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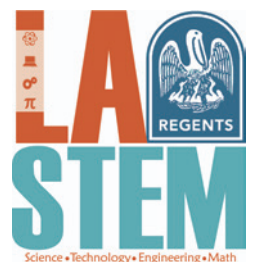


CENTER FOR  
**ECONOMIC  
RESEARCH**

► **SCILS REGIONAL**  
**STEM**  
**WORKFORCE ANALYSIS**  
**REPORT**

2022–2023

**SCILS**  
Region 8 LaSTEM Center



# A Message from Cathi Cox-Boniol SCILS Region 8 LaSTEM Center Director

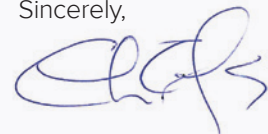
We are pleased to share with you the inaugural edition of the SCILS Regional STEM Workforce Analysis Report, a resource designed to provide insight into the science, technology, engineering, and mathematics (STEM) workforce landscape across North Louisiana. This edition features information to help citizens in our region better understand STEM workforce activities and opportunities along the I-20 corridor. There is so much promise in North Louisiana, and we are excited about using these findings to engage others in creatively and thoughtfully participating in efforts to move STEM forward in our region.



This report is produced by the Center for Economic Research, housed in Louisiana Tech University's College of Business, in partnership with the Science and Technology Education Center (SciTEC) in the College of Education at Louisiana Tech. This publication is made possible through generous support from the Louisiana Board of Regents' LaSTEM program.

Should you wish to be part of this work or want more information on the Center for Economic Research, SciTEC, or the STEM Collective for Innovative Louisiana Stakeholders (SCILS), contact Dr. Patrick Scott at [pscott@latech.edu](mailto:pscott@latech.edu), Dr. Lindsey B. Keith-Vincent at [lbkv@latech.edu](mailto:lbkv@latech.edu), or me at [ccox@latech.edu](mailto:ccox@latech.edu). I hope you find the information included in this report to be of value. We look forward to working together to enhance Louisiana's educational and workforce opportunities through our collective STEM efforts!

Sincerely,



CATHI COX-BONOL  
Center Director  
SCILS Region 8  
LaSTEM Center  
Louisiana Tech University



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STEM Photography: Emerald McIntyre, Louisiana Tech University

## From Our SCILS Partners



“As a long-term education partner in Lincoln Parish, we believe in the objectives SCILS set forth. Not only do we need to further sciences for workforce development, but also our national security. As jobs in technical, scientific, and cyber fields go unfilled, the opportunity to grow the next generation right here in North Louisiana is one we all need to support. HiTech will always back education, especially in STEM sciences. I look forward to seeing many young boys and girls develop into the STEM workforce of the future.

**RICHARD RAUE | CEO, HITECH COMPUTERS**



“The SCILS partnership between the LaSTEM Center and the West Carroll Parish School System is narrowing the equity gap by preparing students in rural communities to thrive in the world of the future. During the summer of 2022, through this partnership and the LDOE JumpStart Summers Program, a total of 31 students from East Carroll and West Carroll Parishes earned the CompTIA IT Fundamentals+ Industry Based Certification. Once earned, this certificate does not expire; rather, it provides a stepping stone to higher level IT certifications and entry-level IT occupations.

**CHRISTY BOYTE | SUPERINTENDENT, WEST CARROLL PARISH SCHOOLS**



“The SCILS grants assist our industry partner, General Dynamic Information Technology, employees, and other underrepresented populations that enroll in their first computer technology course. While pursuing their degree in computer technology or other related certificates, these students have the chance to participate in monthly educational seminars where they network with industry partners.

**QUENTIN CALHOUN | TECHNICAL EDUCATION AND ENGINEERING PROJECT DIRECTOR, BOSSIER PARISH COMMUNITY COLLEGE**



“The work being done by the SCILS Region 8 LaSTEM Center to help address workforce needs in Louisiana is absolutely amazing! The girls from our small school that participated in CS4U were blown away by the knowledge they gained in that short amount of time and the fun that they had. They returned to our campus wanting more and their excitement has been contagious! Many students are now interested in things like coding, cyber security, and giggle bots. Our students are looking forward to developing skills with independent work through Coursera and attending other STEM activities that are offered in the future.

**MISTY SAVAGE | GUIDANCE COUNSELOR/MIDDLE SCHOOL ASSISTANT PRINCIPAL, DOWNSVILLE COMMUNITY CHARTER SCHOOL**

# STEM Employment in North Louisiana's STEM Regions

## What is STEM?

STEM is a classification of many disciplines that integrates the areas of science, technology, engineering, and mathematics. Through STEM, students develop key skills that include problem solving, creativity, and critical analysis.

There is not a universally inclusive list of what is considered a STEM field, but in the U.S., the National Science Foundation (NSF) counts job-related fields in healthcare, social sciences, all types of engineering, chemistry, physics, computer and information technology, life sciences, mathematics, and advanced manufacturing among STEM disciplines. It also recently expanded its definition of STEM workers in 2019 to include all education levels (not just individuals with post-secondary and higher degrees) that support STEM areas. For the sake of this report, any career that requires the use of STEM skills to be successful are counted as STEM jobs.

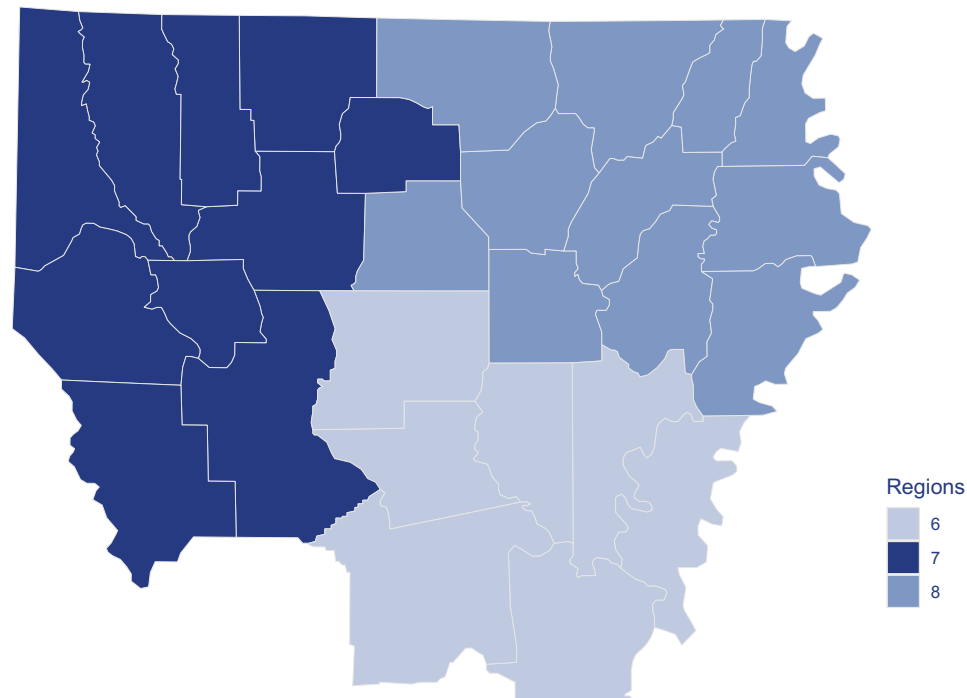
The NSF estimates that as many as 23% of all workers in the U.S. are now considered to be employed in STEM-related jobs at all education levels. This raises some important questions about North Louisiana in the context of this national data. Does North Louisiana employ an equal proportion of jobs in STEM fields? Is pay in STEM-related industries higher than non-STEM employment? Is the same true in relatively urban parishes versus rural parishes in North Louisiana? This report is written to shed light on some of these questions for the northern half of the Pelican State.



## STEM Regions in North LA

The Louisiana Board of Regents categorizes the parishes of Louisiana into eight STEM regions. North Louisiana encompasses Regions 6, 7, and 8. The map in Figure 1 highlights the boundaries for each of these three regions that are the focus of this report. Region 7 reaches as far west as Caddo and DeSoto Parishes and stretches eastward to Lincoln Parish. It extends as far south as Sabine Parish. Region 8 includes northern parishes from Union to East Carroll and reaches south towards Tensas Parish. Region 6 is below Region 8 and lies east of Region 7. It encompasses Winn Parish down to Rapides Parish and east towards Avoyelles Parish. In total, Regions 6, 7, and 8 are comprised of 28 of Louisiana's 64 parishes.

**Figure 1: Map of LaSTEM Regions 6, 7 and 8**



Region 7 is the largest of these three in terms of population, gross domestic product, total personal income, and total employment. Per capita GDP in Region 7 is approximately 24% higher than Region 8 or Region 6, which are not distinguishably different than one another. Each of these three regions contains one of the nine metropolitan statistical areas (MSAs) in Louisiana. Region 6 contains the Alexandria MSA, Region 7 is home to the Shreveport-Bossier City MSA, and Region 8 includes the Monroe MSA.

## STEM versus Non-STEM Employment

Regions 6 and 8 together represent approximately 58% of total employment in Region 7. The Shreveport-Bossier City MSA is the fourth largest MSA in the state and is the most economically diversified locale in North Louisiana. Of 407 income-reporting industry classifications examined, 73 are identified as STEM or STEM-supporting industries based on NSF definitions. On average, 18% of industries are STEM industries in North Louisiana, and 24% of total employment are in these STEM or STEM-supporting industries.

**Figure 2: Proportion of STEM Employment per Region**

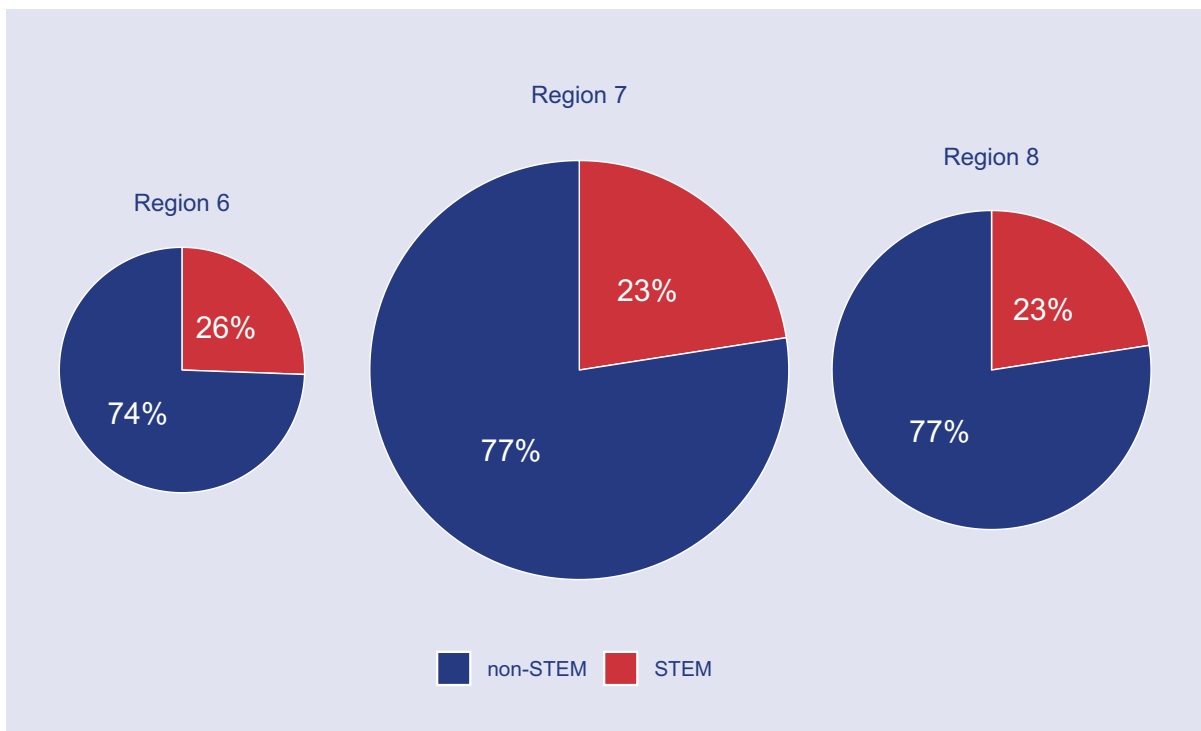


Figure 2 shows the proportion of STEM employment within each Region. The size of each pie chart is scaled to reflect the size of total employment relative to each region. While the proportion of STEM jobs in Region 6 is the highest of all three regions at 26%, total STEM employment is the lowest of all three at nearly 31,000. Regions 7 and 8 both have similar proportions in STEM employment, but in total they employ 76,000 and 35,000 respectively in STEM fields.

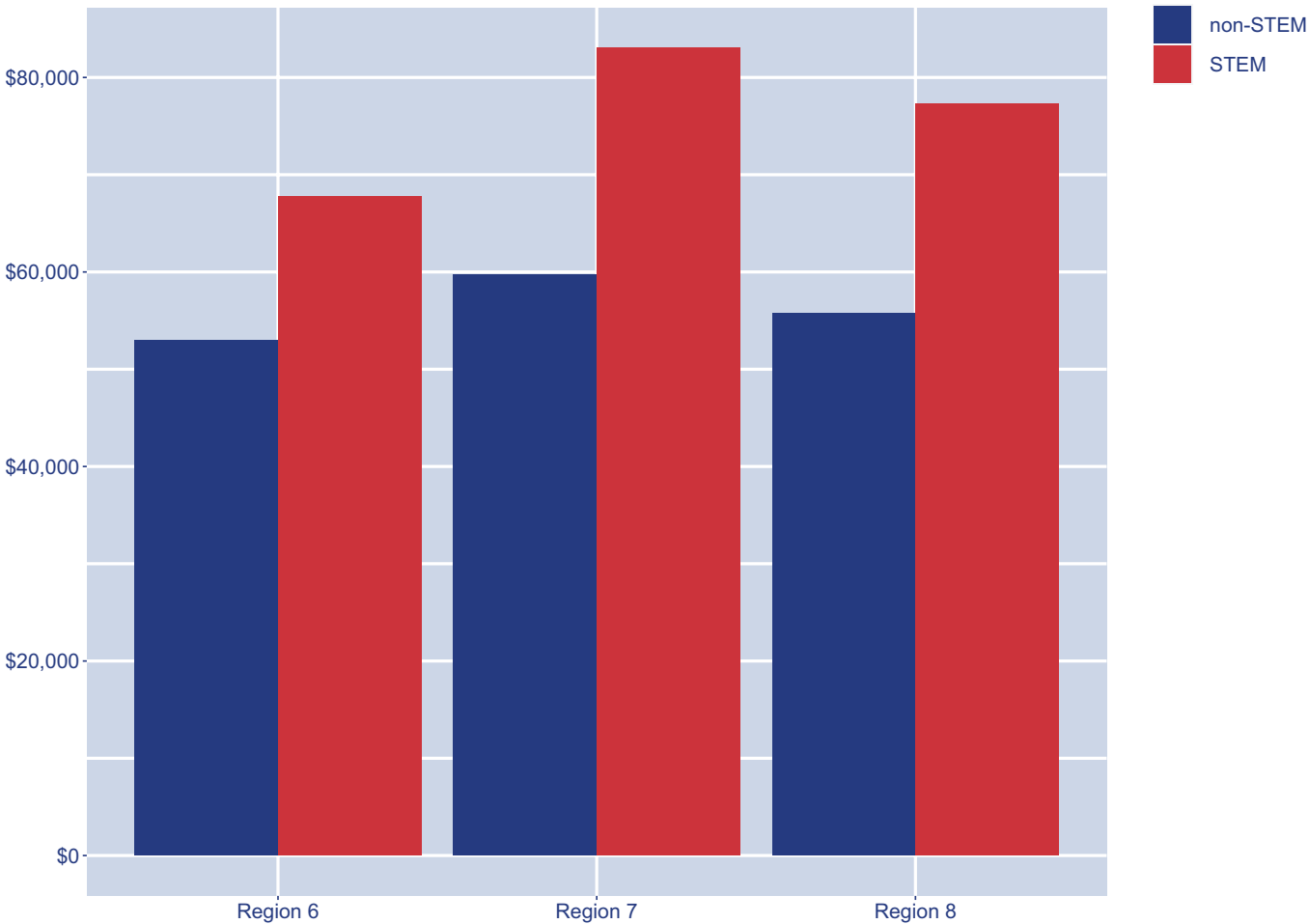
The location of these jobs is also important to the state economy. Regions 6 and 8 are relatively rural. While Region 6 includes the Alexandria MSA, it is currently at risk of being downgraded from a metropolitan statistical area to a micropolitan statistical area due to slow population growth. Rapides Parish, which is the heart of the Alexandria MSA, employs about 64% of all STEM jobs in Region 6. This same disparity is present in Region 7 and 8 as well. In Region 7, the two urban parishes, Caddo Parish and Bossier Parish, collectively employ 75% of all STEM jobs in the region. And in Region 8, Ouachita Parish employs 66% of all STEM jobs in Northeast Louisiana. The urban centers are home to most of the jobs in each region so this is not necessarily a surprise. The non-metro parishes in each region are still relatively robust though. STEM Region 6, excluding Rapides Parish, still has a 23% STEM workforce rate. Region 7, less Caddo and Bossier Parishes, boasts an impressive 21% STEM workforce rate. Region 8, less Ouachita Parish, has a 19% STEM workforce rate. These proportions collectively imply that there is a STEM employment urban/rural divide, but that it may be relatively small. Additionally, this does not account for commuters, as some people do not live and work in the same parish. Disparity in income from STEM and non-STEM jobs may alter this qualitative conclusion.

### STEM Employment Pays

STEM jobs command relatively higher salaries. This is usually explained by the education level STEM jobs are stated to require. The NSF in 2021 reports that just less than 25% of STEM job holders have a high school degree (or GED equivalent) or less, while approximately 44% have a bachelor's degree or higher. Good industry-level and parish-level data on educational attainment is not available. Assuming these national numbers are representative of North Louisiana in general, in Region 7 approximately 33,200 STEM jobs are filled by individuals who have a bachelor's degree or higher. Additionally, using statewide educational attainment data of all individuals with a bachelor's degree or higher who are engaging labor markets, over 36% are employed in a STEM or STEM-supporting field. These can also be calculated for the other two regions. STEM jobs held by individuals with bachelor's degree or higher in Regions 6 and 8 are 13,400 and 15,300 respectively. Of all employed individuals with a post-secondary degree, 41% and 36% are employed in STEM fields in Regions 6 and 8 respectively.

Figure 3 reports average salaries for STEM and non-STEM employment in each of the regions. In Region 8, STEM salaries are \$21,570 higher on average than non-STEM jobs. In Region 7, STEM jobs pay \$23,335 more on average. In Region 6, STEM jobs pay \$14,823 more than non-STEM jobs on average. For all three regions, these differences are statistically different for STEM versus non-STEM employment. The differences though are approximately equal for Region 7 and Region 8. The Region 6 average salary differential is smaller possibly due to the make-up of the economy and a less diversified industry composition.

**Figure 3: STEM and Non-STEM Average Salaries (Real 2020 Dollars)**

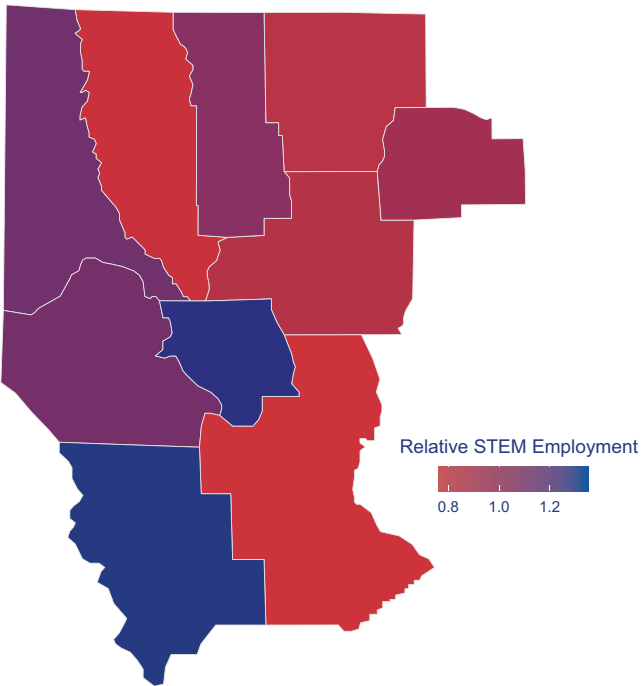


# STEM Across Region 7

STEM Region 7, home to the Shreveport-Bossier City MSA, is populated by nearly 580,000 people which make up about 230,000 households. It contributes 11% to total state output and is the most economically diverse region north of Baton Rouge in Louisiana. Caddo and Bossier Parishes make up 71% of STEM employment in Region 7, but are closer to the middle of the distribution of average salary differences. The dispersion of STEM employment in this region is more nuanced than just urban versus rural parishes.

Figure 4 displays STEM employment location quotients for each parish in Region 7. A location quotient is a proportion of industry size in an area compared to a larger region. In this case, Region 7 is compared to the state. Blue parishes contain a higher proportion of STEM jobs compared to the whole state and thus benefit from the higher incomes that come with those jobs. Red parishes have a lower proportion of STEM jobs than the rest of the state and represent investment opportunities. Purple parishes are in parity with Louisiana. Most of the population center of Region 7, the MSA, is in relative parity. Rural parishes are outliers on one end of the spectrum or the other.

**Figure 4: Region 7 STEM Employment Relative to State by Parish (1 is parity)**



**Table 1: STEM Versus Non-STEM Employment Statistics by Parish**

Parish	Non-STEM Employment	STEM Employment	Non-STEM Average Salary	STEM Average Salary	STEM % GDP
Bienville	5,075	1,190	\$51,714	\$71,497	53%
Bossier	58,324	12,082	\$58,105	\$73,964	31%
Caddo	123,474	41,760	\$57,433	\$80,397	38%
Claiborne	4,302	987	\$46,719	\$68,395	38%
DeSoto	8,727	2,885	\$54,762	\$72,826	51%
Lincoln	21,261	5,621	\$48,953	\$63,054	29%
Red River	2,838	1,164	\$49,373	\$61,807	38%
Webster	13,106	3,979	\$53,177	\$66,962	26%
Sabine	5,727	2,444	\$40,918	\$55,348	41%
Natchitoches	16,906	3,431	\$43,865	\$70,584	20%

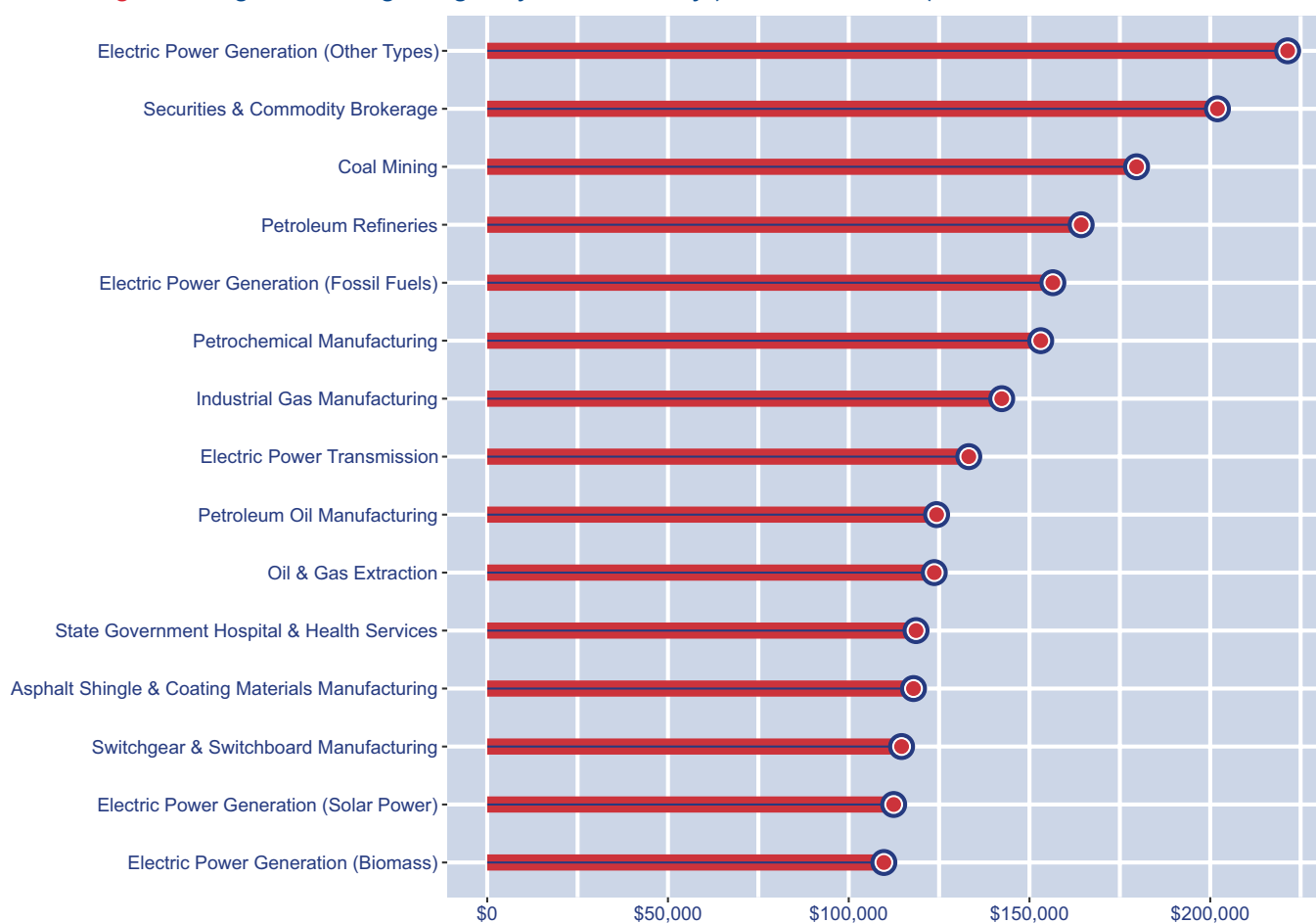


Every parish within Region 7 presents a statistically significant higher average salary for STEM jobs than non-STEM jobs (significant at least at a 95% confidence level). Table 1 quantifies this in columns 3 and 4. STEM industries in all ten parishes contribute more to the GDP of Region 7 than their respective proportion of total jobs. This means that STEM jobs are more productive than non-STEM jobs throughout Region 7. In Bienville Parish and DeSoto Parish, the average STEM job contributes more to regional output (or income) than two non-STEM jobs on average. Bossier and Caddo Parishes are close to that proportion as well. STEM jobs in Caddo, Claiborne, and Natchitoches Parishes pay the largest premium—over \$20,000 each on average.

A hypothetical \$1,000,000 investment at the median of all STEM industries supports 6.3 full-time or full-time equivalent workers and boasts an output multiplier of 2.8. For every dollar invested in a STEM industry in Region 7, it produces \$2.80 in economic output. This is relatively high since Louisiana produces mostly intermediate goods rather than final goods.

Figure 5 highlights the highest paying STEM jobs in Region 7 and their wages in real 2020 dollars. All but two of these fields require a post-secondary degree or higher. Reliable data on the proportion of current job holders that actually meet that minimum qualification are not available. Nonetheless, all 15 jobs pay average salaries that are above the state median income. This further quantifies the value of STEM investment in North Louisiana.

**Figure 5: Region 7 Average Wages by STEM Industry (Real 2020 Dollars)**



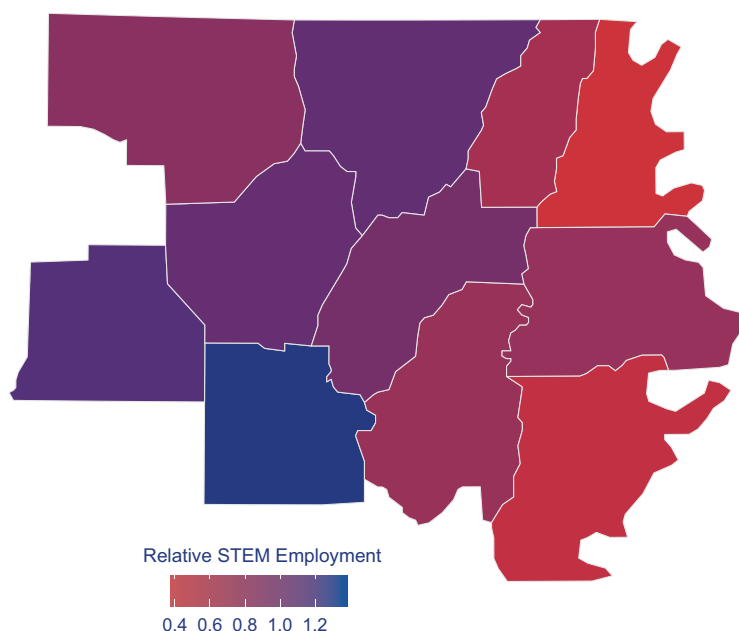
# STEM Across Region 8

Region 8 encompasses 11 parishes and is geographically located in the northeastern portion of the state. The Monroe MSA, which is comprised of Ouachita and Union Parishes, is the seventh largest in terms of employment. Region 8 contributes about 4.5% to state output. Like Region 7, the MSA in Region 8 also employs 71% STEM employment in this region. Figure 6 is organized similar to Figure 4. It shows parish-level location quotients of STEM employment in Region 8 compared to the state as a reference group.

East Carroll and Tensas Parishes (bright red) show underemployment in STEM workforce participation. Caldwell Parish (dark blue) has the highest proportion of STEM employment due to the relatively high number of workers in healthcare and timber industries. Like with Region 7, the MSA parishes and their contiguous neighbors are in parity with the state, meaning that they employ a similar number of STEM jobs compared to the state as a whole.

Region 8 shares some of the same industries as Region 7 among the highest paid STEM careers. Figure 7 shows these ranked in descending order, similar to Figure 5. Nearly all of these careers require at least one post-secondary degree.

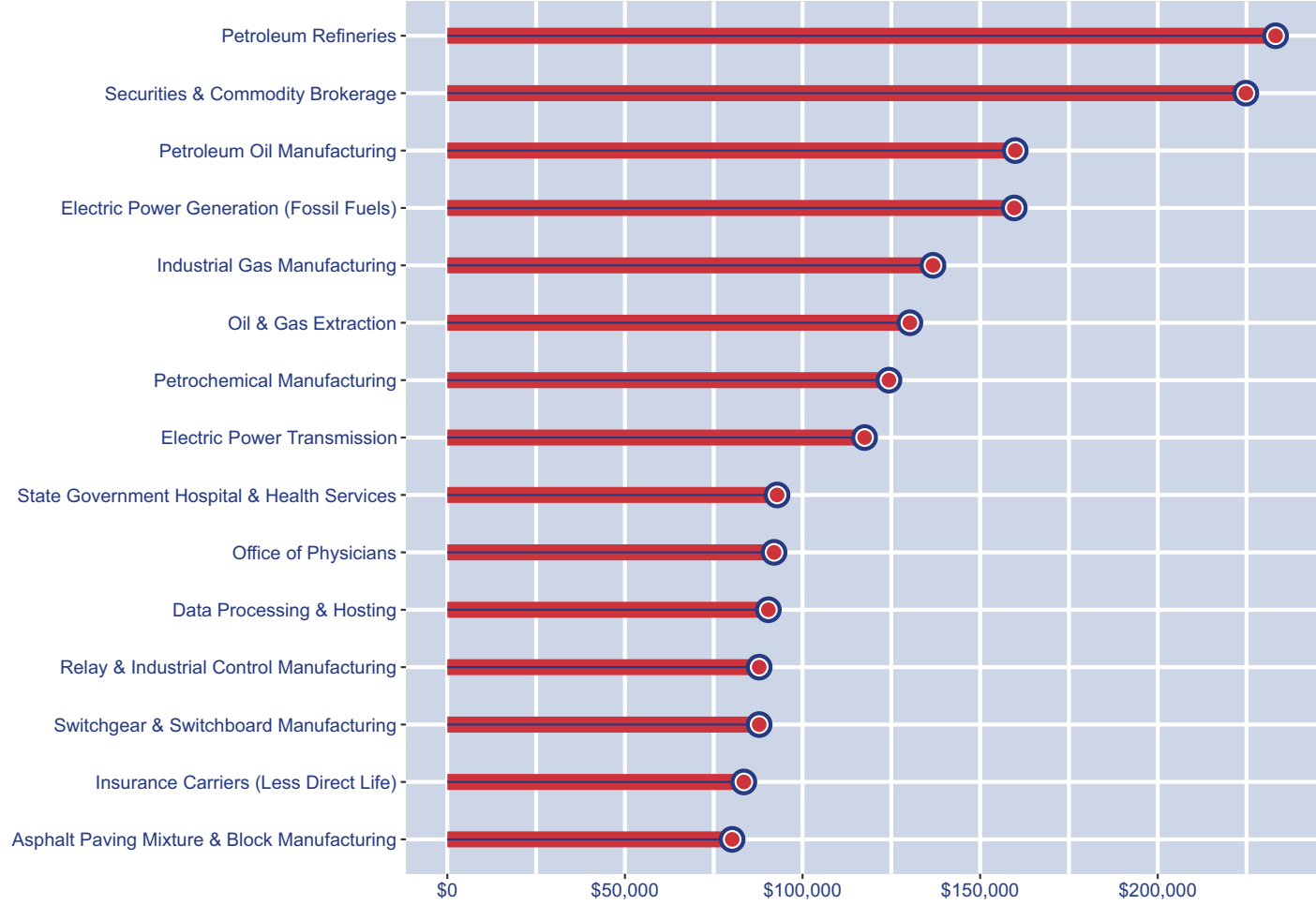
**Figure 6: Region 8 STEM Employment by Parish**



**Table 2: STEM Versus Non-STEM Employment Statistics by Parish**

Parish	Non-STEM Employment	STEM Employment	Non-STEM Average Salary	STEM Average Salary	STEM % GDP
<b>Caldwell</b>	2,522	1,111	\$44,020	\$53,106	43%
<b>East Carroll</b>	2,317	210	\$40,977	\$46,477	10%
<b>Franklin</b>	6,834	1,383	\$40,619	\$54,985	25%
<b>Jackson</b>	3,812	1,327	\$50,657	\$62,888	22%
<b>Madison</b>	3,911	807	\$41,242	\$51,833	33%
<b>Morehouse</b>	7,435	2,395	\$50,602	\$67,084	25%
<b>Ouachita</b>	73,636	23,038	\$56,035	\$70,260	26%
<b>Richland</b>	7,589	2,156	\$44,511	\$57,386	47%
<b>Tensas</b>	1,449	162	\$41,532	\$45,578	11%
<b>Union</b>	7,004	1,657	\$46,039	\$57,325	17%
<b>West Carroll</b>	3,063	529	\$41,102	\$48,498	27%

Figure 7: Region 8 Average Wages by STEM Industry (Real 2020 Dollars)



This highlights once again the important role that higher education plays in developing a robust and well-compensated work force. One distinct feature of Region 8 is that the average salary of these STEM jobs has a higher variance among the top 15 industries, even more so when we consider that these top 15 industries are not the same.

Table 2 reports employment and wage disparities among STEM and non-STEM employment at the parish level. Morehouse, Franklin, and Ouachita Parishes boast the highest wage premium for STEM careers in Region 8. Unsurprisingly, Tensas and East Carroll have the lowest proportion of contribution to GDP from STEM disciplines. This is reflected further in Figure 6. Additionally, the higher portion of STEM contribution to parish GDP for Caldwell and Richland Parishes is mostly due to lack of economic diversity rather than intentional investment in STEM initiatives.

Despite the fact that Region 8 is so much smaller than Region 7, STEM investment is crucially important to economic development in the region. A hypothetical \$1,000,000 direct impact at the median of all STEM industries supports 4.2 full-time or full-time equivalent workers and boasts an output multiplier of 2.6. Every dollar of outside direct investment to STEM industries in Region 8 produces \$2.6 in additional economic output. That same hypothetical \$1,000,000 investment produces over \$120,000 in tax revenues to local and state government once all indirect and induced economic effects are accounted for.

# STEM along the I-20 Corridor

STEM jobs and the additional employment they support represent a critical component to economic growth along Interstate 20. I-20 spans eight parishes in North Louisiana and serves as a major connecting thoroughfare with an estimated daily average of over 50,000 vehicles across STEM Regions 7 and 8. It connects two metropolitan statistical areas (Monroe and Shreveport-Bossier City) as well as two micropolitan statistical areas (Minden and Ruston). Kansas City Southern also operates a primary rail line that runs parallel to I-20 across the state. Along the I-20 corridor, 400,000 workers are employed, of which 91,000 belong to STEM industries.

There are 74 STEM industries across I-20 which represent about 18% of all industries within Louisiana, but not all of these are the same size. STEM industries along the I-20 corridor directly and indirectly employ about 144,000 jobs, which represents approximately 38% of all employment in these eight parishes. Similarly, STEM industries directly and indirectly support approximately 48% of the economy along I-20 which translates into about \$8 billion of personal income. In the parishes along I-20, STEM industries directly and indirectly support over \$32.6 billion in economic output and almost \$7 billion in federal and state tax revenue (real 2020 dollars).

Economic investments to STEM industries are estimated to reduce federal and state tax burdens among households in the lowest income brackets. On average, households with annual income below \$40,000 benefit from a lower tax bill due to the economic growth from STEM investment as well as the progressive nature of federal and state tax codes. The extent of the tax benefit is asymmetric among households that make less than \$15,000, households that make between \$15,000 and \$30,000, and households that make between \$30,000 and \$40,000 in annual income.

**Table 3: Economic Effects of a Hypothetical Positive 1% Increase Across STEM Industries Along I-20 (Real 2020 Dollars)**

	Employment	Labor Income	Total Value Added	Economic Output
<b>Direct Impact</b>	911	\$60,282,984.81	\$97,049,691.38	\$251,301,459.04
<b>Indirect Impact</b>	306	\$14,076,197.88	\$23,691,981.88	\$46,067,557.12
<b>Induced Impact</b>	221	\$7,128,895.40	\$16,982,977.99	\$29,159,862.96
<b>Total Impact</b>	1438	\$81,488,078.09	\$137,724,651.25	\$326,528,879.12

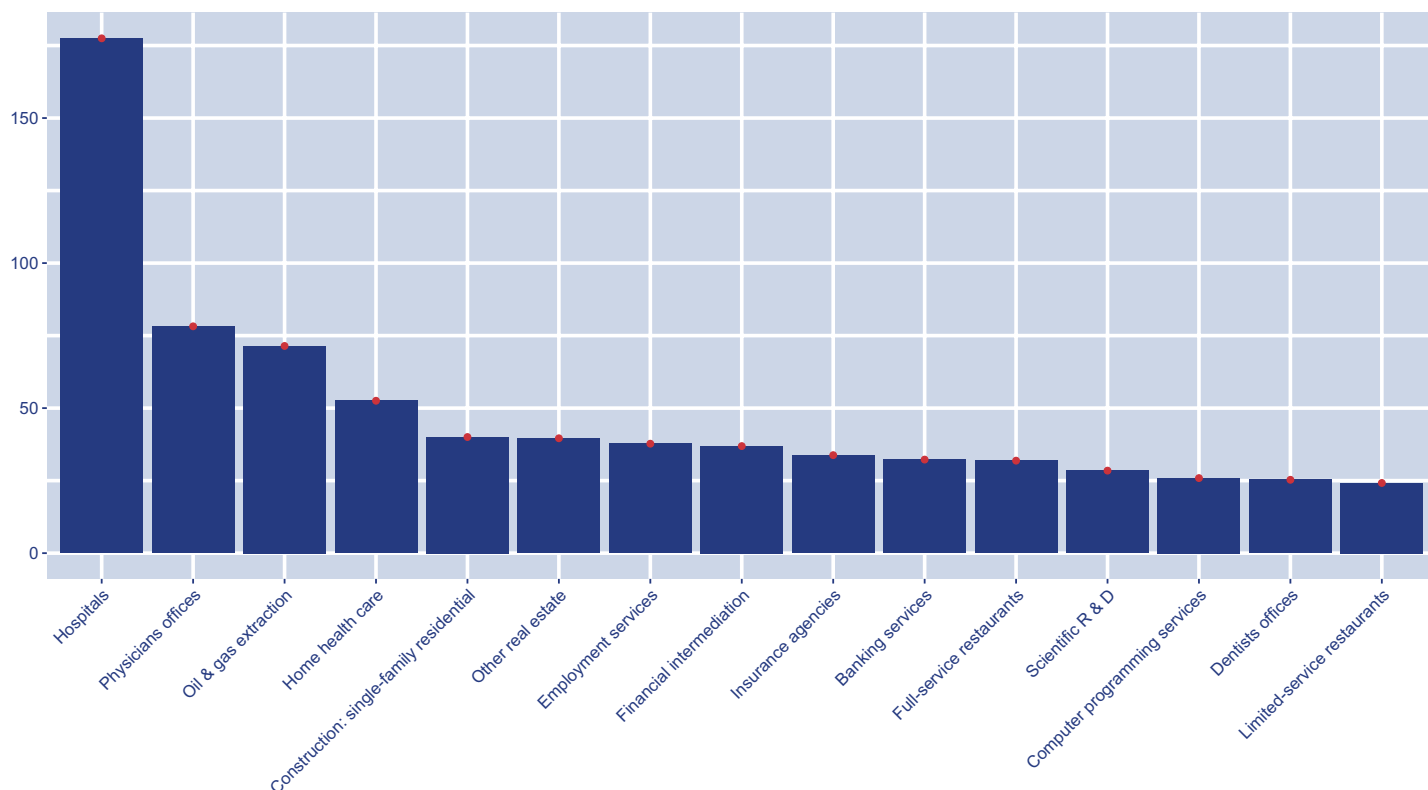
Suppose there is a 1% increase across all STEM industries along I-20. This 1% represents a direct economic impact. This does two things beyond scaling up STEM employment and output. It leads to more demand for goods and services in the production process, and it leads to additional rounds of consumer spending because of higher income and employment. These two additional results are called indirect and induced impacts respectively. The results across all three impact types are summarized in Table 3. Most of the economic effect is centered around the direct impact or initial shock. The indirect and induced impacts are

each lower and do not sum to a value greater than the direct impact. This can be quantified by dividing the total impact by the direct impact for each column (called a type-SAM multiplier). While economic multipliers tend to be lower for smaller, sub-state regions, these multipliers are historically low even for North Louisiana. This indicates that the STEM fields that are concentrated along the I-20 corridor primarily supply intermediate goods and services to production where the final good or services are produced outside of the state. When this occurs, the majority of the economic benefit from investment is ceded to other states and Louisiana does not reap the benefits as much as it could.

Figure 8 shows total employment growth based on a hypothetical 1% shock to all STEM industries along I-20 for the top 15 industries. The bars represent employment growth supported by these industries and includes the sum of direct, indirect, and induced economic effects. As a result, some of these industries that experience labor demand growth are not explicitly STEM industries. This means that these non-STEM industries are the result of induced demand from higher incomes circulating in the impact area. Healthcare industries are among those that enjoy the largest employment and labor income growth as the result of private and public sector investment in STEM initiatives in North Louisiana.

STEM investment along the I-20 corridor highlights some of the broader challenges in North Louisiana, while also showing the important role that it plays for economic development in both urban and rural parishes. Investment in STEM disciplines enjoys a disproportionately greater impact on wage growth. Additionally, growth in these fields helps to reduce poverty by reducing the tax burden among the poorest households in the area.

**Figure 8: Employment Growth in Top 15 Industries (All Industries) for a Hypothetical Positive 1% Shock to STEM Industries (Number of Workers)**



# Opportunities for STEM Growth in North Louisiana

As this report has shown, STEM investment is an important component of economic and personal income growth. Some of the topics touched on in this report imply areas of both opportunity and challenge for North Louisiana. Below are some brief synopses of areas of concern and potential policy actions that can address them. These proposed solutions are not designed to be exhaustive, and others may exist.

## Final Goods and Services Production

Increased diversification of final goods and services production within STEM industries is a long-run concern. The proportion of final goods to total economic output value is about 42% within North Louisiana for STEM fields. For the state as a whole, this proportion is about 49%. This proportion communicates the degree of final goods production within the economy relative to everything that is produced. Final goods production is particularly important because the more of the supply chain that is captured locally, the more economic value and thus income is generated locally. Louisiana, in general, produces an abundance of inputs to production and then exports them to other states who reap the economic benefits relatively more. While this is a broad concern for the Pelican State in general, STEM industries reduce this proportion for the state since they are below the state average. While North Louisiana's proportion of STEM employment is on par with the nation, it exports too many of the benefits to other states who benefit at the expense of Louisiana.

**SOLUTION:** State lawmakers could consider aggressively competing with other states to lure businesses in STEM that produce final goods and services and not just components or inputs to the production process. The state's legislative and executive branches need to work closely together to this end for the benefit of our entire state.







## Diversification Among STEM Industries

Approximately 18% of all industries that are currently reporting in Louisiana are STEM. Region 7 only has 41 of these industries, and Region 8 only has 36. The wider the breadth of economic industry in a particular area, the more likely the next dollar of income will recirculate before it “leaks out” of the region of impact. Recirculation of dollars in a region generally increases the multiplier effect of economic investments. The higher the multiplier, the more any one job leads to a virtuous economic cycle that leads to increased employment and wage growth in adjacent industries. STEM in Regions 7 and 8 currently have an economic output multiplier of 1.3. This means that every dollar of economic activity in a STEM field yields an additional \$0.30 of economic output. This is historically relatively small. Part of this effect can be attributed to the proportion of final goods and services produced, while the major part of this is not enough economic diversity in the area.

**SOLUTION:** It is possible that the lobbying efforts of state lawmakers to lure businesses to the area as described above may also play a role in addressing this concern. Local workforce development professionals should partner with their statewide counterparts to identify which economic opportunities are better partnered with four-year universities to grow the workforce of tomorrow. Attracting greater diversity in STEM industries necessitates a well-educated workforce. Many firms that chose some of our neighboring states over the Pelican State when deciding location, cite concerns over having adequate staffing at the right education level.

## Education is the Silver Bullet

Implied in some of the education statistics discussed on page 7 is that about 31% of STEM workers either have some college or an associate’s degree. Census data shows that Louisiana is among one of the lowest states in the nation for educational attainment on all metrics, but particularly for post-secondary education. Using Bureau of Labor Statistics data, the difference in average annual salary between an associate’s degree and a bachelor’s degree is greater than the difference in average pay for STEM versus non-STEM careers in any of the parishes examined in this study.

**SOLUTION:** Though the legislature has made strides to increase state funding to higher education in recent fiscal years, these efforts are still countering past budgetary cycle cuts over the past 15 years. The cumulative effect of long-term budget cuts to higher education reduces economic growth. Targeted funding for STEM initiatives in higher education, that ultimately lead to more STEM employment, can be a strategy for closing the historic funding gap relatively quickly.



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