An Analysis of Supply and Demand for the STEAM Workforce in South Carolina

(Science, Technology, Engineering, Art, and Math)

September 2015

"Every dollar we contribute to education is an investment in the future…," said Clark Gillespy, South Carolina president for Duke Energy, the largest electrical power holding company in the United States. *"Supporting effective education programs and initiatives that emphasize STEM is a critical focus for Duke Energy."*

"Arguing that the arts and science should and could remain totally separate misses the point. This is not about cultivating more artists or diluting STEM—it's about creating STEM students who think creatively and remain engaged in their learning. True, not everyone will want to or should go into STEM, but the point is to reach those who would contribute in STEM fields but may be turned off by a difficult math class, a boring biology teacher, or not seeing people like them represented in those fields."

Anna Feldman, Research Associate at Future Tense
(www.slate.com/articles/technology/future_tense.html)

INTRODUCTION

With advancements and innovations in technology, the workforce of South Carolina needs comprehensive knowledge of Science, Technology, Engineering, Arts, and Mathematics (STEAM). Is South Carolina producing the right STEAM knowledge at the right levels? What skills or certifications should our future STEAM workers have? Where are the STEAM jobs in South Carolina? Do STEAM jobs really pay more than other occupations?

STEAM OCCUPATIONS

In this report, STEAM occupations have been selected based on information from the Bureau of Labor Statistics, O*NET, the South Carolina Commission on Higher Education, and the Perkins Collaborative. Differing from past analyses, this report includes the "A": the arts. Arts are broken down into the cluster pathways traditionally used: Arts, Audio/Video Technology, and Communication.

STEAM DATA

This report starts with the current situation of STEAM occupations in the Palmetto State including current employment, online job advertisements, employer-requested certifications and soft skills, top counties for employment, wages, and projected STEAM occupations to 2022.

SUPPLY AND DEMAND ANALYSIS

In order to determine if there are any gaps between the workforce supply and the employer demand for STEAM jobs, this report will look at both short-term data and long-term data. The last step is to pull all the data together to show where the gaps are.

Details on sources for data tables in this report can be found on the last page.

CURRENT EMPLOYMENT IN STEAM OCCUPATIONS

In 2014, there were 55,450 occupations related to STEAM in South Carolina (Table 1). Over 45 percent were in Engineering, with Technology (21.6 percent) and Art (21.3 percent) coming in close behind.

TABLE 1	
2014 Employment in STEAM Occupations in SC	

Occupation	2014 Employment	Occupation	2014 Employment
Industrial Engineers	6,320	Urban and Regional Planners	330
Mechanical Engineers	5,670	Aerospace Engineers	300
Civil Engineers	5,240	Computer Hardware Engineers	300
Graphic Designers	2,070	Writers and Authors	290
Public Relations Specialists	1,960	Zoologists and Wildlife Biologists	280
Electrical Engineers	1,880	Forest and Conservation Technicians	250
Industrial Engineering Technicians	1,630	Art Directors	200
Electrical and Electronics Engineering Technicians	1,530	Medical Scientists, Except Epidemiologists	200
Merchandise Displayers and Window Trimmers	1,290	Social Scientists and Related Workers, All Other	190
Electronics Engineers, Except Computer	1,230	Conservation Scientists	180
Environmental Engineers	1,150	Foresters	170
Mechanical Drafters	990	Biological Scientists, All Other	160
Clinical, Counseling, and School Psychologists	960	Agricultural and Food Science Technicians	130
Chemical Technicians	920	Life, Physical, and Social Science Technicians, All Other	130
Nuclear Engineers	880	Fine Artists, Including Painters, Sculptors, and Illustrators	110
Architectural and Civil Drafters	870	Multimedia Artists and Animators	110
Operations Research Analysts	840	Survey Researchers	110
Chemists	840	Psychologists, All Other	110
Civil Engineering Technicians	780	Social Science Research Assistants	110
Mechanical Engineering Technicians	770	Set and Exhibit Designers	100
Surveying and Mapping Technicians	760	Broadcast News Analysts	100
Environmental Science & Protection Technicians, Inc. Health	730	Sound Engineering Technicians	100
Editors	700	Hydrologists	100
Environmental Scientists and Specialists, Including Health	670	Camera Operators, Television, Video, and Motion Picture	90
Commercial and Industrial Designers	650	Film and Video Editors	90
Photographers	590	Biomedical Engineers	90
Broadcast Technicians	550	Actuaries	90
Chemical Engineers	540	Atmospheric and Space Scientists	90
Engineers, All Other	540	Forensic Science Technicians	90
Floral Designers	520	Physical Scientists, All Other	80
Materials Engineers	510	Economists	80
Nuclear Technicians	510	Electro-Mechanical Technicians	70
Technical Writers	500	Microbiologists	60
Audio and Video Equipment Technicians	500	Materials Scientists	60
Health/Safety Engineers, Exc. Mining	480	Fashion Designers	50
Reporters and Correspondents	460	Geological and Petroleum Technicians	50
Electrical and Electronics Drafters	430	Media and Communication Equipment Workers, All Other	40
Engineering Technicians, Except Drafters, All Other	410	Food Scientists and Technologists	40
Biological Technicians	410	Biochemists and Biophysicists	40
Geoscientists, Except Hydrologists and Geographers	400	Craft Artists	30
Statisticians	390	Physicists	30
Interpreters and Translators	370	Historians	30
Environmental Engineering Technicians	370	Drafters, All Other	30
Radio and Television Announcers	350		55,450

CURRENT EMPLOYER NEED IN STEAM OCCUPATIONS

Online job advertisements are one way to see current STEAM occupation demand. Table 2 shows the top STEAM occupations advertised for were Industrial Engineers, followed by Tellers.

TABLE 2		
Online Job Ads for STEAM Jobs in SC, June-August 2015		
Occupation	**Job Ads**	**%**
Industrial Engineers	1,999	16.1%
Tellers	1,283	10.3%
Sales Managers	1,123	9.0%
Accountants and Auditors	1,111	8.9%
Merchandise Displayers and Window Trimmers	1,061	8.5%
Civil Engineers	976	7.8%
Financial Managers	889	7.1%
Loan Officers	888	7.1%
Demonstrators and Product Promoters	660	5.3%
Mechanical Engineers	584	4.7%
Public Relations Specialists	523	4.2%
Bookkeeping, Accounting, and Auditing Clerks	505	4.1%
Electrical Engineers	502	4.0%
Electrical and Electronics Engineering Technicians	347	2.8%
	12,451	100.0%

CERTIFICATIONS AND SKILLS

We can also look at soft skills and professional certifications mentioned in online ads (Table 3). Those interested in STEAM careers would be wise hone their communication, troubleshooting, and teamwork skills and get credentials related to safety, security, engineering, and environmental protection.

TABLE 3	
Top Soft Skills and Certifications from STEAM Online Job Advertisements, June-Aug. 2015	
Soft Skills	**Certifications**
Oral and written communication skills	Occupational Safety & Health Administration Certification
Troubleshooting	Top Secret Sensitive Compartmented Information
Team-oriented, teamwork	Project Management Professional
Analytical skills	Professional Engineer
Quality Assurance	EPA certification
Microsoft Office	Accreditation Board for Engineering and Technology
Detail oriented	Continuing Education
Problem solving	Board Certified
Self-starting / Self-motivated	Certified Public Accountant
Critical thinking	Driver's License

GEOGRAPHY

Geographically, the metropolitan areas (Charleston, Greenville, and Richland counties) are the most flush with STEAM job ads, as shown in Table 4.

TABLE 4
Counties Where Most STEAM Jobs Openings are Listed
June-August 2015

Charleston County
Greenville County
Richland County
Aiken County
York County
Spartanburg County
Florence County
Fairfield County
Horry County
Beaufort County

WAGES

You may have heard that STEAM occupations pay more than others. There is data to back up that claim in Table 5 which shows that many STEAM occupations earn more than the state average for all occupations.

TABLE 5
Wage Comparison, STEAM vs. Non-STEAM in SC 2014

Average Hourly Wage, All Occupations	$19.03

	HIGH		LOW	
Science	Physicists	$ 62.06	Geoscientists, Exc. Hydrologists/Geographers	$ 21.07
Technology	Nuclear Technicians	$ 33.52	Broadcast Technicians	$ 16.36
Engineering	Electronics Engineers, Except Computer	$ 45.27	Health/Safety Engineers, Exc. Mining	$ 32.12
Art	Commercial and Industrial Designers	$ 34.68	Floral Designers	$ 11.45
Math	Operations Research Analysts	$ 33.08	Statisticians	$ 27.68

DECLINING STEM OCCUPATIONS

As shown in Table 6, online job advertisements for STEAM occupations in Science, Engineering, and Art have seen some large declines from 2014-2015.

TABLE 6	
Declining STEAM Occupations 2014-2015	
Medical Scientists, Except Epidemiologists	-178
Merchandise Displayers and Window Trimmers	-129
Statisticians	-104
Mechanical Engineers	-80
Technical Writers	-39
Operations Research Analysts	-37
Aerospace Engineers	-29
Civil Engineering Technicians	-28
Materials Engineers	-27
Chemical Engineers	-24
Environmental Scientists and Specialists, Including Health	-21
Zoologists and Wildlife Biologists	-17
Electronics Engineers, Except Computer	-16
Forest and Conservation Technicians	-14
Biological Technicians	-11
Mathematicians	-10
Agricultural and Food Science Technicians	-10
Floral Designers	-8
Radio and Television Announcers	-8
Survey Researchers	-7
Geoscientists, Except Hydrologists and Geographers	-5

Science	-221
Engineering	-204
Art	-184
Math	-158
Technology	-35

OCCUPATIONAL PROJECTIONS TO 2022 FOR STEAM JOBS

Table 7 shows projected numbers for STEAM occupations in South Carolina by education level required to enter that occupation (as recommended by the US Department of Labor, Bureau of Labor Statistics).

Occupation	2012-22 Growth (%)	2014 Avg. Wage ($)	Education to Enter Occupation
TABLE 7: Projected STEAM Occupations in SC by Education Level, 2012-22			
Ophthalmic laboratory technicians	19.8	14.83	HS/GED+Moderate OJT
Dental laboratory technicians	10.2	17.13	HS/GED+Moderate OJT
Media and communication workers, all other	7.9	21.83	HS/GED+Short OJT
Medical appliance technicians	6.6	19.23	HS/GED+Long OJT
Photographers	5.7	16.26	HS/GED+Long OJT
Sound engineering technicians	18.4	19.13	Technical Certificate+Short OJT
Audio and video equipment technicians	17.5	18.45	Technical Certificate+Short OJT
Nuclear technicians	26.2	33.52	Associate's+Moderate OJT
Avionics technicians	17.7	27.11	Associate's
Industrial engineering technicians	10.8	23.71	Associate's
Mechanical engineering technicians	6.8	24.85	Associate's
Electrical and electronics engineering technicians	3.8	26.99	Associate's
Chemical technicians	3.0	20.32	Associate's+Moderate OJT
Broadcast technicians	2.5	16.36	Associate's+Short OJT
Environmental scientists/specialists, inc. health	19.3	28.34	Bachelor's
Technical writers	17.1	31.65	Bachelor's+Short OJT
Nuclear engineers	16.2	44.09	Bachelor's
Electrical engineers	12.4	39.64	Bachelor's
Film and video editors	10.8	17.67	Bachelor's
Commercial and industrial designers	10.4	34.68	Bachelor's
Art directors	9.8	24.19	Bachelor's+More than 5 yrs. exp.
Multimedia artists and animators	9.1	24.36	Bachelor's+Moderate OJT
Health and safety engineers, exc. mining	8.8	32.12	Bachelor's
Industrial engineers	8.7	38.07	Bachelor's
Mechanical engineers	7.7	41.21	Bachelor's
Camera operators, TV/video/motion picture	7.6	18.77	Bachelor's
Graphic designers	7.1	19.20	Bachelor's
Museum technicians and conservators	6.9	17.16	Bachelor's
Microbiologists	6.1	30.82	Bachelor's
Forensic science technicians	4.7	20.47	Bachelor's+Moderate OJT
Chemists	4.6	34.98	Bachelor's
Geoscientists	2.7	21.07	Bachelor's
Physical scientists, all other	1.7	49.15	Bachelor's
Chemical engineers	1.5	42.55	Bachelor's
Statisticians	31.9	27.68	Master's
Survey researchers	20.7	24.99	Master's
Economists	2.8	32.66	Master's
Hydrologists	2.7	28.57	Master's
Biochemists and biophysicists	24.1	28.21	Doctoral

HS/GED = high school diploma or GED; OJT = on-the-job-training; yrs. exp. = years experience in a related occupation

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SHORT-TERM SUPPLY AND DEMAND

This analysis uses college degrees earned for supply (Table 8) and online job advertisements for demand (Table 9). The Commission on Higher Education provided the degree information (all levels from certificate to Doctorate for 2014) and includes all public and private (but not for-profit) institutions of higher education in the state:

Demand is shown using current online job advertisements for June through August 2015. This series counts job ads, which may or may not have multiple job openings. In order to compare apples to apples, degrees and job advertisements were categorized using the STEAM pathways.

TABLE 8			
STEAM Degrees Conferred in SC 2014			
Pathway	*Degrees*	*%*	*Most Common STEAM Major*
Science	5,008	43.9%	Biology/Biological Sciences
Engineering	1,850	16.2%	Mechanical Engineering
Communication	1,772	15.5%	Creative Writing
Art	982	8.6%	Fine/Studio Arts
Technolgy	927	8.1%	Electrical and Electronic Engineering Technologies/Technicians
Math	667	5.9%	Tie: Economics & General Mathematics
A/V Tech	190	1.7%	Tie: Film/Video and Photographic Arts & Graphic Design
	11,396	100.0%	

TABLE 9			
Job Advertisements for STEAM Occupations in SC			
Pathway	*Job Ads*	*%*	*Most Common Occupation*
Art	1,061	8.5%	Merchandise Displayers and Window Trimmers
Communicaiton	1,183	9.5%	Demonstrators and Product Promoters
Engineering	4,061	32.6%	Industrial Engineers
Math	5,799	46.6%	Tellers
Technology	347	2.8%	Electrical and Electronics Engineering Technicians

SHORT-TERM SUPPLY-DEMAND ANALYSIS

Table 10 compares the percentages for short-term supply (degrees earned), demand (job advertisements), and the differences. In the Difference column, a negative number means that there is more supply than demand, while a positive number shows that the supply of workers is not meeting the demand.

TABLE 10			
Short-Term Supply and Demand			
Pathway	*Degrees*	*Online Ads*	*Difference*
A/V Technology	1.7%	0	-1.7%
Art	8.6%	8.5%	-0.1%
Communication	15.5%	9.5%	-6.0%
Engineering	16.2%	32.6%	16.4%
Math	5.9%	46.6%	40.7%
Science	43.9%	0.0%	-43.9%
Technology	8.1%	2.8%	-5.3%

LONG-TERM WORKFORCE SUPPLY AND DEMAND

Long-term supply (Table 11) can be illustrated through analyzing career clusters of twelfth graders in the state's public high schools. SC Department of Employment and Workforce produces long-term (10-year) occupational projections, which are currently available for 2012-22, and will serve as the source for long-term demand in this report (Table 12). The 10-year occupational projections have been categorized using career pathways to facilitate the comparison process.

TABLE 11			
Career Cluster of 12th Graders 2014-15			
Pathway	*12th Graders*	*%*	*Top "Major" Selected*
Art	4,506	36.2%	Performing Arts
Science	2,584	20.7%	General Science
Engineering	2,437	19.6%	Engineering/Pre-Engineering
Communication	1,114	8.9%	Journalism
A/V Tech	906	7.3%	Graphics
Math	635	5.1%	Math
Technology	278	2.2%	Industrial/Engineering Technology
	12,460	100.0%	

TABLE 12

Projections (2012-22) for STEAM Occupations

Pathway	# Change	%	Most Common Occupation
A/V Technology	380	10.6%	Graphic Designers
Art	204	5.7%	Photographers
Communication	54	1.5%	Technical writers
Engineering	1,750	48.7%	Mechanical engineers
Math	105	2.9%	Statisticians
Science	238	6.6%	Environmental scientists and specialists, including health
Technology	863	24.0%	Nuclear technicians
	3,594	100.0%	

LONG-TERM SUPPLY-DEMAND ANALYSIS

In Table 13, career clusters of high school seniors (supply) are compared to 2012-22 occupational projections (demand). As in the previous table, the last column shows the difference in the two. A negative number means there is not enough supply to keep up with employer demand. Positive numbers mean the supply exceeds the demand.

TABLE 13

Long-Term Supply and Demand

Pathway	Clusters	Occ. Proj.	Difference
A/V Technology	7.3%	10.6%	-3.3%
Art	36.2%	5.7%	30.5%
Communication	8.9%	1.5%	7.4%
Engineering	19.6%	48.7%	-29.1%
Math	5.1%	2.9%	2.2%
Science	20.7%	6.6%	14.1%
Technology	2.2%	24.0%	-21.8%

SUMMARY OF SHORT- AND LONG-TERM DEMAND AND SUPPLY

To summarize these findings, Table 14 transfers the numbers to occupational categories that may need to be adjusted for both short- and long-term planning.

TABLE 14	
Short-Term Analysis	**Long-term Analysis**
Need more college students studying:	*Need more high school students graduating with:*
Math (Banking)	Engineering (Mechanical)
Engineering (Industrial)	Technology (Nuclear)
Need fewer college students studying:	*Need fewer high school students graduating with:*
Science (Biology)	Art (Graphic Art)
Communication (Creative Writing)	Science (General Science)

SOURCES
Table 1, 5, and 12: SC Department of Employment and Workforce, Business Intelligence Department, Occupational Employment and Wages Unit
Tables 2, 3, 4, 6, and 9: The Conference Board's Help Wanted Online® data series
Table 7: SC Department of Employment and Workforce, Business Intelligence Department
Table 8: SC Commission on Higher Education
Table 11: SC Department of Education

Research Analyst: Lorraine Faulds, 803-737-2714, lfaulds@dew.sc.gov
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