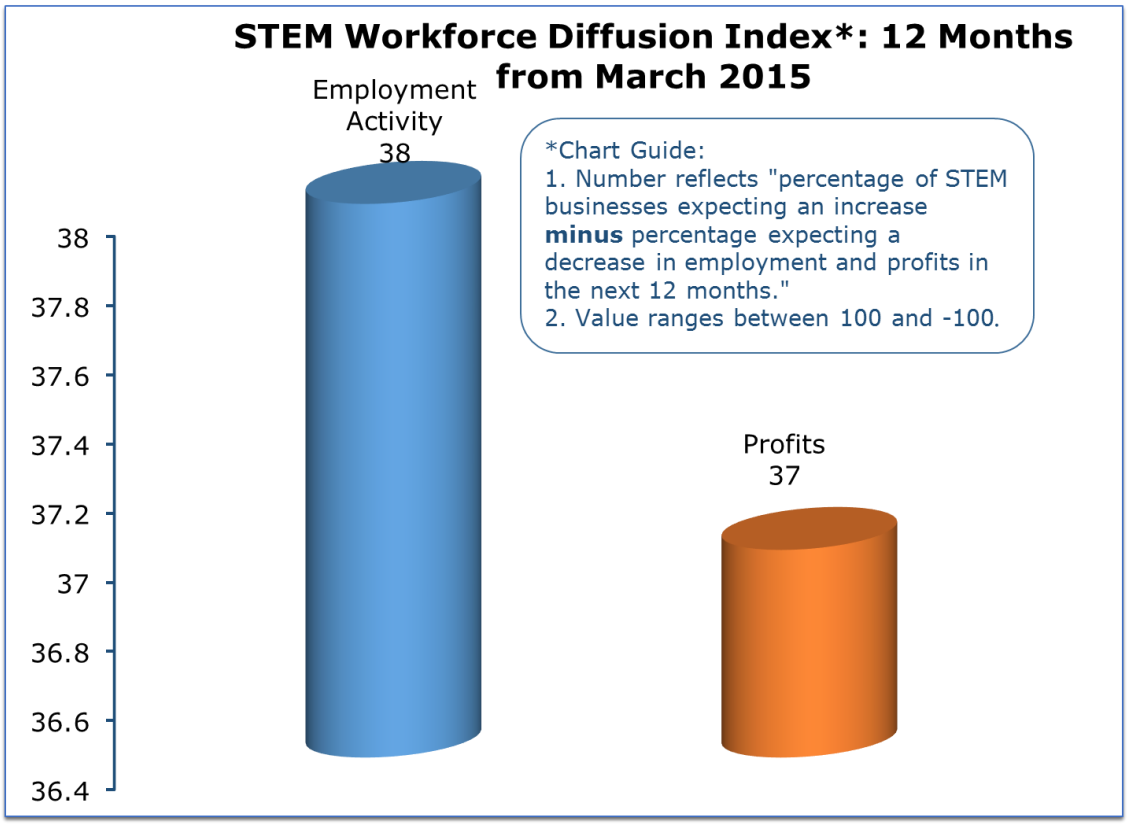
The business outlook is positive for both the U.S. and Tennessee economies. An index value of 50 or higher suggests a positive outlook. These figures are comparable to the CEO business confidence survey conducted quarterly by the Conference Board.[3] The 2015 second-quarter reading of the Conference Board CEO Confidence Index is 58, suggesting a positive outlook. The STEM business outlook for Tennessee is 65, almost two points higher than the STEM business outlook for the nation.

[3] www.conference-board.org.



Hiring and profit expectations. The extensive analysis of STEM workforce dynamics suggests hiring and profit will continue to increase in Tennessee and across the nation. Community stakeholders suggest this trend will continue. The employment activity index, which ranges from -100 to +100, with -100 as very negative and +100 as very positive, shows moderate hiring expectations for the year following March 2015. This index number is the difference between the percent of community stakeholders expecting an increase in hiring and the percent expecting a decrease. The current reading of the employment activity index is 38. The index is higher than that of the business outlook survey for the manufacturing industry conducted by the Federal Reserve Bank of Philadelphia.[4] The August 2015 reading of the Federal Reserve Bank survey is 20, suggesting higher than average economic activity in STEM-related businesses. In addition, there is a positive profit expectation for STEM-related business.

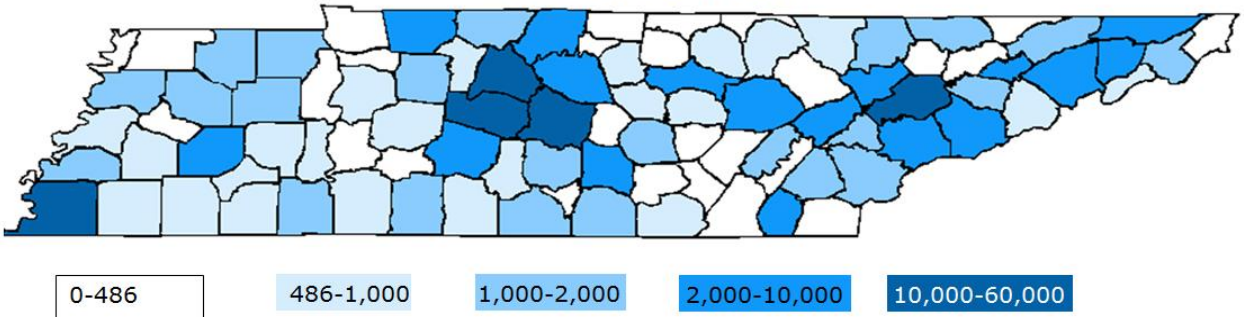
[4] www.phil.frb.org.



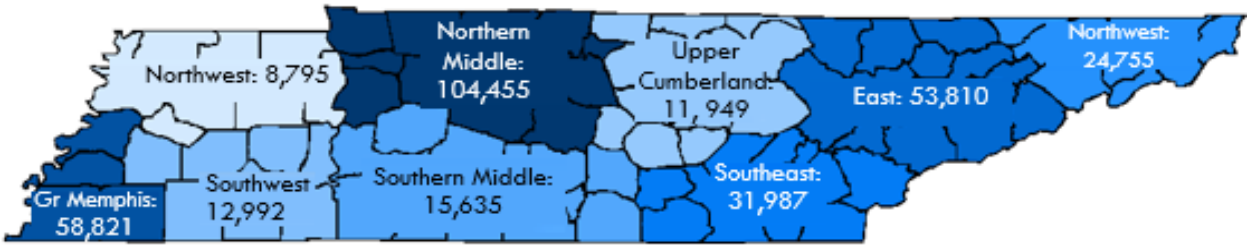
STEM Supply and Demand

How many STEM jobs does Tennessee have? What is the projected growth rate of STEM jobs in the next 10 years? How does supply meet the demand for STEM jobs in Tennessee? What are the key drivers of growth in STEM jobs? Using a number of data sources including the STEM survey, this section projects STEM supply and demand conditions for the next 10 years. As presented in chapter 2, the estimate of STEM workforce in Tennessee numbers was 324,328 in 2014. This figure is used as a baseline job number for forecasting. The following maps highlight the distribution of STEM jobs by both county and region in Tennessee.

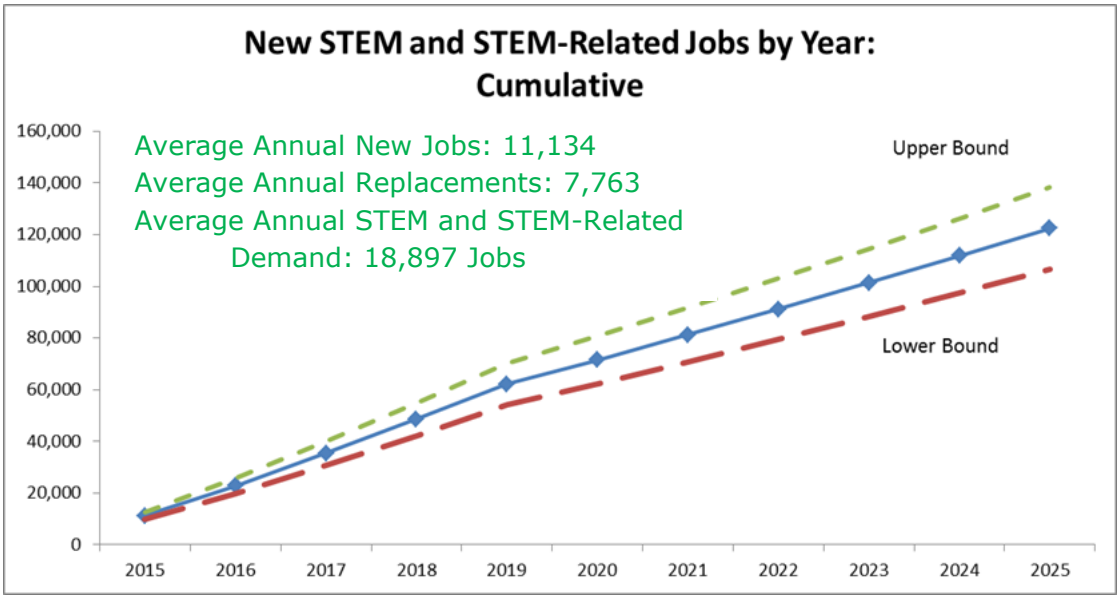
STEM Jobs by County (2014)



Distribution of STEM Jobs by Region



Over the next ten to eleven years, the average annual growth rate of STEM jobs in Tennessee is estimated to be around 3.43 percent. Annual average growth rates are derived from the STEM business survey. Total number of STEM jobs is estimated from the American Community Survey (ACS). This forecast includes not only new jobs but also replacement jobs due to retirement. Total number of replacement STEM jobs between 2014 and 2025 is estimated at around 85,392 in Tennessee. Using several data sources, between 2014 and 2015, Tennessee businesses will add 122,477 new STEM jobs. Adding the total number of replacement STEM workers due to retirement brings the total demand for STEM workers to 207,869. This translates into an average annual demand of 18,897 STEM and STEM-related jobs.



What about the supply side? According to calculations from the University of Tennessee Center for Business and Economic Research, annual average STEM-degree production in Tennessee is estimated at around 11,195. According to supply-and-demand estimates and replacement numbers, the supply-to-demand ratio is estimated at around 0.59, suggesting that 41 percent of demand will be unmet locally. Currently 65 percent of STEM job holders have a STEM degree. In many cases, this implies the workers in the STEM jobs are not properly qualified.

Average Annual ***New*** STEM and STEM-Related Jobs	**11,134**
Average Annual ***Replacement***	**7,763**
Total Demand (Annual Average)	**18,897**
Total Supply (Annual Average Degree Production in STEM)*	**11,195**
Supply-to-Demand Ratio	**0.59242**

*Estimated from Academic Program Supply and Occupational Demand Projections: 2012-2025, by UT Center for Business and Economic Research, 2014

Total Demand by Educational Attainment (Annual Average)		
Degree Level	Percent Breakdown	Total Jobs
HS/VD/AS	28.85%	5,452
BA	59.62%	11,266
MA+	11.54%	2,181

Total Supply by Educational Attainment Level (Annual Average)*		
Degree Level	Percent Breakdown	Total Degrees
Less than BA	29.80%	3,336
BA	57.28%	6,412
MA+	12.93%	1,447

Degree Level Supply to Demand Ratios	
Less than BA	0.6119
BA	0.5691
MA+	0.6635

*Estimated from Academic Program Supply and Occupational Demand Projections: 2012-2025, by UT Center for Business and Economic Research, 2014

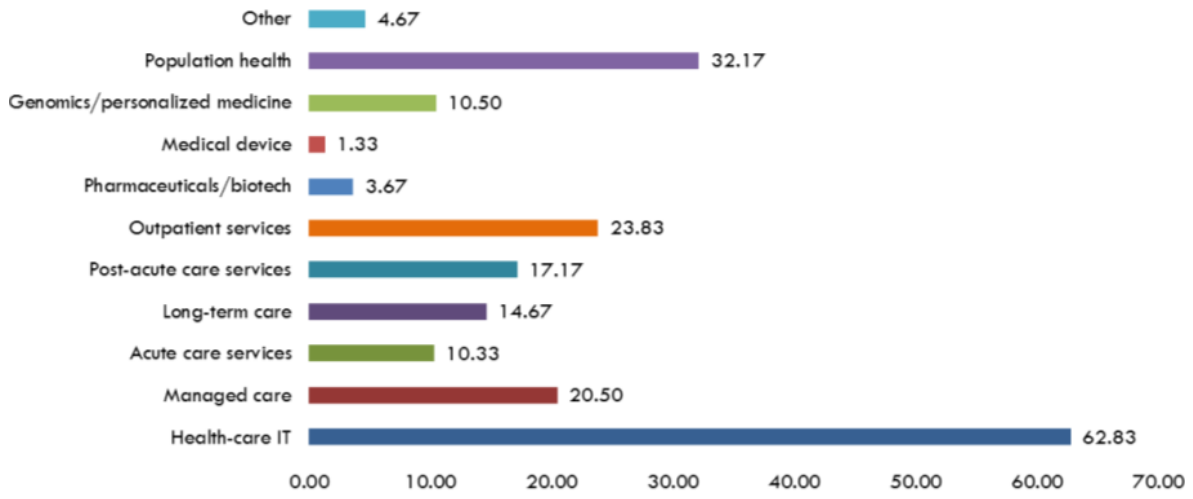
What is the educational attainment breakdown of total STEM workforce demand and supply? To provide an estimate of the educational attainment breakdown of supply and demand, this report uses the BERC STEM survey and a report issued by the University of Tennessee Center for Business and Economic Research. On the demand side, about 60 percent of STEM jobs will require a bachelor's degree. On the supply side, 57 percent of STEM degrees are bachelor's degrees. From the annual average degree-level supply and demand ratios, the following picture emerges: less than bachelor's degree 61 percent; bachelor's degree 57 percent; and graduate degree 67 percent.

What are some of the drivers of growth in STEM occupations? Several sectors have been mentioned throughout the report, including health care, IT, and advanced manufacturing. This report particularly highlights two critical areas: (1) significant growth in some highly specialized occupations and (2) transformative changes in health care, increasing demand for STEM and STEM-related workers.

According to a report issued by the University of Tennessee Center for Business and Economic Research, the supply-and-demand ratio for certain STEM occupations is as low as 0.06, suggesting only 6 percent of demand is met by the supply. For example, the annual supply of environmental engineers is 39, while annual average demand for this job is 650, creating a

94 percent deficit. A recent study by Middle Tennessee State University's Business and Economic Research Center highlights a growing concern among Nashville healthcare industry CEOs regarding the availability of healthcare workers in the Nashville MSA, where the healthcare industry cluster has national prominence.

When asked which healthcare sectors promise growth, the top answer by a wide margin is the healthcare IT sector. Based on this, combined with the outlook for other sectors, the lack of available workforce in STEM fields may be a real damper on the growth of the medical technology and healthcare IT sectors.



"This research includes two distinct elements: 1) a survey of the state of the TN STEM workforce dynamics compared to peers and 2) a survey of stakeholders vested in the STEM economy across the state. The combined results present a clear picture of the gaps and challenges Tennessee faces in the marketplace for the quality jobs of the future. Any elected official, educator, or business person that relies on a STEM workforce will find this research informative and compelling."

—Tim Choate, Mind2Marketplace board member and president/CEO Bondware Inc.

Chapter 7

STEM Workforce Characteristics and STEM Index

STEM Workforce Characteristics

This chapter covers the segment of the survey in which respondents were asked to provide data on current occupations, wages, vacancies, educational requirements, certification requirements, and the difficulty of filling these occupations. Here BERC focuses on two key aspects: average wages and the difficulty of filling jobs.

What are the top STEM occupations by wage? The top 15 STEM occupations have an average wage ranging from $30 to $55 and fall under an assortment of occupational codes. The most lucrative STEM occupation is computer network architect (15-1143) with an average wage of $55. Four occupations tied for 15th, all with an average wage of $30: civil engineers (17-2051), economists (19-3011), information security analysts (15-1122), and surveying and mapping technicians (17-3031).

STEM Occupations Ranked by Average Wage

Occupational Code	Occupational Title	Average Wage	Rank
15-1143	Computer network architects	$55.00	1
15-2090	Miscellaneous mathematical science occupations	$50.00	2
17-2041	Chemical engineers	$45.00	3
11-9041	Architectural and engineering managers	$41.33	4
17-2081	Environmental engineers	$41.08	5
19-1010	Agricultural and food scientists	$40.00	6
17-2110	Industrial engineers, including health and safety	$38.33	7
17-2070	Electrical and electronics engineers	$37.50	8
17-2141	Mechanical engineers	$37.50	8
17-0000	Architecture and engineering occupations	$34.21	10
15-1131	Computer programmers	$31.92	11
15-113X	Software developers, applications and systems software	$31.88	12
11-0000	Management, business, and financial occupations	$30.99	13
15-0000	Computer and mathematical occupations	$30.69	14
17-2051	Civil engineers	$30.00	15
19-3011	Economists	$30.00	15
15-1122	Information security analysts	$30.00	15
17-3031	Surveying and mapping technicians	$30.00	15

What are the top STEM-related occupations by wage? The top 10 STEM-related occupations have an average wage ranging from $29.27 to $52.50, and most fall under the healthcare practitioners and technical occupations group, with only one occupation belonging to the architecture and

engineering occupations group. The highest wages of all STEM-related occupations are group physicians and surgeons (29-1060), with an average wage of $52.50. The outlier, architecture and engineering occupations, ranks fifth and pays an average wage of $35. General healthcare practitioners and technical occupations rank 10th overall with an average wage of $29.27.

STEM-Related Occupations Ranked by Average Wage

Occupational Code	Occupational Title	Average Wage	Rank
29-1060	Physicians and surgeons	$52.50	1
29-1051	Pharmacists	$50.00	2
29-1122	Occupational therapists	$40.00	3
29-1127	Speech-language pathologists	$37.50	4
17-0000	Architecture and engineering occupations	$35.00	5
29-2030	Diagnostic related technologists and techicians	$35.00	5
29-1171	Nurse practitioners	$35.00	5
29-1071	Physicians assistants	$32.50	8
29-1031	Dietitians and nutritionists	$31.67	9
29-0000	Healthcare practitioners and technical occupations	$29.27	10

STEM Occupations Ranked by Difficulty of Filling

Occupational Code	Occupational Title	Difficulty of Filling (1=Extremely Easy) (10=Extremely Difficult)
11-3021	Computer and information systems managers	6
15-0000	Computer and mathematical occupations	6
17-3020	Engineering technicians, except drafters	6
19-0000	Life, physical, and social science occupations	6
15-113X	Software developers, applications, and systems software	6
11-9041	**Architectural and engineering managers**	**7**
17-0000	**Architecture and engineering occupations**	**7**
17-2041	**Chemical engineers**	**7**
17-3010	**Drafters**	**7**
11-0000	**Management, business, and financial occupations**	**7**
19-2030	**Chemists and materials scientists**	**8**
17-2051	**Civil engineers**	**8**
15-1131	**Computer programmers**	**8**
17-2070	**Electrical and electronics engineers**	**8**
17-2141	**Mechanical engineers**	**8**
15-1134	**Web developers**	**8**
19-1010	**Agricultural and food scientists**	**9**
15-1143	**Computer network architects**	**9**
17-2081	**Environmental engineers**	**9**
17-2110	**Industrial engineers, including health and safety**	**9**
11-9121	**Natural sciences managers**	**9**
15-2090	**Miscellaneous mathematical science occupations**	**10**

What are the most difficult STEM occupations to fill? Community stakeholders who participated in the BERC survey ranked occupations from 1 to 10 by difficulty of filling jobs. A rank of one means an occupation is extremely easy to fill, and a rank of 10 means an occupation is extremely

difficult to fill. BERC aggregated the results of the community stakeholders' rankings into a master list that provides an average ranking on the difficulty of filling each occupation. Provided on the previous page is a segment of the master list that illustrates those occupations that are the hardest to fill. For example, the hardest occupation to fill was miscellaneous mathematical science occupations (15-2090), with an average ranking of 10. The occupations that are difficult to fill are not restricted to any set of occupational codes but offer an assortment of occupational profiles.

What are the most difficult STEM-related occupations to fill? This list was obtained in the same manner as the previous list but with STEM-related occupations. The table below offers a picture of the most difficult STEM-related occupations to fill. Physicians and surgeons (29-1060) is the most difficult STEM-related occupation to fill, with speech-language pathologists (29-1127) coming in at a close second. All of the STEM-related occupations that are most difficult to fill come from the healthcare practitioners and technical occupations set of codes (29-0000).

STEM-Related Occupations by Difficulty of Filling

Occupational Code	Occupational Title	Difficulty of Filling
29-1031	Dietitians and nutritionists	6
29-1141	Registered nurses	6
29-2010	Clinical laboratory technologists and technicians	7
29-1051	Pharmacists	7
29-1127	Speech-language pathologists	8
29-1060	Physicians and surgeons	9

Tennessee STEM Exposure Index

Creating an index and updating it annually require timely data at the county level. When dealing with STEM workforce dynamics, measurement at the county level is a challenging issue. This report utilizes the limited existing data on STEM workforce dynamics to present a Tennessee STEM Exposure or Concentration Index by county.

The STEM Exposure Index includes six indicators:

- STEM jobs as percent of total county jobs
- STEM jobs as percent of Tennessee STEM jobs
- Average ACT math score
- Average ACT science score
- College-going rate

- Patents per 1,000 employees (2004-13)

The following table shows the weights of each indicator and the reason for inclusion. The procedure to calculate the final index includes three major steps: (1) calculating averages and standard deviations for each indicator, (2) normalizing each indicator using average and standard deviation scores, and (3) applying the weights to create a final index for each indicator.

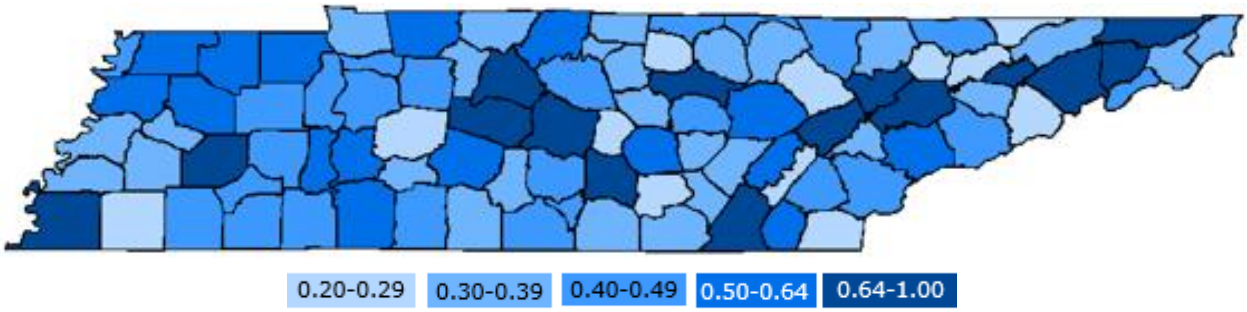
Indicators	Weights	Reason for Inclusion	Data Source
STEM jobs as percent of total county jobs	37.5%	County level STEM intensity	BERC calculations from ACS, ES202
STEM jobs as percent Tennessee STEM jobs	37.5%	Tennessee level STEM intensity	BERC calculations from ACS, ES202
Average ACT math score	5.0%	STEM readiness	Tennessee Department of Education
Average ACT science score	5.0%	STEM readiness	Tennessee Department of Education
College-going rate (%)	5.0%	College-bound	Driveto55.org
Patents per 1,000 employees (2004-13)	10.0%	Creativity	www.uspto.gov
	100.0%		

According to BERC calculations, Knox, Williamson, and Hamilton counties occupy the top three spots in the STEM Exposure Index. Other counties with high scores include Shelby, Davidson, Sullivan, Washington, Anderson, Madison, and Putnam. Rutherford County makes the top 15. A complete list of all counties and a map showing a regional perspective on the concentration are below.

Name	STEM Index	Rank
Knox	0.94	1
Williamson	0.94	2
Hamilton	0.90	3
Shelby	0.89	4
Davidson	0.87	5
Sullivan	0.86	6
Washington	0.84	7
Anderson	0.80	8
Madison	0.77	9
Putnam	0.75	10
Hamblen	0.70	11
Coffee	0.68	12
Greene	0.68	13
Rutherford	0.68	14
Roane	0.65	15

Name	STEM Index	Rank	Name	STEM Index	Rank
Knox	0.94	1	McNairy	0.42	48
Williamson	0.94	2	White	0.41	49
Hamilton	0.90	3	Benton	0.41	50
Shelby	0.89	4	Humphreys	0.41	51
Davidson	0.87	5	Sevier	0.41	52
Sullivan	0.86	6	Chester	0.40	53
Washington	0.84	7	Clay	0.40	54
Anderson	0.80	8	Bedford	0.40	55
Madison	0.77	9	Marshall	0.39	56
Putnam	0.75	10	Franklin	0.39	57
Hamblen	0.70	11	Campbell	0.39	58
Coffee	0.68	12	Lauderdale	0.39	59
Greene	0.68	13	Robertson	0.38	60
Rutherford	0.68	14	Lewis	0.38	61
Roane	0.65	15	Jefferson	0.38	62
Maury	0.63	16	Loudon	0.37	63
Dyer	0.63	17	Giles	0.37	64
Decatur	0.62	18	Dekalb	0.37	65
Bradley	0.59	19	Sequatchie	0.36	66
Blount	0.59	20	Smith	0.36	67
Gibson	0.58	21	Marion	0.36	68
Perry	0.58	22	Johnson	0.36	69
Henry	0.58	23	Hawkins	0.36	70
Weakley	0.57	24	Tipton	0.35	71
Wayne	0.55	25	Crockett	0.35	72
Cumberland	0.53	26	Trousdale	0.34	73
Sumner	0.53	27	Overton	0.34	74
Obion	0.53	28	Stewart	0.33	75
Rhea	0.52	29	Van Buren	0.32	76
Warren	0.50	30	Fentress	0.32	77
Montgomery	0.50	31	Bledsoe	0.31	78
Carroll	0.48	32	Macon	0.31	79
McMinn	0.48	33	Cheatham	0.31	80
Pickett	0.47	34	Haywood	0.31	81
Hardin	0.47	35	Carter	0.30	82
Claiborne	0.47	36	Cocke	0.29	83
Scott	0.46	37	Hancock	0.28	84
Hardeman	0.46	38	Grundy	0.28	85
Henderson	0.46	39	Grainger	0.28	86
Houston	0.45	40	Meigs	0.27	87
Dickson	0.45	41	Polk	0.26	88
Lake	0.45	42	Hickman	0.26	89
Wilson	0.44	43	Fayette	0.26	90
Monroe	0.44	44	Morgan	0.25	91
Unicoi	0.43	45	Moore	0.25	92
Lincoln	0.42	46	Jackson	0.25	93
Lawrence	0.42	47	Cannon	0.23	94
			Union	0.22	95

STEM Exposure Index by County



"This report clearly identifies the impact of the TN STEM Challenge. Tennessee's STEM workforce challenge is real and immediate. The potential for expanded growth in STEM businesses and industry in the state is strong, but Tennessee's current capacity to meet the highly skilled STEM workforce needs to support that growth is seriously underdeveloped. STEM businesses and industry and STEM-related occupations can play a pivotal role in creating a much-improved economic future for Tennessee and Tennesseans. But that future calls for aggressive action to bring business and industry sector pipeline needs in alignment with an educational pipeline that can meet those needs. The facts are clear: Increasing Tennessee's STEM workforce to the U.S. average alone would mean an additional 36,000 STEM jobs in Tennessee, and more importantly, would add $1.823 billion in wages and salaries to Tennessee's economy over the years. The question is: Can we afford not to meet the TN STEM Challenge?"

—Faye Johnson, Mind2Marketplace board member and assistant to the provost for special initiatives at Middle Tennessee State University

Chapter 8

Conclusion

This is the first report highlighting critical challenges facing the STEM workforce in Tennessee. Community stakeholders provided a detailed assessment of STEM supply, STEM pipeline, infrastructure, the role of government, and challenges to businesses. Based on these reviews as well as the state-level assessment of STEM indicators, this report draws the following conclusions:

- *Characteristics of STEM workforce.* Tennessee's STEM workforce is not competitive, characterized by an oversupply of low-skilled STEM workers compared with the nation.
- *STEM workforce supply and demand.* Demand for STEM workers outstrips the STEM supply with an average supply-to-demand ratio of 0.60, suggesting Tennessee either will fill those positions with people without a STEM degree or hire people from other regions.
- *Community stakeholders on STEM workforce dynamics.* Nearly three in four community stakeholders BERC surveyed indicated the STEM workforce challenge for Tennessee is real and involves not only parents and children but also the STEM industry itself, educators, and government. The efforts in this area are fragmented without clear direction from industry, higher education, or government.

Addressing the STEM workforce challenge is critically important for Tennessee for two major reasons:

- *Building the capacity for innovation and creativity.* A STEM workforce is highly educated relative to all other occupations in an economy. For Tennessee, the advanced manufacturing and healthcare industries have become major drivers of economic growth. To build sustainable economic growth, Tennessee should build the capacity of its workforce.
- *Fueling the economy with additional household income.* Addressing the low-skill problem and moving Tennessee's STEM concentration to the national level alone would create an economic impact of nearly $4.5 billion and create an additional 16,000 new jobs.

These benefits are associated with only a small fraction of the significant societal benefits that may be created by addressing the multiple and complex STEM workforce challenges discussed in this report. For example,

creating business efficiency through increasing the capacity of the STEM workforce is not quantified in this report.

> *"Mind2Marketplace exists to bring the brightest and best ideas in middle Tennessee to reality. We strategically link people and organizations to bring innovation and technology to the marketplace. M2M's interest in the STEM dynamics study was to endeavor to quantify the people and organizations that are ready or needed to meet supply demands and to clearly identify the nature of these emerging demands. Dr. Arik's study achieves this objective. Our hope is that the results may prove instructive for how we can work together to achieve a more harmonized balance between the workforce and the companies that meet these demands, while creating increasingly more fertile ground for germinating even better and brighter ideas throughout and beyond the M2M footprint."*
>
> —Brian Robertson, Mind2Marketplace board chair and chief information officer for Rutherford County government

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Appendix

Survey Administration

In order to administer the business survey, BERC performed the following tasks. First, the number of STEM and STEM-related occupations were derived from the 2010 Standard Occupational Classification (SOC) manual and cross-referenced with Tennessee industry employment data from the American Community Survey. Then, this matrix was used to estimate the number of STEM and STEM-related jobs in Tennessee. Next, the sum of the number of STEM and STEM-related employees in each industry was divided by the total number of STEM employees in Tennessee to determine the distribution of STEM occupations across Tennessee's industries. Using this distribution, BERC targeted the industries with the highest percentages of STEM occupations. The companies that received the survey were pulled at random from a list of companies matching BERC's industry search parameters in ReferenceUSA, a business database. BERC made sure that the random assortment of companies was an accurate reflection of business size and location. BERC also targeted several economic development officials, mayors, and schools for participation in the survey. After the design of the survey was complete, BERC mailed each potential respondent a letter describing the study and the survey process. As a result, 210 respondents from all nine regions of Tennessee participated in the survey.

Selecting STEM Occupations

BERC selected STEM occupations according to the U.S. Census Bureau's classification. The Census Bureau's classifications are based on the 2010 SOC manual. According to the listing, there are 63 specific STEM occupations and 35 STEM-related occupations. These two groups are displayed in the table below.

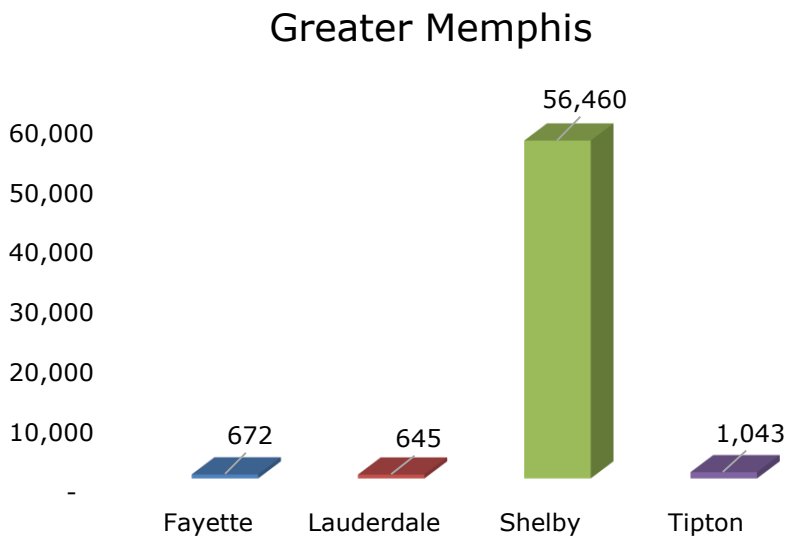
STEM Occupations		
Occupations	Census Code	SOC Code
Management, Business, and Financial Occupations:	***0010-0950***	***11-0000 - 13-0000***
Computer and information systems managers	0110	11-3021
Architectural and engineering managers	0300	11-9041
Natural sciences managers	0360	11-9121
Computer and mathematical occupations:	***1000-1240***	***15-0000***
Computer and information research scientists	1005	15-1111
Computer systems analysts	1006	15-1121
Information security analysts	1007	15-1122
Computer programmers	1010	15-1131
Software developers, applications and systems software	1020	15-113X
Web developers	1030	15-1134
Computer support specialists	1050	15-1150
Database administrators	1060	15-1141
Network and computer systems administrators	1105	15-1142
Computer network architects	1106	15-1143
Computer occupations, all other	1107	15-1199
Actuaries	1200	15-2011
Mathematicians	1210	15-2021
Operations research analysts	1220	15-2031
Statisticians	1230	15-2041
Miscellaneous mathematical science occupations	1240	15-2090
Architecture and Engineering Occupations:	***1300-1560***	***17-0000***
Surveyors, cartographers, and photogrammetrists	1310	17-1020
Aerospace engineers	1320	17-2011
Agricultural engineers	1330	17-2021
Biomedical engineers	1340	17-2031
Chemical engineers	1350	17-2041
Civil engineers	1360	17-2051
Computer hardware engineers	1400	17-2061
Electrical and electronics engineers	1410	17-2070
Environmental engineers	1420	17-2081
Industrial engineers, including health and safety	1430	17-2110
Marine engineers and naval architects	1440	17-2121
Materials engineers	1450	17-2131
Mechanical engineers	1460	17-2141
Mining and geological engineers, including mining safety engineers	1500	17-2151
Nuclear engineers	1510	17-2161
Petroleum engineers	1520	17-2171
Engineers, all other	1530	17-2199
Drafters	1540	17-3010
Engineering technicians, except drafters	1550	17-3020
Surveying and mapping technicians	1560	17-3031

STEM Occupations (Continued)		
Occupations	Census Code	SOC Code
Life, Physical, and Social Science Occupations:	***1600-1965***	***19-0000***
Agricultural and food scientists	1600	19-1010
Biological scientists	1610	19-1020
Conservation scientists and foresters	1640	19-1030
Medical scientists	1650	19-1040
Life scientists, all other	1660	19-1099
Astronomers and physicists	1700	19-2010
Atmospheric and space scientists	1710	19-2021
Chemists and materials scientists	1720	19-2030
Environmental scientists and geoscientists	1740	19-2040
Physical scientists, all other	1760	19-2099
Economists	1800	19-3011
Survey researchers	1815	19-3022
Psychologists	1820	19-3030
Sociologists	1830	19-3041
Urban and regional planners	1840	19-3051
Miscellaneous social scientists and related workers	1860	19-3090
Agricultural and food science technicians	1900	19-4011
Biological technicians	1910	19-4021
Chemical technicians	1920	19-4031
Geological and petroleum technicians	1930	19-4041
Nuclear technicians	1940	19-4051
Social science research assistants	1950	19-4061
Miscellaneous life, physical, and social science technicians	1965	19-4090
Sales and Related Occupations:	***4700-4965***	***41-0000***
Sales engineers	4930	41-9031

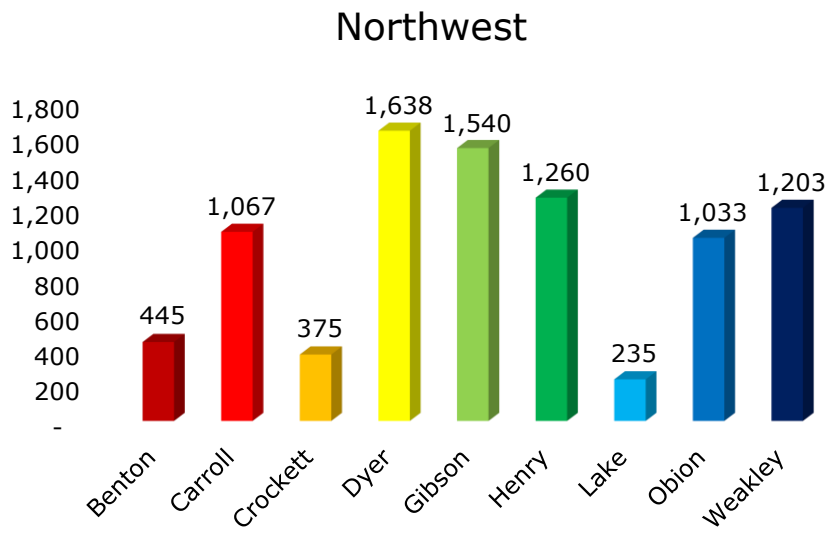
STEM-Related Occupations		
Occupations	Census Code	SOC Code
Management, Business, and Financial Occupations:	***0010-0950***	***11-0000 - 13-0000***
Medical and health services managers	0350	11-9111
Architecture and Engineering Occupations:	***1300-1560***	***17-0000***
Architects, except naval	1300	17-1010
Healthcare Practitioners and Technical Occupations:	***3000-3540***	***29-0000***
Chiropractors	3000	29-1011
Dentists	3010	29-1020
Dietitians and nutritionists	3030	29-1031
Optometrists	3040	29-1041
Pharmacists	3050	29-1051
Physicians and surgeons	3060	29-1060
Physician assistants	3110	29-1071
Podiatrists	3120	29-1081
Audiologists	3140	29-1181
Occupational therapists	3150	29-1122
Physical therapists	3160	29-1123
Radiation therapists	3200	29-1124
Recreational therapists	3210	29-1125
Respiratory therapists	3220	29-1126
Speech-language pathologists	3230	29-1127
Exercise physiologists	3235	29-1128
Therapists, all other	3245	29-1129
Veterinarians	3250	29-1131
Registered nurses	3255	29-1141
Nurse anesthetists	3256	29-1151
Nurse midwives	3257	29-1161
Nurse practitioners	3258	29-1171
Health diagnosing and treating practitioners, all other	3260	29-1199
Clinical laboratory technologists and technicians	3300	29-2010
Dental hygienists	3310	29-2021
Diagnostic related technologists and technicians	3320	29-2030
Emergency medical technicians and paramedics	3400	29-2041
Health practitioner support technologists and technicians	3420	29-2050
Licensed practical and licensed vocational nurses	3500	29-2061
Medical records and health information technicians	3510	29-2071
Opticians, dispensing	3520	29-2081
Miscellaneous health technologists and technicians	3535	29-2090
Other healthcare practitioners and technical occupations	3540	29-9000

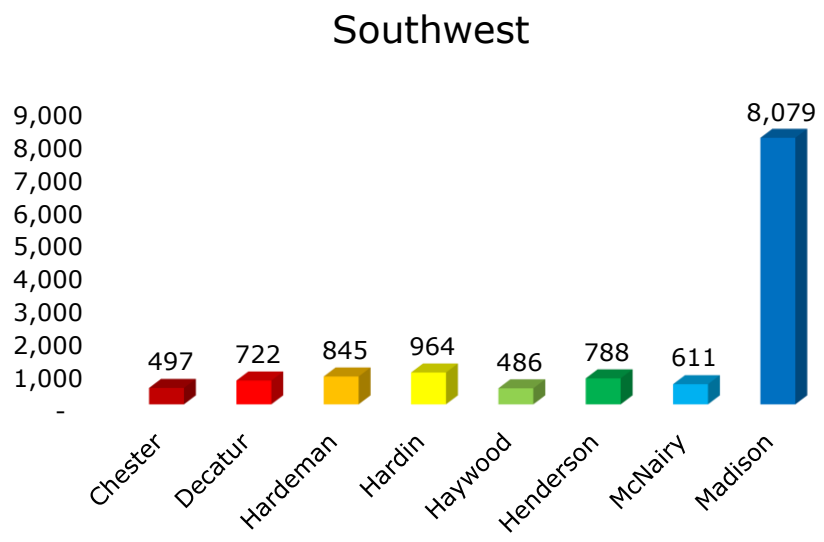
Regional Breakdown

STEM Employment

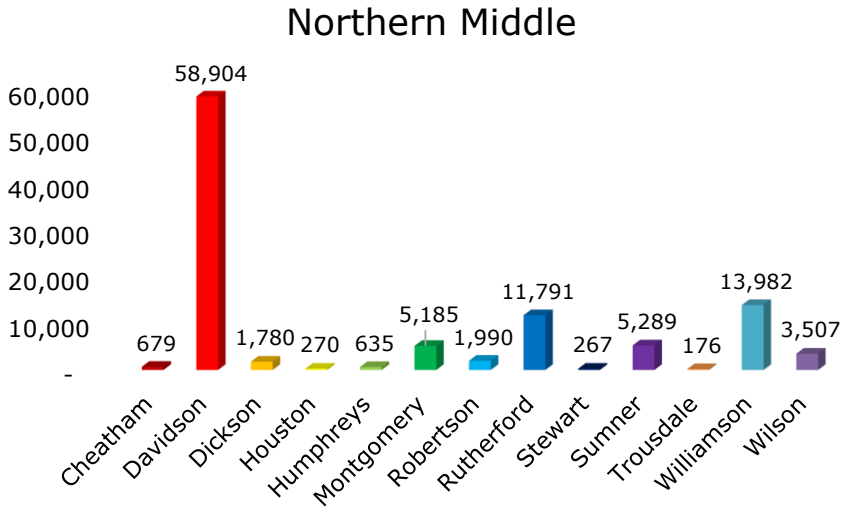


As shown in the graph above, the Greater Memphis region is dominated by Shelby County, with over 59,000 employees. As for the remaining three counties, Tipton County leads with 1,043 employees.

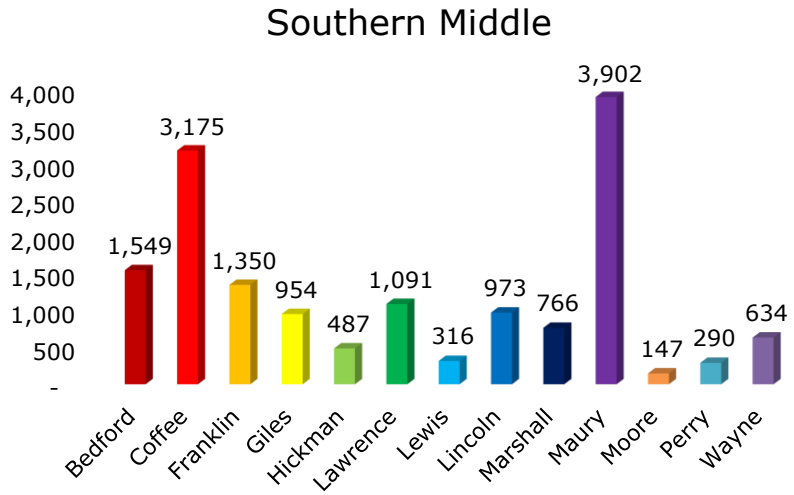




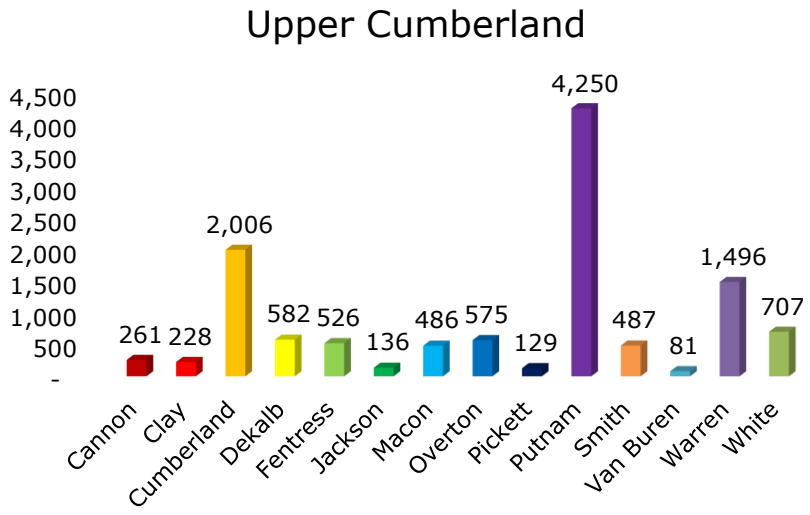
The Northwest region has a more even distribution of employees than Greater Memphis with six counties over 1,000 employees. The other three counties rank between 200 and 500 employees (Benton, Carroll, and Lake). Madison County takes the lead of STEM employment in the Southwest region with over 8,000 employees. As for the other counties, Hardin County leads the pack with 964 employees, with Hardeman County and Henderson County close behind with 845 and 788 employees, respectively.



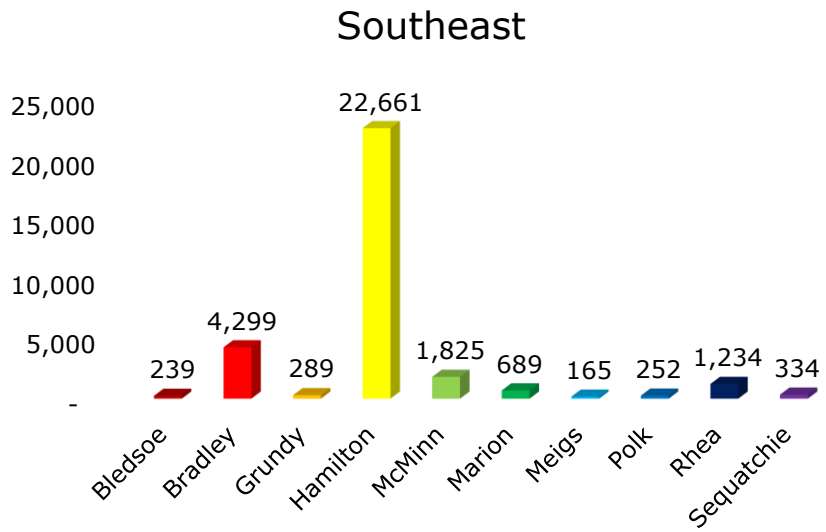
In the Northern Middle region of Tennessee, Davidson County employs the most STEM workers with nearly 59,000 employees. While no county rivals this number, there are still several significant counties of note in this region. Williamson County employs almost 14,000 workers, while Rutherford County employs over 11,000 workers. Sumner, Montgomery, and Wilson counties each employ between 3,000 and 6,000 STEM workers. Also, Robertson County and Dickson County both employ 1,500 to 2,000 workers each.



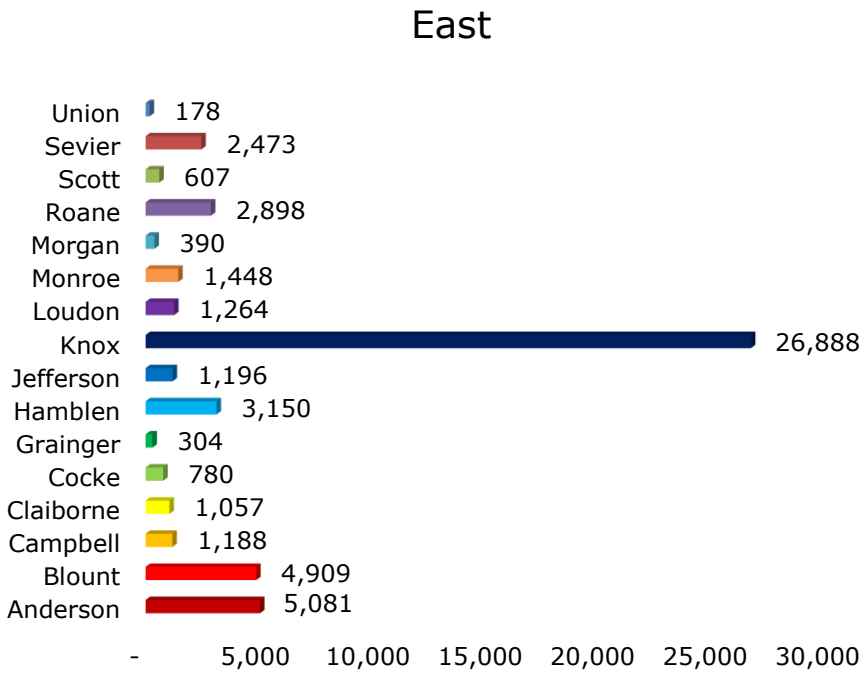
The Southern Middle region is led by Maury County with nearly 4,000 employees. Following behind is Coffee County with just over 3,000 employees. Both Bedford County and Franklin County employ around 1,500 STEM workers, while Lawrence and Lincoln counties both employ around 1,000 workers.



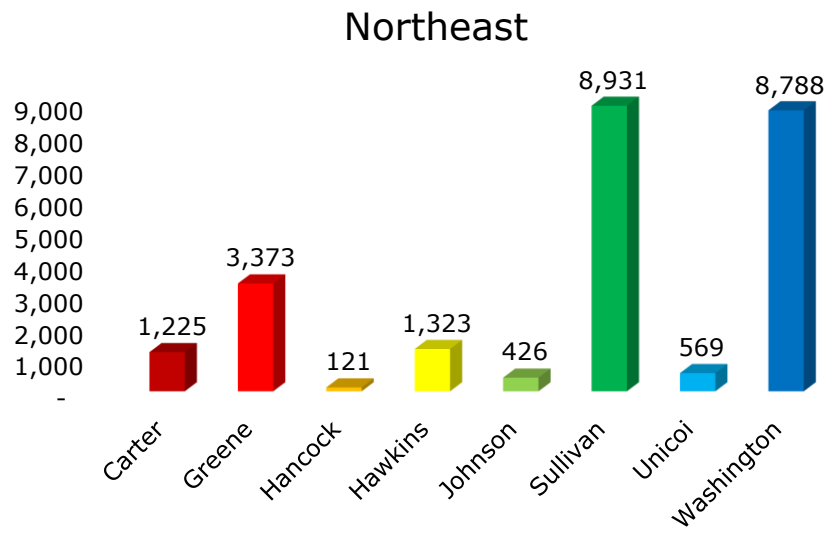
Putnam County leads the Upper Cumberland region with over 4,000 employees. Cumberland County ranks next, with over 2,000 employees, while Warren County employs around 1,500 STEM workers.



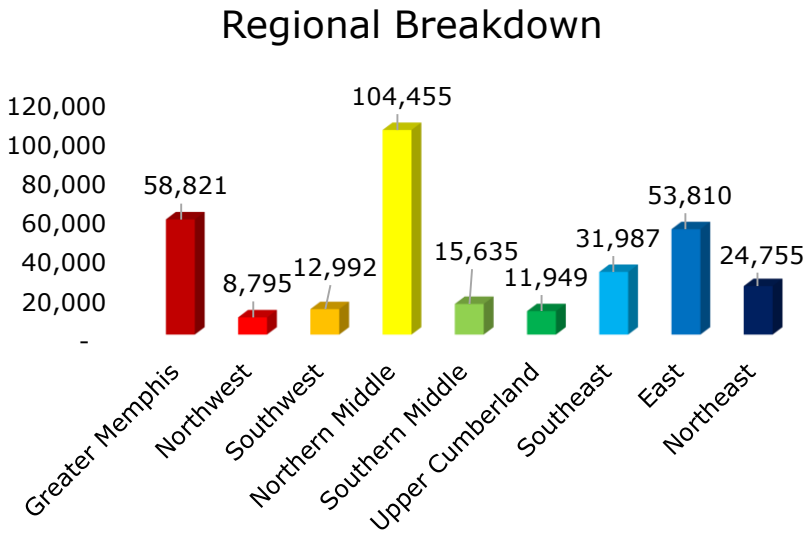
The Southeast region of Tennessee is dominated by Hamilton County, which employs over 22,000 STEM workers. The rest of the counties are led by Bradley County with over 4,000 employees, McMinn County with nearly 2,000 employees, and Rhea County with just over 1,000 employees.



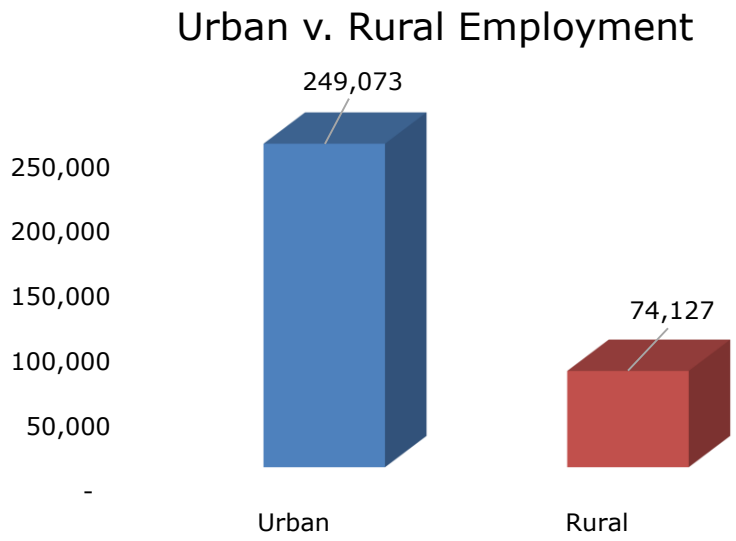
Knox County employs the most STEM workers in the East region with just almost 27,000 employees. Some of the other counties can be grouped together in the following manner: Anderson County and Blount County employ around 5,000 STEM workers; Hamblen County, Roane County, and Sevier County employ 2,500 to 3,500 STEM workers; and Monroe County, Loudon County, Jefferson County, Claiborne County, and Campbell County employ over 1,000 STEM workers. The remaining counties employ less than 1,000 STEM workers.



The Northeast region is led by both Sullivan County and Washington County, with over 8,500 STEM workers. Greene County employs over 3,000 STEM workers, while Hawkins County and Carter County both employ over 1,000 STEM workers.

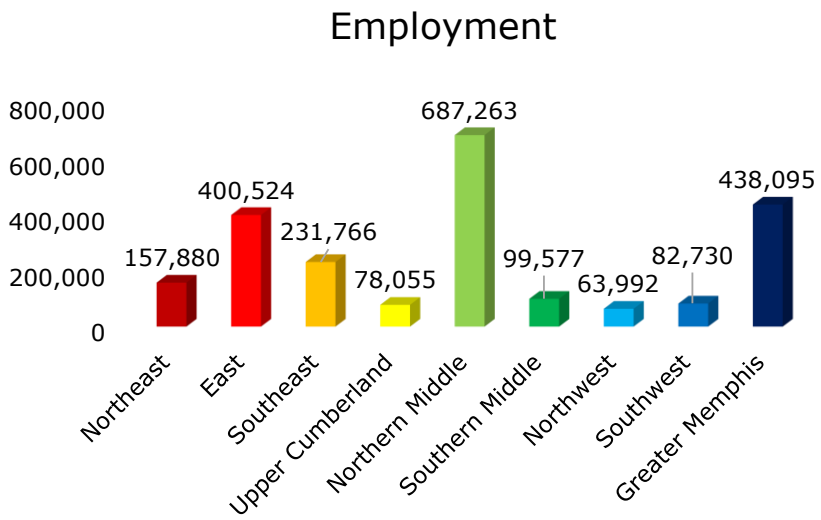


The previous graph presents a regional breakdown of the state of Tennessee by STEM employment. This graph is solely a composite of all the previous graphs. As the graph shows, the Northern Middle region employs the most STEM workers with over 104,000 employees. The Greater Memphis region ranks next, employing over 59,000 STEM workers. The East region follows after, with nearly 54,000 employees.

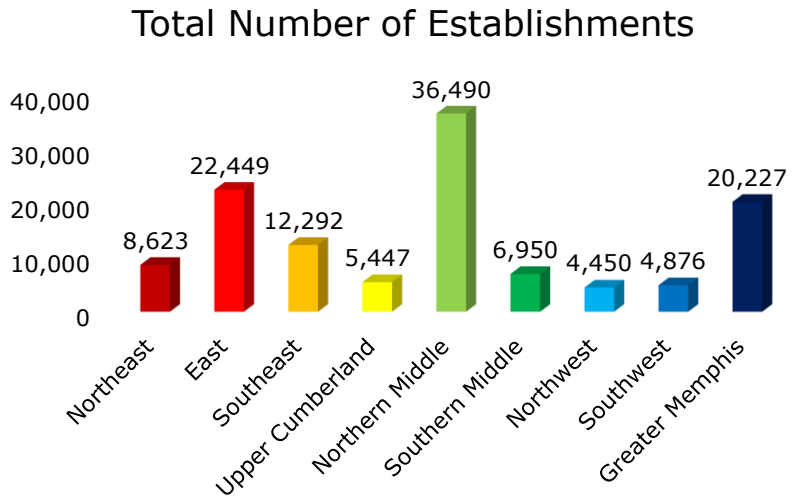


As the previous graph demonstrated, the top four STEM employing regions in the state of Tennessee are the four urban regions: Northern Middle, Greater Memphis, East, and Southeast. The combined amount of STEM employees for these counties totals nearly 250,000 workers, while the rural regions only employ 74,000 STEM workers.

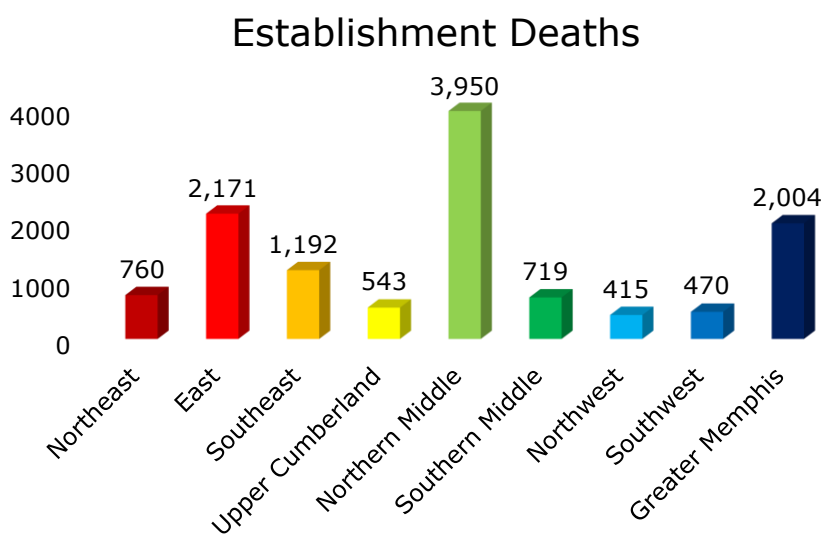
Entrepreneurship



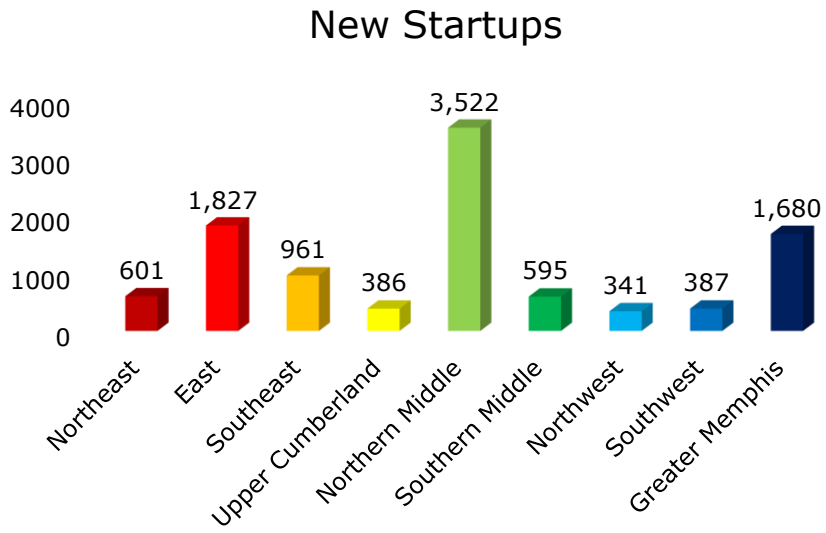
This employment data from 2010 to 2011 reflects all employment in the state of Tennessee, not just STEM employment. This graph closely resembles the regional breakdown of STEM employment shown previously in this report. The top four regions in total employment are also the top four regions in STEM employment, the urban regions. The only rural region with over 100,000 employees is the Northeast region, with the Southern Middle region close behind with 99,577 employees.



Tennessee as a whole has nearly 122,000 establishments. The large portion of these are in Northern Middle Tennessee with 36,000. Greater Memphis and East Tennessee also hold a large share with over 20,000 each. The remaining six regions have between 4,500 to 12,000 establishments as displayed in the chart above.

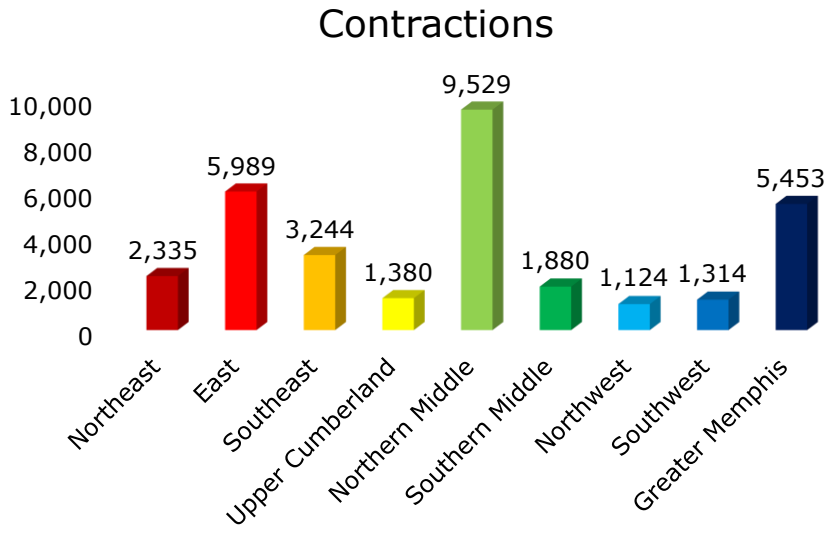


Northern Middle Tennessee leads the state in largest number of establishment deaths with nearly 4,000. East and Great Memphis regions follow with just over 2,000 each. On the other hand, Northwest, Southwest, and Upper Cumberland regions saw the least amount of deaths with 400 to 550 each.

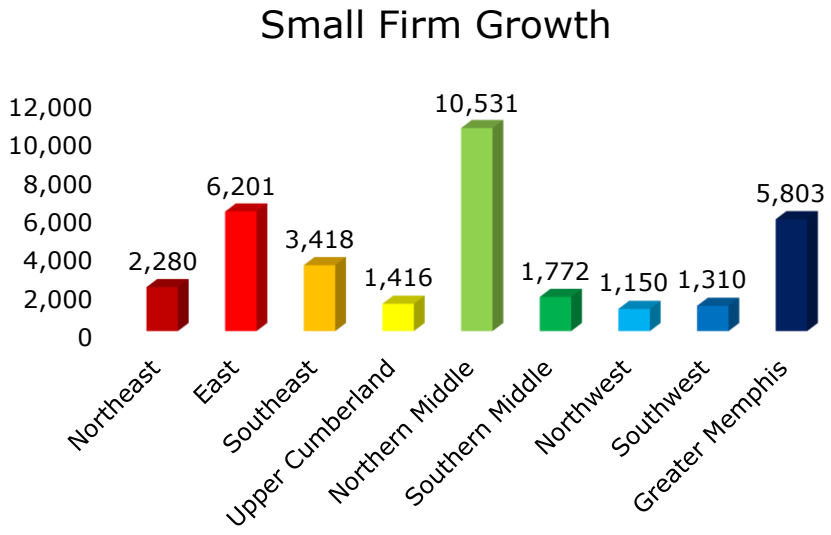


In contrast to establishment deaths, over 10,000 new startups came to the nine Tennessee regions. Northern Middle experienced the largest number of

new startups with around 3,500. East and Greater Memphis regions received over 1,500 new startups while Southeast experienced 961. The remaining regions received between 300 to just over 600 new startups.



Over 32,000 business contractions occurred over the state of Tennessee. Northern Middle, East, and Greater Memphis experienced the most contractions ranging from 5,500 to just over 9,500. In terms of the lowest amount of contractions, Northwest, Southwest, and Upper Cumberland had less than 1,500 each.



The large portion of Tennessee's small firm growth took place in Northern Middle Tennessee, 10,531 of 32,291. East and Greater Memphis regions had 6,201 and 5,803 small firms that grew. The remaining six regions had between 1,000 and 3,500

Responses to Open Ended Questions

What role should parents play?

Parents should have an active role.

Parents should take advantage of extracurricular opportunities to expand their children's horizons and expose them to a wide array of learning experiences.
Parents should mentor and instruct their children.
Parents should encourage their children and be a part of their educational process by being aware and active.
Parents should educate their children about STEM opportunities.
Parents should play a big role in steering children to STEM fields and away from throwaway college degrees.
Parents are the driving force. STEM based programs are more difficult to master and therefore need discipline to take up and learn. Parents are the only ones who can start and end with enforced discipline mastery in the beginning.
Parents play a crucial role in STEM education. These fields often require resources outside of the classroom. While parents may not necessarily possess the knowledge to assist their child in these fields, it is important that parents take an active role in helping their child find and utilize resources.
Parents should coach their children from early age of school, scouts, etc.
Parents should advise their children.
Parents should be very active based on their children's apparent talents or known interests.
Parents should help by expressing the importance and the need for STEM occupations. They should also try to make STEM subjects fun and exciting. In addition, they should try to get the education system to focus, not just on Math and English, but also the sciences and help them make these subjects exciting by exploring the real world applications of these subjects.
Parents should educate their children.
Parents should be aware of the options and educate their children to help them make a good decision.
Parents should act as mentors, offer guidance, and provide information on fields that would also appeal to their talents.
Parents should encourage their children to continue to learn and expose them to potential jobs and career paths in the STEM-related fields.
Parents should support local STEM in School Initiatives.
Parents should make their children successful in school.
Parents should be teaching and guiding their children.
Parents should encourage their children, give them information on STEM related opportunities, and encourage them through seminars and a better understanding of science related opportunities.
Parents should help to create a love for STEM by providing information, but, they should let their children make their own decisions based on the love and talent they have for the field.
Parents should inform their children about career opportunities.
Parents should determine the areas of interest their children have and show them how they can make a career out of doing what they enjoy.
Parents should act as encouragers, supporters, and advisors for their children.
Parents should inform their children about different occupations and their requirements, preparing children for more technologically advanced careers.
Parents should direct their children towards career and technical education courses and serve as a tnAchieves mentor for their children.
Parents should have a directional and supportive role in their children's lives.
Parents should educate their children of the opportunity.
Parents should act as evaluators of the program.
Parents should have active role by being more involved in helping their children investigate a career in STEM fields.
Parents should realize that STEM education is fundamental to the success of their children and that it is their responsibility to emphasize it just like they do sports or the arts.
Parents should help educate their children on what programs and careers are available.
Parents should be active, positive influences in their children's lives.
Parents should support their children, discuss job options, and related fields of study.
Parents should encourage curiosity in their children by exposing them to various fun science-related activities, museums, etc.
Parents should attend the open house opportunities provided to them in order to see what jobs are available to their children when the students graduate from high school and post-secondary schools.
Parents should become a partner in their children’s schooling by communicating regularly with their children and their children's teachers, school administrators, and counselors to learn more about their children’s STEM learning opportunities and performance.
Parents should be the frontline to help students make the decisions.
Parents should use day to day examples of how STEM makes their lives better to motivate and inspire their children to pursue STEM.

What role should parents play?

Parents should have a small role.

Parents should encourage their children.
Parents should encourage their children.
Parents should encourage schools to offer more STEM classes.
Parents should treat STEM occupational choices as respectable and worth pursuing. They should also encourage enrollment in STEM curriculum and extra-curricular activities. In addition, parents should provide access to computers and other STEM-related devices for regular use.
Parents should make children aware of the opportunities.
Parents should discuss current events with their children.
Parents should not degrade a STEM future.
Parents should promote STEM to their children.
Parents should understand the essential need for these skills.
Parents should encourage their children.
Parents should promote better jobs in the future.
Parents should be responsible for twenty-five percent of their child's STEM education.
Parents should encourage their children.
Parents should encourage their children.
Parents should encourage their children to find a career that they can excel in and not just have them complete college.
Parents should be there to back up the educators and to encourage their children if they do take an interest in STEM related careers.
Parents should encourage their children.
Parents should encourage their children to excel academically.
Parents should offer lots of encouragement to their children.
Parents should encourage their children to enter these fields because of the potential economic benefits and opportunities.
Parents should encourage early learning and the development of cognitive skills that are geared toward math and science, as well as encourage females to explore STEM careers.
Parents should be caring and motivational with their own children.
Parents should encourage their children in these fields.
Parents should talk with their children about the importance of STEM and the fact that studying those areas can lead to long-term, well paying, and secure jobs in their children's future.
Parents should encourage their children's' interests in STEM.
Parents should support higher education achievement.
Parents should encourage and nurture curiosity and experiences in these careers.
Parents should encourage their children to do what they love and find a way to make a living at it.
Parents should encourage their children and provide options for them.
Parents should be educated on the outlook on STEM jobs so that they can help encourage their children to look at that as an option.
Parents should encourage children to pursue the areas that they enjoy.
Parents should act as advocates for STEM.
Parents should act as role models that their children can follow. Regardless if it is in a STEM-related field, they should encourage their children with good examples at home, show that work ethics are important, and that college or any vocational course is important, etc.
Parents should become more familiar with potential STEM occupations for their children.
Parents should have a better understanding of what pathways are out there to help educate their children on career choices, getting more children into STEAM subjects.
Parents should encourage their children to do their homework and go to a college that fits their educational ability.
Parents should encourage their children to study, hold them accountable for their grades, and take them to possible future job locations where these skills are necessary to kindle an interest in the related field of study.
Parents should make sure that their children get an education.
Parents should guide their children.
Parents need to see the value of STEM field jobs and then encourage their children to pursue those jobs whenever the child shows aptitude.
Parents should encourage their children.
Parents should advise their children.
Parents should encourage their children to understand how things work, not just take for granted that they do.
Parents should support their children to be creative overall.
Parents should support children/young adults to participate and encourage their children to further their education.
Parents should be aware of their children's abilities and encourage them.
Parents should act as a role model and encourage their children.
Parents should encourage their children.
Parents should back up their children and help them.
Parents should play a supportive role.
Parents should help students research STEM opportunities and career fields.
Parents should act as motivators of STEM knowledge for their children.
Parents should learn about STEM and discuss it with their children.
Parents should become involved in STEM and be made aware of what is available.
Parents should have graduated high school and be able to help their children fill out papers.
Parents should be the motivating force toward their children's personal goals.
Parents should have an advisory role for their children and more education for themselves.
Parents should encourage their children to stretch their boundaries and not be afraid to move out of their comfort zones.

What role should parents play?

Parents should not have a role.

Parents should allow their children to explore their interests.
Parents should be responsible for the character and upbringing of the child. The child must make their choice as to their career. Why push a child towards something they have no interest in.

What role should educators play?

Educators should have an active role.

Educators should offer more hands-on learning opportunities in the classroom.
Educators should develop curricula for the education of persons in fields where jobs are available and work with the business community to place the students in paid internships.
Educators should have a big role in steering children to STEM fields and away from throwaway college degrees.
Educators should promote STEM as the way out of low income cycle. They need to work to convince minorities and females that STEM is for everyone who will work hard enough to master the skills.
Educators should provide students with a controlled environment within which to teach science and technology with hands on activities.
Educators should be available to provide valuable resources to students seeking an education in STEM related fields.
Educators should begin testing early and identify STEM students. They should then reward those students based on scholarship, competitions, etc.
Educators should require more STEM instruction throughout students' education.
Educators should weave STEM education into a variety of different curricula. They should also incorporate emerging technology trends into the classroom environment. In addition, they should encourage extracurricular STEM activities and increase awareness of the availability of such activities.
Educators should coordinate with parents, advise them, and encourage their students' development by learning more about their individual interests and talents. They should also be more objective than parents.
Educators should introduce students to role models in STEM-related industries.
Educators should help to increase the focus on STEM subjects. They should also make learning those subjects exciting and explore the real world applications of those subjects. In addition, the should have students explore the job opportunities in these fields.
Educators should be able to recognize those future jobs which may require STEM-related skills.
Educators should reveal the avenues available and provide the curriculum and support to allow students to use these vehicles.
Educators should provide proper education in STEM fields to secure educational preparedness.
Educators should make STEM subjects more interesting for students.
Educators should expose students to potential jobs and career paths in the STEM-related fields and adapt curriculum that encourages and engages the students interest in pursuing STEM-related fields.
Educators need to better understand the needs of industry, evaluate students' abilities, and then utilize the knowledge gained from industries to help guide students to the right course of study.
Educators must insure that students are trained to properly perform the tasks that will be required of them in their career. They should insure that what they are teaching meets the students and potential employers needs.
Educators should include STEM-related materials in their classes and show that these are jobs open to all individuals. They definitely need to encourage and support all who show an interest in STEM fields.
Educators should place more emphasis on math and science learning, especially for students who demonstrate aptitude or interest in STEM occupations.
Educators should identify students with STEM-related aptitudes.
Educators should be able to recognize skill sets among students. They should encourage students with strong skill sets in STEM to pursue advanced studies and make the most of their natural skills.
Educators should pay attention to clues that students might be interested in or capable of STEM.
Secondary educators should guide students towards careers and not just degrees. For this to be realized, secondary educators need an opportunity to learn more about STEM occupations and the benefits of technical skill sets.
Educators should provide discounts on student loan repayment for entering a field directly connected with STEM, much like incentives offered to education majors who choose to teach in designated school districts.
Educators should inspire students to have goals and show them the way to meet those goals. They should also expose students to career options they may not have thought about.
Educators should encourage students to explore various career options, invite speakers into the classroom, perhaps do field trips, and stress STEM job options via homework and project assignments.
Educators should provide information to their students and all teachers and schools starting in elementary grades on up should provide more information on STEM occupations to build interest.
Educators should give students opportunities to understand STEM-related fields, as well as explain the different alternatives and bring real-life examples that connect to the STEM field, etc.
Educators should provide AP CTE courses.
Educators should introduce students to STEM occupations and provide an opportunity for STEM-related education.
Educators should serve a technical and demonstrative role.
Educators should bring STEM education to the forefront. They should also encourage students and show them that there are endless possibilities and help them to realize that those careers are not beyond their reach.
Educators should teach their students and broaden the area of STEM education. Teachers should promote STEM and inspire their students to choose STEM programs.
STEM field. At this time the focus seems to be only on reading and math...which are important but we need to not lose our ability to help our students be interested and "like" science too.
Educators should be engaged with the community and the employers in the region.
Educators should show the students new and interesting technology because there is a lot of inspiration out there that could open students up to the idea of getting engaged.
Educators should be "coaches" that encourage the students to be challenged and prepared to make a living by finding a job to fulfill a societal need and contribute to GNP.
Educators should partner more with local business to create intern or apprentice programs. One does not need to be a college graduate to be successful. Technology centers can educate machining, drafting, computer, and welding for industrial and technical areas.
Educators should offer special classes for the students with STEM-related abilities.
Educators should promote colleges specific to STEM and have an introductory type class explaining where students could fit in.
Educators should ensure that students are getting as much information as possible and make STEM as interesting as possible so the individuals will want to move into this field.
Educators should encourage participation in science fairs and visits to businesses involved in STEM-related processes.
Educators should create lessons that entice students to be active participants in classes. They also need to be integrating STEM across the curriculum and at earlier grades.
Educators should be an instrument of STEM preparation and STEM innovation.
Educators should have the biggest role. Educators should have meetings with the county government and get people who can help with these things come in a couple of times and help their county's future.
Educators should educate the parents in addition to the students on the importance of the STEM educational fields.

What role should educators play?

Educators should have a small role.

Educators should encourage their students.
Educators should support their students.
Educators should advise their students.
Educators should provide the public with information on what studies are available.
Educators should expose teens to STEM occupations.
Educators should teach their students.
Educators should be able to provide a proper education to their students.
Educators should have the same role as parents.
Educators should be responsible for twenty-five percent of their students' STEM education.
Educators should motivate their students.
Educators should provide stronger encouragement.
Educators should act as pragmatic guides.
Educators should place an emphasis of rigor in academics.
Educators should provide lots of encouragement.
Educators should fill the same role as the parents.
Educators should encourage and guide students to STEM career choices.
Educators should be teaching children the necessary skills.
Educators should play the role of exposing students to STEM topics and careers.
Educators should provide realistic details of possible career futures and explain the necessary education required to have
Educators should provide information and encouragement, especially for females.
Educators should inform students about how education relates to the real world of career.
Educators should encourage students that do well in these areas to pursue STEM education and careers.
Educators should act as mentors for their students.
Educators should be encouragers. They should encourage students to identify their strengths and pursue careers in the
Educators should act as advisors for their students.
Educators should inform students about the need to be prepared for available occupations and future occupations in our
Educators should have a better understanding how the application of education plays in the STEAM (Science, Technology, Engineering, Arts, Math) world. They should be able to better connect the subjects and know how to take the education to
Educators should encourage their students to excel and go to a school that fits their ability to learn.
Educators should encourage students with an aptitude in the area of study to look at career options early.
Educators should make sure they are teaching the essentials which students will need to survive in this world.
Educators should teach and be willing to do what it take with students.
Educators should explain the process so that students are aware of what STEM does.
Educators should introduce students to the program.
Educators should encourage and inform students about the job opportunities within STEM fields. Students are often
Educators should act as an informational contact for helping students in the decision making process on continuing
Educators should encourage their students and provide academic assistance.
Educators should be positive role models and provide education to help further career goals.
Educators should educate their students.
Educators should more actively promote all levels of STEM careers and education.
Educators should learn about STEM and discuss it with their students.
Educators should provide the means for the parent to know what is available.
Educators should serve as role models to the students. Educators are founts of experience. They have already been where the students are going, undergone what they will go through, and are in a position to pass along lessons, not only
Educators should focus educational programs toward real world vocations.
Educators should serve an informational role by showing the students what is available and needed.
Educators should be encouraging students to pursue STEM-related fields.
Educators should encourage females of their capabilities in STEM.
Educators should properly train the next generation to advance into the roles of innovators.

What role should educators play?

Educators should not have a role in STEM specific education.

Educators should give the best, most informative, and unbiased education possible.
Educators should be caring for, motivating, and sharing the correct information with the students.
Educators should make occupational choices apparent. They should give students a very clear picture of the job
Educators should teach and train their students.
Educators should be qualified in the math and science areas in order to be effective teachers.

What other factors do you think affect the supply of a STEM workforce?

Economic Problems

There are a large number of welfare recipients.
The vibrant economy has an affect on the supply of a STEM workforce.
Socio-economic factors affect the supply of a STEM workforce. If the S-E factors do not promote education or higher skills the student will not follow through with the education that will give them the skills.
There is not enough funding.
The available compensation or salary has an affect on the supply of a STEM workforce.
The STEM job outlook and salary have an affect on the supply of a STEM workforce.
Funding has an affect on the supply of a STEM workforce.
The location of potential jobs, salary compensation, benefit packages, and an enjoyable work place have an affect on the supply of a STEM workforce.

What other factors do you think affect the supply of a STEM workforce?

Community awareness/demand for STEM

Religious communities and churches have an affect on the supply of a STEM workforce.
The perception of STEM and the absence of role models have an affect on the supply of a STEM workforce.
STEM needs to promote simplified versions of desirable STEM-related occupations. There is very little comprehension of what a student will "do" with the STEM training they receive in school as it relates to the workforce. It is common to hear the phrase "never use this in the real world" in relation to STEM-related subjects. It is important to change that perception so that a typical student sees the advantage of STEM-related courses of study.
Absence and ignorance of work opportunities have an affect on the supply of a STEM workforce.
The lack of knowledge about STEM has an affect on the supply of as STEM workforce.
The lack of understanding of current and future job reliance on STEM skills has an affect on the supply of a STEM workforce.
There is a lack of understanding as to the importance of future growth.
The knowledge of what is needed in STEM is lacking. There needs to be a better forum for educators and industries to share information.
There are biases against sex and the media portrayal of STEM jobs and workers is unfavorable.
The presence of clear career opportunities has an affect on the supply of a STEM workforce.
Marketing opportunities have an affect on the supply of a STEM workforce.
There is a misconception that advanced manufacturing involving STEM skill sets is the same that it was 15-20 years ago - dark, dirty, and physically straining. Today's manufacturing is nothing like that and the compensation for the STEM skill set is excellent.
There is not enough information about advancement in career fields.
Frequent guidance and partnerships with industries have an affect on the supply of a STEM workforce.
Job shadow, internship, and apprenticeship opportunities have an affect on the supply of a STEM workforce.
There is a lack of understanding as to what options are available, so younger people are not interesting in exploring STEM education.
The identification of prospective STEM candidates has an affect on the supply of a STEM workforce.
There is a lack of motivation in the form of information (i.e. showing the monetary and reward side of a STEM vocation).
The absence of role models and the poor understanding of the types of jobs available have an affect on the supply of a STEM workforce.

What other factors do you think affect the supply of a STEM workforce?

Education

There is a lack of desire for current educational administration to support a field that they do not understand and/or are not qualified to teach.
There are poor primary and secondary education systems.
The promotion of the types of work required has an affect on the supply of a STEM workforce. Also, social promotion of students. I hear about students who graduate with a B average who must take at least a year of remedial math before they can even begin to understand science based courses. Make no mistake, the secondary educational system sets the underprivileged up for failure when they do not really teach math and science and grade too easily.
Students at the high school level need to be motivated. They need to be shown how even the average student can take advantage of a STEM education. Teach them to not just focus on engineers and scientists, but on skilled jobs such as high tech machinist, draftsmen, and carpenters.
Parents, local governments, and school boards need to be educated about the costs, benefits, and opportunities of STEM.
People do not realize how many occupations fall under the STEM category. Students that struggle with math and sciences feel that they will never be able to achieve in the STEM fields. Girls, especially, are not encouraged to explore the fields of math, science, and engineering (outside of certain health care fields).
The students' surroundings and neighborhoods where they live have an affect on the supply of a STEM workforce.
Some technical careers, especially the trades, are not looked upon as a good career choice for today's students. Parents and teachers need to be better educated on the types of jobs that are available and encourage their students to pursue a career that fits their skills and interests.
These fields are not the easiest educational fields to enter. They require a lot education, which is very costly and very challenging. Also, our government is leaning towards punishing high earners through increasing taxation, which is less of an incentive to take a risk of costlier education and higher risk of failure in attempting to attain higher levels of education.
It is critical that college is affordable and accessible.
The low opinion held for community colleges. Parents, students, and some educators do not realize what education is really needed for most STEM jobs.
The cost of higher education has an affect on the supply of a STEM workforce.
Secondary students are not equipped with the right vision of 21st century industry. For quite some time, students have been told that anything other than a four-year degree is settling for mediocrity. Students must see today's industry sectors and the dividends that are offered. They must learn that while a piece of paper is important, real measureable skills will always ensure a way to provide economic stability.
Community activities, contests, and scholarships have an affect on the supply of a STEM workforce.
Talent, academics, and love for the field have an affect on the supply of a STEM workforce.
The quality of teaching has an affect on the supply of a STEM workforce.
Educating the general public about what STEM is and what jobs qualify has an affect on the supply of a STEM workforce.
Post-high school educational opportunities have an affect on the supply of a STEM workforce.
There is a lack of emphasis on the need to take on hard subjects.
Job availability and the training and education level of the individual have an affect on the supply of a STEM workforce.
Income, available jobs, location, and education have an affect on the supply of a STEM workforce.
The problem of making sure that the students are prepared for the work field has an affect on the supply of a STEM workforce.
Currently the major emphasis is on reading and math. In most school systems, science has been neglected, often having science instructional time cut. This is not helping us produce students who are eager to enter STEM-related fields.
Educational preparedness is an issue.
The emphasis of the curriculum in most schools focuses on sports achievement more than academic achievement.
High schools focus to much on testing english, algebra, and science instead of real world applications. Students will be the best testing adults with no real world application and use of what is taught to them.
Students have poor math skills and there is a lack of emphasis on sciences in K-12 schools.
Having a peer group of classmates will have an affect on the supply of a STEM workforce.
In some areas, students are actually pushed to take only the items that are required. These are fields that are actually profitable and can be used in different industries.
Even though STEM teaching is encouraged, there is not enough encouragement in the upper grades for hands-on activities like science fair projects.
There is a lack of STEM education.
The STEM concept in Tennessee is relatively new. Parents are uninformed even though there is an abundance of available information. Many teachers are still struggling to grasp the STEM concept. Teachers still see math and science as separate entities to be taught separately. Technology and engineering students have previously been taught by a completely different type of teacher in a completely different environment.
Promoting STEM careers early in the child's educational career at the elementary level has an affect on the supply of a STEM workforce.
Knowledge of practical math and science skills has an affect on the supply of a STEM workforce.

What other factors do you think affect the supply of a STEM workforce?

Problems with the STEM Industry

The manufacturing and oil industries have been limited in past years. The growth of STEM requires more of these jobs and companies such as FORD, GM, BP, and so on to partner with schools early in a student's life.
STEM job availability is only as good as the city's technology sectors where one chooses to live. If cities do not invest in STEM jobs, schools will not invest in children to seek STEM placement.
Open-border trade policies like TPP will help make STEM jobs not available for graduates. This is a big reason for the reduction of STEM related jobs over the past 10 years.
Small businesses are penalized for hiring employees. These businesses need to incentives to hire STEM, veteran workforce, and create apprenticeships.
other than the classroom. We try to hire students to work part-time while in college to help build their experience, but there is an added expense in doing this.
The thought of whether or not STEM will last for generations to come has an affect on the supply of a STEM workforce.
The location of STEM education and jobs has an affect on the supply of a STEM workforce.
The workforce is poorly motivated.
Employers need to be more involved.

What are the major challenges associated with the factors affecting the supply of a STEM workforce?

Education

Education is a major challenge associated with the factors affecting the supply of a STEM workforce.
Knowledge is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a lack of trained personnel.
There is a lack of qualified math and science teachers in grade schools.
There is a lack of educational administrative support for STEM in public high schools.
There are poor primary and secondary schools.
Secondary education in urban environments do not prepare students effectively.
There is not a clearly defined and structured education plan to connect students to the workforce.
Educators are attempting to fit all education in a one-size-fits-all box.
There is not affordable access to post-secondary education.
There are not enough students with critical thinking and communication skills coming out of high school.
Educational institutes that do not offer or push STEM.
Education is a major challenge associated with the factors affecting the supply of a STEM workforce.
The current focus on "lowest common denominator" schooling fails to encourage greater STEM training with students interested in and capable of such training.
There is a lack of institutional motivation in the school systems.
There is not a strong enough vocational/educational focus for teenagers.
There is a lack of educated candidates.
Schools do not have the investment to maintain smaller student-to-teacher ratios in schools.
There is not a good STEM curriculum that favors breadth over depth.
There is not enough money for education.
Education is a major challenge associated with the factors affecting the supply of a STEM workforce.
Education is not meeting the employers needs.
Access to education is a major challenge associated with the factors affecting the supply of a STEM workforce.
The cost of education is a major challenge associated with the factors affecting the supply of a STEM workforce.
The difficulty of attaining higher degrees of education is a major challenge associated with the factors affecting the supply of a STEM workforce.
The availability of college and qualified students pursuing STEM learning are major challenges associated with the factors affecting the supply of a STEM workforce.
There needs to be more early-childhood learning of STEM-related subjects.
There are not enough engineers.
The education system from the start (i.e. kindergarten and elementary) is a major challenge associated with the factors affecting the supply of a STEM workforce.
Students have poor math skills. They avoid STEM because they know it is math heavy.
There is not enough interest from high-achieving students.
There is not enough quality equipment for schools.
The schools system is not offering classes because they are not on standardized tests.
There is too much emphasis on college.
There is a lack of STEM experience and education.
Academics are a major challenge associated with the supply of a STEM workforce.
There is a lack of adequate education in STEM.
Students need to be educated as to what to do with their education and career choice.
There is not enough education on what education-specific careers require.
Educational opportunities and funding are major challenges associated with the factors affecting the supply of a STEM workforce.
The availability of effective teachers in STEM areas is a major challenge associated with the factors affecting the supply of a STEM workforce.
There are not enough teachers trained in STEM education.
The weakness of high school curriculum is a major challenge associated with factors affecting the supply of a STEM workforce.
There needs to be systemic alignment of educational programs throughout the system.
There is an emphasis on easier subjects.
There is a lack of education in the local school system.
There needs to be more willingness from individuals to get the education for STEM jobs.
Education is a major challenge associated with the factors affecting the supply of a STEM workforce.
Proper education is a major challenge associated with the factors affecting the supply of a STEM workforce.
There are a lack of hands-on experiences.
There is not enough training throughout the educational process.
Teachers are a major challenge associated with the factors affecting the supply of a STEM workforce.
Education is a major challenge associated with the factors affecting the supply of a STEM workforce.
There are not enough educated workers.
The sharing of information through education system is a major challenge associated with the supply of a STEM workforce.
People are educationally unprepared for STEM.
There is not enough emphasis on STEM by the educational system.
The rigor of the courses that at taught is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is poor math preparation in the educational system.
There are not enough competent educators.
The field of computer technology or computer science is pushed way more than other STEM fields.
Students see science as too hard or too 'nerdy.'
There is too much emphasis on sports vs academics.
There is not a well-trained supply of educators.
Academic preparation is a major challenge associated with the factors affecting the supply of a STEM workforce.
There needs to be a greater emphasis on helping students make informed career choices.
There are no educational incentives for the present workforce to upgrade their skills.
Students are not prepared to enter college.
There is little training among the workforce in STEM.
There is not comprehensive education in the workforce.

What are the major challenges associated with the factors affecting the supply of a STEM workforce?

Finances/Incentives/Resources

Financial assistance is a major challenge associated with the factors affecting a STEM workforce.
The teachers' pay scale for their areas should reflect the private industry's pay scale.
Educated workers are extremely costly.
Candidates are willing to move for more money. There is a lack of loyalty and understanding of all the benefits derived from STEM.
Incentives are a major challenge associated with the factors affecting the supply of a STEM workforce.
Rewards are a major challenge associated with the factors affecting the supply of a STEM workforce.
Finances are a major challenge associated with the factors affecting the supply of a STEM workforce.
Money and resources are major challenges associated with the factors affecting the supply of a STEM workforce.
STEM services are not compensated adequately.
Government disincentives are a major challenge associated with the factors affecting the supply of a STEM workforce.
College being expensive is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is not enough funding for technical education.
The cost of a college education is a major challenge associated with factors affecting the supply of a STEM workforce.
Pay, as it relates to competition in Nashville's market, is a major challenge associated with the factors affecting the supply of a STEM workforce.
Money in education is a major challenge associated with factors affecting the supply of a STEM workforce.
There is a lack of materials available.
Grants are a major challenge associated with the factors affecting the supply of a STEM workforce.
The availability of funds is a major challenge associated with the factors affecting the supply of a STEM workforce.
The cost of higher education and high student loan rates are major challenges associated with the factors affecting the supply of a STEM workforce.
Incentives are a major challenge associated with the factors affecting the supply of a STEM workforce.
Finances are a major challenge associated with the factors affecting the supply of a STEM workforce.
There is not enough funding in schools.
There is no monetary help for the present workforce to upgrade their skills.
Community resources are major challenge associated with the factors affecting the supply of a STEM workforce.

What are the major challenges associated with the factors affecting the supply of a STEM workforce?

Lack of Awareness/Information

There is lack of awareness about STEM.
There are a lack of role models.
Parents in urban centers do not consistently encourage and promote high educational standards in the home.
There is too little promotion made to these students on STEM careers and how they can be a part of them.
Public interest is a major challenge associated with the factors affecting the supply of a STEM workforce.
STEM is not perceived as a highly desirable occupation.
STEM is perceived as being "too hard" compared to other opportunities.
There is a lack of knowledge about programs.
There is concern about misdirecting or "pigeon-holing" children.
There is not enough knowledge about the program.
There is a lack of understanding by the public of need for these skills.
There is a lack of business awareness of STEM applicants.
Educating parents on the merits of STEM is a major challenge associated with the factors affecting the supply of a STEM workforce.
STEM awareness is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a lack of information and understanding regarding STEM.
STEM careers are not seen as attractive.
Parents and students are unaware of the opportunities associated with STEM.
There is a lack of available STEM information.
There is a lack of students with the interest and ability to learn.
There is a lack of motivation in today's youth. They look at STEM as hard and do not want to challenge themselves.
There is a lack of understanding about the skills required for certain jobs.
Children being supported by their parents is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a low level of interest in the student population.
The appearance of "unexciting" occupations in STEM related fields is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is little exposure of students to a wide range of career choices.
There is a lack of interest in STEM fields.
Awareness is major challenge associated with the factors affecting the supply of a STEM workforce.
There in no line of sight from education to career.
There is not enough emphasis by parents and teachers for students to pursue science and math careers.
There is a misconception about careers in the STEM area.
There is weak family support of students.
There is a lack of community support for STEM programs.
There is not enough active encouragement to students about the importance of STEM.
Culture and awareness are major challenges associated with the factors affecting the supply of a STEM workforce.
There needs to be a better understanding of the potential career opportunities in STEM fields.
STEM occupations are not the flashiest jobs.
There is a lack of knowledge about these types of jobs.
There is a lack of emphasis on the rewards of a STEM education.
There is a lack of interest on students' parts.
There is a lack of career planning prior to and at the college level.
There is not enough information out there about STEM.
Most people have no idea what STEM is and they are under the impression that anyone that can add can do this field.
There is not enough emphasis on fostering children's natural curiosity about how things work.
Opinion is a major challenge affecting the supply of a STEM workforce.
There is a lack of knowledge of STEM professions.
There is not enough knowledge about the pay associated with STEM jobs.
The ability to apply to real life situations is a major challenge associated with the factors affecting the supply of a STEM workforce.
Students and parents are satisfied with the status quo.
Parents not understanding how to help their children is a major challenge associated with the factors affecting the supply of a STEM workforce.

What are the major challenges associated with the factors affecting the supply of a STEM workforce?

Challenges within the industry/workforce

There is poor coordination between educators and business.
Cultural norms are a major challenge associated with the factors affecting the supply of a STEM workforce.
Socioeconomic expectations from the community and the family are major challenges associated with the factors affecting the supply of a STEM workforce.
Overseas jobs are a major challenge associated with the factors affecting the supply of a STEM workforce.
City economies are a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a lack of STEM job related work experience in the workforce.
There is a lack of preparation in STEM skills.
On-site training is a major challenge associated with the factors affecting the supply of a STEM workforce.
Open-border trade policies are a major challenge associated with the factors affecting the supply of a STEM workforce.
Job availability is a major challenge associated with the factors affecting the supply of a STEM workforce.
The distance to available jobs is a major challenge associated with the factors affecting the supply of a STEM workforce.
The competition for workers is major challenge associated with the factors affecting the supply of a STEM workforce.
There are not enough workers in the workforce.
The lack of supply is pushing wages higher, which negatively affects smaller businesses.
Sexism is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a lack of initiative in the workforce and a poor economy.
There is a lack of adequate, statewide, advertising strategy supporting 21st century industries.
Training is a major challenge associated with the factors affecting the supply of a STEM workforce.
Tennessee's emphasis on a non-union workforce is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is bias against women being in science jobs.
There is a need to relocate from desired communities.
There are not enough quality applicants.
Talent is a major challenge associated with the factors affecting the supply of a STEM workforce.
The lack of communication skills is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a lack of people skills among the workforce.
There is a lack of information on the program.
Training is a major challenge associated with the factors affecting the supply of a STEM workforce.
There are not enough connections with industries that provide the jobs that need the skills.
Availability is a major challenge associated with the factors affecting the supply of a STEM workforce.
The fear of failure is a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a lack of jobs in the county.
Location is a major challenge associated with the factors affecting the supply of a STEM workforce.
Jobs are a major challenge associated with the factors affecting the supply of a STEM workforce.
Cultural change is a major challenge associated with the factors affecting the supply of a STEM workforce.
The availability of trained people is a major challenge affecting the supply of a STEM workforce.
There is a lack of younger people coming into the STEM workforce.
The older workforce retiring is a major challenge associated with the factors affecting the supply of a STEM workforce.
There are not enough people being creative.
Soft skills are a major challenge associated with the factors affecting the supply of a STEM workforce.
Work ethic is a major challenge associated with the factors affecting the supply of a STEM workforce.
Access is a major challenge associated with factors affecting the supply of a STEM workforce.
Family responsibilities are a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a lack of work ethic in the younger generation.
The availability of public assistance to provide needs is a major challenge associated with the factors affecting the supply of a STEM workforce.
Keeping educated people in this area to work is a major challenge associated with the factors affecting the supply of a STEM workforce.
Unmotivated youth are a major challenge associated with the factors affecting the supply of a STEM workforce.
There is a bias on teachers' parts about females.
Bigger cities have the ability to promote STEM more than smaller cities.

What are the major challenges associated with the pipeline for the STEM workforce?

Lack of knowledge/interest

There needs to be more awareness of desirable jobs associated with STEM courses of study.
STEM is not seen as not exciting.
Students believe that they have to excel in math in order to have a job in a STEM field.
There is not enough emphasis in the public sector on what is needed for STEM skills.
There is not enough interest in STEM within the student population.
Conflicting interests are a major challenge associated with the pipeline for the STEM workforce.
The "have-it-now" society is a major challenge associated with the pipeline for the STEM workforce.
There is not enough interest in STEM jobs.
There needs to be a greater understanding of the jobs available.
There needs to be a greater understanding of STEM careers.
After the plan of being a doctor or an engineer fails, students do not look for other options.
There is a lack of knowledge about STEM degrees.
There is a lack of understanding about STEM careers by students and parents.
Interest is a major challenge associated with the pipeline for the STEM workforce.
There is a lack of guidance to seek STEM jobs.
There is not enough knowledge about the existence of the pipeline for the STEM workforce.
There is not enough knowledge about the STEM workforce.
Getting young people interested in STEM-related careers is a major challenge associated with the pipeline for the STEM workforce.
There needs to be a greater focus on convincing parents to encourage their children to pursue careers that require STEM skill sets.
There is a lack of parental guidance for students.
There is a lack of student initiative.
Culture and awareness are major challenges associated with the pipeline for the STEM workforce.
There is not enough education about the potential salary associated with STEM jobs.
There is a lack of desire to complete education.
Wanting to start family too soon is a major challenge associated with the pipeline for the STEM workforce.
There is not enough knowledge about STEM.
Younger workers are not being directed to STEM fields.
Getting STEM information into the right places is a major challenge associated with the pipeline for the STEM workforce.
Public opinion is a major challenge associated with the pipeline for the STEM workforce.
There is not enough knowledge of the job market.

What are the major challenges associated with the pipeline for the STEM workforce?

Education

Education is the major challenge associated with the pipeline for the STEM workforce.
The uneducated cycle in our current society needs to be broken.
There is a lack of qualified math and science teachers in grade schools.
There needs to be a smooth transition from education to employment.
There is a lack of verbal and written communication skills in the workforce.
There are not enough critical-thinking skills in the workforce.
There needs to be a course of study which remains current and relevant to modern STEM needs.
There are not enough educators who are competent to teach a curriculum which will be sufficient to create a STEM workforce.
Students coming into the workforce lack good communication skills.
STEM education and knowledge needs to be improved.
There is not enough quality public education in Tennessee.
There needs to be more hands-on STEM workers that can teach to students.
There needs to be a greater focus on maintaining good investments with teachers of STEM classes.
Students are not taught basic technology skills.
There needs to be more emphasis on the knowledge and skills needed to be able to complete the path to STEM-related skills.
There need to be pre-education requirements for post-secondary education (i.e. just getting through high school in order to be able to
Students should be offered money for the completion of their post-secondary education programs.
There is a lack of interest in high level Ph.D.-type studies.
There needs to be more open access to education.
College and technical programs need to be made more available.
There needs to be a greater focus on matching college courses or technical programs with the knowledge and skills needed by employers.
Students are afraid of the complexity of STEM degrees.
There is a lack of sufficient mathematical skill sets in the workforce.
Training for teachers is a major challenge associated with the pipeline for the STEM workforce.
Education is a major challenge associated with the pipeline for the STEM workforce.
There are not enough qualified teachers at both the secondary and post-secondary levels to teach STEM courses.
Changes are not being demanded in the educational system or from our citizens.
The availability of courses is a major challenge associated with the pipeline for the STEM workforce.
There is a lack of sufficient mentors in the STEM fields.
There needs to be a greater emphasis on the teaching the skills that prepare one for the work place, such as soft skills and interpersonal
Students need to see more real world applications of STEM.
Students need to be shown more than just computers in order to interest them in STEM fields.
Parents and students need to be educated about STEM.
Academic preparation is a major challenge associated with the pipeline for the STEM workforce.
Students need to be taught what they need to know, instead of what they need to take a test.
There is a lack of educating parents and students about STEM programs, along with the job opportunities that are available in these fields.
There is a disconnect between undergraduate education and workforce requirements.
Educators are unwilling to listen to workforce needs.
Employers are unwilling to share their needs with educational institutions.
There is not enough technology in K-12 schools.
Teachers do not have the skills to properly teach STEM.
There is too much emphasis on sports and not enough on the future.

What are the major challenges associated with the pipeline for the STEM workforce?

Market Problems

There is a lack of available job opportunities.
There are not enough qualified applicants.
Availability is a major challenge associated with the pipeline for the STEM workforce.
Demand is a major challenge associated with the pipeline for the STEM workforce.
Cost is a major challenge associated with the pipeline for the STEM workforce.
There is not enough supply in the STEM workforce.
If supply exists within a region, it often leaves that region. This phenomenon is known as "Brain Drain."
There is not enough skilled labor coming into the workforce.
There are too few opportunities for high-level training at a young age.
There are not enough qualified individuals to fill high competency jobs.
Drain."
Time is a major challenge associated with the pipeline for the STEM workforce.
There are a lack of qualified candidates.
There is not enough funding for STEM.
The compensation for STEM jobs is a major challenge associated with the pipeline for the STEM workforce.
The cost of education is a major challenge associated with the pipeline for the STEM workforce.
There are not enough students with STEM-learning capabilities.
The skills of the workforce do not match their expectation of pay.
Workforce needs should be aligned with training capacity.
Equipment is a major challenge associated with the pipeline for the STEM workforce.
Scheduling is a major challenge associated with the pipeline for the STEM workforce.
The cost of college is a major challenge associated with the pipeline for the STEM workforce.
Job options are a major challenge associated with the pipeline for the STEM workforce.
The need to relocate for the job is a major challenge associated with the pipeline for the STEM workforce.
The demand for experience is greater than supply for experience.
Finding quality applicants is a major challenge associated with the pipeline for the STEM workforce.
Talent is a major challenge associated with the pipeline for the STEM workforce.
Ability is a major challenge associated with the pipeline for the STEM workforce.
Experience is a major challenge associated with the pipeline for the STEM workforce.
There needs to be more women and minority candidates in STEM fields.
There need to be more opportunities for those with low income and the disadvantaged.
Today's workforce is not prepared for the jobs that are currently in the market.
There is a severe deficiency in future skilled workers.
There is a lack of money required to complete education.
The workforce itself is a major challenge associated with the pipeline for the STEM workforce.
Training is a major challenge associated with the pipeline for the STEM workforce.
Many older workers need to be retrained.
The volume of people starting is a major challenge associated with the pipeline for the STEM workforce.
The demand for a skilled STEM workforce exceeds the supply of a skilled STEM workforce.
There has been an exponential growth in demand.
The lag time to catch up plus foreign competition are major challenges associated with the pipeline for the STEM workforce.
Work ethic is a major challenge associated with the pipeline of the STEM workforce.
The competition among companies for employees is a major challenge associated with the pipeline for the STEM workforce.
The varying salaries and benefit structures are major challenges associated with the pipeline for the STEM workforce.
Experience is a major challenge associated with the pipeline for the STEM workforce.
Pay levels are a major challenge associated with the pipeline for the STEM workforce.
There are not enough responsible employees.
The number of students entering the workforce is fewer than the number of people retiring.
Women looking in other professions is a major challenge associated with the pipeline for the STEM workforce.
Changing immigration laws are a major challenge associated with the pipeline for the STEM workforce.
There is a lack of funding for STEM.
STEM typically narrows down in focus, but more general application are needed.
The economic situation of potential students is a major challenge associated with the pipeline for the STEM workforce.

What are the major challenges associated with the pipeline for the STEM workforce?

Community

The welfare mentality is a major challenge associated with the pipeline for the STEM workforce.
More parents need to be involved in order to improve their children's chances of being more successful.
Finding young people with a good work ethic is difficult.
People are not working towards future demand.
People with STEM skills should be encouraged to seek out further STEM education and employment.
There is a lack of funds in families for continued education.
Students see lifelong learning as a downside to STEM.
STEM survives better in big cities, but people like rural culture instead.

What role do technological resources (hardware and software) play in attracting and maintaining a STEM workforce?

Helps improve quality of work

It is positive to have state of art equipment in order to do jobs.
Technological resources play a role later once the basics are there. More equipment is used to hone the skills of the STEM workforce.
Technological resources are critical for STEM workers.
Access to a computer is obviously required for any STEM-related field.
Employing a STEM workforce necessarily means providing access to the tools they require, typically including high-end hardware and a variety of software licenses. Failure to maintain these technological resources will result in not having a STEM workforce anymore.
Technological resources can be useful for young adults and teenagers to invigorate their yearning to learn.
Technological resources expand the potential for opportunities to the STEM workforce.
Technological resources increase educational opportunities.
Training programs must be kept technologically up-to-date.
Technological resources build and maintain legitimacy among industries.
Technological resources allow folks to stay closer to home.
Technological resources make the business feel more contemporary.
Technological resources make doing the job possible.
Expanding resources allows the workforce to do the job in a variety of ways.
Technological resources make work more efficient.
Businesses must be willing to spend the necessary money to support these resources.
Technological resources are important to advance communities.
Technological resources are important to the advancement of educational institutions.
Lagging behind the country in high-speed internet access puts a region behind the curve immediately.
The economy is technology driven today.
Technological resources drive the business.
Technological resources allow businesses to advertise more.
Community infrastructure needs to be upgraded.
Cities that offer community-wide Wi-Fi have worked well.
Technological resources facilitate interactions with the rest of the STEM workforce.
Students need to have access to reliable, high quality internet.
Software needs to be comprehensive and easily obtainable.

What role do technological resources (hardware and software) play in attracting and maintaining a STEM workforce?
Helps attract/maintain employees
Technological resource provide proficiency in attracting and maintain a STEM workforce.
Technological resources provide efficiency in attracting and maintaining a STEM workforce.
The quality and quantity of technological resources play a role in attracting and maintaining a STEM workforce.
Technological resources provide exposure in attracting and maintain a STEM workforce.
Technological resources provide inspiration in attracting and maintaining a STEM workforce.
Information plays a role in attracting and maintaining a STEM workforce.
Technological resources are the maximum condition for success in attracting and maintaining a STEM workforce.
needed.
Technological resources act as an enabler in attracting and maintaining a STEM workforce.
Candidates want the "latest and greatest" technological resources.
Candidates do not necessarily understand the costs associated with the newest technological resources.
Technological resources play some role in attracting and maintaining a STEM workforce.
Technological resources attract workers to businesses.
Technological resources provide efficiency in attracting and maintaining a STEM workforce.
Without the resources available a STEM worker would have little to no reason to accept a position that does not support
People can relate more to a company that fits the system and lifestyle they have.
Technological resources act as an enabler in attracting and maintaining a STEM workforce.
Technological resources have somewhat of a role in attracting and maintaining a STEM workforce, but they are not a major
Technological resources are an attraction to high school students.
People are attracted to STEM fields because of the technological resources.
Technological resources play a role in attracting students to particular programs.
Computers play a role in attracting and maintaining a STEM workforce.
Robots play a role in attracting and maintaining a STEM workforce.
KNexs kits play a role in attracting and maintaining a STEM workforce.
Technological resources are the #2 factor in attracting and maintaining a STEM workforce.
Pharmacy equipment plays a role in attracting and maintaining a STEM workforce.
Businesses must be current on hardware and software in order to attract and maintain a STEM workforce.
Technological resources are required to attract employees.
Technological resources are important to promote STEM programs to students.
Technology resources play the most important role in attracting and maintain a STEM workforce.
The industry relies on technology to attract and maintain a STEM workforce.
Scholarships play a role in attracting and maintaining a STEM workforce.
Businesses need to stay current with technological resources in order to attract and maintain a STEM workforce.
Hardware and software play a major role in attracting and maintain a STEM workforce.
Internet access plays a role in attracting and maintaining a STEM workforce.
Updated hardware plays a role in attracting and maintaining a STEM workforce.
Adaptable software plays a role in attracting and maintaining a STEM workforce.
The sustainability of technological resources plays a role in attracting and maintaining a STEM workforce.
Hardware and software are the primary fields used to attract and maintain a STEM workforce.
Technological resources must be state of the art in order to attract and maintain a STEM workforce.
The STEM workforce uses technological resources to attract for several reasons.
Staying up-to-date with technological resources plays a role in attracting and maintaining a STEM workforce.

What role do technological resources (hardware and software) play in attracting and maintaining a STEM workforce?
Previous technological experience/knowledge
Proficiency in office software, such as MS Word, Excel, Outlook, and PowerPoint, is required.
Experience in industry-related software, such as SPSS and MATLAB is desirable.
Basic computer and networking knowledge is desirable.
Learning is a constantly improving process. A business must upgrade or fall behind.
Students need access to these resources early in the educational process.
Students need to be on the cutting edge of technological resources.
Students from rural areas need to be able to compete with those in larger markets.
Technological resources prepare students to enter the STEM workforce.
Hardware and software have significant cost factors.
Social media is playing a more important role than technological resources.
Everyone today must have some technological training.

What role do technological resources (hardware and software) play in attracting and maintaining a STEM workforce?

None or little

Technological resource play a very little role at first because one has to learn the basics first.
Technological resources play a very little role in attracting and maintaining a STEM workforce.
Businesses should push hands-on experience first.

What role do other resources such as programs and funding play in attracting and maintaining a STEM workforce?

To attract/maintain workforce

Programs and funding are attractive to qualified applicants.
Programs and funding tend toward longevity in the workforce.
Businesses should not have to incentivize people for a chance at a brighter financial future.
Programs and funding play the role of seeding talent in attracting and maintaining a STEM workforce.
Programs and funding provide exposure in attracting and maintaining a STEM workforce.
Programs and funding play the role of training in attracting and maintaining a STEM workforce.
Programs and funding play a massive role in attracting and maintaining a STEM workforce.
Funding is critical, but parent/educator/government cooperation is the most important aspect of attracting and maintaining a STEM workforce.
Programs and funding play a little role in attracting and maintaining a STEM workforce.
Programs and funding play a lot of roles in attracting and maintaining a STEM workforce.
Programs and funding ensure an ongoing supply of skilled workers.
Programs and continued funding encourage engagement.
Programs and funding play a monetary role in attracting and maintaining a STEM workforce.
Programs play a physical role in attracting and maintaining a STEM workforce.
Programs and funding play an emotional role in attracting and maintaining a STEM workforce.
Smaller businesses will require additional funding in order to be able to become competitive with larger businesses in attracting and maintaining a STEM workforce.
Funding schools to have the right program is critical to attracting and maintaining a STEM workforce.
Programs and funding play the role of enabling the attraction and maintenance of a STEM workforce.
In order to attract people to STEM, information about what programs are available is needed. This requires funding.
Adult need to be made aware of STEM as well as children and students. Adults lack the knowledge and thus do not pursue STEM education. Funding matters in attracting and maintaining a STEM workforce.
Programs and funding are the #1 factor in attracting and maintaining a STEM workforce.
Programs and funding produce a workforce with the knowledge to do STEM work.
Programs and funding play the role of continuing educational opportunities for the STEM workforce.
Leveraging these programs against other fields plays a role in attracting and maintaining a STEM workforce.
Programs and funding are very important in attracting and maintaining a STEM workforce.
Programs and funding have to be present in order to attract and maintain a STEM workforce.
Programs and funding would encourage a lot of people to enroll in STEM education.
People go where the money is located.
STEM programs need to be in place in schools in order to attract and maintain a STEM workforce.
Partnerships and internships are major drivers in attracting and maintaining a STEM workforce.
A large array of programs plays a role in attracting and maintaining a STEM workforce.
Adequate funding is needed to attract and maintain a STEM workforce.
Projected 10-year funding plays a role in attracting and maintaining a STEM workforce.
The STEM workforce is more attracted to the type of program. The workforce should not refuse good pay, but salary is not the biggest motivator.

What role do other resources such as programs and funding play in attracting and maintaining a STEM workforce?

Other resources, besides programs and funding, play more important roles in STEM

Educators should test for aptitude and encourage those who have talent and skill.
The education for the STEM workforce must be affordable.
Providing or supporting a continuing education program is extremely important in maintaining a STEM workforce. More so than in other fields, it is mandatory that a STEM workforce stays current on the latest developments in their area of technical expertise.
Programs and funding are not as critical as a business managing its use of technology.
Programs and funding have no role in attracting and maintaining a STEM workforce.
Without other resources, the STEM student will not be able to compete with other programs that offer the best students help and guidance.
Effective new programs are not possible when the capacity to implement them is strained.
Programs and funding, without fundamental skills, are worthless.

What role do other resources such as programs and funding play in attracting and maintaining a STEM workforce?

Programs and funding play important roles in various STEM components

Programs and funding must be used as a non-traditional means of preparing the STEM workforce.
Programs and funding are in high demand.
Any resources that do not cost the STEM workforce additional money are highly beneficial.
Programs and funding need to be the most current available.
Changing the mindset of today's workforce may require an advertising program.
Programs and funding provide learning opportunities for students.
Elementary and middle school programs have helped students become aware of STEM at earlier ages. This does require consistency and funding.
Programs and funding limit potential college debt.
Programs and funding lead to new developments in STEM fields.
Programs and funding leverage Tennessee against other states and regions.
Education funding at all levels in Tennessee is deficient.
Individuals no longer know how to use a slide rule.
Individuals rely upon programs to do their work today.
Programs speed up productivity.
Education funding cuts need to be more discriminate.
Legislators should reward schools who focus on STEM with programs and funding.
Businesses should do as much advertising as they can to promote their programs.
Teaching STEM is costly. High schools are not adequately funded to meet the needs of the industry.
Funding resources would benefit the students.

What role do other resources such as programs and funding play in attracting and maintaining a STEM workforce?

STEM businesses are not funded

Businesses do not receive funding for the STEM workforce.

What other resources do you offer in order to attract and maintain a STEM workforce?

Financial incentives

Bonuses can be offered in order to attract and maintain a STEM workforce.
Paid vacations and retreats can be offered in order to attract and maintain a STEM workforce.
A reimbursement for continuing education can be offered in order to attract and maintain a STEM workforce.
Good wages and benefits can be offered in order to attract and maintain a STEM workforce.
Ownership can be offered in order to attract and maintain a STEM workforce.
Reimbursement for educational expenses upon competition can be offered in order to attract and maintain a STEM workforce.
Tuition assistance and student loan repayment can be offered in order to attract and maintain a STEM workforce.
Competitive market salaries can be offered in order to attract and maintain a STEM workforce.
Limited reimbursement for school expenses can be offered in order to attract and maintain a STEM workforce.
A salary can be offered in order to attract and maintain a STEM workforce.
Money can be offered in order to attract and maintain a STEM workforce.
A good pay rate for the area can be offered in order to attract and maintain a STEM workforce.
Good pay can be offered in order to attract and maintain a STEM workforce.

What other resources do you offer in order to attract and maintain a STEM workforce?

Additional benefits

Soft skill training to foster teamwork within companies can be offered in order to attract and maintain a STEM workforce.
Health and investment benefits can be offered in order to attract and maintain a STEM workforce.
Breaking the "I can't" mentality can attract and maintain a STEM workforce.
Eliminating the "dumbing down" of our educational system brought on by the No Child Left Behind campaign can attract and maintain a STEM workforce.
In addition to continuing education, retirement, vacation/sabbatical, and health plans are offered as good traditional ways to attract STEM
More modern methods, flex time, mobile offices, and company-paid smart phones can be offered in order to attract and maintain a STEM workforce.
Snacks can be offered in order to attract and maintain a STEM workforce.
A flexible work schedule can be offered in order to attract and maintain a STEM workforce.
Transfers and promotions within the company can be offered in order to attract and maintain a STEM workforce.
Hooks or benefits can be offered in order to attract and maintain a STEM workforce.
Job fairs can be offered in order to attract and maintain a STEM workforce.
A platform for success can be offered in order to attract and maintain a STEM workforce.
Encouragement to work hard, persevere, and be rewarded by the results can be offered in order to attract and maintain a STEM workforce.
Flexible work schedules so people can go to class can be offered in order to attract and maintain a STEM workforce.
Strong administrative support can be offered to attract and maintain a STEM workforce.
Work/life consideration can be offered in order to attract and maintain a STEM workforce.
Leading health care options can be offered in order to attract and maintain a STEM workforce.
Coalitions with industry to target specific sectors and occupations in demand can be offered in order to attract and maintain a STEM workforce.
Accounting programs can be offered in order to attract and maintain a STEM workforce.
Computer programs can be offered in order to attract and maintain a STEM workforce.
Promotions can be offered in order to attract and maintain a STEM workforce.
Flexible work hours and shifts can be offered in order to attract and maintain a STEM workforce.
Advancement can be offered in order to attract and maintain a STEM workforce.

What other resources do you offer in order to attract and maintain a STEM workforce?

Good work environment

Social gatherings can be offered in order to attract and maintain a STEM workforce.
Contests can be offered in order to attract and maintain a STEM workforce.
A winning environment can be offered in order attract and maintain a STEM workforce.
School sponsored tours can be offered in order to attract and maintain a STEM workforce.
Businesses should advertise in order to attract and maintain a STEM workforce.
Quality of life for employees can be offered in order to attract and maintain a STEM workforce.
Good working conditions can be offered in order to attract and maintain a STEM workforce.
Only hiring persons that have training in STEM fields can attract and maintain a STEM workforce.
A good environment with others and the flexibility to do the job can be offered in order to attract and maintain a STEM workforce.

What other resources do you offer in order to attract and maintain a STEM workforce?

Educational incentives

An easy conversion from school to internship to employment can be offered in order to attract and maintain a STEM workforce.
Workshops can be offered in order to attract and maintain a STEM workforce.
Training employees as necessary can attract and maintain a STEM workforce.
An active internship program when there are not the resources to hire can be offered in order to attract and maintain a STEM workforce.
Continuing education can be offered in order to attract and maintain a STEM workforce.
Constant training can be offered in order to attract and maintain a STEM workforce.
Continuing education can be offered in order to attract and maintain a STEM workforce.
In-house training and manufacturer/industry seminars can be offered in order to attract and maintain a STEM workforce.
Encouragement to further education if desired can be offered in order to attract and maintain a STEM workforce.
Business-education partnerships can be offered in order to attract and maintain a STEM workforce.
Additional training and certification in the career field can be offered in order to attract and maintain a STEM workforce.
STEM classes can be offered in order to attract and maintain a STEM workforce.
Allowing students to see the fun side of STEM work and that math is not so bad when it is applied can attract and maintain a STEM
On the job training and licensing can be offered in order to attract and maintain a STEM workforce.
Continuing education can be offered in order to attract and maintain a STEM workforce.
Experiential learning and a hands-on approach can be offered in order to attract and maintain a STEM workforce.

Should there be a role for the government to play in promoting STEM workforce dynamics? If so, what role?

Serve a financial role

The government should provide funding to private institutions to promote STEM workforce dynamics.
The government should serve a financial role and provide grants to promote STEM workforce dynamics.
The government should maybe provide funding to promote STEM workforce dynamics.
The government should provide financial help for high-tech vocational skills to promote STEM workforce dynamics.
The government should provide financial assistance for STEM college degrees.
The government should fund research and provide training in STEM-related fields in the economic interest of everyone.
The government should provide funding to promote STEM workforce dynamics.
The government should reward successful programs with more funding and public acknowledgment to promote STEM workforce dynamics.
The government should provide training grants to students to promote STEM workforce dynamics.
The government should provide money for STEM programs.
The government should provide incentives for matching funds to promote STEM workforce dynamics.
The government should serve a financial role to promote STEM workforce dynamics.
The government should provide funding for students wanting to go into STEM fields.
The government should provide incentives to small businesses to promote STEM workforce dynamics.
The government should offer small businesses incentive to buy-in to STEM programs.
The government should provide funding for high schools to start STEM coursework to engage the students earlier in their education and promote the positive aspects of a position in the STEM workforce.
The government should support educational expenses.
The government should provide funding for the right programs to promote STEM workforce dynamics.
The government should provide some funding to promote STEM workforce dynamics.
The government should lower the tax burden on employers to encourage job growth.
The government should provide competitive grants to promote STEM workforce dynamics.
The government should do nothing other than offering discounts on student loans to promote STEM workforce dynamics.
The government should provide funding for students to go to school to promote STEM workforce dynamics.
The government should provide more scholarships for STEM students to promote STEM workforce dynamics.
The government should provide internships to help students financially.
The government should provide tuition discounts for Tennessee students to promote STEM workforce dynamics.
The government should influence, fund, and demand systemic changes in the educational system that trains the supply of
The government should fund more education than sports to promote STEM workforce dynamics.
The government should give more money for education to promote STEM workforce dynamics.
The government should provide grants to promote STEM workforce dynamics.
The government should put their money where the return is the greatest to promote STEM workforce dynamics.
The government should provide scholarship money to students in STEM fields.
The government should make grants and training available for educators to promote STEM workforce dynamics.
The government should provide financial aid to promote STEM workforce dynamics.
The government should offer tax incentives to promote STEM workforce dynamics.
The government should recruit and fund students in pursuit of an education to promote STEM workforce dynamics.
The government should provide discounted educational services for STEM areas to promote STEM workforce dynamics.
The government should provide education to promote STEM workforce dynamics.
The government should provide training to promote STEM workforce dynamics.
The government should provide funding to promote STEM workforce dynamics.

Should there be a role for the government to play in promoting STEM workforce dynamics? If so, what role?

Should not be in STEM

The government should stay out of STEM.
The government should not micromanage STEM workforce dynamics.
The government should make education flexible and get out of the way.
The government should let innovation take over.
The government should provide GED programs to promote STEM workforce dynamics.
The government should promote STEM workforce dynamics through the education system.
The government alone should have a limited role in the promotion of STEM workforce dynamics.
No.
No.
No.
No.
No.
The government is into STEM too much. The government must let the people to drive STEM.

Should there be a role for the government to play in promoting STEM workforce dynamics? If so, what role?

Should promote/inform in STEM
The government should provide program monitoring and audits to promote STEM workforce dynamics.
The government should focus on domestic, rather than foreign STEM workforce dynamics.
The government should conquer the digital divide to promote STEM workforce dynamics.
The government should attract high-tech employers to promote STEM workforce dynamics.
The government should promote living in Tennessee specifically to out of state STEM employees.
The government should work to promote STEM to students directly.
The government should provide motivation through job qualification requirements to promote STEM workforce dynamics.
The government should lead by example and stay current with technological innovations to promote STEM workforce dynamics.
The government should play an educational role in promoting STEM workforce dynamics.
The government should always promote education. The government should promote STEM-related schooling whether it is at universities or technical schools. The government's role should be in providing funding and guidelines for STEM courses.
The government should advertise to promote STEM workforce dynamics.
The government should educate teachers to promote STEM workforce dynamics.
The government should facilitate increased cooperation between economic-community development boards and higher education institutions to promote STEM workforce dynamics.
The government should create a "one-stop shop" that includes all entities that can help attract, retain, and grow businesses in Tennessee.
The government should provide incentives to employers to promote STEM workforce dynamics.
The government should support the state government to promote STEM workforce dynamics.
The government should provide publicity to promote STEM workforce dynamics.
The government should educate the general public to promote STEM workforce dynamics.
The government should serve as a facilitator in the promotion of STEM workforce dynamics.
The government should provide opportunities to promote STEM workforce dynamics.
The government should provide program support to promote STEM workforce dynamics.
The government should partner with the private sector to promote STEM as a career and help direct the conversation about STEM workforce needs.
The government should provide awareness programs to Tennessee businesses to promote STEM workforce dynamics.
The government should provide information on occupational supply and demand projections to promote STEM workforce dynamics.
The government should provide incentives and awareness to promote STEM workforce dynamics.
The government should provide resources, hardware, and software for training to promote STEM workforce dynamics.
The government should honor good students rather than good football players.
The government should promote STEM workforce dynamics.
The government should provide incentives to promote STEM workforce dynamics.
The government should promote STEM programs.
The government should provide marketing activities to promote STEM workforce dynamics.
The government can facilitate the promotion of STEM workforce dynamics in many ways.
The government should emphasize, endorse, and advocate for STEM.
The government should help provide information to students and K-12 staff to promote STEM workforce dynamics.
The government should promote STEM workforce dynamics.

Should there be a role for the government to play in promoting STEM workforce dynamics? If so, what role?

Should regulate/involved in STEM areas

The government should provide gigabit internet in all major metropolitan areas in the state.
The government should support internal technological changes to promote STEM workforce dynamics.
The government should ensure the availability of health care benefits to promote STEM workforce dynamics.
The government should use its resources related to workforce training and placement services to guide job candidates into fields with demand for workers.
The government should work to create a dedicated workforce.
The government should ensure the return on investment by accountability to promote STEM workforce dynamics.
The IRS should be allowed to make it mandatory that individuals are trained in order to be in STEM fields.
The government should provide regular testing and continuing education to promote STEM workforce dynamics.
The government should lead in certain programs not going to be pursued by private industry to promote STEM workforce dynamics.

What are the potential ways to engage business, industry, and other community partners to advance STEM?

Encourage/promote

Visibility and marketing are potential ways to engage business, industry, and other community partners to advance STEM. For example, sell the idea and merits of rebuilding middle class America through the advancement of STEM.
Advertising promotions are potential ways to engage business, industry, and other community partners to advance STEM.
Sponsoring some sort of career readiness fair is a potential way to engage business, industry, and other community partners to advance STEM.
Employers are desperate for employees. Most employers will see that promoting themselves to high schools will effect their future growth.
Advertising the STEM program is a potential way to engage business, industry, and other community partners to advance STEM.
Having businesses go out into the public and into schools to make students and parents aware of the future STEM-related career options is a potential way to engage business, industry, and other community partners to advance STEM.
Involvement and interactions are potential ways to engage business, industry, and other community partners to advance STEM.
Proving that STEM jobs will help grow the economy is a potential way to engage business, industry, and other community partner to advance STEM.
Industries should reach out to schools at all levels. They can provide guidance, information, field trips, partnerships, internships, mentors, job shadowing, and other opportunities.
Creating a more aggressive awareness campaign is a potential way to engage business, industry, and other community partners to advance STEM.
Getting all segments in a room to discuss the need for a greater focus on STEM is a potential way to engage business, industry, and other community partners to advance STEM. Each group can express its opinion from its unique perspective to help educate each other and form cooperative efforts to promote STEM education and training.
In west Tennessee, the manufacturing companies are very cooperative and willing to help.
Workforce development boards need to communicate their needs to educators. Their needs should be the driving force for educators.
Getting businesses to realize and accept that STEM is important to everyone are potential ways to engage business, industry, and other community partners to advance STEM.
Working together to promote the programs and career opportunities is a potential way to engage business, industry, and other community partners to advance STEM.

What are the potential ways to engage business, industry, and other community partners to advance STEM?

Provide Incentives

Gigabit internet adoption and increasing broadband to all homes in the state are potential ways to engage business, industry, and other community partners to advance STEM.
Incentives which emphasize collaboration in the community are potential ways to engage business, industry, and other community partners to advance STEM.
Money through stipends, tax breaks, contract awards, and scholarship awards to owners for their children is a potential way to engage business, industry, and other community partners to advance STEM (i.e. for every dollar spent on a STEM employee a credit at a state college is given to the spender's children or grandchildren.)
Providing incentives for engaging in STEM-related activities and hiring STEM-related workers are potential ways to engage business, industry, and other community partners to advance STEM.
Placing an emphasis on economic and community development boards to not only visit a certain number of businesses, but make a certain number of connections between higher education and workforce needs is a potential way to engage business, industry, and other community partners to advance STEM.
Connecting qualified candidates with potential employers is a potential way to engage business, industry, and other community partners to advance STEM.
Tax incentives are potential ways to engage business, industry, and other community partners to advance STEM.
Giving work credit to STEM education to encourage students to work in STEM jobs while obtaining their degree is a potential way to engage business, industry, and other community partners to advance STEM.
Incentives are a potential way to engage business, industry, and other community leaders to advance STEM.
A user-friendly (both applicant and employer) jobs posting service is a potential way to engage business, industry, and other community partners to advance STEM.
Setting up industry councils is a potential way to engage business, industry, and other community partners to advance STEM. Encourage more workforce dialogue between economic development staff and specific businesses. Introduce top level executives to university and community college programs that can be customized for their needs.
Regional skills panels are potential ways to engage business, industry, and other community partners to advance STEM.
Having competitive events among local students to showcase STEM learning is a potential way to engage business, industry, and other community leaders to advance STEM.
Salary promotions and opportunities for advancement are potential ways to engage business, industry, and other community partners to advance STEM.
Making STEM profitable for business, industry, and other community partners is a potential way to engage these partners to advance STEM.

What are the potential ways to engage business, industry, and other community partners to advance STEM?

Educate

Being proponents of and mentors to those who show promise in STEM fields and are willing to sacrifice is a potential way to engage business, industry, and other community partners to advance STEM.
Allowing businesses and industries to interact with educators to develop the needed training is a potential way to engage business, industry, and other community partner to advance STEM.
Subsidizing education of current employees while they are working for their current employer is a potential way to engage business, industry, and other community partners to advance STEM.
Bringing all interested parties together around education to train and supply a workforce to meet the industry's demands is a potential way to engage business, industry, and community partners to advance STEM.
Offering the opportunity to participate in extracurricular STEM-related events is a potential way to engage business, industry, and other community partners to advance STEM.
Education and recruitment through professional and civic organizations as well as through PTAs and school boards are potential ways to engage business, industry, and other community partners to advance STEM.
Social interaction and seminar promotion are potential ways to engage business, industry, and other community partners to advance STEM.
Internship programs are potential ways to engage business, industry, and other community partners to advance STEM.
Developing partnerships with local colleges and high schools is a potential way to engage business, industry, and other community partners to advance to STEM.
Working with local chambers of commerce and hosting job fairs are potential ways to engage business, industry, and other community partners to advance STEM.
Discussions between educators and business owners about what is needed are potential ways to engage business, industry, and other community partners to advance STEM.
Mentoring programs with Tennessee students, with tax abatement incentives, is a potential way to engage business, industry, and other community partners to advance STEM.
Forming committees to recognize scholars rather than football players and basketball players and give awards to scholars is a potential way to engage business, industry, and other community partners to advance STEM.
Educating business, industry, and other community partners on the benefits of the STEM program is a potential way to engage these community partners to advance STEM.
Mentorships are potential ways to engage business, industry, and other community partners to advance STEM.
Internships, partnerships, lectureships, sponsorships, and scholarships are potential ways to engage business, industry, and other community partner to advance STEM.
Education is a potential way to engage business, industry, and other community partners to advance STEM.
The schools have to accept assistance from the businesses and community partners rather than saying they do not have enough time to participate.
Providing a research and development consultant pro bono to the industry, in their career field, is a potential way to engage business, industry, and other community partners to advance STEM. Helping them to see applications to further their business opportunities is also important.
Offering free classes to business owners and staff is a potential way to engage business, industry, and other community partners to advance STEM.

What are the major challenges associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics?

Educational

STEM should have training programs at home.
Creating incentives for education is a major challenge associated with the STEM workforce and the government's role in promoting STEM workforce
Educators need to hold one another accountable and get better.
Education simply is not changing as rapidly as the STEM workforce environment is changing. Children are still using printed textbooks.
STEM requires a certain level of education and skill sets. Many smaller business cannot afford to hire someone with those skill sets or compete against the bigger companies for that workforce. Without help from the government, many small companies or lower income students will not be able to participate in building that infrastructure and the workforce. Money becomes the major challenge associated with the building and promotion of STEM.
Just getting students to take and follow through with the coursework associated with STEM degrees is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Colleges/universities must have qualified faculty.
High schools must have qualified faculty.
Schools must have the current technology for use by students.
Educating teachers is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Educating the public as to what STEM is and what is needed to qualify is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Cooperation among the various education systems that often operate in silos is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Higher education's budget limitations often delay replacing outdated equipment.
The lack of education of the legislators is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Educators should pull the smartest students and encourage them to enter STEM fields.
The lack of buy-in by some educators and parents is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.

What are the major challenges associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics?

Government

The government needs to set the goals for STEM and then get out of the way.
The government needs to get out of STEM.
The government makes a mess of STEM.
The distrust of government meddling is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The state lags behind the private sector in its use of technology.
Resistance from our conservative state government is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The government will screw up STEM.
The possible lack of backing by prominent government officials is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Politics, power, and greed are major challenges associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Politics are a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Politics are a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The government is not focusing on economic factors.
The government tends to use longer processes that take time in getting licenses.
The government puts additional work on processes for STEM companies.
Cooperation between the private and public sector who often do not communicate well is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The government can only represent its constituents. Citizens must, ultimately, see value in change and take personal steps to make that change.
Legislators are not willing to fund STEM programs.
The government getting on board is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The centralized leadership is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The government is too slow to move on things.
Government regulations are a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The government is usually too bureaucratic and moves too slow.

What are the major challenges associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics?

Financial

The current funding focus is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Funding is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Money and leadership are major challenges associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Money is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The possible lack of funding is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Small businesses need to buy-in to STEM.
Finances are a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The potential waste of money on non-productive programs and technology is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Funding and support for concurrent credit are major challenges associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Budget cuts are a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Funding is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Using designated funds wisely is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Too much money is diverted for administration of needs.
Expenses are a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
There needs to be more knowledge about the income associated with STEM fields.
Funding is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.

What are the major challenges associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics?

STEM Industry

Personal agendas and greed are major challenges associates with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Credit needs to be given to companies promoting STEM education.
The lack of vision is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The metropolitan versus rural dynamic is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Inertia is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Suspicion or opposition by teachers' unions is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Time is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The interest of today's workforce is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
There needs to be a recognized processes for cooperation between economic developers and workforce development providers.
The socioeconomic stratification present in the state of Tennessee presents unique challenges unlike most states. Creating a sense of urgency in all classes is imperative.
Gathering the necessary information as to what is available and what is needed is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Communication is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Vision is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Coordination and alignment are major challenges associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Creating a balanced statewide program is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Reporting outcomes are a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The industry's needs are different across the state. A STEM worker in Memphis has different specializations than in Knoxville or Chattanooga.
The industry is not properly engaged in creating actual solutions. They are frequently surveyed, but rarely are they part of building a specific solution.
Diversity is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The lack of a common vision is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
STEM as a 'term' is mostly meaningless. It must be translated to careers and pay levels.
The lack of direction is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Fragmentation, rather than a cohesion of efforts, is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
Getting the message about STEM to the youth is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM dynamics.
There are not enough people that understand this field fully.
Testing people to see what they are good at is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.
The privacy of confidential business operations is a major challenge associated with the STEM infrastructure and the government's role in promoting STEM workforce dynamics.

How does the advancement of technology affect your business?

Greatly affects the business financially/productively

Our business can offer more to participants and employees.
The advancement of technology can become a reckoning force in the community.
The advancement of technology opens doors to other opportunities.
The advancement of technology makes our business cost more.
The advancement of technology makes our business more efficient.
The advancement of technology makes our business more profitable.
The advancement of technology increases our business' return on investment.
The advancement of technology creates more talent for our business.
The advancement of technology allows our business to develop new products.
Technology drives our business.
The advancement of technology reduces training for our business.
A strong STEM sector increases business opportunities for our company.
The rising tide lifts all boats.
Software is always evolving and our STEM workforce needs to constantly be updating its knowledge.
New hardware has the potential for creating greater efficiencies in speed and execution.
New platforms and ideas revolutionize the way industries approach problems requiring solutions that did not exist two years ago.
The advancement of technology brings greater efficiency to our business.
The advancement of technology increases insight for our business.
The advancement of technology leads to greater professionalism in our business.
The internet has created great opportunities for innovation in our business.
The advancement of technology brings improved efficiencies to our business.
The advancement of technology advances product designs for our business.
The advancement of technology helps make certain aspects of our business more streamlined.
The advancement of technology is crucial in health care, but it is also expensive.
The advancement of technology affects our business the same way it does every other business.
Quality information management is essential to our business.
The latest computer technology makes our business' information management system work better.
The advancement of technology helps weed out the weaker players from our business.
The advancement of technology helps our business have more reach.
The advancement of technology opens up the possibility of parody for our business.
The products sold need to continue to upgrade and expand to satisfy the consumer's need to tie all their
The advancement of technology makes our business market our product to the technologically savvy (and the ones that think they are).
Our business is constantly working to stay ahead of technological advances.
The advancement of technology increases the need for more technical people to stay competitive.
The advancement of technology improves productivity in our business by converting manual operations to computerized operations.
The advancement of technology means that our business must upgrade our systems frequently.
The advancement of technology helps our business stay competitive in the global market.
The advancement of technology affects the data security of our business.
The advancement of technology gives our business remote access.
The advancement of technology has created the telecommuting workforce.
The advancement of technology requires increased funding to purchase up-to-date industry equipment.
The advancement of technology places an importance on training faculty.
The advancement of technology provides opportunities to create industry-driven programmatic offerings.
The advancement of technology greatly affects our business.
The advancement of technology hurts the business due to fewer personal relationships.
Health care is becoming more technologically oriented.
Our business is using technology to improve accuracy.
The advancement of technology improves efficiency for our business.
The advancement of technology increases the need for each student to have a computer.
The advancement of technology changes our clients' processes.
The advancement of technology leads to the internationalization of standards.
Our business must advance to stay competitive.
The advancement of technology reduces cost via improved effectiveness.
The advancement of technology gives our business more automation opportunities.
If our business takes advantage of new technology, it improves the services our business can provide to our constituents.
If used correctly, the advancement of technology helps improve efficiencies within our organization.
Our business needs to stay in step with technological advances.
The advancement of technology affects our business' delivery of services.

How does the advancement of technology affect your business? (Continued)

Greatly affects the business financially/productively

The advancement of technology affect our business' communication.
The advancement of technology equals the expense of investment versus the expense of return.
The advancement of technology affects the modernization and efficiency of our business.
The advancement of technology acts as a containment of costs for our business.
Improved technology can reduce the number of workers required for our business.
Our business can serve the county better with technological advances.
Our business can be on top of new ideas to promote the community.
The advancement of technology can keep members better informed about our county.
The advancement of technology greatly affects our business.
The advancement of technology has a positive affect on our business.
The advancement of technology affects our business' research and development activities.
The advancement of technology improves supply chain management for our business.
The advancement of technology opens up new opportunities for our business.
It costs our business to keep up-to-date, but it pays dividends.
The advancement of technology is very necessary to our business.
The advancement of technology is directly correlated our business being affected.
Our business is continually updating its systems and software.
Our business stays on top of the latest technological advancements in the field.
The advancement of technology affects the way our business operates.
The advancement of technology makes our community more marketable to potential prospects.
The advancement of technology affects our business quite a bit. Our company is not located in Tennessee, but across the border in Alabama. It is a national company.

How does the advancement of technology affect your business?

Changes the dynamics

Our business is a training organization. A transition from face-to-face training to on-line is taking place. Dale Carnegie must be advanced technologically.
Our business has to continuously improve and do more with less human equity.
Personal and verbal communication skills are also very important to our business.
The advancement of technology changes the way our business operates.
Our business is constantly learning new equipment and procedures in health care.
The advancement of technology keeps our business in a state of constant change.
The advancement of technology creates new rules and regulations.
Our business has to be willing to take chances.
Our business used technology to replace workers.
The advancement of technology drastically affects our business. Technology changes everyday and our business must keep pace with these changes.

How does the advancement of technology affect your business?

Little to no affect

Our business is regulated by the Department of Transportation.
The advancement of technology affects our business' competition.
The advancement of technology affects our business somewhat.
The advancement of technology affects the IT department of our business.
The advancement of technology minimally affects our business.

Does your business have any concerns about the future resources and funding for STEM-related programs?

Yes

Yes.
As an engineering consulting company, we are totally dependent on math-based education producing graduates who are capable of grasping and understanding engineering concepts. We as a country are losing ground on producing this type of workforce.
Future resources and funding for STEM-related programs are too prescribed to the past and not the future.
Critical thinking and communication skills are very important. The ability to proficiently use office software is also very important.
Our business is affected by the economy and state-forced reductions in revenue. This limits opportunities for infrastructure investment.
Yes.
tnAchieves and Tennessee Promise are a good step to help encourage training. We will have to wait 3 - 5 years to see the results.
Yes.
Our business is concerned about the future funding and support for STEM-related programs.
Our business is concerned about costs, rural infrastructure, and the lack of high-speed internet.
Yes. There are not enough engineers whose skills and expectation of pay match.
There are always concerns with funding due to the continued decrease in state funding and increasing tuition costs.
Yes. There is the fear that businesses cannot keep up with the technological advances and expectations of customers.
Our business feels things may get stronger or at least hope they do.
Yes. Where is our business going to find people qualified to do our type work?
There should be enough funding to help businesses out.
Sure. Funding for STEM-related programs needs to be a priority. STEM careers are getting more attention, but the focus needs to stay with providing the training needed to meet the needs of today's employers.
Yes. It is hard to budget for continued changes.
Needs more definition
The local county commission is attempting to cut off our funding.
Prospective employees come with more skill and knowledge gaps than ever.
Yes. Health care, regulatory, and legal costs take funds away that could be invested in STEM programs.
Grants and government funding are essential.
There are always concerns in anything one does, but it has to be worked through.
There seems to be a lack of funding to help grow these programs, especially in rural communities.
Tennessee has to have broadband internet in all rural communities before the rest can happen. Until all students have access to broadband internet, nothing will change.
In Tennessee, focusing more on the automotive industry seems to leave out most STEM-related interests. Production can obviously be improved through research and development, but most successful STEM-related programs start out with small business individuals.

Does your business have any concerns about the future resources and funding for STEM-related programs?

No

As of today, none.
No. I doubt funding will be there for me.
Unknown.
As a very small business, probably not, but businesses small and large know that they can benefit.
No.
No, we consider ourselves to be "on our own."
Not sure.
No.
No direct concerns.
No.
No.
I have not heard of any concerns.
No.

How will your business be impacted if you are unable to fill these jobs?

Greatly impacted

If these jobs are not filled, our business will be a much smaller company and possibly obsolete.
If these jobs are not filled, our business will be forced to train our own employees to fill these jobs.
If these jobs are not filled, our business will experience slower growth.
If these jobs are not filled, our business will have a harder time maintaining a quality product.
If these jobs are not filled, our ability to expand and reach into new markets will be limited.
If these jobs are not filled, our business will be unable to continue our expansion. Our business will also be barred from opportunities in our field that require a larger in-house team.
If these jobs are not filled, our business will experience a loss of profitability and customer base.
Our business must fill these jobs. The use of technology is a major part of our cost reduction planning.
If these jobs are not filled, our business will experience lost opportunities.
If these jobs are not filled, our business will not exist.
If these jobs are not filled, our business will compromise patient safety and our future growth.
It is vital to have these roles filled. Our business will be unable to provide products without STEM-qualified employees.
If these jobs are not filled, our business will not be able to grow into higher-technology areas.
If these jobs are not filled, our business will experience slower growth.
If these jobs are not filled here, they will be filled elsewhere, or our business will be forfeit.
If these jobs are not filled, our business will experience a marginal negative impact.
If these jobs are not filled, our business will not be able to provide appropriate patient care.
If these jobs are not filled, our business will experience a negative impact. Our business cannot stay competitive.
If these jobs are not filled, workforce training will slow and the ability to deliver products and services to the industry will decrease.
If these jobs are not filled, there will be a longer learning curve to get employees acclimated and performing at a high level.
If these jobs are not filled, our business will not be able to grow.
If these jobs are not filled, our business will lose our accreditations and go out of business.
If these jobs are not filled, the care of residents will suffer.
If these jobs are not filled, there will be a reduction in customer service.
If these jobs are not filled, our business will operate less efficiently and possibly need to contract services out to companies with the technical expertise that we do not have.
If these jobs are not filled, our business will not experience growth.
If these jobs are not filled, other employees will fill the gap and we will be unable to offer the services we need to provide.
If these jobs are not filled, our business will be behind other industries.
If these jobs are not filled, our business will be left behind.
If these jobs are not filled, our business will be unable to compete in the marketplace.
If these jobs are not filled, our business will not be able to deliver the quantity or quality that we previously delivered.
If these jobs are not filled, our business will experience a loss of ability to offer STEM programs to students.
If our business is not able to fill these jobs, there will be a big impact on education.
If these jobs are not filled, it puts more work on those that are already doing those jobs.
Filling the jobs is necessary to conducting business.
If these jobs are not filled, our business will experience slow growth and advancement.
If these jobs are not filled, our recruitment efforts will be unsuccessful without these skills.
Numbers are addressed from a national standpoint. A lot of our company's business is related to the Department of Defense and if we cannot get the right workforce contracts our business would be lost.

How will your business be impacted if you are unable to fill these jobs?

Impacted neither positively or negatively, just caused change

If these jobs are not filled, our business will look more to automated computer systems to take the place of
If these jobs are not filled, our business will have to train people ourselves, just like we do now.
If these jobs are not filled, our business will retain the workforce we have and step up to the changes.
If these jobs are not filled, our business will need to outsource the services.

How will your business be impacted if you are unable to fill these jobs?

No/little impact

If these jobs are not filled, our business will not feel a great impact.
If these jobs are not filled, the company itself will not be impacted as much as the type of business. The competitiveness of the automotive industry will demand that these jobs not go unfilled or the automobiles produced will not fulfill the consumer demand and if that happens that could potentially cause the collapse of the automotive industry, which would seriously impact our business.
If these jobs are not filled, our business will experience very little impact.
If these jobs are not filled, our business will not experience very much impact.

What is your business willing to do to fill these unoccupied STEM jobs?

Nothing

Our business is willing to do nothing to fill these unoccupied STEM jobs.
Our business is willing to wait to fill these unoccupied STEM jobs.
This is not a priority for our business.

What is your business willing to do to fill these unoccupied STEM jobs?

Outsourcing

Our business is willing to seek financial assistance and community/businesses involvement to fill these
Our business is willing to provide opportunities and fair wages to qualified candidates to fill these unoccupied
Our business is willing to support vocational programs to fill these unoccupied STEM jobs.
Our business is willing to outsource or find a more fitting computer system to fill these unoccupied STEM jobs.
Our business is willing to provide paid internships and sponsor H1B applicants from other countries in addition to working with local job fairs and charitably supporting local STEM-related school projects to fill these unoccupied
Our business is willing to actively participate in programs and some funding to fill these unoccupied STEM jobs.
Our business is willing to encourage volunteers, accept student interns, and provide pre-college exposure to jobs to fill these unoccupied STEM jobs.
Our business is willing to provide internal and external educational programs, including tuition reimbursement and promotion opportunities for our current workforce to fill these unoccupied STEM jobs.
Our business is willing to outsource to fill these unoccupied STEM jobs.
Our business is willing to provide training to fill these unoccupied STEM jobs.
Our business is willing to go outside Tennessee and pay a premium to attract the workforce necessary to fill these unoccupied STEM jobs.
Our business is willing to sublet or recruit to fill these unoccupied STEM jobs.
Our business is willing to work with schools, seek out students, create curricula, and offer tuition reimbursements and apprenticeship programs to fill these unoccupied STEM jobs.
Our business is willing to identify local students interested in health care and offer assistance to fill these unoccupied STEM jobs. Our business is also willing to recruit and hire staff from outside of Tennessee.
Our business is willing to continue searching and encourage potential candidates to fill these unoccupied STEM
Our business is willing to provide pay for individuals to go to school, offer flexible schedules, and purchase new equipment to fill these unoccupied STEM jobs.
Our business is willing to search for employees nation-wide to fill these unoccupied STEM jobs.
Our business is willing to give scholarships to help train future employees to fill these unoccupied STEM jobs.
Our business is willing to encourage current employees to seek the training necessary to fill these unoccupied
Our business is willing to be part of the county or regional education and awareness efforts to fill these unoccupied STEM jobs.
Our business is willing to attempt to get more funding from the local government to fill these unoccupied STEM
Our business is willing to offer more training and education on STEM to fill these unoccupied STEM jobs.
Our business is willing to host job fairs to fill these unoccupied STEM jobs.
Our business is willing to recruit from outside the local area if necessary, but preferably to hire locally if possible to fill these unoccupied STEM jobs.
Our business is willing to increase program opportunities to fill these unoccupied STEM jobs.
Our business is willing to work with local universities and colleges to ensure the right curricula in STEM-related fields to fill these unoccupied STEM jobs.

What is your business willing to do to fill these unoccupied STEM jobs?

Inside Training
Our business is willing to train the employees ourselves to fill these unoccupied STEM jobs.
Our business is willing to relocate people if necessary to fill these unoccupied STEM jobs.
Our business is willing to develop the positions internally if adequate candidates are not available in the marketplace to fill these unoccupied STEM jobs.
Our business is willing to provide on-the-job training to fill these unoccupied STEM jobs.
Our business is willing to train current staff to fill these unoccupied STEM jobs.
Our business is willing to provide internal training to fill these unoccupied STEM jobs.
Our business is willing to do our own training to fill these unoccupied STEM jobs.
Our business is willing to take applicants with no experience, train them, and also help with their licenses and certifications to fill these unoccupied STEM jobs.
Our business is willing to train our own as much as possible to fill these unoccupied STEM jobs.
Our business is willing to offer on-the-job training as well as on-site training to fill these unoccupied STEM jobs.

How do you think the current "bureaucracy" of the teaching profession will affect the future implementation of STEM programs in schools?

Negatively
There are too many "teachers" that do not comprehend the real world implications of running a successful business. The bureaucracy can hold back progress!
The education system is not flexible and cannot shift fast enough to meet the demand.
The current "bureaucracy" of the teaching profession will negatively affect the future implementation of STEM programs in schools.
The current "bureaucracy" of the teaching profession will make the necessary changes very difficult to implement. A top heavy bureaucratic structure is highly resistant to flexibility and change, which are the two things a credible STEM pipeline needs.
The current "bureaucracy" of the teaching profession will negatively affect the future implementation of STEM programs in schools (see recent leader in The Economist magazine).
The current "bureaucracy" of the teaching profession hampers the creativity of teachers in order to meet frequently untested standards.
The current "bureaucracy" of the teaching profession is too bureaucratic.
The current "bureaucracy" of the teaching profession will probably inhibit progress, as usual.
The current "bureaucracy" of the teaching profession will slow or delay the growth of STEM programs.
The current "bureaucracy" of the teaching is difficult. Many trade schools are overloaded with people who have to be there due to some requirement, the teachers are tired of having to pass them, the teaching positions become unattractive, and the students who want to learn are impacted.
The current "bureaucracy" of the teaching profession, like most bureaucracies, will probably move slowly towards achieving goals and will tend to focus on growing its own turf rather than a "big picture" view.
The current "bureaucracy" of the teaching profession could be an adverse factor unless those in regulatory positions are completely aware of the programs.
The current "bureaucracy" of the teaching profession is resistant to new curricula and teaching methods.
The current "bureaucracy" of the teaching profession has missed opportunities for candidates, delays, etc.
The current "bureaucracy" of the teaching profession will slow the implementation of STEM programs in schools unless the leaders educate themselves about STEM careers and become advocates for STEM programs.
The current "bureaucracy" of the teaching profession definitely gets in the way of the future implementation of STEM programs in schools.
The current "bureaucracy" of the teaching profession will negatively affect the future implementation of STEM programs in schools.
The current "bureaucracy" of the teaching profession is not worried or concerned with the future implementation of STEM programs in schools.
The current "bureaucracy of the teaching profession has a bias against females, is untrained themselves, and has a lack of understanding of STEM jobs, etc.

How do you think the current "bureaucracy" of the teaching profession will affect the future implementation of STEM programs in schools?

Greatly

The current "bureaucracy" of the teaching profession will greatly affect the future implementation of STEM programs in schools.
The current "bureaucracy" of the teaching profession has to be held accountable for its effect on the future implementation of STEM programs in
The current "bureaucracy" of the teaching profession is ground zero and a successful teaching effort around STEM is essential to building a workforce for the future.
The current "bureaucracy" of the teaching profession heavily affects the future implementation of STEM programs in schools. The U.S. is falling behind other countries as it relates to STEM programs, thus increasing our need for work visas, etc.
The current "bureaucracy" of the teaching profession will very much affect the future implementation of STEM programs in schools.
The current "bureaucracy" of the teaching profession will affect the future implementation of STEM programs in schools due to the lack of consequences for producing graduates that lack real industry skill sets. In most of the higher education arena, graduating students is the supreme goal. There is no real consequence for the lack of current industry skills for the institution or faculty. The TCAT model provides a process that ensures industry-driven programs remain active while programs that are no longer needed are closed. The institution and faculty members are responsible for not only graduating a student, but also a job placement in the field of study. This model provides both a carrot and a stick and ensures that the skills being taught are industry-driven.
The current "bureaucracy" of the teaching profession may need to focus more on the future implementation of STEM programs in schools.
There are wonderful examples of "one-off" successes; however, the system is not set up for frequent or fast change for any industry.
The current "bureaucracy" of the teaching profession will affect the culture of the future implementation of STEM programs in schools. STEM needs to be translated to careers, educational requirements, and pay potential.
The current "bureaucracy" of the teaching profession needs to be flexible and available for change.
The current "bureaucracy" of the teaching profession's affect on the future implementation of STEM programs in schools is just a matter of priorities and work load.

How do you think the current "bureaucracy" of the teaching profession will affect the future implementation of STEM programs in schools?

Little

The current "bureaucracy" of the teaching profession will have little effect on the future implementation of STEM programs in schools. The teachers will have little sway either way. This is a socioeconomic issue. Until it becomes "cool" to learn these harder subjects, they will be hard to promote.
The current "bureaucracy" of the teaching profession will not affect the future implementation of STEM programs in schools because those who fail to get onboard soon drown.

How do you think the current "bureaucracy" of the teaching profession will affect the future implementation of STEM programs in schools?

Problem is something besides bureaucracy

The teaching staff needs to stay current on all training.
Since STEM relies heavily on mathematics, the teaching profession needs to rethink its approach to math. Many scholastic institutions treat math as something that they just need to get students through for the minimum state requirements. They do not engage the students in going beyond that minimum requirement. The same is true in the sciences.
There needs to be a curriculum reevaluation in schools.
The bigger problem is finding competent teachers/faculty to teach STEM classes.
This question is highly subjective. The current "bureaucracy" of the teaching profession was well received in my high school for a time. If STEM is to be implemented it cannot be just another passing craze. The education system sees that way to often. There will also be a strong resistance to change.
The program needs to be developed by long-time educators, not just people with an education degree. This means that people who have worked in the trenches and can help develop a program palatable to working teachers are needed.
The teaching of STEM classes needs to be exciting and hands-on. STEM classes need to be hard enough to make sure students are grasping the information, but not so hard that people are turned away. Students must be given the resources to increase their desire to grow in their knowledge.
There is too much government interference with educators. Teachers should be allowed to "teach" because they are the specialists, not the governor.
Yes. Too many Ph.D.'s are too jealous to admit others into their field.
Teachers should only be paid on their class graduation rates.
Teachers do not like change, but most true educators love making a real difference.

Thinking about your business' supply-chain and clients, where do you project the technological advancements are most likely to occur?

Manufacturing

Technological advancements are most likely to occur in the manufacturing arena where businesses can use their know-how to effectively produce goods better and as cheaply as the lesser developed countries.
Technological advancements are most likely to occur in product development.
Technological advancements are most likely to occur in manufacturing processes, new product developments using technologies, and government mandated improvements.
Technological advancements are most likely to occur in machinery and equipment.
Technological advancements are most likely to occur in manufacturing processes that become more automated and less labor dependent.
Technological advancements are most likely to occur in advanced manufacturing, transportation, distribution, logistics, and IT.
Technological advancements are most likely to occur in process automation.
Technological advancements are most likely to occur in in-house production and distribution.
Technological advancements are most likely to occur in the supply chain.
Technological advancements are most likely to occur in manufacturing.
Technological advancements are most likely to occur in robotics.

Thinking about your business' supply-chain and clients, where do you project the technological advancements are most likely to occur?

Health

Technological advancements are most likely to occur in medical records communications.
Technological advancements are most likely to occur in B2B, health care, transportation, and education.
Technological advancements are most likely to occur in chemistry and industrial engineering.
Technological advancements are most likely to occur around health care and manufacturing.
Technological advancements are most likely to occur in IT medical technology.
Technological advancements are most likely to occur in transportation, communication, and bio-engineering (pharmaceutical and health-related industries).
Technological advancements are most likely to occur in health and engineering.
Technological advancements are most likely to occur in diagnostic and patient treatment equipment.
Technological advancements are most likely to occur in pharmaceutical prescription processing machines. There will be more hiring of certified pharmacy technicians to learn to use the greater technology of machines to process the prescriptions.

Thinking about your business' supply-chain and clients, where do you project the technological advancements are most likely to occur?

IT

Technological advancements are most likely to occur in communication systems and information systems.
Technological advancements are most likely to occur as continued innovation in internet-related business tools.
Technological advancements are most likely to occur in electronics and remote diagnostics.
Technological advancements are most likely to occur in electronics and software.
Technological advancements are most likely to occur in IT.
Technological advancements are most likely to occur in the availability of real time data across the board.
Technological advancements are most likely to occur in providing web-based services and using GIS technology to better analyze data to prioritize work flow.
Technological advancements are most likely to occur in biotechnology and IT.
Technological advancements are most likely to occur in communicating with the world.

Thinking about your business' supply-chain and clients, where do you project the technological advancements are most likely to occur?

General Business

Technological advancements are most likely to occur with outside resources.
Technological advancements are most likely to occur everywhere. Without trying to be less than helpful, there is no aspect of the workforce which is touched or can be touched by technology that does not have the opportunity for its incremental advancement to experience a sudden surge due to a breakthrough that has a relevant application.
Technological advancements are likely to occur in third-party services, such as research services.
Technological advancements are most likely to occur in water conservation and reclamation as well as efficiency and safety.
Technological advancements are most likely to occur among businesses' clients.
Technological advancements are most likely to occur among businesses' clients.
Technological advancements are most likely to occur in all businesses to some extent.
Technological advancements are most likely to occur in the energy sector.

What are the major challenges your business faces in recruiting a STEM workforce?

Financial Challenges

Our business uses sales and soft skill trainers to recruit a STEM workforce.
Finances are a major challenge in recruiting a STEM workforce.
Resources are a major challenge in recruiting a STEM workforce.
Affordability is a major challenge in recruiting a STEM workforce.
Salary is a major challenge in recruiting a STEM workforce.
Research and development funding is a major challenge in recruiting a STEM workforce.
Money is a major challenge in recruiting a STEM workforce.
Financial compensation is a major challenge in recruiting a STEM workforce.
Offering attractive salaries to qualified applicants is a major challenge in recruiting a STEM workforce.
Pay is a major challenge in recruiting a STEM workforce.
Compensation is a major challenge in recruiting a STEM workforce.
The lack of funding is a major challenge in recruiting a STEM workforce.
The need to expand programs is a major challenge in recruiting a STEM workforce.
Time and money are major challenges in recruiting a STEM workforce.
Finances are a major challenge in recruiting a STEM workforce.
Funding is a major challenge in recruiting a STM workforce.

What are the major challenges your business faces in recruiting a STEM workforce?

Labor Force Challenges

The presence of fewer qualified candidates is a major challenge in recruiting a STEM workforce.
The lack of education and training is a major challenge in recruiting a STEM workforce.
Unprepared workers are a major challenge in recruiting a STEM workforce.
The availability of talent is a major challenge in recruiting a STEM workforce.
The absence of proper training is a major challenge in recruiting a STEM workforce.
The low number of qualified applicants is a major challenge in recruiting a STEM workforce.
The high number of applicants who think they are qualified when they are not even close is a major challenge in recruiting a STEM workforce.
Finding qualified individuals is a major challenge in recruiting a STEM workforce.
Finding qualified, local, entry-level people is a major challenge in recruiting a STEM workforce.
Competing with other companies for a small pool of qualified people is a major challenge in recruiting a STEM workforce.
Finding people with specific skill sets relevant to our business is a major challenge in recruiting a STEM
Opposition or inertia from the teacher/school bureaucracy is a major challenge in recruiting a STEM
The lack of availability is a major challenge in recruiting a STEM workforce.
Finding a locally trained workforce is a major challenge in recruiting a STEM workforce.
Transient candidates are a major challenge in recruiting a STEM workforce.
Finding tech-savvy people is a major challenge in recruiting a STEM workforce.
Finding quality employees at a price our business can afford to invest in is a major challenge in recruiting
The competitiveness for a small workforce pool is a major challenge in recruiting a STEM workforce.
Finding qualified personnel is a major challenge is recruiting a STEM workforce.
Work ethic is a major challenge in recruiting a STEM workforce.
Finding qualified college graduates is a major challenge in recruiting a STEM workforce.
Finding people who want to work for a small employer is a major challenge in recruiting a STEM workforce.
Supply, much less than demand, is a major challenge in recruiting a STEM workforce.
The quality of supply being much less that the industry standard is a major challenge in recruiting a STEM
The lack of understanding of industry expectations is a major challenge in recruiting a STEM workforce.
Finding quality applicants that are highly ethical and can be trusted is a major challenge in recruiting a STEM workforce.
Education is a major challenge in recruiting a STEM workforce.
Language barriers are major challenges in recruiting a STEM workforce.
Education is a major challenge in recruiting a STEM workforce.
Experience is a major challenge in recruiting a STEM workforce.
Communication skills are a major challenge in recruiting a STEM workforce.
Finding qualified candidates to chose from is a major challenge in recruiting a STEM workforce.
The need for harder workers is a major challenge in recruiting a STEM workforce.
Exposure to viable candidates is a major challenge in recruiting a STEM workforce.
The competition from other companies is a major challenge in recruiting a STEM workforce.
Availability is a major challenge in recruiting a STEM workforce.
Size is a major challenge in recruiting a STEM workforce.
The lack of advancement is a major challenge in recruiting a STEM workforce.
Getting the right people is a major challenge in recruiting a STEM workforce.
The community is a major challenge in recruiting a STEM workforce.
The lack of a well-prepared workforce is a major challenge in recruiting a STEM workforce.
Unprepared workers are a major challenge in recruiting a STEM workforce.
Generational factors such as poor work ethic and a lack of soft skills are major challenges in recruiting a
Finding workers that are high school/college ready is a major challenge in recruiting a STEM workforce.
Finding properly trained individuals is a major challenge in recruiting a STEM workforce.
Even given college training, most of the STEM workforce needs more specific "training" for a company

What are the major challenges your business faces in recruiting a STEM workforce?

STEM Awareness

The lack of awareness in the general population is a major challenge in recruiting a STEM workforce.
Creating opportunities through marketing efforts is a major challenge in recruiting a STEM workforce.
Exposure is a major challenge in recruiting a STEM workforce.
Maintaining a positive attitude is a major challenge in recruiting a STEM workforce.
Legality and advertising are major challenges in recruiting a STEM workforce.

What are the major challenges your business faces in recruiting a STEM workforce?

None

Our business has very limited needs in regards to recruiting a STEM workforce.
Our business does not really face any challenges in recruiting a STEM workforce.
Our business is not really challenged to recruit a STEM workforce.
This is not a priority for our business.
None.