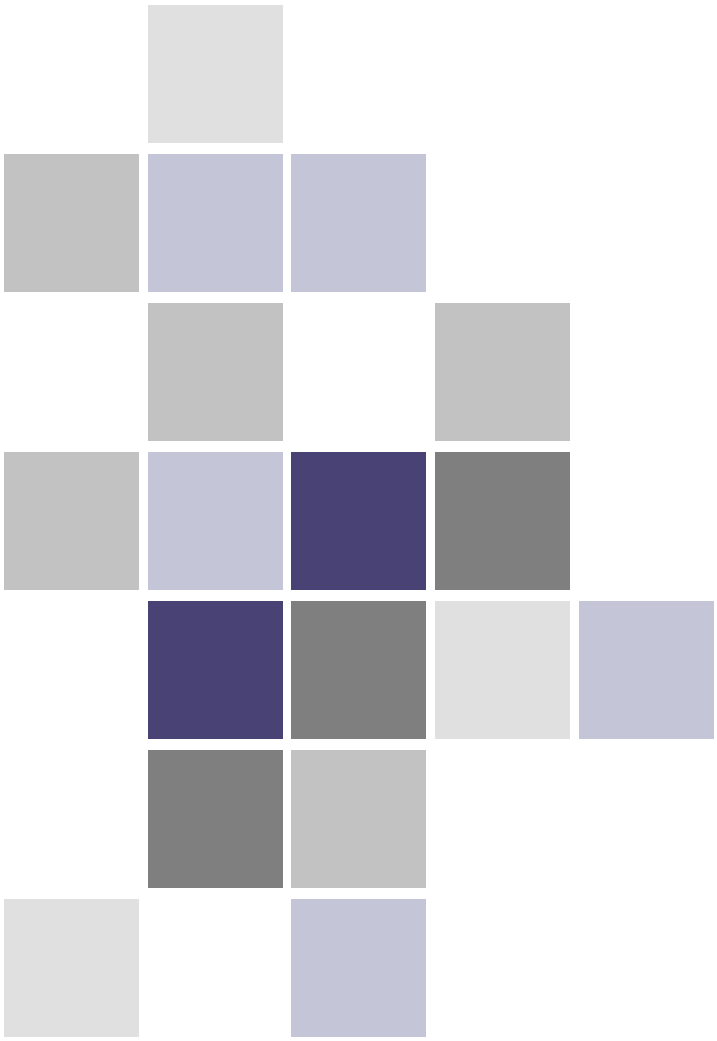
MGT CONSULTING GROUP

SYSTEM-WIDE STEM PROGRAM NEEDS ASSESSMENT

UNIVERSITY OF NORTH CAROLINA SYSTEM

Final Report

August 6, 2019



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1.0: INTRODUCTION

In March 2019, The University of North Carolina System Office engaged MGT Consulting to provide a review of the UNC System and its constituent institutions related to STEM programming needs at the undergraduate level. STEM Programs were defined as those involving engineering, hard science, health science, technology, and math. The effort was designed to consider the strengths, weaknesses, opportunities and needs of each constituent institution and any regional similarities and differences.

STUDY OBJECTIVES

The critical components of the study were defined by the System Office in the original RFP. Through this engagement, MGT were to complete the following tasks:

- Coordinate, support, and assist the Board of Governors and UNC System Office staff in the execution of the Task Force's work to oversee a review and analysis of the programmatic needs of the UNC System and its constituent institutions in the various disciplines of engineering, information technology, physical sciences and health sciences existing at our universities, taking into account the strengths, weaknesses, opportunities, and needs of each constituent institution, and any regional similarities and differences.
- Consider immediate and projected needs of the state and the impact of any relevant best-practices among other similar programmatic areas to encourage systemwide efficiencies.
- Develop an understanding of the current situation across the UNC System through a review and analysis of population demographic trends, education statistics, occupational and workforce data, educational attainment and participation figures.
- Review prior studies, reports, and strategic planning and master plan documents that have relevance to the proposed study.
- Work with constituent institutions as well as UNC system staff to gather information and conduct a series of stakeholder input (data collection) efforts to gain a more in-depth understanding of higher education programs, funding plans and gaps, preferences, barriers, current options, and potential access/delivery models appropriate for their region of the state.
- Using the information collected, arm the Task Force with recommendations to consider in the preparation of a UNC System Plan to meet those enrollment needs consistent with program strategies and objectives to be presented to the Joint Legislative Capital Improvements Oversight Committee and the Fiscal Research Division.

IMPORTANT CONSIDERATIONS

The following caveats should be considered when reviewing the data and analysis in this report and drawing conclusions about STEM capacity and projected supply and demand in North Carolina:

- Programs were identified as STEM by the System Office for the purposes of this study. As a result of conversations with individual institutions, some modifications in the program listings were made, namely the addition of several programs at the request of institutions and with the approval of the System Office.
- The Department of Homeland Security categorizes STEM programs more broadly than those included in this study, and these definitions are utilized by some institutions. It should be noted that the System office carefully examined other programs suggested by individual institutions to be designated as STEM, and conveyed any changes to the consultant team.
- Enrollment trend data referenced throughout this report were provided by the System Office and include upper-division majors only (juniors and seniors). Students declare majors at a variety of stages in their college experience at different institutions, sometimes when they enroll and as late as spring of sophomore year. In order to compare "apples-to-apples," the consultant team, in cooperation with the System Office, chose to examine only upper-division first majors.
- Fifteen of the 17 institutions within the UNC System offer STEM programs, and each was included in the process and afforded an opportunity to provide input describing their circumstances and future STEM plans.
- The data received from the System office identifies each individual STEM program by CIP designation (Classification of Instructional Programs). The subsequent analyses for this report relied on this designation to group programs by STEM categories (Hard Science, Health Science Technology, Engineering and Math), as well as compare similar STEM programs across institutions or geographies, and also make comparisons to future SOC occupational openings (Standard Occupational Classification) to determine potential magnitude of demand for STEM graduates. Where at all possible, the consultant team with the assistance of the UNC System Data Analytics team, made an attempt to resolve any program coding inconsistencies identified. The consultant did not have direct access to descriptions of courses or detailed program content that may distinguish a particular program classification.
- The focus of the full study is bachelor's STEM program enrollment changes and the repercussions on physical space and resources. As such, graduate and professional program enrollments/degree awards (including medical school enrollments) were not considered in the scope of the analysis. However, it should be noted that during the consultant's meetings with the UNC institutions, there was considerable commentary about plans to grow enrollments in graduate STEM programs. Impact on capacity needs across the UNC System will be driven by future enrollment changes at all academic levels. Graduate program expansion would also have implications for classroom, instructional and research lab space, new faculty hires, support personnel, research stipends, and both capital and operating related resources.
- It is important to understand that enrollment increases across an institution can significantly impact some STEM programs and related academic departments, even if growth is not in STEM

majors. For example, since most students will need to take foundational math and science courses (biology, science, chemistry, etc.) as part of their core curriculum, enrollment increases in even arts and humanities majors will result in additional teaching/classroom burdens on these departments, even if no additional majors are added to the programs specifically. However, the potential impacts of overall enrollment growth of these core courses and programs did not factor into the current analysis.

- NC Tower reports the rates with which recent UNC System bachelor's degree recipients remain employed in the state following graduation. The data are aggregated at the two-digit CIP level and so, are broadly generalizable to that level of discipline groupings. The estimated employment retention rates are derived from U.S. Census American Community Survey data, and include four annual points in time beyond graduation as the metric. There are multiple reasons why a UNC System graduate would not be employed at any of the four annual time points including; pursuit of additional education, employment out of state, unemployment status. Furthermore, the data do not distinguish between persons employed in-state in STEM vs. non-STEM occupations.
- Future population changes across North Carolina will certainly impact the pipeline of in-state traditional age undergraduate enrollments in the System. The state's population is expected to grow 11.3% resulting in a gain of just over 1.2 million residents between 2020 and 2030. However, the 18-24 age cohort is expected to grow by only 5% during that same 10-year period generating a statewide gain for just over 52,000 more traditional college age residents. A further breakdown of the projected growth of the 18-24 year old cohort across designated geographic regions for this analysis indicate 58 counties will experience a loss in this traditional college-going age group, while 42 will realize a gain. The negative impact could be felt the most in the Western Region (4% decline) and the Piedmont-Triad Region (3% decline).
- In the most recent academic year (2017-18), 24 private institutions located in North Carolina conferred nearly 2,700 STEM Bachelor's degrees across 50 plus CIP codes. The vast majority (65%) of these degrees were, in descending order: Biology, Kinesiology, Nursing, Math and Chemistry, and concentrated in several of the more prominent institutions.

REPORT OUTLINE

This report is structured with an additional five chapters, including:

Chapter 2: Statewide STEM Degree Production: This chapter offers a summary of historical and projected undergraduate STEM program enrollments and degrees awards across the state as a whole.

Chapter 3: Regional STEM Degree Production: This chapter offers a summary of STEM program historical and projected enrollments and degrees awarded (supply) and Magnitude of employment by industry sector (demand) within each of five geographic regions that consist of individual or paired North Carolina Prosperity Zones.

Chapter 4: STEM Category Supply and Demand Analysis: This chapter assesses the magnitude and distribution of System STEM programs, enrollment growth, and relevant occupational openings from

undergraduate STEM programs within each of the five STEM categories separately (Engineering, Hard (Physical) Sciences, Health Sciences, Math, and Technology).

Chapter 5: Summary of Findings: This chapter summarizes the observations and key findings from the study related to STEM enrollment trends and capacity across the System by STEM category and region.

Supplementing the report are a number of Appendices with detailed data, including:

Appendix A: UNC System undergraduate STEM CIP list included in the study analysis.

Appendix B: UNC System historical and projected upper-division STEM program enrollment and degree award trends by institution.

Appendix C: STEM Occupational Projections.

Appendix D: STEM Degree Awards from Private Institutions in North Carolina.

Appendix E: UNC institutional profiles and information relevant to their STEM programs.

2.0: STATEWIDE STEM DEGREE PRODUCTION

In order to assess the ability of the UNC System to meet the workforce needs of the state for qualified STEM candidates, the consultant team analyzed historical enrollment and degree award trends and projections (supply) for comparison to the relevant occupational projections for positions requiring a bachelor's degree in STEM disciplines (demand).

NATIONAL TRENDS IN STEM OCCUPATIONS

A recent 2019 Jobs Growth Index report prepared by RCLCO Real Estate Advisors, tracks markets where STEM job growth is concentrated across the country[1]. They note that there is an ever-increasing reliance and integration of STEM jobs into the U.S. economy. Data produced by the U.S. Bureau of labor Statistics forecasts employment as a whole will increase by 7.4% from 2016-2026. Comparatively, STEM employment nationally will continue to grow much quicker at 10.8% across that same time period. According to U.S. Department of Commerce data, STEM workers enjoy a significant wage advantage earning 29% to 39% more per hour than their non-STEM counterparts dependent upon education level. Further, data indicate that roughly half of all STEM jobs are in computer or mathematics related fields including IT.

The report presents a comparative measure called the STEM Job Growth Index or "STEMdex" derived from 26 weighted metrics and applied to 38 metropolitan areas across the country. For the last three years of this indexing, two areas in North Carolina have made the top 10 markets associated with STEM employment opportunities, industries and growth. For the last two annual reports, Raleigh was ranked #2 and Charlotte #3, trailing only Austin, TX. Additionally, the Raleigh metro was ranked 6th in terms of STEM occupation & location quotient (LC), a comparative measure of the ratio of STEM jobs to total jobs in the local market compared to the national ratio. Raleigh shows its strong STEM focus having a 1.77 LC, or 77% more stem jobs per total jobs than the country as a whole.

The importance of STEM jobs and subsequently STEM educational opportunities in a market is further supported by a 2018 data summary prepared by the Pew Research Center.[2] Looking at data for adults 25 and older working in 74 occupations from 1990 to 2016 found that there were significant earnings advantages (median annual earnings of full-time, year-round workers). For those holding a bachelor's degree in a STEM focused job, the earnings advantage was roughly $20,000 across all industry sectors. It was also reported that 36% of all STEM workers held a bachelor's degree as their highest education level, while an additional 29% held a graduate or professional degree. However, only 52% of workers with a bachelor's degree in a STEM field worked in a STEM occupation. Management, business and finance occupations were the most frequent non-STEM occupations for STEM degree holders. A significant pay

[1] 2019 STEM Job Growth Index, Taylor Mammen and Ryan Guerdan, RCLCO Real Estate Advisors, January 31, 2019. RCLCO.com.

[2] 7 Facts About the STEM Workforce, Nikki Graf, Richard Fry, and Cary Fun, FACTANK News In The Numbers, https://www.pewresearch.org/fact-tank/2018/01/09.

differential is apparent for those who had a college major in STEM vs. who majored in a non-STEM discipline, despite if they are or are not employed in a STEM occupation.

A Bureau of Labor Statistics 2017 publication[3] noted that nationally, STEM employment of 8.6 million accounted for 6.2% of all jobs in 2015. STEM jobs grew at a rate of 10.5% from 2009-2015 across the country. Over the same time period, the number of STEM job opportunities in North Carolina grew at a comparable rate of 10.3% (more than 22,000 additional jobs). Not surprisingly, several areas of North Carolina met or exceeded the percent of STEM employment to total employment; including Durham-Chapel Hill (13.1%) Raleigh (10.3%), and Charlotte (6.4%). In addition, Wilmington (5.4%) and New Bern (5.3%) host substantial shares of STEM jobs, as compared to total jobs.

Nationally, over 99% of STEM employment was in occupations that typically require some type of postsecondary education for entry, compared with 36% of overall employment. Occupations that typically require a bachelor's degree for entry, made up 73% of STEM employment, as compared to 21% of overall jobs which require a four-year degree at entry (in 2015).

Both nationally and within the state of North Carolina, STEM related occupations and the resulting demand for STEM-related academic credentials (particularly at the bachelor's level) is and is projected to remain strong. It is essential to the overall economy of North Carolina as a national leader in STEM-related industry for the UNC System to continue to provide a robust slate of STEM degree options for residents across the state. The remainder of this chapter summarizes and details the enrollment trends leading to four-year degree completion among STEM disciplines in the System, along with projections for the future.

STATEWIDE STEM ENROLLMENT TRENDS

The University System provided the most recent five years of enrollment data based on upper division majors only for each undergraduate STEM program identified at each institution. The program inventory represents 104 unique CIP codes as displayed in **Appendix A**. The first and last years' data are depicted in this chapter, while all five years of historical data are displayed for each institution in **Appendix B**. It is important to note that, while most programs in the analysis had enrollments throughout the 2014-2018 Fall terms, some that existed in 2014 have been discontinued, while others were added in 2015 or later years. Furthermore, STEM enrollment data provided by the UNC System include only upper division first majors for consistency of analysis and comparison. In each of the following sections of this chapter, we first provide some historical trends in STEM program capacities as context for 5-year and 10-year STEM projections that will inform the System Office and the individual institutions as they proceed to Phase Two of the larger study focus on physical space needs and capital resources allocation.

ENROLLMENT GROWTH BY STEM GROUPING

In Fall 2014, the UNC System offered 251 individual STEM programs across fifteen institutions. By 2018, the number of CIP programs had grown to 264 (**Exhibit 2-1**), with 104 unique CIPs, a net gain of 13

[3] U.S. Bureau of Labor Statistics, Spotlight on Statistics, STEM Occupations: Past, Present, An Future. Stella Fayer, Alan Lacey, and Audrey Watson, January 2017.

programs. The largest share of programs was categorized as Hard Sciences (33%), followed by Health Science (24%), Engineering (20%), Technology (14%), and Math (9%).

EXHIBIT 2-1
TOTAL UNDERGRADUATE STEM DEGREE PROGRAMS
OFFERED ACROSS THE SYSTEM BY STEM GROUPING
FALL 2014 AND FALL 2018

STEM Category	Fall 2014		Fall 2018	
	#	%	#	%
Hard Science	86	34%	87	33%
Health Science	56	22%	64	24%
Engineering	52	21%	54	20%
Technology	34	14%	36	14%
Math	23	9%	23	9%
Grand Total	**251**	**100%**	**264**	**100%**

Source: UNC System Office, 2019.

In Fall 2018, UNC System STEM programs enrolled 40,572 junior and seniors (upper-division declared majors), up approximately 18% from 34,441 in Fall 2014 as noted in **Exhibit 2-2**. Technology programs experienced the strongest growth, with an increase of more than 2,100 students (44%).

EXHIBIT 2-2
TOTAL UNDERGRADUATE UPPER DIVISION STEM ENROLLMENTS*
ACROSS THE SYSTEM BY STEM GROUPING
FALL 2014 AND FALL 2018

STEM Category	Fall 2014		Fall 2018		5- Year	5- Year
	#	%	#	%	# Change	% Change
Hard Science	10,308	30%	11,289	28%	981	10%
Health Science	9,594	28%	10,726	26%	1,132	12%
Engineering	8,166	24%	9,779	24%	1,613	20%
Technology	4,796	14%	6,903	17%	2,107	44%
Math	1,577	5%	1,875	5%	298	19%
Grand Total	**34,441**	**100%**	**40,572**	**100%**	**6,131**	**18%**

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

ENROLLMENT GROWTH BY PROGRAM TYPE

To analyze individual growth of similar programs across the system, offerings at different institutions with the same CIP were consolidated. Some programs which were similar in nature, but with different CIPs or program names also were consolidated (e.g., Environmental Science and Environmental Studies). By doing this, we were able to formulate a clearer picture of which program types have the most enrollments across the system. Note that historical enrollment and degree award data for all individual STEM programs are listed in **Appendix B** by institution.

The 20 largest STEM program categories across the system account for more than three-quarters of all Fall 2018 STEM upper division enrollments (over 30,700), as shown in **Exhibit 2-3**. Biology programs enroll the most students within the system, constituting 15% of STEM enrollments, followed by Nursing (13%), and Computer Science (10%), each having between 4,000 to 6,000 enrollments. Other program categories account for less than 10% of the total STEM upper division enrollments across the System. Among the top 20 programs, six are Engineering, five are Technology, four are Health Science, four are Hard Science, and one is Math.

EXHIBIT 2-3
TOP 20 STEM CIP CODES BY FALL 2018 ENROLLMENT*

CIPs	Program Description	Fall 2014		Fall 2018	
		#	%	#	%
260101	Biology/Biological Sciences	5,314	15%	5,928	15%
513801	Nursing/Registered Nursing/Registered Nurse	4,634	13%	5,109	13%
110701	Computer Science	2,606	8%	4,076	10%
141901	Mechanical Engineering	1,194	3%	1,579	4%
400501	Chemistry	1,602	5%	1,534	4%
270101/270301	Mathematics and Applied Mathematics	1,283	4%	1,427	4%
030103/030104	Environmental Science/Studies	1,015	3%	1,387	3%
260908/310501/310505	Exercise Science/Physiology	1,201	3%	1,150	3%
512201/512207	Public Health/Public Health Education and Promotion	966	3%	1,006	2%
510701	Health/Health Care Administration/Management	440	1%	948	2%
141001	Electrical and Electronics Engineering	847	2%	940	2%
450601	Data Science/Financial informatics (Economics)	969	3%	925	2%
140101	Engineering (one with a concentration in Mechatronics)	545	2%	762	2%
140801	Civil Engineering	714	2%	750	2%
150612	Automotive Engineering Technology/Industrial Technology/Technician	575	2%	706	2%
520201/521201	Management Information Systems and Business Analytics	572	2%	668	2%
140901	Computer Engineering	546	2%	664	2%
110103	Information Technology	311	1%	577	1%
159999	Engineering Technologies and Engineering-Related Fields/Construction Management	251	1%	575	1%

* STEM enrollment figures include only upper division first majors.

Source: UNC System Office, 2019.

The 20 programs (by CIP or CIP grouping) with the largest growth based on enrollment counts among STEM disciplines from Fall 2014 to Fall 2018 are displayed in **Exhibit 2-4**. Enrollments in these programs constituted more than two-thirds (67%) of all STEM enrollments across the system in 2018. The top 10 programs represent roughly a 4,900 enrollment increase from Fall 2014, or 80% of STEM upper division enrollment growth over the five years Fall 2014 to 2018. Among the top 20 programs experiencing the greatest enrollment increases, nine are Engineering, four are Technology, three are Health Science, two are Hard Science, and two are Math.

EXHIBIT 2-4
TOP 20 STEM CIP CODES BY OVERALL ENROLLMENT* GROWTH
FALL 2014 AND FALL 2018

CIPs	Program Description	Fall 2014		Fall 2018		5- Year # Change	5- Year % Change
		#	%	#	%		
110701	Computer Science	2,606	8%	4,076	10%	1,470	56%
260101	Biology/Biological Sciences	5,314	15%	5,928	15%	614	12%
510701	Health/Health Care Administration/Management	440	1%	948	2%	508	115%
513801	Nursing/Registered Nursing/Registered Nurse	4,634	13%	5,109	13%	475	10%
141901	Mechanical Engineering	1,194	3%	1,579	4%	385	32%
030103/030104	Environmental Science/Studies	1,015	3%	1,387	3%	372	37%
159999	Engineering Technologies and Engineering-Related Fields/Construction	251	1%	575	1%	324	129%
140501	Bioengineering and Biomedical Engineering	176	1%	447	1%	271	154%
110103	Information Technology	311	1%	577	1%	266	86%
140101	Engineering (one with a concentration in Mechatronics)	545	2%	762	2%	217	40%
270101/270301	Mathematics and Applied Mathematics	1,283	4%	1,427	4%	144	11%
110901	Computer Systems Networking and Telecommunications	166	0%	307	1%	141	85%
150612	Automotive Engineering Technology/Industrial Technology/Technician	575	2%	706	2%	131	23%
140901	Computer Engineering	546	2%	664	2%	118	22%
520201/521201	Management Information Systems and Business Analytics	572	2%	668	2%	96	17%
141001	Electrical and Electronics Engineering	847	2%	940	2%	93	11%
270501/279999	Mathematics and Statistics	166	0%	254	1%	88	53%
150613	Manufacturing Engineering/Applied Engineering Technology/Technician	99	0%	180	0%	81	82%
510201	Communication Sciences and Disorders	167	0%	244	1%	77	46%
150805	Mechanical Engineering/Mechanical Technology/Technician	143	0%	215	1%	72	50%

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

The 20 programs (by CIP or CIP grouping) with the largest projected growth in enrollments among STEM disciplines over the next ten years are displayed in **Exhibit 2-5**. Enrollments in these programs are projected to constituted nearly 75% of all STEM enrollments in the System in ten years. Of these top 20 programs, six are Health Science, four are Engineering, five are Technology, four are Hard Science, and one is Math. The top 5 programs are projected to add anywhere from 1,000 to 4,000 enrollments respectively, during that time period.

EXHIBIT 2-5
TOP 20 STEM CIP CODES WITH LARGEST PROJECTED ENROLLMENTS*
AT 5-YEARS AND 10-YEARS IN THE FUTURE

CIPs	Program Description	Fall 2018	5-year Projections	10-year Projections	10-year # change over 2018
110701	Computer Science	4,076	6,379	8,153	4,077
260101	Biology/Biological Sciences	5,928	6,979	8,125	2,197
510701	Health/Health Care Administration/Management	948	2,089	2,680	1,732
513801	Nursing/Registered Nursing/Registered Nurse	5,109	6,140	6,833	1,724
512201/512207	Public Health/Public Health Education and Promotion	1,006	1,712	2,031	1,025
260908/310501/310505	Exercise Science/Physiology	1,150	1,480	2,051	901
270101/270301	Mathematics and Applied Mathematics	1,427	1,847	2,199	772
261501	Neuroscience	62	400	800	738
030103/030104	Environmental Science/Studies	1,387	1,784	2,089	702
110103	Information Technology	577	836	1,054	477
140101	Engineering (one with a concentration in Mechatronics)	762	924	1,203	441
150612	Automotive Engineering Technology/Industrial Technology/Technician	706	886	1,127	421
141901	Mechanical Engineering	1,579	1,734	1,943	364
400501	Chemistry	1,534	1,722	1,895	361
159999	Engineering Technologies and Engineering-Related Fields/Construction Management	575	718	927	352
450601	Data Science/Financial informatics (Economics)	925	1,122	1,254	329
310504	Kinesiology	322	500	650	328
110401	Management Information Systems/Information Science/Studies	134	294	456	322
520201/521201	Management Information Systems and Business Analytics	668	730	945	277
510000	Integrated Health Sciences	29	200	300	271

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

ENROLLMENT GROWTH BY INSTITUTION AND REGION

STEM enrollment changes by institution between Fall 2014 and Fall 2018 are displayed in **Exhibit 2-6**. As shown, the institutions with the strongest enrollment growth rate during this time horizon were UNC Wilmington (49%), which also experienced the second largest numerical growth in STEM enrollments (1,000+), followed by UNC Charlotte (37%), and NC A&T (35%). Several institutions experienced declines in STEM enrollments during the last five years, including Elizabeth City State University (decline of 33%) and Winston-Salem State University (decline of 16%).

EXHIBIT 2-6
TOTAL STEM ENROLLMENTS* BY INSTITUTION
FALL 2014 AND FALL 2018

Institution	Fall 2014		Fall 2018		5- Year # Change	5- Year % Change
	#	%	#	%		
University of North Carolina - Charlotte	4,759	14%	6,505	16%	1,746	37%
University of North Carolina - Wilmington	2,238	6%	3,334	8%	1,096	49%
University of North Carolina - Chapel Hill	4,249	12%	5,154	13%	905	21%
East Carolina University	4,019	12%	4,751	12%	732	18%
Appalachian State University	2,406	7%	3,100	8%	694	29%
North Carolina A&T**	1,721	5%	2,316	6%	595	35%
Western Carolina University	1,717	5%	1,949	5%	232	14%
University of North Carolina - Greensboro	1,903	6%	2,108	5%	205	11%
University of North Carolina - Asheville	580	2%	712	2%	132	23%
University of North Carolina - Pembroke	562	2%	641	2%	79	14%
North Carolina Central University**	541	2%	579	1%	38	7%
North Carolina State University	7,156	21%	7,157	18%	1	0%
Fayetteville State University**	852	2%	850	2%	(2)	0%
Elizabeth City State University**	263	1%	176	0%	(87)	-33%
Winston-Salem State University**	1,475	4%	1,240	3%	(235)	-16%
Grand Total	**34,441**	**100%**	**40,572**	**100%**	**6,131**	**18%**

* STEM enrollment figures include only upper division first majors.
**Designates an HBCU.
Source: UNC System Office, 2019.

The chart that is depicted in **Exhibit 2-7** illustrates the historical growth rate of all undergraduate degree-seeking students (Y-axis) at each institution Fall 2014 to Fall 2018 compared to the rate of growth of upper-division STEM majors (X-axis) in corresponding Fall terms. Two institutions (ECSU and WSSU) experienced declines in both total undergraduates and STEM majors, while NC State and Fayetteville State remained static on both enrollment metrics. All others show positive undergraduate enrollment growth (less than 20%). Growth in STEM majors was far more diverse, with four institutions (ASU, NCA&T, UNC-C, and UNC-W) achieving expansion between 25% to 49% over the five-year period. The size of the concentric circles indicates the relative magnitude of upper division STEM enrollments headcount of each institution in the UNC System as of Fall 2018. NC State, with the largest number of undergraduate upper division STEM majors virtually remained unchanged over that time period.

EXHIBIT 2-7
OVERALL UNDERGRADUATE DEGREE-SEEKING ENROLLMENT GROWTH COMPARED TO STEM ENROLLMENT GROWTH BY INSTITUTION, FALL 2014-2018

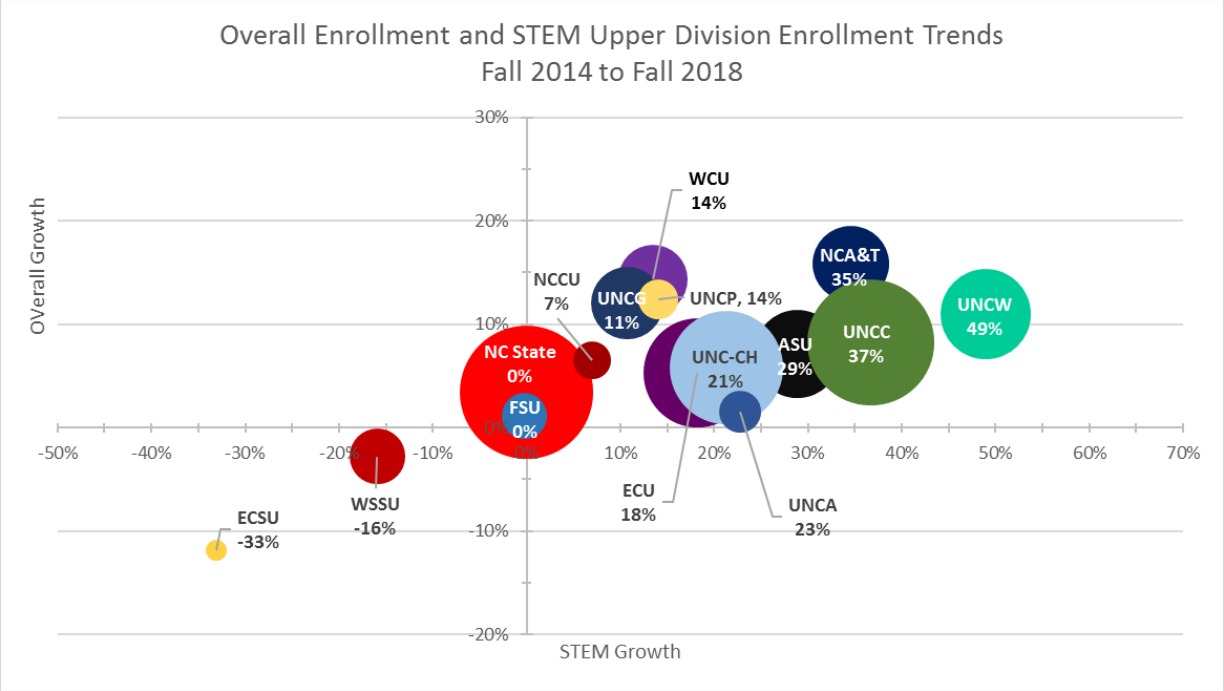


Exhibit 2-8 displays the STEM enrollments (upper division majors) in Fall 2018 compared with the overall undergraduate degree-seeking enrollments at each institution. As shown, the share of those enrolled in undergraduate STEM programs across the System is 22%. However, STEM programs are more heavily concentrated (percent of undergrad enrollments) at some campuses than others, namely NC State, UNC Chapel Hill, UNC Charlotte, and Winston Salem State. Those five institutions account for 47% of the degree-seeking undergraduates across the System, yet represent 58% of the upper division STEM enrollments.

EXHIBIT 2-8
FALL 2018 OVERALL UNDERGRADUATE DEGREE-SEEKING ENROLLMENTS
AND STEM ENROLLMENTS* BY INSTITUTION

Institution	Degree-Seeking Undergraduates	Upper-division STEM Enrollments	
	#	#	%
North Carolina State University	23,708	7,157	30%
University of North Carolina - Chapel Hill	18,946	5,154	27%
University of North Carolina - Charlotte	23,939	6,505	27%
Winston-Salem State University**	4,610	1,240	27%
University of North Carolina - Wilmington	14,076	3,334	24%
North Carolina A&T**	10,299	2,316	22%
East Carolina University	22,330	4,751	21%
University of North Carolina - Asheville	3,478	712	20%
Western Carolina University	9,835	1,949	20%
Appalachian State University	17,265	3,100	18%
Fayetteville State University**	4,915	850	17%
University of North Carolina - Greensboro	16,238	2,108	13%
Elizabeth City State University**	1,553	176	11%
University of North Carolina - Pembroke	5,960	641	11%
North Carolina Central University**	5,913	579	10%
Grand Total	**183,065**	**40,572**	**22%**

* STEM enrollment figures include only upper division first majors.
**Designates an HBCU.
Source: UNC System Office, 2019.

When specifically considering enrollments of African-American students in the System, however, a different pattern emerges, as depicted in **Exhibit 2-9**. In Fall 2018, 15% of students in the UNC System were enrolled at one of the five HBCUs. This closely approximates the share of upper-division STEM enrollments through these five institutions (13%). Given that more than half (53%) of African-Americans enrolled in the System attend HBCUs by choice or necessity, these students may have less access to the full range of STEM program opportunities available across the System. As a consequence, some African-American students in North Carolina may have to choose to either attend an HBCU or major in the STEM specialty of greatest interest to them. This is of particular importance as interview discussions at the HBCU institutions indicated their minority student STEM degree recipients are in high demand by employers in North Carolina and nationally. According to data published by the Pew Research Center, nationally African Americans are underrepresented in the workforce across most STEM clusters.[4]

[4] Pew Research Center, FACTTANK News in the Numbers, January 2018.

EXHIBIT 2-9
OVERALL UNDERGRADUATE DEGREE-SEEKING ENROLLMENTS, AFRICAN-AMERICAN UNDERGRADUATE DEGREE-SEEKING ENROLLMENTS, AND UPPER-DIVISION STEM ENROLLMENTS* BY INSTITUTION

Institution	Degree-Seeking Undergraduates		African-American Degree-Seeking Undergraduates		Upper-division STEM Enrollments*	
	#	%	#	%	#	%
North Carolina State University	23,708	13%	1,321	3%	7,157	18%
University of North Carolina - Charlotte	23,939	13%	3,866	10%	6,505	16%
University of North Carolina - Chapel Hill	18,946	10%	1,478	4%	5,154	13%
East Carolina University	22,330	12%	3,511	9%	4,751	12%
University of North Carolina - Wilmington	14,076	8%	585	1%	3,334	8%
Appalachian State University	17,265	9%	601	2%	3,100	8%
North Carolina A&T**	**10,299**	**6%**	**8,443**	**21%**	**2,316**	**6%**
University of North Carolina - Greensboro	16,238	9%	4,848	12%	2,108	5%
Western Carolina University	9,835	5%	525	1%	1,949	5%
Winston-Salem State University**	**4,610**	**3%**	**3,598**	**9%**	**1,240**	**3%**
Fayetteville State University**	**4,915**	**3%**	**3,024**	**8%**	**850**	**2%**
University of North Carolina - Asheville	3,478	2%	181	0%	712	2%
University of North Carolina - Pembroke	5,960	3%	1,990	5%	641	2%
North Carolina Central University**	**5,913**	**3%**	**4,767**	**12%**	**579**	**1%**
Elizabeth City State University**	**1,553**	**1%**	**1,109**	**3%**	**176**	**0%**
Grand Total	**183,065**	**100%**	**39,847**	**100%**	**40,572**	**100%**
Share of enrollments at HBCUs	**27,290**	**15%**	**20,941**	**53%**	**5,161**	**13%**

* STEM enrollment figures include only upper division first majors.
**Designates an HBCU.
Source: UNC System Office, 2019.

STEM ENROLLMENT PROJECTIONS

Institutions were asked to provide five-year and ten-year upper-division enrollment projections by program, and these are shown in the tables which follow. Degree award projections were calculated by the consulting team for at each institution based on historical degree awards. Those data and projections were then rolled up into the five STEM categories to identify corresponding statewide UNC System enrollment projections along with potential estimates of STEM baccalaureate degree awards at the 5-year and 10-year horizon as seen in **Exhibit 2-10**. Although Math upper-division majors remain relatively small in comparison out 10 years, the enrollments in other four STEM categories are predicted to converge in magnitude.

EXHIBIT 2-10
UNDERGRADUATE STEM ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY STEM GROUPING
FIVE-YEAR AND TEN-YEAR PROJECTIONS

Institution	Fall 2018 Enrollments	Enrollments		Degree Awards	
		5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	9,779	11,410	13,287	3,748	4,334
Hard Science	11,289	13,813	16,389	4,316	4,962
Health Science	10,726	14,609	17,361	6,888	8,060
Math	1,875	2,582	3,051	1,041	1,227
Technology	6,903	10,202	12,880	3,135	3,873
Grand Total	**40,572**	**52,616**	**62,969**	**19,128**	**22,457**

* STEM enrollment figures include only upper division first majors.
Source: Enrollment projections were provided by each institution, while degree award projections were calculated by the consulting team for each institution based on historical degree awards within each of the five STEM categories. Detailed projections by institution and program are shown in Appendix B.

A further illustration of the projected statewide enrollment growth across the STEM categories is offered in **Exhibit 2-11**. Technology is predicted to significantly outpace the other STEM categories according to the cumulative institutional derived projections over the next 10 years. However, Health Sciences is forecast to make the most actual gains in undergraduate STEM majors.

EXHIBIT 2-11
UNDERGRADUATE STEM ENROLLMENT* GROWTH BY CATEGORY
FIVE-YEAR AND TEN-YEAR PROJECTIONS

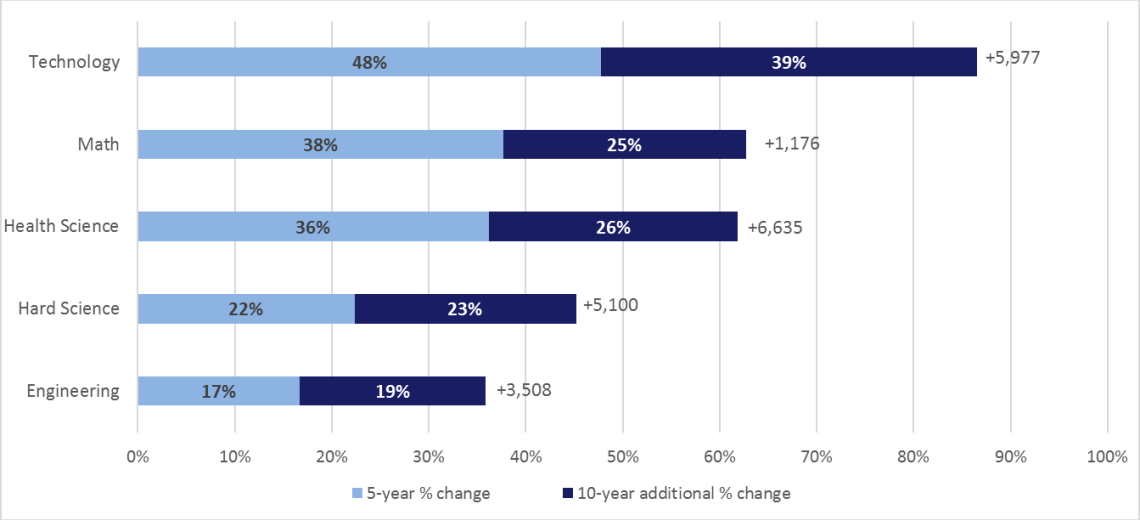


Exhibit 2-12 displays the distribution of all undergraduate STEM upper-division majors across the System as of Fall 2018, and as projected by each institution five years and ten years into the future. Estimated degree awards, as calculated by the consultant team based on an historical trends model are also presented. For a variety of reasons, institutions varied considerably in the magnitude of projected STEM enrollment growth going forward. Projections were provided to the consultant team on a program by program basis and rolled up into the cumulative STEM totals per institution.

EXHIBIT 2-12
UNDERGRADUATE STEM ENROLLMENT* AND DEGREE AWARDS BY INSTITUTION
FIVE-YEAR AND TEN-YEAR PROJECTIONS

Institution	Fall 2018 Enrollments	Enrollments		Degree Awards	
		5-year Projections	10-year Projections	5-year Projections	10-year Projections
Appalachian State University	3,100	3,962	4,634	1,624	1,874
East Carolina University	4,751	5,680	6,720	2,319	2,675
Elizabeth City State University**	176	327	488	94	139
Fayetteville State University**	850	1,100	1,234	436	487
North Carolina A&T University**	2,316	2,942	3,823	959	1,251
North Carolina Central University**	579	818	952	492	568
North Carolina State University	7,157	8,036	8,769	2,951	3,218
UNC Asheville	712	768	926	325	380
UNC Chapel Hill	5,154	7,349	9,283	1,839	2,174
UNC Charlotte	6,505	9,667	12,116	3,295	4,140
UNC Greensboro	2,108	2,494	3,076	833	996
UNC Pembroke	641	1,163	1,163	437	437
UNC Wilmington	3,334	4,588	5,409	1,850	2,180
Western Carolina University	1,949	2,394	2,815	942	1,096
Winston-Salem State University**	1,240	1,328	1,561	732	842
System STEM Total	**40,572**	**52,616**	**62,969**	**19,128**	**22,457**

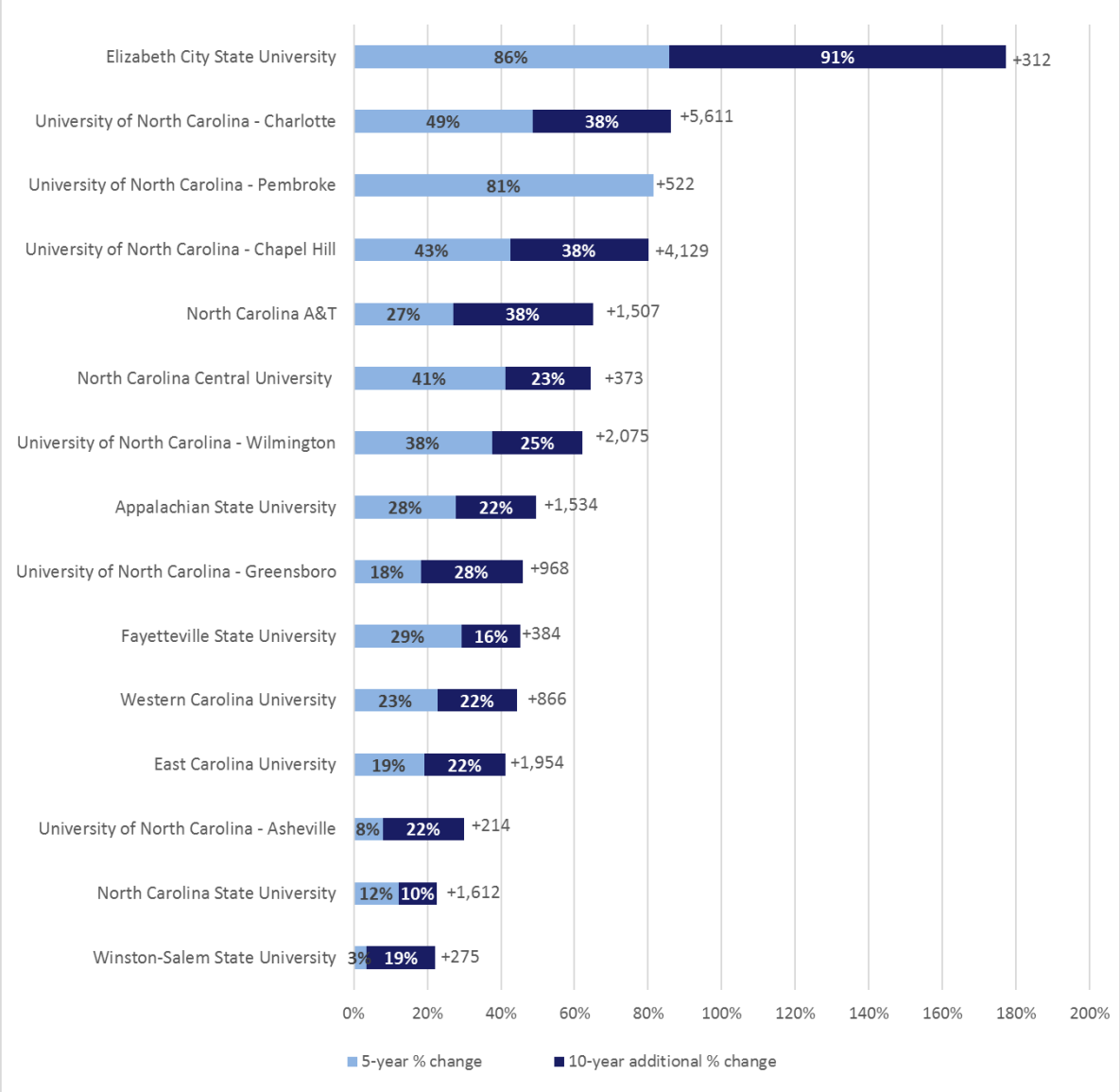
* STEM enrollment figures include only upper division first majors.

**Designates an HBCU.

Source: Enrollment projections were provided by each institution, while degree award projections were calculated by the consulting team for at each institution based on historical degree awards. Detailed projections by institution and program are shown in **Appendix B**.

Similar to the previous chart (**Exhibit 2-12**) that displayed statewide growth rates across the five STEM categories, **Exhibit 2-13** provides an illustration of the projected growth of all STEM upper-division majors at each institution in the System at the pending 5-year and 10-year interval. Elizabeth City State University is projected to surpass, by far, the STEM growth rate of all other institutions. However, due to their current STEM enrollment size, they will realize one the smallest gains in actual STEM enrollment numbers. Conversely, East Carolina projects to add nearly 2,000 STEM undergraduate upper-division majors across the 10-year horizon, but will experience a relatively conservative growth rate in comparison to other institutions. UNC-Charlotte and UNC-Chapel Hill are expecting the largest numerical gains in undergraduate STEM majors.

EXHIBIT 2-13
UNDERGRADUATE STEM ENROLLMENT* GROWTH BY INSTITUTION
FIVE-YEAR AND TEN-YEAR PROJECTIONS

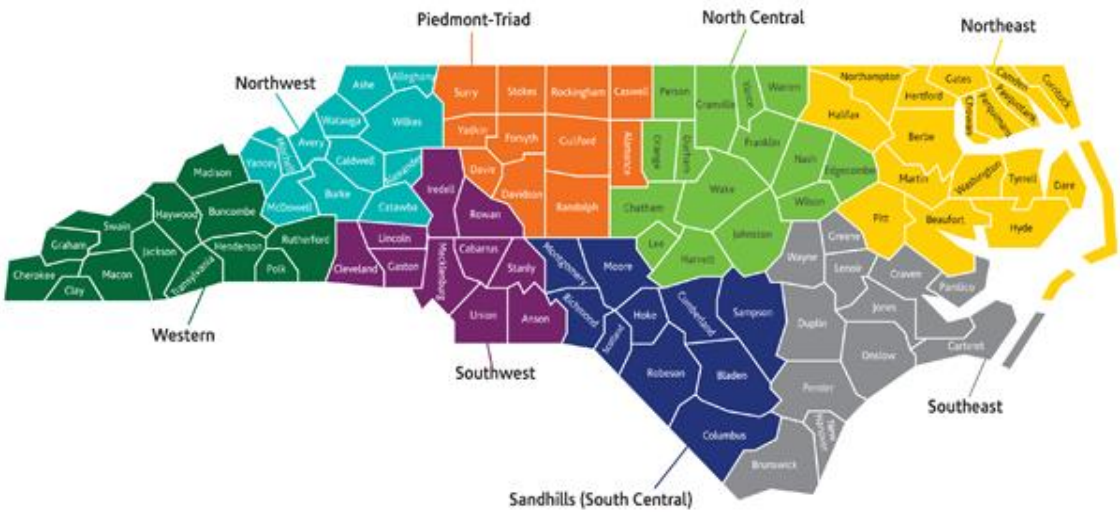


Source: Enrollment projections were provided by each institution.

3.0: REGIONAL STEM DEGREE PRODUCTION

The state of NC has eight designated Prosperity Zones, according to the Department of Commerce, as follows, and as shown in **Exhibit 3-1**.

EXHIBIT 3-1
NC PROSPERITY ZONES



Source: North Carolina Department of Commerce, 2019.

For the purposes of this study, the consultant team combined some Prosperity Zones for regional analyses of supply and demand related to STEM disciplines (i.e., enrollments, degree awards, and occupational projections). Each region consists of one or two prosperity zones and is home to three UNC system institutions. The five regions, along with their associated Prosperity Zones and the UNC System institutions which fall within them are as follows.

EXHIBIT 3-2
STUDY REGIONS AND THEIR ASSOCIATED INSTITUTIONS

Western Region
Appalachian State University
University of North Carolina - Asheville
Western Carolina University
Piedmont-Triad Region
North Carolina A&T
University of North Carolina - Greensboro
Winston-Salem State University
North Central Region
North Carolina Central University
North Carolina State University
University of North Carolina - Chapel Hill
South Central Region
Fayetteville State University
University of North Carolina - Pembroke
University of North Carolina - Charlotte
Eastern Region
East Carolina University
Elizabeth City State University
University of North Carolina - Wilmington

Source: MGT analysis, 2019.

As shown in **Exhibit 3-3**, the three institutions in the North Central Region comprised nearly one-third of all STEM enrollments in the System in Fall 2018, although their share dropped three percentage points from five years earlier. The Western and Piedmont-Triad Regions each had 14% of STEM enrollments in Fall 2018, the smallest shares in the System. The South Central Region evidenced the strongest growth, with the addition of 1,823 enrollments over the five-year period, an increase of 30%.

EXHIBIT 3-3
UNDERGRADUATE STEM ENROLLMENTS* BY PROSPERITY ZONE, REGION AND INSTITUTION
FALL 2014 AND FALL 2018

Prosperity Zone	Institution	Fall 2014		Fall 2018		5- Year	5- Year
		#	%	#	%	# Change	% Change
Northwest	Appalachian State University	2,406	7%	3,100	8%	694	29%
Western	Western Carolina University	1,717	5%	1,949	5%	232	14%
Western	University of North Carolina - Asheville	580	2%	712	2%	132	23%
Western Region Subtotal		**4,703**	**14%**	**5,761**	**14%**	**1,058**	**22%**
Piedmont-Triad	North Carolina A&T**	1,721	5%	2,316	6%	595	35%
Piedmont-Triad	University of North Carolina - Greensboro	1,903	6%	2,108	5%	205	11%
Piedmont-Triad	Winston-Salem State University**	1,475	4%	1,240	3%	(235)	-16%
Piedmont-Triad Region Subtotal		**5,099**	**15%**	**5,664**	**14%**	**565**	**11%**
North Central	North Carolina State University	7,156	21%	7,157	18%	1	0%
North Central	University of North Carolina - Chapel Hill	4,249	12%	5,154	13%	905	21%
North Central	North Carolina Central University**	541	2%	579	1%	38	7%
North Central Region Subtotal		**11,946**	**35%**	**12,890**	**32%**	**944**	**8%**
Southwest	University of North Carolina - Charlotte	4,759	14%	6,505	16%	1,746	37%
Sandhills	Fayetteville State University**	852	2%	850	2%	(2)	0%
Sandhills	University of North Carolina - Pembroke	562	2%	641	2%	79	14%
South Central Region Subtotal		**6,173**	**18%**	**7,996**	**20%**	**1,823**	**30%**
Northeast	East Carolina University	4,019	12%	4,751	12%	732	18%
Southeast	University of North Carolina - Wilmington	2,238	6%	3,334	8%	1,096	49%
Northeast	Elizabeth City State University**	263	1%	176	0%	(87)	-33%
Eastern Region Subtotal		**6,520**	**19%**	**8,261**	**20%**	**1,741**	**27%**
Grand Total		**34,441**	**100%**	**40,572**	**100%**	**6,131**	**18%**

* STEM enrollment figures include only upper division first majors.
**Designates an HBCU.
Source: UNC System Office, 2019.

The distribution of enrollments by STEM category within each region are displayed in **Exhibit 3-4**. As shown, Health Science enrollments constitute the largest shares of STEM enrollments in the Western, Piedmont-Triad, and Eastern Regions, while Engineering enrollments are most prominent in the North Central and South Central Regions of the State.

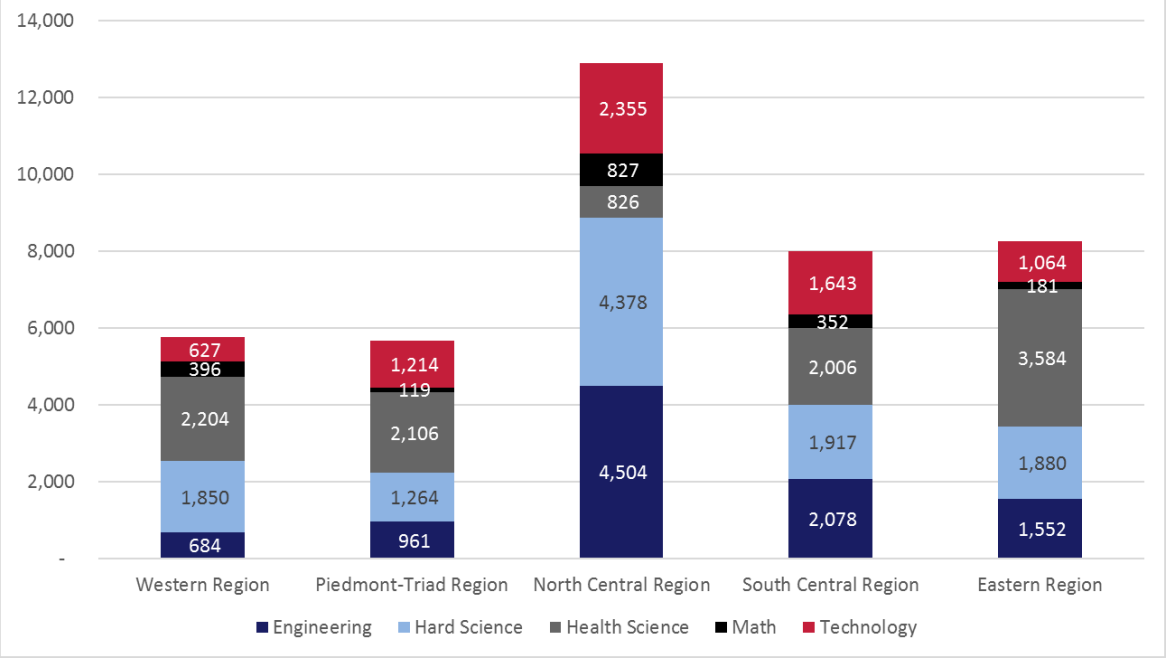
EXHIBIT 3-4
UNDERGRADUATE STEM ENROLLMENTS* BY REGION AND STEM CATEGORY SHARE
FALL 2014 AND FALL 2018

Western Region	Fall 2014		Fall 2018	
	#	%	#	%
Engineering	348	7%	684	12%
Hard Science	1,473	31%	1,850	32%
Health Science	2,119	45%	2,204	38%
Math	315	7%	396	7%
Technology	448	10%	627	11%
Regional Sub-Total	**4,703**	**100%**	**5,761**	**100%**
Piedmont-Triad Region	**Fall 2014**		**Fall 2018**	
	#	%	#	%
Engineering	822	16%	961	17%
Hard Science	1,055	21%	1,264	22%
Health Science	2,418	47%	2,106	37%
Math	76	1%	119	2%
Technology	728	14%	1,214	21%
Regional Sub-Total	**5,099**	**100%**	**5,664**	**100%**
North Central Region	**Fall 2014**		**Fall 2018**	
	#	%	#	%
Engineering	4,311	36%	4,504	35%
Hard Science	4,411	37%	4,378	34%
Health Science	798	7%	826	6%
Math	696	6%	827	6%
Technology	1,730	14%	2,355	18%
Regional Sub-Total	**11,946**	**100%**	**12,890**	**100%**
South Central Region	**Fall 2014**		**Fall 2018**	
	#	%	#	%
Engineering	1,591	26%	2,078	26%
Hard Science	1,391	23%	1,917	24%
Health Science	1,828	30%	2,006	25%
Math	329	5%	352	4%
Technology	1,034	17%	1,643	21%
Regional Sub-Total	**6,173**	**100%**	**7,996**	**100%**
Eastern Region	**Fall 2014**		**Fall 2018**	
	#	%	#	%
Engineering	1,094	17%	1,552	19%
Hard Science	1,978	30%	1,880	23%
Health Science	2,431	37%	3,584	43%
Math	161	2%	181	2%
Technology	856	13%	1,064	13%
Regional Sub-Total	**6,520**	**100%**	**8,261**	**100%**

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

Exhibit 3-5 provides a visual representation of Fall 2018 enrollments by region and STEM Category.

EXHIBIT 3-5
STEM ENROLLMENTS* BY REGION AND STEM CATEGORY
FALL 2018

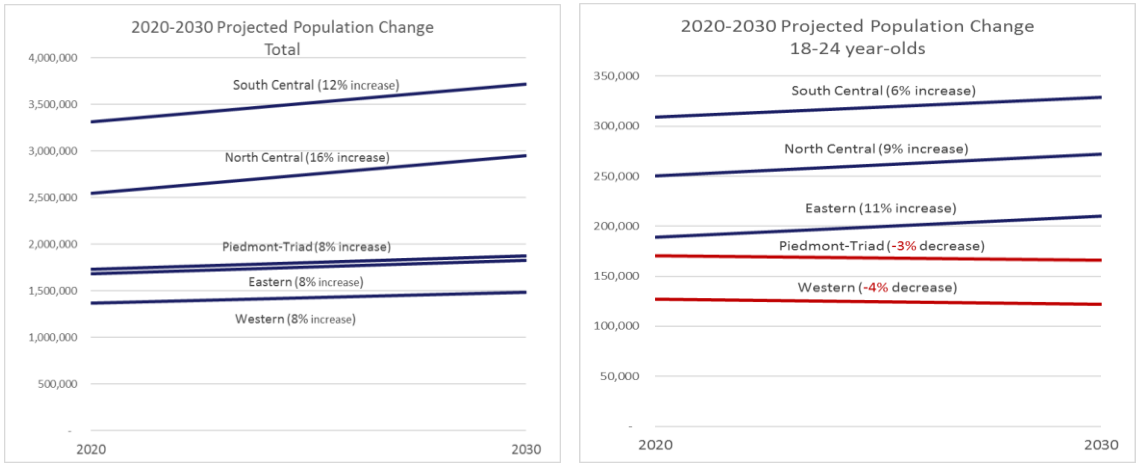


* STEM enrollment figures include only upper division first majors.

Source: UNC System Office, 2019.

Exhibit 3-6 displays the projected population growth for each region from 2020 to 2030, along with the projected growth among 18-24 year-olds. As shown, the population of each region is projected to increase (between 8% and 16%). Two of the five regions, however, anticipate decreases in the 18-24 year-old population, the target age for traditional college students. The Piedmont-Triad Region projects a 3% decrease in the college-age population, while the Western Region projects a 4% decrease. While the other three regions anticipate increases in the 18-24 year-old age group, they will be less significant than the total population increases

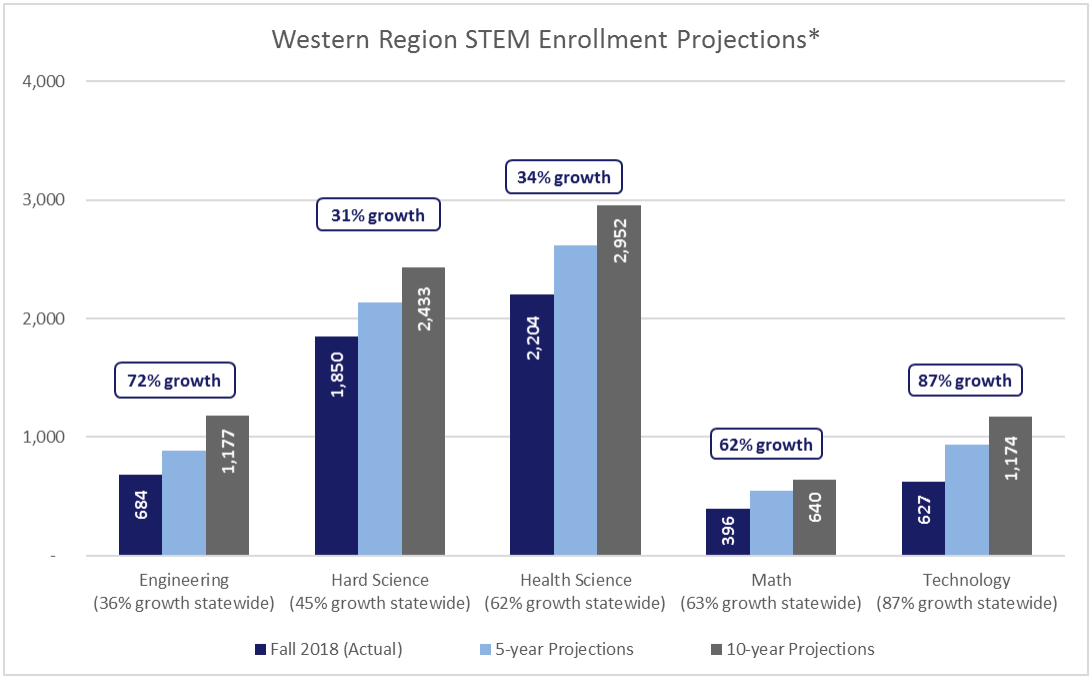
EXHIBIT 3-6
POPULATION PROJECTIONS BY REGION, TOTAL AND 18-24 YEAR-OLD AGE GROUP
2020 TO 2030



Source: NC Office of State Budget and Management, Demographic and Economic Analysis Section (from October 13, 2014).

Exhibit 3-7 displays the Western Region's projected enrollment growth by STEM category. As shown, institutions in the region anticipate strongest enrollment growth over the next ten years in the categories with their current smallest enrollment counts: Technology (87%), Engineering (72%), and Math (62%).

EXHIBIT 3-7
REGIONAL ENROLLMENT GROWTH BY STEM CATEGORY



* STEM enrollment figures include only upper division first majors.

Exhibit 3-8 displays actual and projected enrollments for the top 20 programs offered in the Western Region. As shown, programs in every STEM category are represented - seven are in Health Science, five are in Hard Science, four are in Engineering, two are in Technology, and two are in Math. Biology/Biological Sciences is expected to be the STEM program with the largest enrollments in the Western Region, by far.

EXHIBIT 3-8
WESTERN REGION TOP 20 STEM PROGRAMS BY 10-YEAR PROJECTED ENROLLMENTS*

Western	Fall 2018 (Actual)	5-year Projections	10-year Projections
Biology/Biological Sciences	822	991	1,178
Registered Nursing/Registered Nurse	620	641	668
Management Information Systems	269	482	609
Computer Science	358	457	565
Exercise Science	458	477	492
Environmental Studies/Science	413	448	486
Chemistry, General	305	347	382
Public Health/Public Health Education and Promotion	181	283	368
Communication Sciences and Disorders	244	286	313
Integrated Health Sciences	29	200	300
Insurance	138	254	299
Dietetics/Dietitian	176	220	267
Mathematics and Applied Mathematics	212	234	259
Engineering Technology	143	175	225
Engineering (with a concentration in Mechatronics)	105	110	210
Emergency Medical Technology/Technician (EMT Paramedic)	186	195	205
Engineering	100	150	200
Sustainable Technology	144	172	192
Geology/Earth Science	106	119	133
Construction Engineering Technology/Technician	70	100	125

* STEM enrollment figures include only upper division first majors.

Alignment of regional STEM degree programs with employment opportunities in the local workforce is one factor in determining appropriate program access and capacity. **Exhibit 3-9** illustrates annual job openings (new positions and turnover) in STEM related occupations that require an undergraduate degree for entry across the Western Region of North Carolina.

Common across all five regions, Nursing positions dominate the projected openings from 2018 through 2026. Not unlike other states, a nursing shortage continues across North Carolina, and UNC regional institution projected nursing program enrollments fall short of annual workforce demand.

Additionally, other Top 20 STEM focused annual occupational openings across this region with significant need include; four other health related professions, three engineering fields and construction management. A full listing of all 67 STEM related occupations and their corresponding annual openings projections are presented in **Appendix C-2**. In summary, a total of 3,377 annual STEM openings are projected. These break down by STEM groupings as follows:

- Nursing = 27% (916)
- Engineering = 18% (608)
- Other Health Sciences = 15% (507)
- Technology/IT = 9% (298)
- Math = 2.5% (86)
- Other (possible STEM employment) = 24% (814)

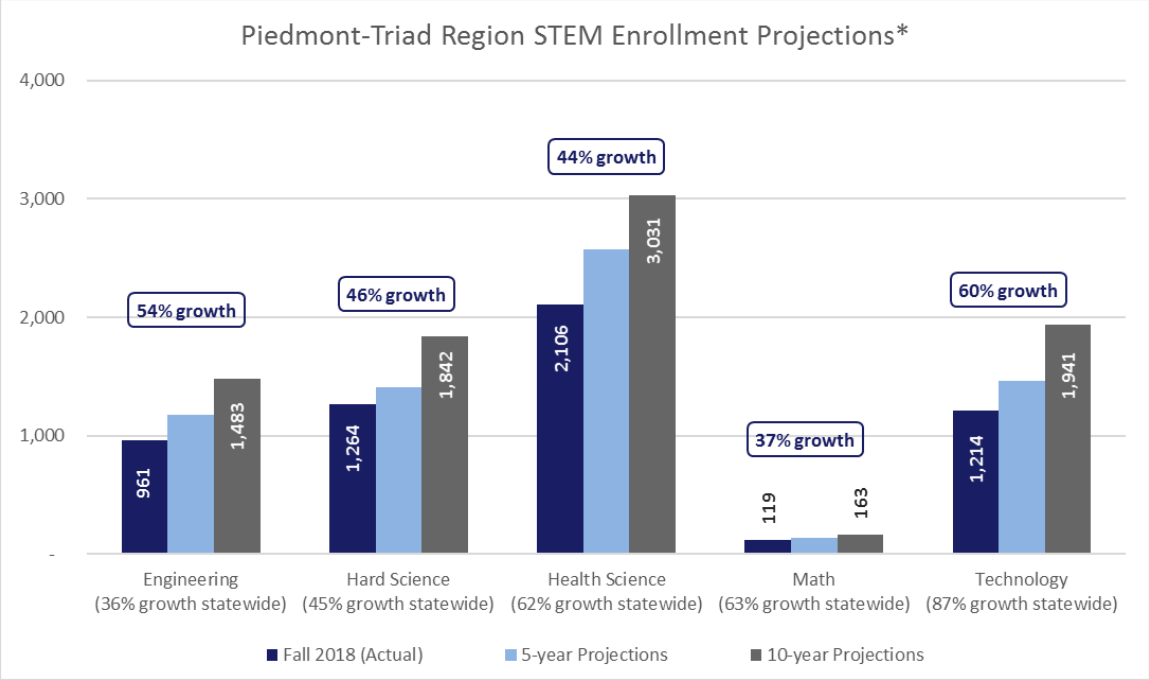
EXHIBIT 3-9
WESTERN REGION TOP 20 OCCUPATIONS BY ANNUAL PROJECTED OPENINGS

Western Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	12,759	14,016	1,257	7,327	916	Top 20 - Annual Openings
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	2,548	2,601	53	1,627	203	
11-9199	Managers, All Other	1,507	1,637	130	1,310	164	
11-9021	Construction Managers	1,310	1,452	142	980	123	
27-2022	Coaches and Scouts	722	801	79	977	122	
11-9111	Medical and Health Services Managers	1,024	1,159	135	881	110	
15-1132	Software Developers, Applications	894	1,155	261	840	105	
17-2112	Industrial Engineers	1,209	1,307	98	818	102	
13-1111	Management Analysts	687	792	105	763	95	
27-1024	Graphic Designers	856	889	33	752	94	
29-2010	Clinical Laboratory Technologists and Technicians	1,111	1,199	88	718	90	
13-1051	Cost Estimators	586	644	58	592	74	
25-1194	Vocational Education Teachers, Postsecondary	721	699	(22)	573	72	
17-2141	Mechanical Engineers	840	901	61	546	68	
29-2034	Radiologic Technologists	907	969	62	538	67	
29-2021	Dental Hygienists	707	761	54	478	60	
17-3026	Industrial Engineering Technicians	567	572	5	459	57	
19-2031	Chemists	399	442	43	436	55	
11-2202	Sales Managers	457	487	30	427	53	
11-3011	Administrative Services Managers	458	488	30	366	46	

Source: North Carolina Department of Commerce, 2019.

Exhibit 3-10 displays the projected enrollment growth of institutions in the Piedmont-Triad Region by STEM category. As shown, institutions in the region anticipate strongest enrollment growth over the next ten years in the Technology (60%) and Engineering (54%).

EXHIBIT 3-10
REGIONAL ENROLLMENT GROWTH BY STEM CATEGORY



* STEM enrollment figures include only upper division first majors.

The Top 20 programs offered in the Piedmont-Triad Region are shown in **Exhibit 3-11** in order of 10-year enrollment magnitude. Programs in every STEM category are represented - seven are in Health Science, three are in Hard Science, four are in Engineering, five are in Technology, and one is in Math. Biology/Biological Sciences and Nursing are expected to be the STEM programs with the largest enrollments in the Piedmont-Triad Region, by large margins.

EXHIBIT 3-11
PIEDMONT-TRIAD REGION TOP 20 STEM PROGRAMS BY 10-YEAR PROJECTED ENROLLMENTS*

Piedmont-Triad	Fall 2018 (Actual)	5-year Projections	10-year Projections
Biology/Biological Sciences	937	1,019	1,386
Registered Nursing/Registered Nurse	1,010	1,128	1,294
Computer Science	366	533	762
Kinesiology	322	500	650
Information Technology	153	277	418
Computer Systems Networking and Telecommunications	307	340	375
Applied Engineering Technology	99	200	300
Mechanical Engineering	214	214	250
Public Health Education and Promotion	140	210	250
Business Education – Information Technology	105	203	225
Health/Health Care Administration/Management	139	150	200
Chemistry, General	146	168	186
Mathematics and Applied Mathematics	119	143	163
Audiology/Audiologist and Speech-Language Pathology/Pathologist	102	142	162
Exercise Science/Physiology	139	145	160
Biochemistry	125	139	153
Management Information Systems	272	95	146
Bioengineering and Biomedical Engineering	76	100	143
Clinical Laboratory Science/Medical Technology/Technologist	105	115	120
Electrical and Electronics Engineering	99	105	115

* STEM enrollment figures include only upper division first majors.

Alignment of regional STEM degree programs with employment opportunities in the local workforce is one factor in determining appropriate program access and capacity. **Exhibit 3-12** illustrates annual job openings (new positions and turnover) in STEM related occupations that require an undergraduate degree for entry across the Piedmont-Triad Region.

As mentioned earlier, nursing annual openings dominate this region as well with more than four times as many position openings projected per year as the next largest STEM occupation in demand. The national nursing shortage also exists across North Carolina, and UNC regional institution projected nursing program enrollments fall short of annual workforce demand.

Other Top 20 STEM focused annual occupational openings across this region with significant need include four other health related professions, three engineering fields and construction management, and two technology/IT related occupations. A full listing of all 67 STEM related occupations and their corresponding annual openings projections are presented in **Appendix C-3**. In summary, a total of 4,454 annual STEM openings are projected. These break down by STEM groupings as follows:

- Nursing = 26% (1,164)
- Engineering = 18% (791)

- Other Health Sciences = 14% (640)
- Technology/IT = 10% (427)
- Math = 3% (140)
- Other (partial STEM employment) = 25% (1,126)

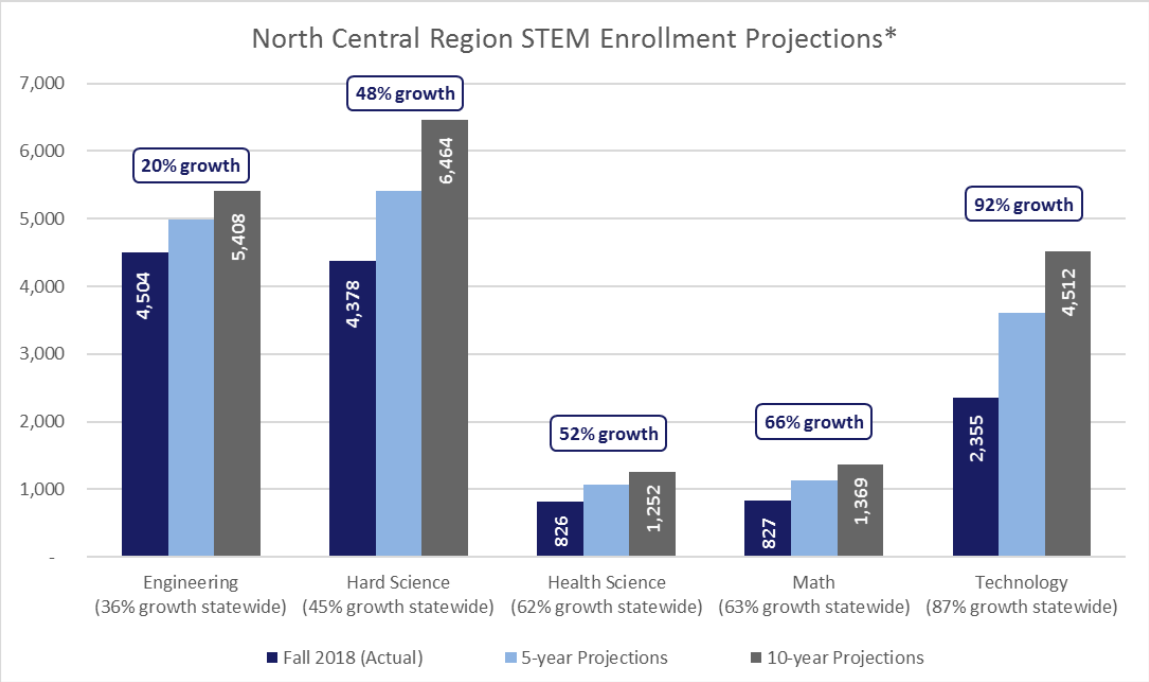
EXHIBIT 3-12
PIEDMONT-TRIAD REGION TOP 20 OCCUPATIONS BY ANNUAL PROJECTED OPENINGS

Piedmont-Triad Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	17,668	18,731	1,063	9,313	1,164	Top 20 - Annual Openings
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	3,660	3,660	-	2,238	280	
11-9199	Managers, All Other	2,548	2,658	110	1,726	216	
11-9021	Construction Managers	1,757	1,866	109	1,207	151	
13-1111	Management Analysts	1,348	1,468	120	1,183	148	
15-1132	Software Developers, Applications	1,436	1,721	285	1,176	147	
27-2022	Coaches and Scouts	923	971	48	1,167	146	
17-2112	Industrial Engineers	1,644	1,798	154	1,139	142	
11-9111	Medical and Health Services Managers	1,391	1,522	131	1,127	141	
27-1024	Graphic Designers	1,273	1,271	(2)	1,046	131	
29-2010	Clinical Laboratory Technologists and Technicians	1,560	1,617	57	923	115	
13-1051	Cost Estimators	921	953	32	845	106	
17-2141	Mechanical Engineers	1,297	1,381	84	831	104	
25-1194	Vocational Education Teachers, Postsecondary	1,315	1,245	(70)	791	99	
11-2022	Sales Managers	874	917	43	715	89	
29-2034	Radiologic Technologists	1,411	1,442	31	683	85	
29-2021	Dental Hygienists	1,052	1,089	37	601	75	
17-3026	Industrial Engineering Technicians	717	723	6	554	69	
11-3011	Administrative Services Managers	707	740	33	546	68	
19-2031	Chemists	608	628	20	509	64	

Source: North Carolina Department of Commerce, 2019.

Exhibit 3-13 displays the projected enrollment growth of institutions in the North Central Region by STEM category. As shown, institutions in the region anticipate strongest enrollment growth over the next ten years in the Technology (92%), followed distantly by Math (66%).

EXHIBIT 3-13
REGIONAL ENROLLMENT GROWTH BY STEM CATEGORY



* STEM enrollment figures include only upper division first majors.

The North Central Region's Top 20 programs in order of 10-year enrollment magnitude are shown in **Exhibit 3-14**. Programs in every STEM category are represented - nine are in Engineering, five are in Hard Science, two each are in Health Science, Technology, and Math. Again, Biology/Biological Sciences is expected to be the most popular STEM program (largest enrollments), followed by Computer Science, Mathematics/Applied Mathematics, and Financial Informatics (Economics) with more than 1,000 enrolled juniors and seniors in each program type.

EXHIBIT 3-14
NORTH CENTRAL REGION TOP 20 STEM PROGRAMS BY 10-YEAR PROJECTED ENROLLMENTS*

North Central	Fall 2018 (Actual)	5-year Projections	10-year Projections
Biology/Biological Sciences	2,197	2,550	2,817
Computer Science	1,418	1,451	1,950
Mathematics and Applied Mathematics	695	966	1,178
Financial informatics (Economics)	779	972	1,094
Mechanical Engineering	742	860	973
Neuroscience	62	400	800
Environmental Studies/Science	491	634	770
Registered Nursing/Registered Nurse	428	547	653
Electrical and Electronics Engineering	519	559	602
Textile Sciences and Engineering	507	533	560
Chemistry, General	521	532	542
Computer Engineering, General	399	431	466
Chemical Engineering	401	432	465
Bioengineering and Biomedical Engineering	371	425	458
Civil Engineering, General	374	413	445
Information Science/Studies	102	250	400
Aerospace, Aeronautical and Astronautical/Space Engineering	212	271	306
Industrial Engineering	228	246	265
Physics, General	230	245	259
Physical Sciences, Other		80	240

* Stem enrollment figures include only upper division first majors.

Alignment of regional STEM degree programs with employment opportunities in the local workforce is one factor in determining appropriate program access and capacity. **Exhibit 3-15** illustrates annual job openings (new positions and turnover) in STEM related occupations that require an undergraduate degree for entry across the North Central Region of North Carolina.

Among the Top 20 STEM focused annual occupational openings across this region with significant need, Nursing again leads the openings, but close behind is Software Applications Developers. Additionally, this Top 20 group includes four engineering and construction management, and three other technology/IT categories. A full listing of all 67 STEM related occupations and their corresponding annual openings projections are presented in **Appendix C-4**. In summary, a total of 12,936 annual STEM openings are projected. These break down by STEM groupings as follows:

- Technology/IT = 22% (2,864)
- Engineering = 19% (2,454)
- Nursing = 17% (2,246)
- Other Health Sciences = 10% (1,323)
- Math = 3% (357)
- Other (possible STEM employment) = 23% (2,970)

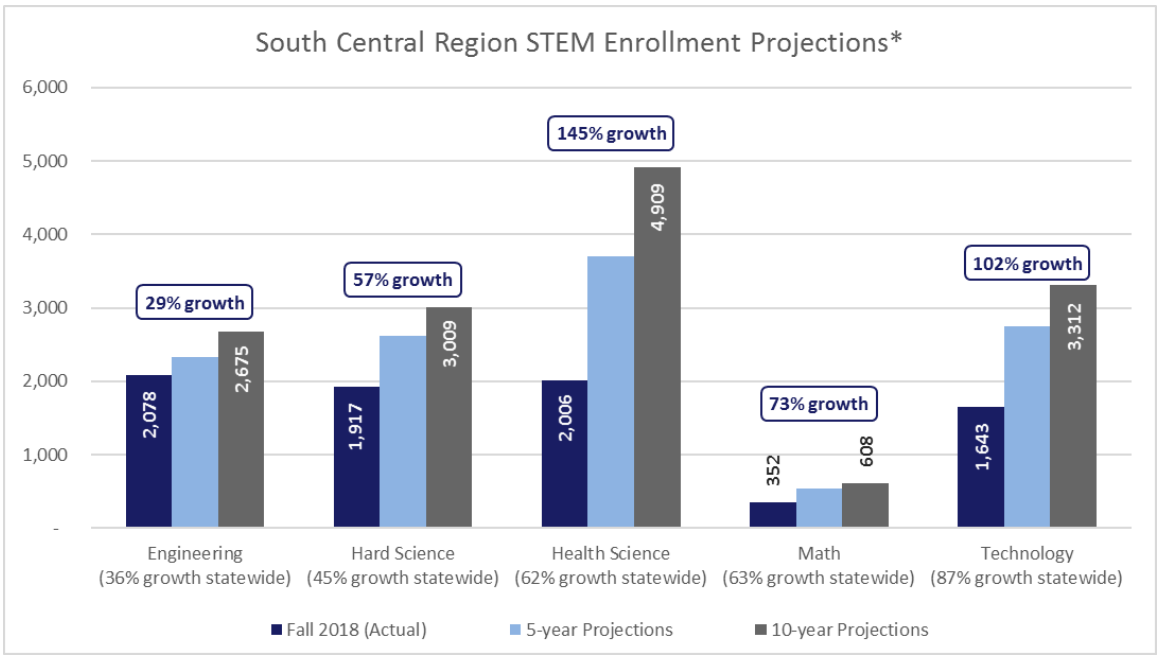
EXHIBIT 3-15
NORTH CENTRAL REGION TOP 20 OCCUPATIONS BY ANNUAL PROJECTED OPENINGS

North Central Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	26,870	31,602	4,732	17,985	2,248	Top 20 - Annual Openings
15-1132	Software Developers, Applications	13,664	17,505	3,841	12,645	1,581	
11-9199	Managers, All Other	8,984	9,774	790	6,615	827	
13-1111	Management Analysts	5,582	6,450	868	5,405	676	
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	6,358	6,597	239	4,200	525	
11-9021	Construction Managers	4,685	4,926	241	3,154	394	
27-2022	Coaches and Scouts	2,173	2,438	265	2,987	373	
15-1133	Software Developers, Systems Software	4,214	4,462	248	2,699	337	
17-2051	Civil Engineers	3,581	3,891	310	2,694	337	
11-9111	Medical and Health Services Managers	2,558	3,039	481	2,393	299	
29-2010	Clinical Laboratory Technologists and Technicians	2,923	3,275	352	2,039	255	
27-1024	Graphic Designers	2,187	2,344	157	2,024	253	
17-2112	Industrial Engineers	2,773	3,064	291	1,961	245	
15-1152	Computer Network Support Specialists	2,465	2,704	239	1,909	239	
13-1051	Cost Estimators	1,968	2,079	111	1,867	233	
17-2141	Mechanical Engineers	2,522	2,854	332	1,830	229	
11-2022	Sales Managers	2,013	2,172	159	1,730	216	
19-2031	Chemists	2,000	2,105	105	1,728	216	
17-2071	Electrical Engineers	2,389	2,613	224	1,633	204	
19-2041	Environmental Scientists and Specialists, Including Health	1,546	1,734	188	1,570	196	

Source: North Carolina Department of Commerce, 2019.

Exhibit 3-16 displays the projected enrollment growth of institutions in the South Central Region by STEM category. As shown, institutions in the region anticipate dramatic enrollment growth over the next ten years in Health Science (145%) and Technology (102%) programs.

EXHIBIT 3-16
REGIONAL ENROLLMENT GROWTH BY STEM CATEGORY



* STEM enrollment figures include only upper division first majors.

In **Exhibit 3-17**, the South Central Region's Top 20 programs in order of 10-year enrollment magnitude are displayed. Programs in every STEM category are represented - seven are in Engineering, five are in Hard Science, five are in Health Science, two are in Technology, and one in Math. In the South Central Region, Computer Science and Health/Health Care Administration/Management programs are projected to top the list of enrollments (with approximately 3,000 and 2,100 enrollments, respectively), followed by Exercise Science and Biology/Biological Sciences with more than 1,000 enrolled juniors and seniors in each.

EXHIBIT 3-17
SOUTH CENTRAL REGION TOP 20 STEM PROGRAMS BY 10-YEAR PROJECTED ENROLLMENTS*

South Central	Fall 2018 (Actual)	5-year Projections	10-year Projections
Computer Science	1,439	2,476	3,036
Health/Health Care Administration/Management	492	1,585	2,106
Exercise Science	394	693	1,220
Biology/Biological Sciences, General	804	956	1,130
Mechanical Engineering	623	660	720
Registered Nursing/Registered Nurse	394	591	650
Biology	283	491	491
Environmental Studies/Science	207	338	413
Registered Nursing/Registered Nurse	315	350	400
Mathematics and Applied Mathematics	249	320	374
Civil Engineering, General	302	330	360
Electrical and Electronics Engineering	250	300	350
Engineering Technologies and Engineering-Related Fields	187	215	280
Geology/Earth Science, General	167	215	277
Mechanical Engineering/Mechanical Technology/Technician	215	250	275
Chemistry, General	187	219	260
Computer Engineering, General	189	225	260
Information Technology	182	250	250
Public Health, General	83	160	200
Systems Engineering	137	165	200

* STEM enrollment figures include only upper division first majors.

Alignment of regional STEM degree programs with employment opportunities in the local workforce is one factor in determining appropriate program access and capacity. **Exhibit 3-18** illustrates annual job openings (new positions and turnover) in STEM related occupations that require an undergraduate degree for entry across the South Central Region.

Nursing leads the STEM related annual occupational openings, but several other categories project over 1,000 annual openings. Top 20 STEM focused annual occupational openings across this region with significant need include four other health related occupations, two technology/IT occupations, and three engineering fields, and construction management. A full listing of all 67 STEM related occupations and their corresponding annual openings projections are presented in **Appendix C-5**. In summary, a total of 13,422 annual STEM openings are projected. These break down by STEM groupings as follows:

- Technology/IT = 19% (2,501)
- Engineering = 18% (2,378)
- Nursing = 17% (2,305)
- Other Health Sciences = 9% (1,228)
- Math = 24% (592)
- Other (possible STEM employment) = 30% (3,997)

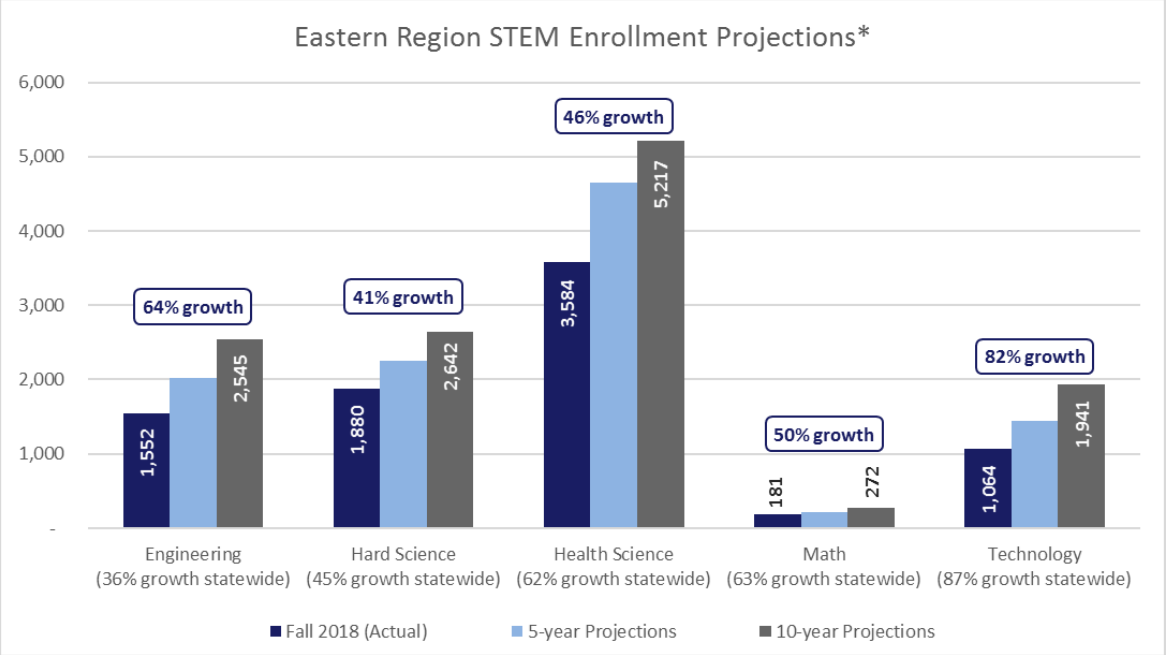
EXHIBIT 3-18
SOUTH CENTRAL REGION TOP 20 OCCUPATIONS BY ANNUAL PROJECTED OPENINGS

South Central Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	30,375	34,183	3,808	18,440	2,305	Top 20 - Annual Openings
15-1132	Software Developers, Applications	8,756	11,645	2,889	8,731	1,091	
13-1111	Management Analysts	8,286	9,921	1,635	8,567	1,071	
11-9199	Managers, All Other	10,516	11,929	1,413	8,513	1,064	
11-9021	Construction Managers	6,285	7,403	1,118	5,267	658	
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	6,955	7,379	424	5,001	625	
27-2022	Coaches and Scouts	2,112	2,492	380	3,098	387	
13-1051	Cost Estimators	2,408	2,883	475	2,770	346	
27-1024	Graphic Designers	2,691	2,946	255	2,576	322	
11-2022	Sales Managers	2,771	3,088	317	2,547	318	
11-9111	Medical and Health Services Managers	2,740	3,171	431	2,452	307	
15-1133	Software Developers, Systems Software	3,038	3,539	501	2,370	296	
15-1122	Information Security Analysts	2,148	2,907	759	2,284	286	
17-2051	Civil Engineers	2,725	3,109	384	2,245	281	
17-2141	Mechanical Engineers	2,557	2,916	359	1,885	236	
17-2112	Industrial Engineers	2,501	2,806	305	1,822	228	
25-1194	Vocational Education Teachers, Postsecondary	2,207	2,211	4	1,562	195	
11-3011	Administrative Services Managers	1,634	1,841	207	1,440	180	
15-1131	Computer Programmers	2,553	2,527	(26)	1,394	174	
15-1134	Web Developers	1,608	1,901	293	1,388	174	

Source: North Carolina Department of Commerce, 2019.

Exhibit 3-19 displays the projected enrollment growth of institutions in the Eastern Region by STEM category. As shown, institutions in the region anticipate the most significant enrollment growth over the next ten years in Technology (82%) and Engineering (64%) programs.

EXHIBIT 3-19
REGIONAL ENROLLMENT GROWTH BY STEM CATEGORY



* STEM enrollment figures include only upper division first majors.

Exhibit 3-20 displays actual and projected enrollments for the Top 20 programs offered in the Eastern Region. As shown, programs in every STEM category are represented - seven are in Health Science, four are in Hard Science, four are in Engineering, three are in Technology, and two are in Math. In the Eastern Region, the number of enrolled students in Registered Nursing (nearly 3,000 juniors and seniors) is projected to far outpace the other STEM programs, followed by Biology/Biological Sciences, Public Health, Public Health Education and Promotion, and Industrial Technology/Technician (with more than 1,000 enrolled students in each program).

EXHIBIT 3-20
EASTERN REGION TOP 20 STEM PROGRAMS BY 10-YEAR PROJECTED ENROLLMENTS*

Eastern	Fall 2018 (Actual)	5-year Projections	10-year Projections
Registered Nursing/Registered Nurse	2,219	2,700	2,985
Biology/Biological Sciences, General	856	973	1,122
Public Health, Public Health Education and Promotion	517	966	1,108
Industrial Technology/Technician	689	861	1,077
Engineering, General	393	491	614
Engineering Technologies and Engineering-Related Fields	354	453	572
Computer Science	495	694	950
Chemistry, General	302	353	422
Environmental Studies/Science	276	364	420
Information Technology	242	309	386
Marine Biology and Biological Oceanography	174	187	234
Mathematics and Applied Mathematics	152	184	225
Management Information Systems, General	116	140	180
Exercise Physiology	159	165	179
Health/Health Care Administration/Management	131	160	170
Data Science (Economics)	146	150	160
Dietetics/Dietitian	78	110	140
Manufacturing Engineering Technology/Technician	81	101	127
Therapeutic Recreation/Recreational Therapy	119	123	127
Health Professions and Related Clinical Sciences	90	100	125

* STEM enrollment figures include only upper division first majors.

Alignment of regional STEM degree programs with employment opportunities in the local workforce is one factor in determining appropriate program access and capacity. **Exhibit 3-21** illustrates annual job openings (new positions and turnover) in STEM related occupations that require an undergraduate degree for entry across the Eastern Region.

As with North Carolina's other five regions, Nursing positions dominate the projected openings from 2018 through 2026. Additionally, other Top 20 STEM focused annual occupational openings across this region with significant need include; four other health related professions, three engineering fields, and construction management. A full listing of all 67 STEM related occupations and their corresponding annual openings projections are presented in **Appendix C-6**. In summary, a total of 4,003 annual STEM openings are projected. These break down by STEM groupings as follows:

- Nursing = 28% (1,121)
- Engineering = 16% (647)
- Other Health Sciences = 16% (619)
- Technology/IT = 8% (320)
- Math = 3% (103)
- Other (possible STEM employment) = 25% (1,003)

EXHIBIT 3-21
EASTERN REGION TOP 20 OCCUPATIONS BY ANNUAL PROJECTED OPENINGS

Eastern Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	14,808	16,647	1,839	8,968	1,121	Top 20 - Annual Openings
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	2,570	2,732	162	2,144	268	
11-9199	Managers, All Other	2,101	2,279	178	1,537	192	
11-9021	Construction Managers	1,576	1,711	135	1,132	142	
11-9111	Medical and Health Services Managers	1,283	1,460	177	1,115	139	
27-2022	Coaches and Scouts	548	617	69	1,079	135	
13-1111	Management Analysts	1,131	1,284	153	1,065	133	
15-1132	Software Developers, Applications	856	1,151	295	932	117	
29-2010	Clinical Laboratory Technologists and Technicians	1,083	1,201	118	849	106	
25-1194	Vocational Education Teachers, Postsecondary	869	828	(41)	751	94	
27-1024	Graphic Designers	777	839	62	728	91	
29-2034	Radiologic Technologists	1,137	1,252	115	692	87	
13-1051	Cost Estimators	691	755	64	691	86	
17-2112	Industrial Engineers	802	925	123	617	77	
29-2021	Dental Hygienists	885	937	52	560	70	
17-2141	Mechanical Engineers	778	859	81	537	67	
17-2051	Civil Engineers	626	687	61	480	60	
25-2032	Career/Technical Education Teachers, Secondary School	350	381	31	477	60	
11-2022	Sales Managers	497	546	49	441	55	
19-2031	Chemists	171	198	27	419	52	

Source: North Carolina Department of Commerce, 2019.

OCCUPATIONAL OUTLOOK AND LABOR NEEDED

Overviews of each region are provided below, with details of each Prosperity Zone. Data related to population of each Prosperity Zone were gathered from Access NC.[5] Narrative specific to the workforce of each Zone were provided by the 2018 Prosperity Zone Data Books.[6]

WESTERN REGION

Prosperity Zone: Northwest

Counties: Alexander, Alleghany, Ashe, Avery, Burke, Caldwell, Catawba, McDowell, Mitchell, Watauga, Wilkes, Yancey

Cities: Boone, Hickory, North Wilkesboro

Demographics, Labor Force and Economy: The Northwest Prosperity Zone has a 2017 estimated population of 619,122, declining .23% since the 2010 Census. In 2010, the zone population was 53.6% rural. The 2017, estimated attainment of a bachelor's degree was 19.4%.

[5] Regional Profiles, ACCESSNC North Carolina Department of Commerce Economic Data and Site Information, on the Internet https://accessnc.nccommerce.com/DemographicsReports/, visited May 29, 2019.

[6] 2018 Prosperity Zone Data Books, published June 2018 by the North Carolina Department of Commerce Labor & Economic Analysis Division, on the Internet at https://www.nccommerce.com/data-tools-reports/labor-market-data-tools/labor-market-publications#prosperity-zone-data-books, visited May 29, 2019.

In 2016, 63% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force decreased 2.5% from 294,865 in 2006 to 287,517 in 2016. Business establishments declined 1.9% in the zone from 2012 to 2017, compared to a 5.4% increase for North Carolina statewide.

PROSPERITY ZONE: WESTERN

Counties: Buncombe, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, Polk, Rutherford, Swain, Transylvania

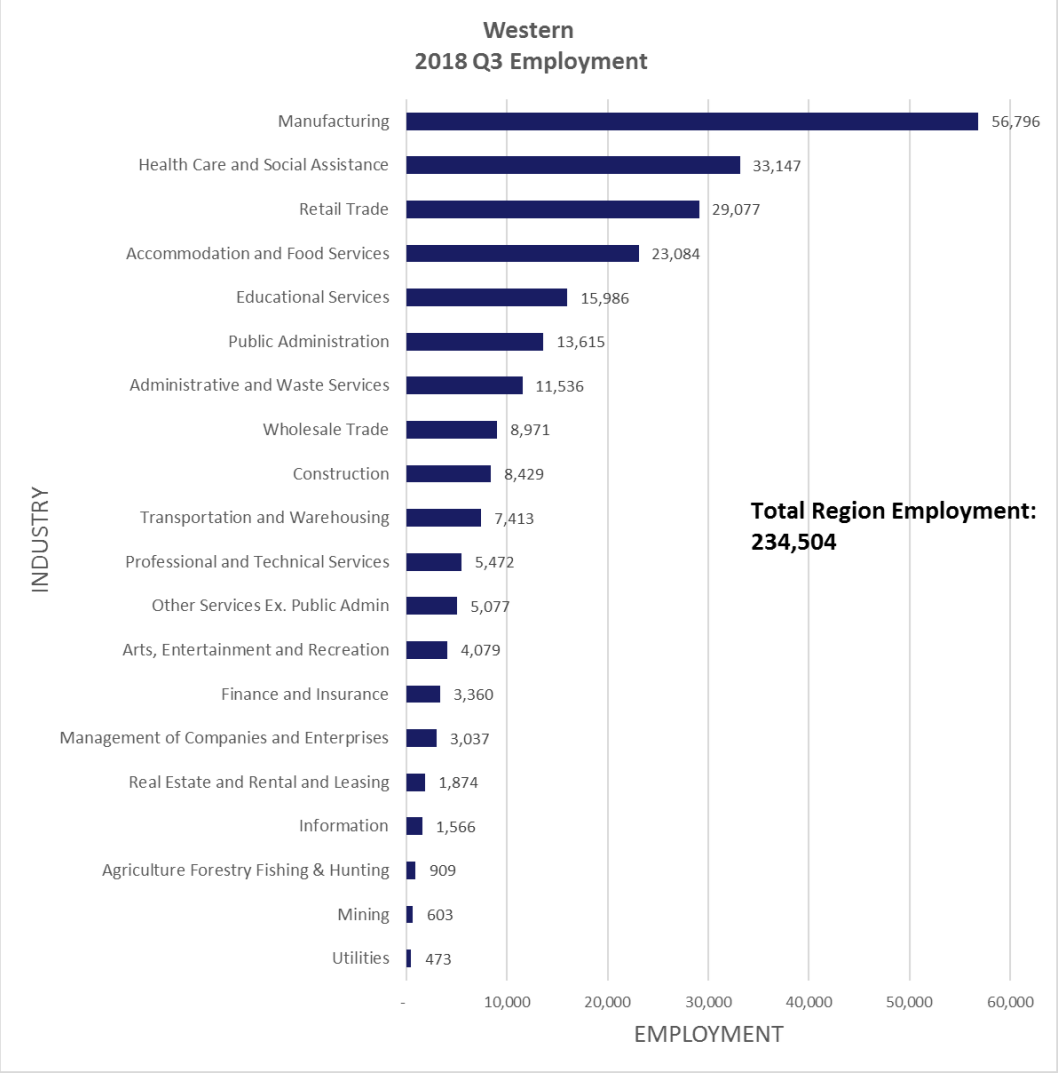
Cities: Asheville, Franklin, Waynesville

Demographics, Labor Force and Economy: The Western Prosperity Zone has a 2017 estimated population of 702,789, growing 3.15% since the 2010 Census. In 2010, the zone population was 50.2% rural. The 2017 estimated attainment of a bachelor's degree was 30.1%.

In 2016, 63% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force increased 3.5% from 320,207 in 2006 to 331,559 in 2016. Business establishments increased 6.1% in the zone from 2012 to 2017, compared to a 5.4% increase for North Carolina statewide.

Regional Employment by Industry: The following chart details out the top industries and total employment in the region based on the latest data from the N.C. Department of Commerce from the third quarter of 2018.

EXHIBIT 3-22
OVERALL EMPLOYMENT BY INDUSTRY IN WESTERN REGION, THIRD QUARTER 2018



Source: AccessNC, North Carolina Department of Commerce, 2019 (https://accessnc.nccommerce.com/DemographicsReports/).

PIEDMONT-TRIAD REGION

Prosperity Zone: Piedmont-Triad

Counties: Alamance, Caswell, Davidson, Davie, Forsyth, Guilford, Randolph, Rockingham, Stokes, Surry, Yadkin

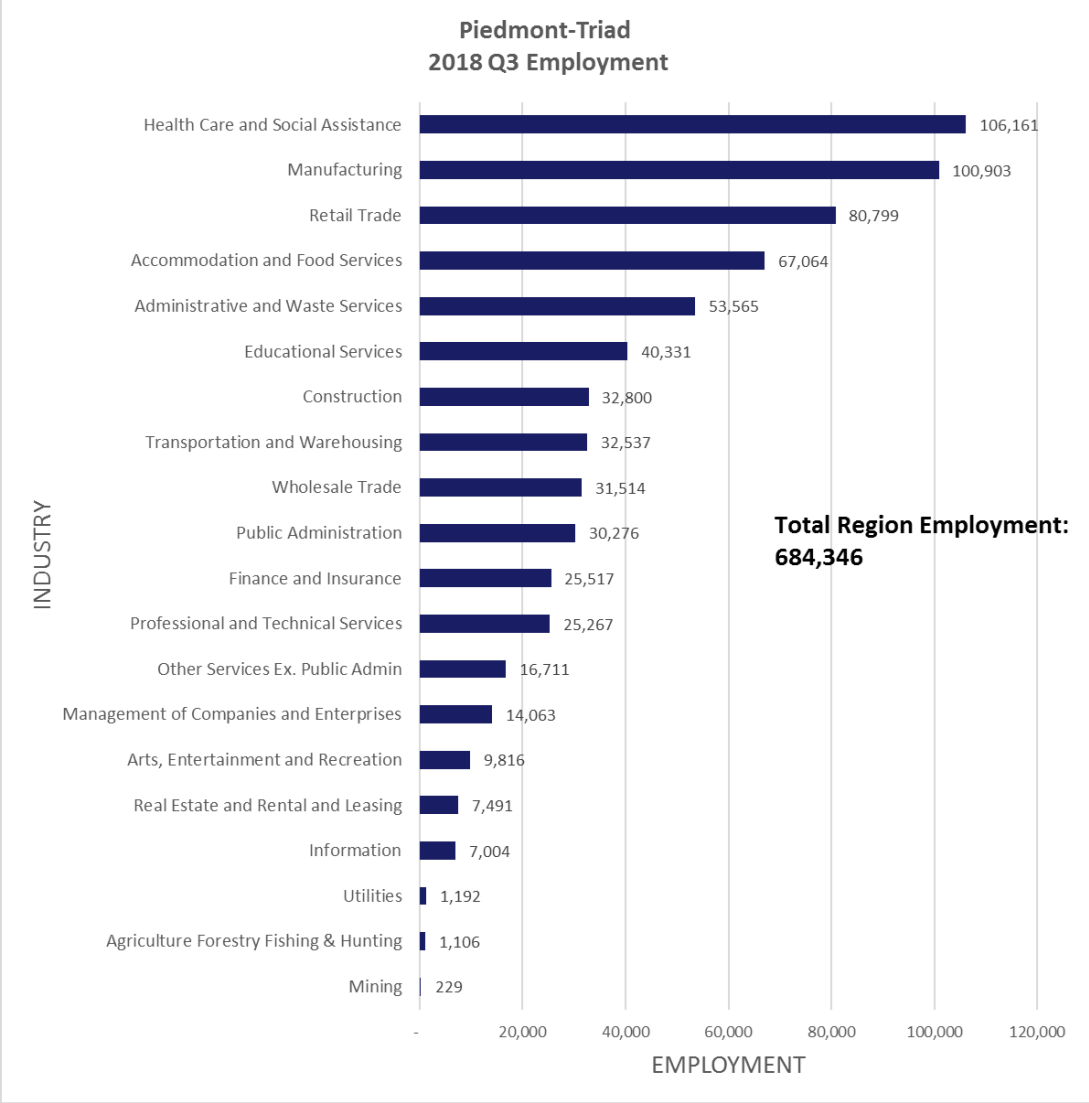
Cities: Greensboro, High Point, Winston-Salem

Demographics, Labor Force and Economy: The Piedmont-Triad Prosperity Zone has a 2017 estimated population of 1,662,777, growing 3.09% since the 2010 Census. In 2010, the zone population was 32.1% rural. The 2017 estimated attainment of a bachelor's degree was 26.4%.

In 2016, 64% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force increased 1% from 801,489 in 2006 to 809,341 in 2016. Business establishments remained flat in the zone from 2012 to 2017, compared to a 5.4% increase for North Carolina statewide.

Regional Employment by Industry: The following chart details out the top industries and total employment in the region based on the latest data from the N.C. Department of Commerce from the third quarter of 2018.

EXHIBIT 3-23
OVERALL EMPLOYMENT BY INDUSTRY IN PIEDMONT-TRIAD REGION, THIRD QUARTER 2018



Source: AccessNC, North Carolina Department of Commerce, 2019 (https://accessnc.nccommerce.com/DemographicsReports/).

NORTH CENTRAL REGION

Prosperity Zone: North Central

Counties: Chatham, Durham, Edgecombe, Franklin, Granville, Harnett, Johnston, Lee, Nash, Orange, Person, Vance, Wake, Warren, Wilson

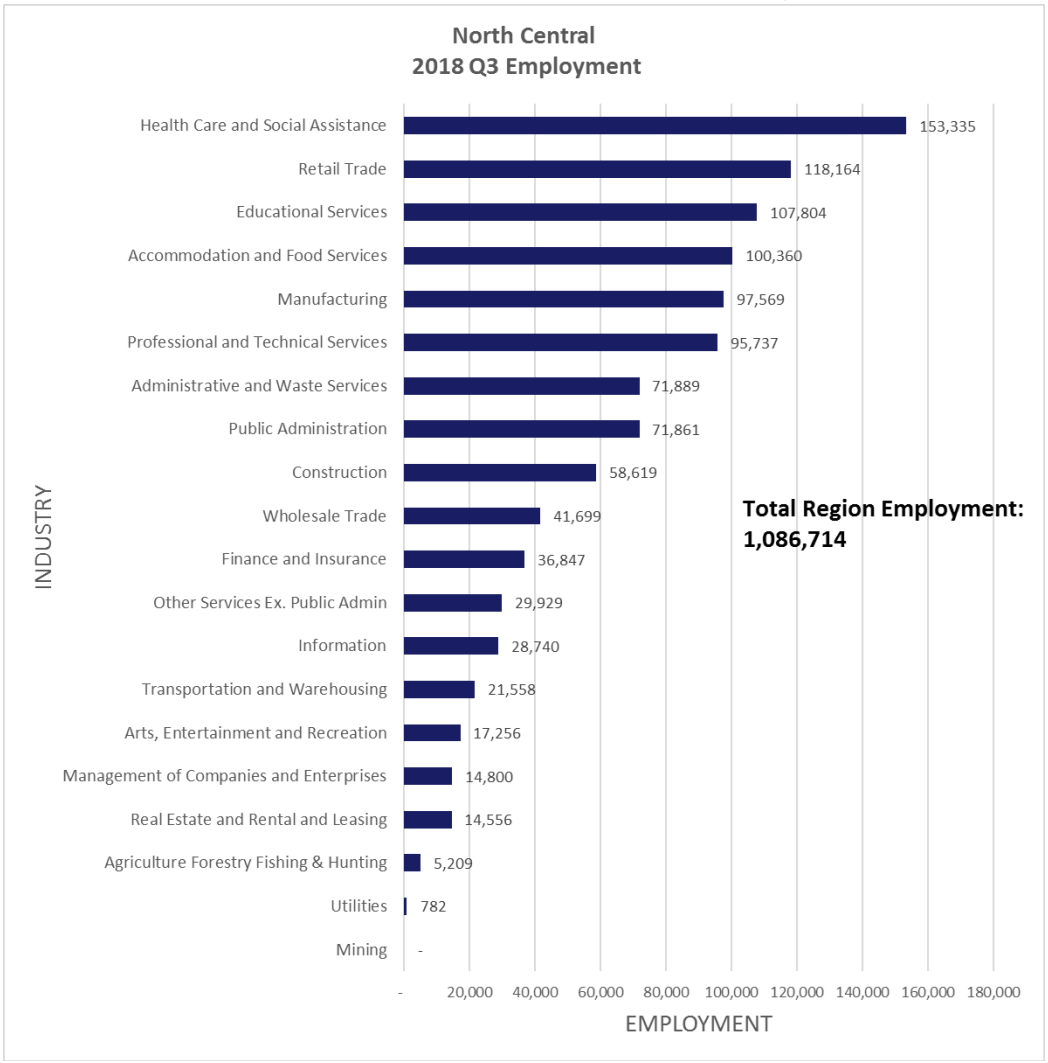
Cities: Durham, Raleigh, Rocky Mount, Wilson

Demographics, Labor Force and Economy: The North Central Prosperity Zone has a 2017 estimated population of 2,365,473, growing 9.14% since the 2010 Census. In 2010, the zone population was 27.2% rural. The 2017 estimated attainment of a bachelor's degree was 39.3%.

In 2016, 68% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force increased 18.4% from 1,013,910 in 2006 to 1,200,915 in 2016. Business establishments increased 9.4% in the zone from 2012 to 2017, compared to a 5.4% increase for North Carolina statewide.

Regional Employment by Industry: The following chart details out the top industries and total employment in the region based on the latest data from the N.C. Department of Commerce from the third quarter of 2018.

EXHIBIT 3-24
OVERALL EMPLOYMENT BY INDUSTRY IN NORTH CENTRAL REGION, THIRD QUARTER 2018



Source: AccessNC, North Carolina Department of Commerce, 2019 (https://accessnc.nccommerce.com/DemographicsReports/).

SOUTH CENTRAL REGION

PROSPERITY ZONE: SANDHILLS

Counties: Bladen, Columbus, Cumberland, Hoke, Robeson, Montgomery, Moore, Richmond, Sampson, Scotland

Cities: Fayetteville, Lumberton, Pinehurst, Rockingham

Demographics, Labor Force and Economy: The Sandhills Prosperity Zone has a 2017 estimated population of 876,435, growing 2.37% since the 2010 Census. In 2010, the zone population was 44.9% rural. The 2017 estimated attainment of a bachelor's degree was 20.3%.

In 2016 65% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force decreased 3.5% from 356,113 in 2006 to 343,760 in 2016. Business establishments declined 2.1% in the zone from 2010 to 2017, compared to an 8.1% increase for North Carolina statewide.

PROSPERITY ZONE: SOUTHWEST

Counties: Anson, Cabarrus, Cleveland, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Stanly, Union

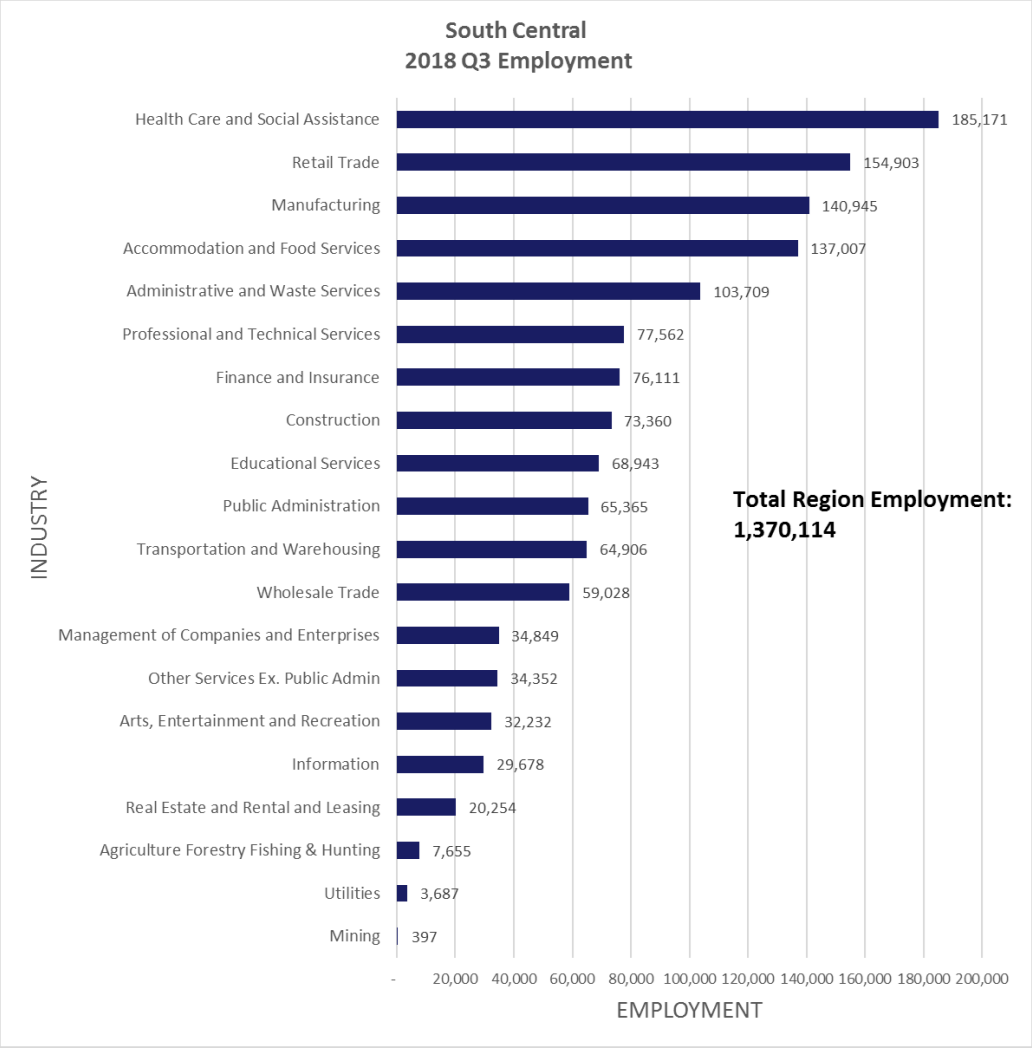
Cities: Charlotte

Demographics, Labor Force and Economy: The Southwest Prosperity Zone has a 2017 estimated population of 2,239,836, growing 8.37% since the 2010 Census. In 2010, the zone population was 20% rural. The 2017 estimated attainment of a bachelor's degree was 33.3%.

In 2016, 68% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force increased 19.9% from 985,489 in 2006 to 1,181,472 in 2016. Business establishments increased 10% in the zone from 2012 to 2017, compared to a 5.4% increase for North Carolina statewide.

Regional Employment by Industry: The following chart details out the top industries and total employment in the region based on the latest data from the N.C. Department of Commerce from the third quarter of 2018.

EXHIBIT 3-25
OVERALL EMPLOYMENT BY INDUSTRY IN SOUTH CENTRAL REGION, THIRD QUARTER 2018



Source: AccessNC, North Carolina Department of Commerce, 2019 (https://accessnc.nccommerce.com/DemographicsReports/).

EASTERN REGION

PROSPERITY ZONE: NORTHEAST

Counties: Beaufort, Bertie, Camden, Chowan, Currituck, Dare, Gates, Halifax, Hertford, Hyde, Martin, Northampton, Pasquotank, Perquimans, Pitt, Tyrrell, Washington

Cities: Elizabeth City, Greenville

Demographics, Labor Force and Economy: The Northeast Prosperity Zone has a 2017 estimated population of 535,874, growing .14% since the 2010 Census. In 2010, the zone population was 54.6% rural. The 2017 estimated attainment of a bachelor's degree was 22%.

In 2016, 63% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force decreased .7% from 245,610 in 2006 to 243,936 in 2016. Business establishments declined 5.7% in the zone from 2012 to 2017, compared to a 5.4% increase for North Carolina statewide.

PROSPERITY ZONE: SOUTHEAST

Counties: Brunswick, Carteret, Craven, Duplin, Greene, Jones, Lenoir, New Hanover, Onslow, Pamlico, Pender, Wayne

Cities: Goldsboro, Jacksonville, Kinston, New Bern, Wilmington

Demographics, Labor Force and Economy: The Southeast Prosperity Zone has a 2017 estimated population of 1,050,258, growing 5.52% since the 2010 Census. In 2010, the zone population was 36.4% rural. The 2017 estimated attainment of a bachelor's degree was 25.2%.

In 2016, 63% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force increased 6.8% from 427,286 in 2006 to 456,338 in 2016. Business establishments increased 3.4% in the zone from 2012 to 2017, compared to a 5.4% increase for North Carolina statewide.

Regional Employment by Industry: The following chart details out the top industries and total employment in the region based on the latest data from the N.C. Department of Commerce from the third quarter of 2018.

PROSPERITY ZONE: NORTHEAST

Counties: Beaufort, Bertie, Camden, Chowan, Currituck, Dare, Gates, Halifax, Hertford, Hyde, Martin, Northampton, Pasquotank, Perquimans, Pitt, Tyrrell, Washington

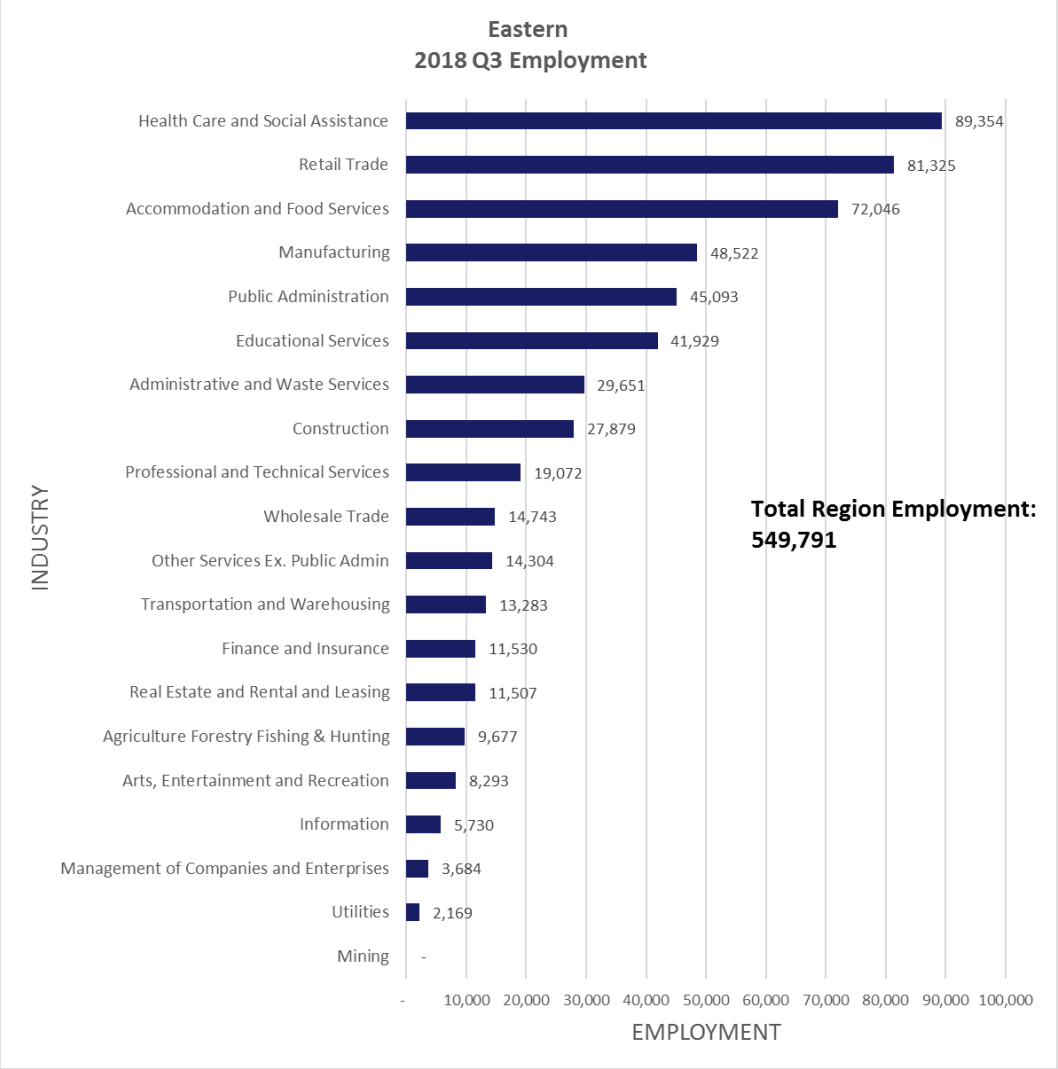
Cities: Elizabeth City, Greenville

Demographics, Labor Force and Economy: The Northeast Prosperity Zone has a 2017 estimated population of 535,874, growing 1.2% since the 2010 Census. In 2010, the zone was 55% rural. The 2017 estimated attainment of a bachelor's degree was 22%.

In 2016, 63% of jobholders were in the 25-54 age group, considered prime-age workers. The total labor force decreased .7% from 245,610 in 2006 to 243,936 in 2016. Business establishments declined 5.7% in the zone from 2010 to 2017, compared to an 8.1% increase for North Carolina statewide.

Noted Industries: Ship and Boat Building, Pharmaceutical and Medicine Manufacturing

EXHIBIT 3-26
OVERALL EMPLOYMENT BY INDUSTRY IN EASTERN REGION, THIRD QUARTER 2018



Source: AccessNC, North Carolina Department of Commerce, 2019 (https://accessnc.nccommerce.com/DemographicsReports/).

4.0: STEM CATEGORY SUPPLY AND DEMAND ANALYSIS

In this chapter, data related to the enrollments and degree awards (supply) and occupational outlook (demand) for STEM programs are offered by category (Engineering, Hard Science, Health Science, Math, and Technology) and Region.

For each STEM category, we display the following data points for consideration by the System as it examines and plans for the future of STEM programming across the state:

- Fall 2018 upper-division enrollment distribution by region
- Historical five-year upper-division enrollment growth by region (2014-2018)
- Five- and ten-year upper-division enrollment projections, distribution, and growth by region
- Distribution of programs by type across institutions/regions
- Gap analysis – annual projected occupational openings (demand) compared to degree award projections (supply) at the 10-year horizon

Some caveats apply to these data.

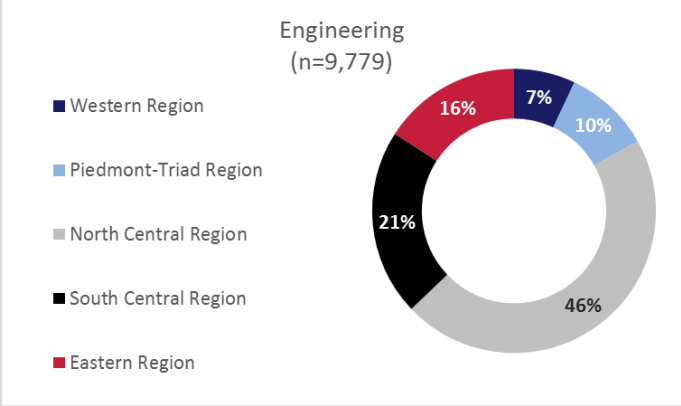
1. The projected degree awards were derived through calculations based on a weighted conversion of historical enrollments to degree attainment at each institution by program. The resulting degree efficiency coefficient by STEM category was applied to five-year and 10-year enrollment projections for all programs at that institution within the STEM category. For a detailed description of the calculation of these metrics, please see **Appendix B**.
2. As in previous chapters, in some instances, CIP Titles represent a combination of similar programs for analysis purposes. When calculating the supply-demand gap through the application of the CIP-SOC crosswalk (available through the U.S. Department of Labor), several program CIP designations within each STEM category did not match an occupational code (SOC). As a result, the degree awards associated with those programs could not be correlated with an occupation as part of the gap analysis. The magnitude of those programs is noted under the appropriate table and could be related to a number of occupations.
3. For most academic programs, there is not a one-to-one correlation between academic discipline and a single occupation.
4. All occupation projections were screened for degree level at entry (bachelor's only were selected with less than five years' experience required).
5. Alignment of STEM program production to occupational capacity and vice-versa is a complex process and, more often than not, a less than perfect representation of supply vs. demand. Program (CIP codes) and market occupations (SOC codes) do not typically result in a clean one-to-one match. Many CIP programs could supply a single SOC, and many SOCs could utilize degree recipients from the same CIP program. Using an established crosswalk system reduces some of the variance and overlap, but caution should be exercised when attempting to draw conclusions

of under- or over-supply without acknowledging the multiple pathways between degree/credential and job opportunities.

ENGINEERING SUPPLY AND DEMAND ANALYSIS

Of the nearly 10,000 engineering enrollments in the System in 2018, nearly half were enrolled in the North Central Region, as shown in **Exhibit 4-1.**

EXHIBIT 4-1
ENGINEERING ENROLLMENT* BY REGION, FALL 2018



* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

Enrollments increased in Engineering programs across the System an average of 20% over the last five years, as shown in **Exhibit 4-2**. Enrollment counts in Engineering programs increased most significantly in the South Central Region (an increase of 487 upper-division students or 31%), while the Eastern Region demonstrated the strongest percentage growth (458, or 42%).

EXHIBIT 4-2
ENGINEERING ENROLLMENT* GROWTH BY REGION
FALL 2014 TO FALL 2018

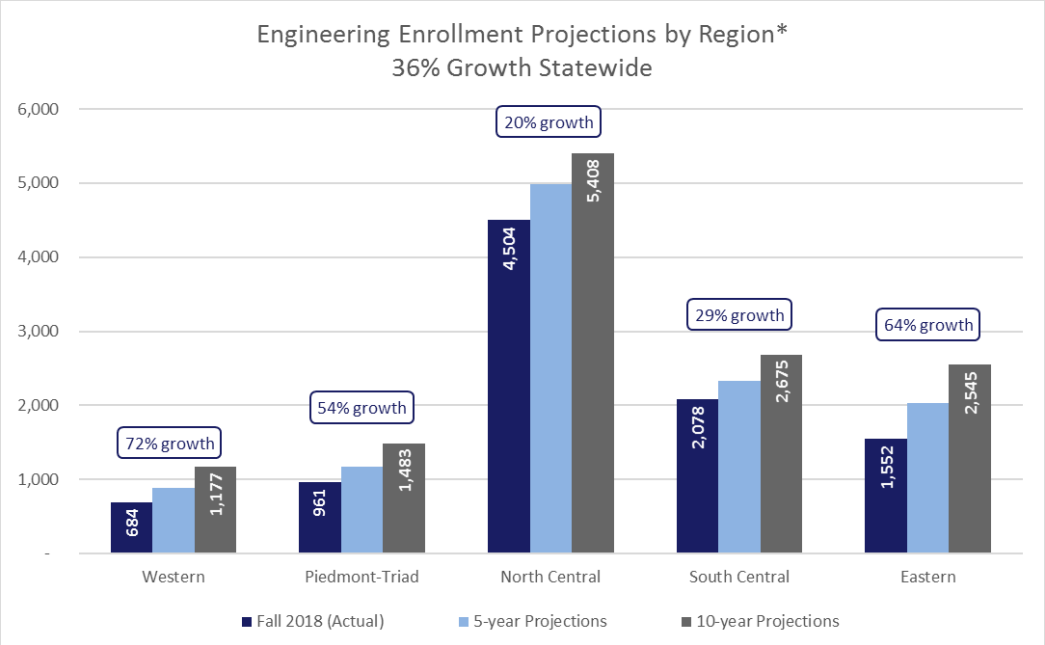
Engineering	Fall 2014		Fall 2018		# change	% change
	#	%	#	%		
Western Region	348	4%	684	7%	336	97%
Piedmont-Triad Region	822	10%	961	10%	139	17%
North Central Region	4,311	53%	4,504	46%	193	4%
South Central Region	1,591	19%	2,078	21%	487	31%
Eastern Region	1,094	13%	1,552	16%	458	42%
Engineering Group Subtotal	**8,166**	**100%**	**9,779**	**100%**	**1,613**	**20%**

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

As shown in **Exhibit 4-3**, the System projects 36% growth in Engineering program enrollments over the next ten years across the state, but growth rates vary significantly by region. The Western Region (which

has the smallest share of Engineering students in the System) expects to grow Engineering enrollments by 72% over the next decade, while the North Central Region, which comprises the bulk of System Engineering enrollments, anticipates 20% growth over the same time horizon.

EXHIBIT 4-3
ENGINEERING COUNTS, DISTRIBUTION, AND GROWTH BY REGION



* STEM enrollment figures include only upper division first majors.

Source: Fall 2018 enrollment data provided by the UNC System, five-year and ten-year projections provided by institutions.

The overwhelming majority of Engineering program offerings are available in the Piedmont-Triad and North Central Regions (**Exhibit 4-4**). NC State, NC A&T, and UNC Charlotte offer the most varied Engineering program options (17, 14, and 9 programs, respectively).

EXHIBIT 4-4
ENGINEERING PROGRAM DISTRIBUTION

CIP	Program Description	Western			Piedmont-Triad			North Central			South Central			Eastern		
		ASU	UNC-A	WCU	NCA&T	UNC-G	WSSU	NCCU	NCSU	UNC-CH	FSU	UNC-P	UNC-C	ECU	ECSU	UNC-W
04.0401	Environmental Design in Architecture								✓							
14.0101	Engineering		✓	✓					✓					✓		
14.0201	Aerospace, Aeronautical and Astronautical/Space Engineering								✓							
14.0301	Agricultural Engineering				✓✓				✓							
14.0401																
14.0501	Bioengineering and Biomedical Engineering				✓				✓	✓						
14.0701	Chemical Engineering				✓				✓							
14.0801	Civil Engineering, General				✓				✓				✓			
14.0901	Computer Engineering, General				✓				✓				✓			
14.1001	Electrical and Electronics Engineering			✓	✓				✓				✓			
14.1401	Environmental/Environmental Health Engineering								✓							
14.1801	Materials Engineering								✓							
14.1901	Mechanical Engineering				✓				✓				✓			
14.2301	Nuclear Engineering								✓							
14.2701	Systems Engineering												✓			
14.2801	Textile Sciences and Engineering								✓							
14.3301	Construction Engineering								✓							
14.3501	Industrial Engineering				✓				✓							
14.3801	Geomatics				✓											
15.0000	Engineering Technology, General			✓												
15.0201	Civil Engineering Technology/Technician												✓			
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician			✓									✓			
15.0399	Electrical and Electronic Engineering Technologies/Technicians, Other				✓											
15.0507	Sustainable Technology	✓							✓							
15.0612	Industrial Technology/Technician and Automotive Engineering Technology				✓									✓		
15.0613	Manufacturing Engineering Technology/Technician				✓									✓		
15.0805	Mechanical Engineering/Mechanical Technology/Technician												✓			
15.1001	Construction Engineering Technology/Technician			✓												
15.1301	Drafting and Design Technology/Technician, General													✓		
15.9999	Engineering Technologies and Engineering-Related Fields, Other				✓								✓	✓	✓	
TBD	Coastal Engineering*															✓
	Institution Totals	**1**	**1**	**5**	**14**				**17**	**1**			**9**	**5**	**1**	**1**
	Regional Totals	**7**			**14**			**18**			**9**			**7**		

Source: UNC System Office, 2019; STEM Program Listings by CIP.

*UNC Wilmington's Coastal Engineering program has not yet been assigned a CIP, but will begin in Fall 2019.

Exhibit 4-5 displays the Engineering CIP codes offered through the UNC System, along with their associated occupational SOC codes. In many cases, CIPs are associated with multiple SOCs and vice versa. Note that this crosswalk references only occupations which require either an associate or bachelor's degree at the entry level.

EXHIBIT 4-5
ENGINEERING PROGRAM CIP-SOC CROSSWALK

Occupational Descriptor →			Architects, Except Landscape and Naval	Landscape Architects	Engineers, All Other	Aerospace Engineers	Agricultural Engineers	Biomedical Engineers	Chemical Engineers	Civil Engineers	Software Developers, Applications	Software Developers, Systems Software	Computer Hardware Engineers	Electrical Engineers	Electronics Engineers, Except Computer	Environmental Engineers	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	Cost Estimators	Materials Engineers	Mechanical Engineers	Nuclear Engineers	Industrial Engineers	Civil Engineering Technicians	Electrical and Electronics Engineering Technicians	Environmental Engineering Technicians	Industrial Engineering Technicians	Mechanical Engineering Technicians	Construction Managers	Architectural and Civil Drafters	Electrical and Electronics Drafters	Mechanical Drafters	Drafters, All Other
	SOC Code		17-1011	17-1012	17-2199	17-2011	17-2021	17-2031	17-2041	17-2051	15-1132	15-1133	17-2061	17-2071	17-2072	17-2081	17-2111	13-1051	17-2131	17-2141	17-2161	17-2112	17-3022	17-3023	17-3025	17-3026	17-3027	11-9021	17-3011	17-3012	17-3013	17-3019
	Occupational Projections		232	35	135	48	2	36	62	770	3041	683	126	448	254	112	45	846	34	704	66	795	302	231	25	357	106	1468	248	75	148	15
CIP Code	CIP Title	Annual Degree Awards at Year 10																														
04.0401	Environmental Design in Architecture	39	✓	✓																												
14.0101	Engineering	306			✓																											
14.0201	Aerospace, Aeronautical and Astronautical/Space Engineering	92				✓																										
14.0301	Biological/Agricultural Engineering	55					✓																									
14.0401	Architectural Engineering	26			✓																											
14.0501	Bioengineering and Biomedical Engineering	232						✓																								
14.0701	Chemical Engineering	199							✓																							
14.0801	Civil Engineering	310								✓																						
14.0901	Computer Engineering	239									✓	✓	✓																			
14.1001	Electrical and Electronics Engineering	390				✓								✓	✓																	
14.1401	Environmental/Environmental Health Engineering	37														✓	✓															
14.1801	Materials Engineering	47																✓	✓													
14.1901	Mechanical Engineering	617				✓			✓									✓														
14.2301	Nuclear Engineering	28																			✓											
14.2701	Systems Engineering	80			✓																											
14.2801	Textile Sciences and Engineering	243						✓																								
14.3301	Construction Engineering	19			✓					✓								✓														
14.3501	Industrial Engineering	135																				✓										
14.3801	Geomatics	13			✓																											
15.0201	Civil Engineering Technology/Technician	23																					✓									
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	67																						✓								
15.0399	Electrical and Electronic Engineering Technologies/Technicians	22																						✓								
15.0507	Sustainable Technology	122																							✓							
15.0612	Industrial Technology/Technician	271																								✓						
15.0613	Manufacturing Engineering Technology/Technician	151																								✓						
15.0805	Mechanical Engineering/Mechanical Technology/Technician	78																									✓					
15.1001	Construction Engineering Technology/Technician	53																✓					✓					✓				
15.1301	Drafting and Design Technology/Technician	19																											✓	✓	✓	✓

Source: CIP codes from UNC System Office, 2019; Crosswalk with SOC Codes developed via the U.S. Bureau of Labor Statistics.

Exhibit 4-6 provides a summary of projected degree awards at the 10-year horizon and associated occupational openings available to those entry level bachelor's degree candidates. In order to incorporate most occupations for which recent bachelor's graduates might apply, we have also chosen to include occupations for which an associate's degree is acceptable at the entry level. It is important to note when reviewing these data that the occupational openings are in no way cumulative. There is rarely a one-to-one correlation between degree awards and occupational openings. A graduate with a degree in Mechanical Engineering, for example, could be a qualified candidate for a number of occupational titles. Similarly, a job of Environmental Engineer could be an appropriate position for graduates from several different degree programs. It's also important to remember that degree awards do not reflect an absolute pipeline that is guaranteed to produce candidates who enter the profession directly, immediately, or within North Carolina.

Finally, some CIP designations match only with occupational categories which are so broad they are screened out entirely. An occupational category, for example, which includes jobs requiring a different educational level than a bachelor's degree, or more experience than most recent bachelor's graduates already possess.

As a result, these comparisons shown in **Exhibit 4-6** should be understood as a broad summary of the occupational market (demand) and the UNC System's ability to meet the state's needs through production of qualified Engineering graduates (supply).

EXHIBIT 4-6
ENGINEERING SUPPLY/DEMAND GAP
OCCUPATIONAL OPENINGS VS. 10-YEAR DEGREE PROJECTIONS

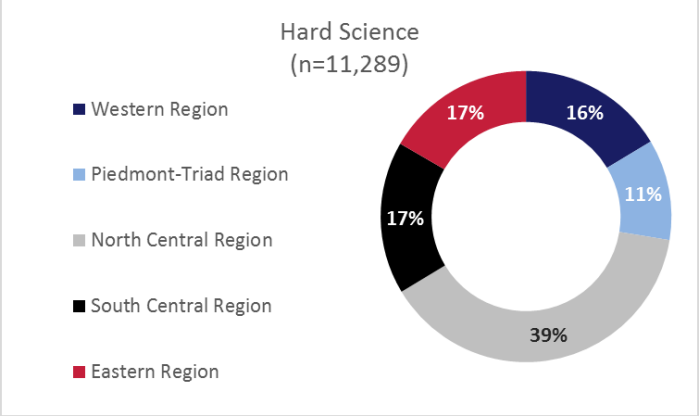
CIP	CIP Title	10-Year Degree Awards	Annual Occupational Openings	Supply: Demand Ratio
14.1901	Mechanical Engineering	617	1,597	39%
14.1001	Electrical and Electronics Engineering	390	750	52%
14.0801	Civil Engineering	310	770	40%
14.0101	Engineering	306	135	228%
15.0612	Industrial Technology/Technician	271	357	76%
14.2801	Textile Sciences and Engineering	243	34	721%
14.0901	Computer Engineering	239	3,850	6%
14.0501	Bioengineering and Biomedical Engineering	232	36	647%
14.0701	Chemical Engineering	199	62	322%
15.0613	Manufacturing Engineering Technology/Technician	151	357	42%
14.3501	Industrial Engineering	135	795	17%
15.0507	Sustainable Technology	122	25	486%
14.0201	Aerospace, Aeronautical and Astronautical/Space Engineering	92	48	192%
14.2701	Systems Engineering	80	135	60%
15.0805	Mechanical Engineering/Mechanical Technology/Technician	78	106	73%
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	67	231	29%
14.0301	Biological/Agricultural Engineering	55	2	3658%
15.1001	Construction Engineering Technology/Technician	53	2,616	2%
14.1801	Materials Engineering	47	879	5%
04.0401	Environmental Design in Architecture	39	267	15%
14.1401	Environmental/Environmental Health Engineering	37	157	24%
14.2301	Nuclear Engineering	28	66	42%
14.0401	Architectural Engineering	26	135	19%
15.0201	Civil Engineering Technology/Technician	23	302	8%
15.0399	Electrical and Electronic Engineering Technologies/Technicians	22	231	9%
14.3301	Construction Engineering	19	1,750	1%
15.1301	Drafting and Design Technology/Technician	19	248	8%
14.3801	Geomatics	13	135	10%

Source: North Carolina Department of Commerce occupation data. Degree award projections were calculated based on UNC System historical degree award and applied to 10-year enrollment projections provided by institutions.
Notes: Annual occupational openings are derived by equally distributing total projected openings provided by the state across the time period (2017-2026).

HARD SCIENCE SUPPLY AND DEMAND ANALYSIS

More than 11,000 juniors and seniors were enrolled in Hard Science programs in the System in 2018, and the largest share (more than one-third) were enrolled in the North Central Region, as shown in **Exhibit 4-7**.

EXHIBIT 4-7
HARD SCIENCE ENROLLMENT* BY REGION, FALL 2018



* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

Hard Science enrollments by juniors and seniors across the System increased an average of 10% between Fall 2014 and 2018. The most significant Hard Science enrollment growth was seen in the South Central Region (an increase of 526 upper-division students or 38%), while decreases in Hard Science enrollments were evidenced in the North Central and Eastern Regions (33 and 98 students, respectively).

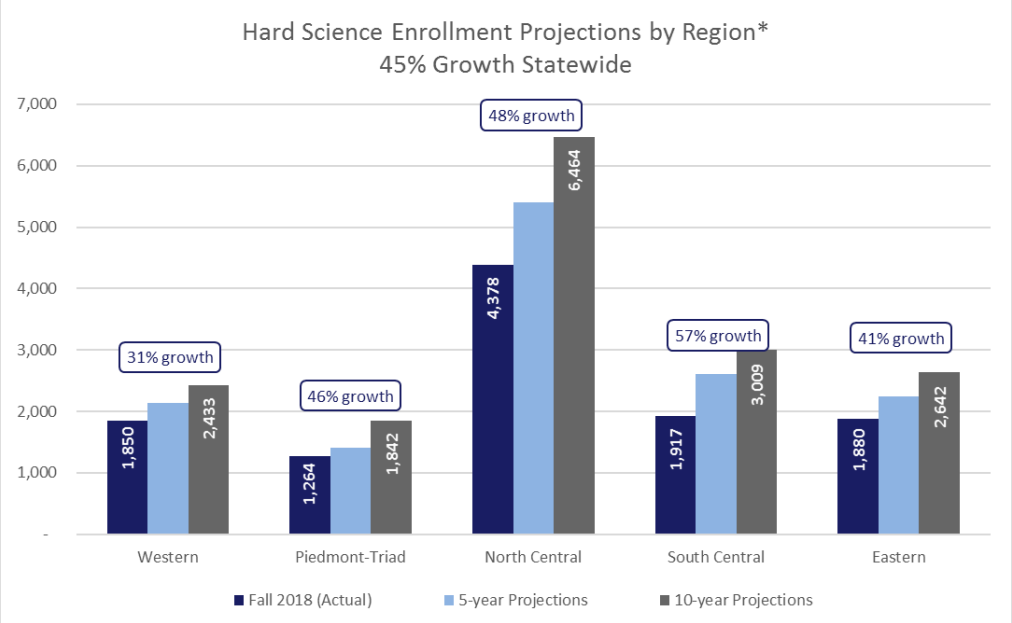
EXHIBIT 4-8
HARD SCIENCE ENROLLMENT* GROWTH BY REGION
FALL 2014 TO FALL 2018

Hard Science	Fall 2014		Fall 2018		# change	% change
	#	%	#	%		
Western Region	1,473	14%	1,850	16%	377	26%
Piedmont-Triad Region	1,055	10%	1,264	11%	209	20%
North Central Region	4,411	43%	4,378	39%	(33)	-1%
South Central Region	1,391	13%	1,917	17%	526	38%
Eastern Region	1,978	19%	1,880	17%	(98)	-5%
Hard Science Group Subtotal	**10,308**	**100%**	**11,289**	**100%**	**981**	**10%**

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

As shown in **Exhibit 4-9**, the System projects 45% growth in Hard Science program enrollments over the next ten years across the state, but growth rates vary somewhat by region. Strongest growth is predicted in the South Central Region (57%), while more modest growth is anticipated in the Western Region (31%). The North Central Region is still anticipated to offer the largest share of Hard Science enrollments.

EXHIBIT 4-9
HARD SCIENCE ENROLLMENTS PROJECTIONS BY REGION



* STEM enrollment figures include only upper division first majors.

Source: Fall 2018 enrollment data provided by the UNC System, five-year and ten-year projections provided by institutions.

Biology and Chemistry are available majors at all institutions in the study, and Physics is offered at most. The majority of Hard Science program offerings are available in the North Central Region (as shown in **Exhibit 4-10**). NC State and UNC Chapel Hill offer the greatest variety among Hard Science program options (13 and 10 programs, respectively) and UNC-Wilmington is not far behind with nine. The Piedmont-Triad Region has the fewest programs (10) available. Of the five institutions with four or fewer Hard Science programs four are HBCUs.

EXHIBIT 4-10
HARD SCIENCE PROGRAM DISTRIBUTION

CIP	Program Description	Western			Piedmont-Triad			North Central			South Central			Eastern		
		ASU	UNC-A	WCU	NCA&T	UNC-G	WSSU	NCCU	NCSU	UNC-CH	FSU	UNC-P	UNC-C	ECU	ECSU	UNC-W
03.0103 03.0104	Environmental Science/Studies	✓✓	✓	✓				✓	✓	✓✓		✓✓	✓			✓✓
03.0201	Natural Resource Conservation and Management			✓												
26.0101	Biology/Biological Sciences*	✓	✓	✓	✓	✓	✓	✓	✓	✓✓	✓	✓	✓	✓	✓✓	✓✓
26.0102	Pharmaceutical Sciences							✓								
26.0202	Biochemistry					✓			✓					✓		
26.0301	Botany/Plant Biology								✓							
26.0502	Microbiology, General								✓							
26.0701	Zoology/Animal Biology								✓							
26.0801	Genetics, General								✓							
26.1102	Biostatistics									✓						
26.1201	Biotechnology											✓				
26.1302	Marine Biology and Biological Oceanography															✓
26.1501	Neuroscience									✓						
30.3301	Sustainability Studies**														✓	
40.0401 40.0404 40.0499	Atmospheric Sciences and Meteorology		✓		✓				✓				✓	✓		
40.0501	Chemistry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
40.051	Forensic Chemistry***			✓✓												
40.0601	Geology/Earth Science, General	✓		✓					✓	✓			✓	✓		✓
40.0607	Oceanography, Chemical and Physical								✓							✓
40.0801	Physics	✓	✓		✓	✓		✓	✓	✓		✓	✓	✓		✓
40.9999	Physical Sciences									✓						
41.9999	Science Technologies/Technicians, Other								✓							
43.0106	Forensic Science										✓					
	Institution Totals	6	5	7	4	4	2	5	13	10	3	6	6	6	4	9
	Regional Totals	18			10			28			15			19		

Source: UNC System Office, 2019; STEM Program Listings by CIP.

*ECSU's Pharmaceutical Science program is listed under CIP 26.0101.

**Sustainability Studies is pending BOG and SACSCOC approval at ECSU.

***Forensic Science at Western Carolina is listed under CIP 40.0510.

Exhibit 4-11 displays the Hard Science CIP codes offered through the UNC System, along with their associated occupational SOC codes. In many cases, CIPs are associated with multiple SOCs and vice versa. Note that this crosswalk references only occupations which require either an associate or bachelor's degree at the entry level.

EXHIBIT 4-11
HARD SCIENCE PROGRAM CIP-SOC CROSSWALK

Occupational Descriptor →			Environmental Scientists and Specialists, Including Health	Conservation Scientists	Foresters	Biological Scientists, All Other	Life Scientists, All Other	Secondary School Teachers, Except Special and Career/Technical Education	Microbiologists	Zoologists and Wildlife Biologists	Atmospheric and Space Scientists	Chemists	Forensic Science Technicians	Geoscientists, Except Hydrologists and Geographers	Hydrologists	Physical Scientists, All Other	Environmental Science and Protection Technicians, Including Health	Life, Physical, and Social Science Technicians, All Other	Forensic Science Technicians
	SOC Code		19-2041	19-1031	19-1032	19-1029	19-1099	25-2031	19-1022	19-1023	19-2021	19-2031	19-4092	19-2042	19-2043	19-2099	19-4091	19-4099	19-4092
	Occupational Projections		458	50	27	116	19	1901	46	49	11	485	86	65	19	62	173	193	86
CIP Code	CIP Title	Annual Degree Awards at Year																	
03.0103	Environmental Studies	395	✓																
03.0104	Environmental Sciences	293	✓																
03.0201	Natural Resource Conservation and Management	22		✓	✓														
26.0101	Biology/Biological Sciences	3042				✓	✓	✓											
26.0301	Botany/Plant Biology	32				✓													
26.0502	Microbiology	46							✓										
26.0701	Zoology/Animal Biology	63								✓									
26.0801	Genetics	30				✓													
26.1102	Biostatistics	30				✓													
26.1201	Biotechnology	5				✓													
26.1302	Marine Biology and Biological Oceanography	117				✓													
26.1501	Neuroscience	362				✓													
40.0401	Atmospheric Sciences and Meteorology	36									✓								
40.0404	Meteorology	18									✓								
40.0499	Atmospheric Sciences and Meteorology	6									✓								
40.0501	Chemistry	657						✓				✓							
40.051	Forensic Chemistry	25										✓							✓
40.0601	Geology/Earth Science	223												✓	✓				
40.0607	Oceanography, Chemical and Physical	45												✓	✓				
40.0801	Physics	217						✓								✓			
40.9999	Physical Sciences	11																	
41.9999	Science Technologies/Technicians	19															✓	✓	
43.0106	Forensic Science	28																	✓

Source: CIP codes from UNC System Office, 2019; Crosswalk with SOC Codes developed via the U.S. Bureau of Labor Statistics.

Exhibit 4-12 provides a summary of projected degree awards at the 10-year horizon and associated occupational openings available to those entry level bachelor's degree candidates. In order to incorporate most occupations for which recent bachelor's graduates might apply, we have also chosen to include occupations for which an associate's degree is acceptable at the entry level. It is important to note when reviewing these data that the occupational openings are in no way cumulative. There is rarely a one-to-one correlation between degree awards and occupational openings. A graduate with a degree in Physical Sciences, for example, could be a qualified candidate for a number of occupational titles. Similarly, a job of Chemist could be an appropriate position for graduates from several different degree programs. It's also important to remember that degree awards do not reflect an absolute pipeline that is guaranteed to produce candidates who enter the profession directly, immediately, or within North Carolina.

Finally, some CIP designations match only with occupational categories which are so broad they are screened out entirely. An occupational category, for example, which includes jobs requiring a different educational level than a bachelor's degree, or more experience than most recent bachelor's graduates already possess.

As a result, these comparisons shown in **Exhibit 4-12** should be understood as a broad summary of the occupational market (demand) and the UNC System's ability to meet the state's needs through production of qualified Hard Science graduates (supply).

EXHIBIT 4-12
HARD SCIENCE SUPPLY/DEMAND GAP
OCCUPATIONAL OPENINGS VS. 10-YEAR DEGREE PROJECTIONS

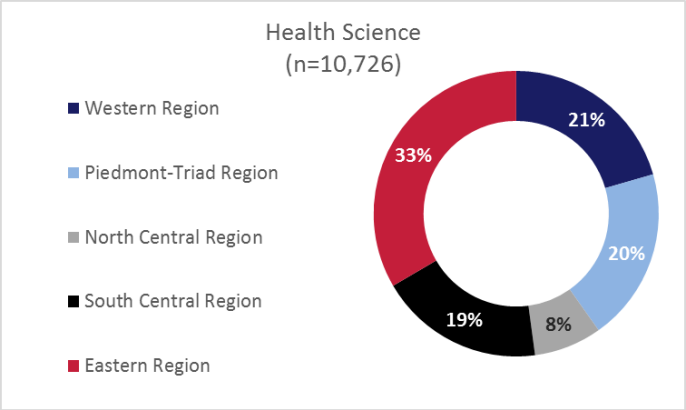
CIP	CIP Title	10-Year Degree Awards	Occupational Openings	Supply: Demand Ratio
26.0101	Biology/Biological Sciences	3,042	2,036	149%
40.0501	Chemistry	657	2,386	28%
03.0103	Environmental Studies	395	458	86%
26.1501	Neuroscience	362	116	311%
03.0104	Environmental Sciences	293	458	64%
40.0601	Geology/Earth Science	223	84	265%
40.0801	Physics	217	1,901	11%
26.1302	Marine Biology and Biological Oceanography	117	116	101%
26.0701	Zoology/Animal Biology	63	49	127%
26.0502	Microbiology	46	46	100%
40.0607	Oceanography, Chemical and Physical	45	84	53%
40.0401	Atmospheric Sciences and Meteorology	36	11	320%
26.0301	Botany/Plant Biology	32	116	28%
26.1102	Biostatistics	30	116	26%
26.0801	Genetics	30	116	25%
43.0106	Forensic Science	28	86	33%
40.0510	Forensic Chemistry	25	571	4%
03.0201	Natural Resource Conservation and Management	22	78	28%
41.9999	Science Technologies/Technicians	19	366	5%
40.0404	Meteorology	18	11	158%
40.9999	Physical Sciences	11	62	17%
40.0499	Atmospheric Sciences and Meteorology	6	11	57%
26.1201	Biotechnology	5	116	5%

Source: North Carolina Department of Commerce occupation data. Degree award projections were calculated based on UNC System historical degree award and applied to 10-year enrollment projections provided by institutions.
Notes: Annual occupational openings are derived by equally distributing total projected openings provided by the state across the time period (2017-2026).

HEALTH SCIENCE SUPPLY AND DEMAND ANALYSIS

Of the nearly 11,000 Health Science enrollments among juniors and seniors in the UNC System in 2018, one- third, the largest share, were enrolled in the Eastern Region, as shown in **4-13**.

EXHIBIT 4-13
HEALTH SCIENCE ENROLLMENT* BY REGION, FALL 2018



* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

System enrollments increased in Health Science programs across the System an average of 12%. Most significantly enrollment growth in Health Science, by far, was evidenced in the Eastern Region (an increase of 1,153 upper-division students or 47%), while other regions demonstrated more modest growth, or decline (in the case of the Piedmont-Triad Region).

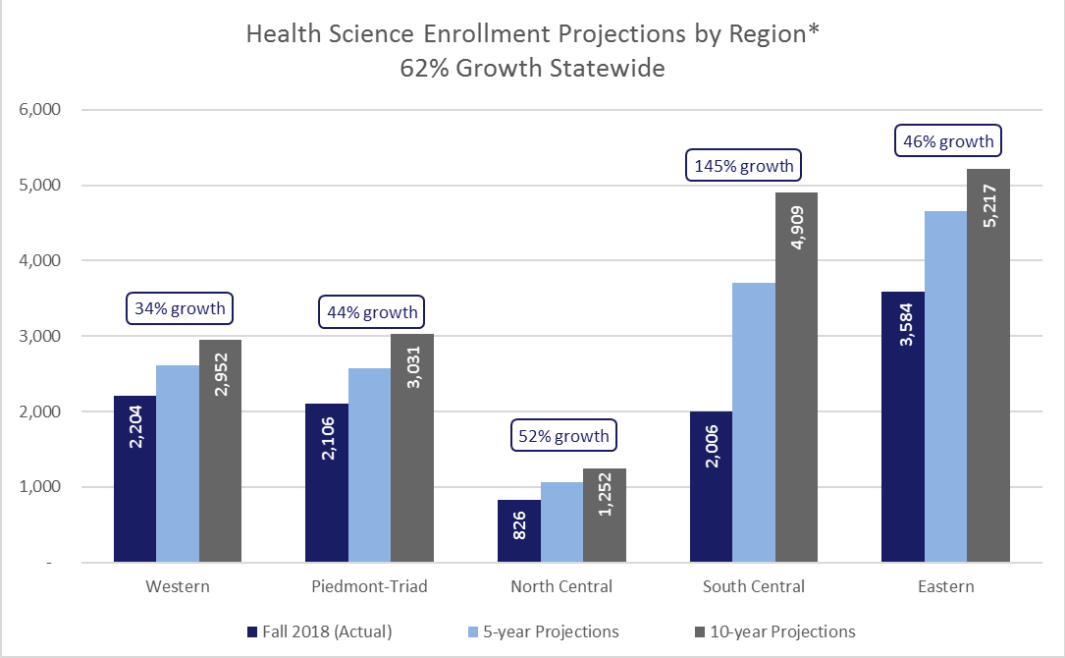
EXHIBIT 4-14
HEALTH SCIENCE ENROLLMENT* GROWTH BY REGION
FALL 2014 TO FALL 2018

Health Science	Fall 2014		Fall 2018		#	%
	#	%	#	%	change	change
Western Region	2,119	22%	2,204	21%	85	4%
Piedmont-Triad Region	2,418	25%	2,106	20%	(312)	-13%
North Central Region	798	8%	826	8%	28	4%
South Central Region	1,828	19%	2,006	19%	178	10%
Eastern Region	2,431	25%	3,584	33%	1,153	47%
Health Science Group Subtotal	**9,594**	**100%**	**10,726**	**100%**	**1,132**	**12%**

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

As shown in **Exhibit 4-15**, the System projects 62% growth in Health Science program enrollments over the next ten years across the state, but growth rates vary significantly by region. Dramatic growth is predicted in the South Central Region (145%), significantly increasing its share of Health Science enrollments within the System. The most modest growth is anticipated in the Western Region (34%). The Eastern Region has the largest share of Hard Science enrollments, and that is anticipated to continue into the next decade.

EXHIBIT 4-15
HEALTH SCIENCE FALL 2018 ENROLLMENTS AND 5-YEAR & 10-YEAR PROJECTIONS BY REGION



* STEM enrollment figures include only upper division first majors.
Source: Fall 2018 enrollment data provided by the UNC System, five-year and ten-year projections provided by institutions.

The majority of Health Science program offerings are available in the Western and Eastern Regions (as shown in **Exhibit 4-16**). East Carolina and Western Carolina Universities offer the greatest variety among Health Science program options (11 and 9 programs, respectively). A Registered Nursing major is available at the majority of institutions in the study (12 of the 15 institutions). While no Health Science programs are available through NC State, a significant variety are offered close by through UNC Chapel Hill.

EXHIBIT 4-16
HEALTH SCIENCE PROGRAM DISTRIBUTION

CIP	Program Description	Western			Piedmont-Triad			North Central			South Central			Eastern		
		ASU	UNC-A	WCU	NCA&T	UNC-G	WSSU	NCCU	NCSU	UNC-CH	FSU	UNC-P	UNC-C	ECU	ECSU	UNC-W
19.0501	Nutrition									✓						
26.0908	Exercise Physiology													✓		
31.0501	Exercise Science												✓			
31.0504	Kinesiology				✓											
31.0505	Exercise Science	✓					✓									
51.0000	Integrated Health Sciences			✓✓												
51.0201	Communication Sciences and Disorders, General	✓		✓												
51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist					✓								✓		
51.0602	Dental Hygiene/Hygienist									✓						
51.0701	Health/Health Care Administration/Management	✓					✓			✓	✓		✓	✓		
51.0706	Health Information/Medical Records Administration/Administrator													✓		
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)			✓												
51.0907	Medical Radiologic Technology/Science - Radiation Therapist									✓						
51.0908	Respiratory Care Therapy/Therapist												✓			
51.0913	Athletic Training/Trainer			✓												✓
51.0999	Allied Health Diagnostic, Intervention, and Treatment Professions												✓			
51.1005	Clinical Laboratory Science/Medical Technology/Technologist						✓			✓				✓		
51.2201	Public Health, General	✓											✓			✓
51.2202	Environmental Health			✓						✓				✓		
51.2206	Environmental Health and Safety				✓											
51.2207	Public Health Education and Promotion		✓			✓		✓						✓		
51.2305	Music Therapy/Therapist	✓														
51.2309	Therapeutic Recreation/Recreational Therapy			✓			✓							✓		✓
51.2310	Vocational Rehabilitation Counseling/Counselor						✓							✓		
51.3101	Dietetics/Dietitian	✓		✓										✓		
51.3801	Registered Nursing/Registered Nurse	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓
51.9999	Health Professions and Related Clinical Sciences															✓
TBD	Health Informatics									✓						
	Institution Totals	**7**	**1**	**9**	**3**	**3**	**6**	**2**	**0**	**8**	**2**	**1**	**6**	**11**	**0**	**5**
	Regional Totals	**17**			**12**			**10**			**9**			**16**		

Source: UNC System Office, 2019; STEM Program Listings by CIP.
*UNC Chapel Hills's Health Informatics program has not been assigned a CIP, but will begin in Fall 2019.

Exhibit 4-17 displays the Health Science CIP codes offered through the UNC System, along with their associated occupational SOC codes. In many cases, CIPs are associated with multiple SOCs and vice versa. Note that this crosswalk references only occupations which require either an associate or bachelor's degree at the entry level.

EXHIBIT 4-17
HEALTH SCIENCE PROGRAM CIP-SOC CROSSWALK

Occupational Descriptor →			Dietitians and Nutritionists	Dietetic Technicians	Exercise Physiologists	Coaches and Scouts	Dental Hygienists	Medical and Health Services Managers	Radiation Therapists	Radiologic Technologists	Respiratory Therapists	Respiratory Therapy Technicians	Athletic Trainers	Clinical Laboratory Technologists and Technicians	Health Educators	Environmental Scientists and Specialists, Including Health	Occupational Health and Safety Specialists	Therapists, All Other	Recreational Therapists	Registered Nurses
	SOC Code		29-1031	29-2051	29-1128	27-2022	29-2021	11-9111	29-1124	29-2034	29-1126	29-2054	29-9091	29-2010	21-1091	19-2041	29-9011	29-1129	29-1125	29-1141
	Occupational Projections		179	31	40	1164	485	996	37	533	352	0	59	682	179	458	140	34	30	7754
CIP Code	CIP Title	Annual Degree Awards at Year																		
19.0501	Nutrition	38	✓	✓																
26.0908	Exercise Physiology	90			✓															
31.0501	Exercise Science	466				✓														
31.0504	Kinesiology	248				✓														
31.0505	Exercise Science	299			✓															
51.0602	Dental Hygiene/Hygienist	23					✓													
51.0701	Health/Health Care Administration/Management	989						✓												
51.0706	Health Information/Medical Records Administration/Administrator	29						✓												
51.0907	Medical Radiologic Technology/Science - Radiation Therapist	19							✓	✓										
51.0908	Respiratory Care Therapy/Therapist	37									✓	✓								
51.0913	Athletic Training/Trainer	21											✓							
51.1005	Clinical Laboratory Science/Medical Technology/Technologist	77												✓						
51.2201	Public Health	370						✓							✓					
51.2202	Environmental Health	90														✓	✓			
51.2206	Environmental Health and Safety	23															✓			
51.2207	Public Health Education and Promotion	555													✓					
51.2305	Music Therapy/Therapist	10																✓		
51.2309	Therapeutic Recreation/Recreational Therapy	193																	✓	
51.3101	Dietetics/Dietitian	208	✓	✓																
51.3801	Registered Nursing/Registered Nurse	3684																		✓

Source: CIP codes from UNC System Office, 2019; Crosswalk with SOC Codes developed via the U.S. Bureau of Labor Statistics.

Exhibit 4-18 provides a summary of projected degree awards at the 10-year horizon and associated occupational openings available to those entry level bachelor's degree candidates. In order to incorporate most occupations for which recent bachelor's graduates might apply, we have also chosen to include occupations for which an associate's degree is acceptable at the entry level. It is important to note when reviewing these data that the occupational openings are in no way cumulative. There is rarely a one-to-one correlation between degree awards and occupational openings. A graduate with a degree in Nutrition, for example, could be a qualified candidate for a number of occupational titles. Similarly, a job of Exercise Physiologists could be an appropriate position for graduates from several different degree programs. It's also important to remember that degree awards do not reflect an absolute pipeline that is guaranteed to produce candidates who enter the profession directly, immediately, or within North Carolina.

Finally, some CIP designations match only with occupational categories which are so broad they are screened out entirely. An occupational category, for example, which includes jobs requiring a different educational level than a bachelor's degree, or more experience than most recent bachelor's graduates already possess.

As a result, these comparisons shown in **Exhibit 4-18** should be understood as a broad summary of the occupational market (demand) and the UNC System's ability to meet the state's needs through production of qualified Health Science graduates (supply).

EXHIBIT 4-18
HEALTH SCIENCE SUPPLY/DEMAND GAP
OCCUPATIONAL OPENINGS VS. 10-YEAR DEGREE PROJECTIONS

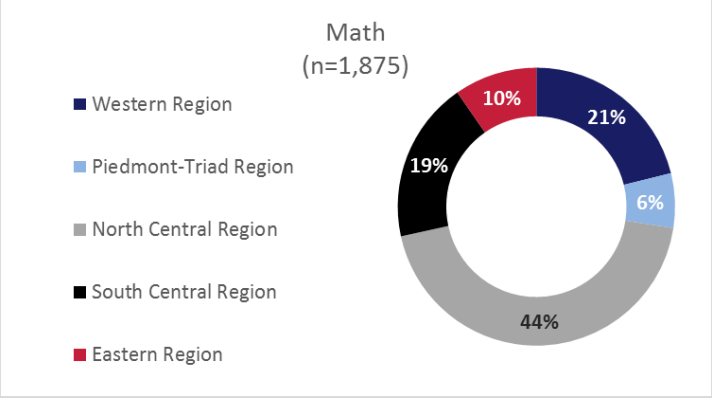
CIP	CIP Title	10-Year Degree Awards	Occupational Openings	Supply: Demand Ratio
51.3801	Registered Nursing/Registered Nurse	3,684	7,754	48%
51.0701	Health/Health Care Administration/Management	989	996	99%
51.2207	Public Health Education and Promotion	555	179	310%
31.0501	Exercise Science - Not found	466	1,164	40%
51.2201	Public Health	370	1,175	32%
31.0505	Exercise Science	299	40	741%
31.0504	Kinesiology	248	1,164	21%
51.3101	Dietetics/Dietitian	208	209	99%
51.2309	Therapeutic Recreation/Recreational Therapy	193	30	653%
26.0908	Exercise Physiology	90	40	223%
51.2202	Environmental Health	90	598	15%
51.1005	Clinical Laboratory Science/Medical Technology/Technologist	77	682	11%
19.0501	Nutrition	38	209	18%
51.0908	Respiratory Care Therapy/Therapist	37	352	10%
51.0706	Health Information/Medical Records Administration/Administrator	29	996	3%
51.2206	Environmental Health and Safety	23	140	17%
51.0602	Dental Hygiene/Hygienist	23	485	5%
51.0913	Athletic Training/Trainer	21	59	35%
51.0907	Medical Radiologic Technology/Science - Radiation Therapist	19	570	3%
51.2305	Music Therapy/Therapist	10	34	30%

Source: North Carolina Department of Commerce occupation data. Degree award projections were calculated based on UNC System historical degree award and applied to 10-year enrollment projections provided by institutions.
Notes: Annual occupational openings are derived by equally distributing total projected openings provided by the state across the time period (2017-2026).

MATH SUPPLY AND DEMAND ANALYSIS

Math is the smallest of the five STEM categories, with fewer than 2,000 enrollments across the UNC System, nearly half of which are at institutions in the North Central Region, as shown in **Exhibit 4-19**.

EXHIBIT 4-19
MATH ENROLLMENT* BY REGION, FALL 2018



* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

Math program enrollments increased almost 20% across the System between Fall 2014 and Fall 2018. Enrollment counts in Math programs increased most significantly in the North Central Region (an increase of 131 upper-division students or 19%), while the Piedmont-Triad Region demonstrated the strongest percentage growth (43, or 57%).

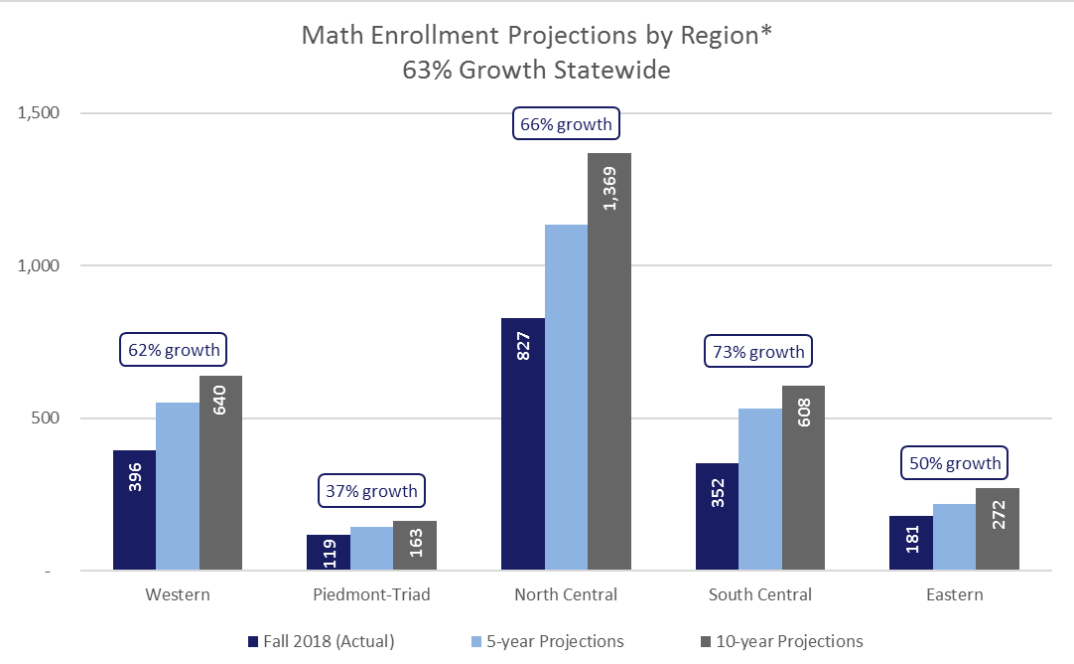
EXHIBIT 4-20
MATH ENROLLMENT* GROWTH BY REGION
FALL 2014 TO FALL 2018

Math	Fall 2014		Fall 2018		# change	% change
	#	%	#	%		
Western Region	315	20%	396	21%	81	26%
Piedmont-Triad Region	76	5%	119	6%	43	57%
North Central Region	696	44%	827	44%	131	19%
South Central Region	329	21%	352	19%	23	7%
Eastern Region	161	10%	181	10%	20	12%
Math Group Subtotal	**1,577**	**100%**	**1,875**	**100%**	**298**	**19%**

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

As shown in **Exhibit 4-21**, the System projects 63% growth in Math program enrollments over the next ten years across the state, but growth rates vary somewhat by region. The most significant growth is predicted in the South Central Region (73%), while the most modest growth is anticipated in the Piedmont-Triad (37%). The North Central Region has the largest share of Math enrollments, and that is anticipated to continue into the next decade.

EXHIBIT 4-21
MATH FALL 2018 ENROLLMENTS AND 5-YEAR & 10-YEAR PROJECTIONS BY REGION



* STEM enrollment figures include only upper division first majors.

Source: Fall 2018 enrollment data provided by the UNC System, five-year and ten-year projections provided by institutions.

Math is an available major at every System institution in the study, and Math programs are fairly well distributed across the state, as shown in **Exhibit 4-22**. Between four and six programs are offered in each Region of the study.

EXHIBIT 4-22
MATH PROGRAM DISTRIBUTION

CIP	Program Description	Western			Piedmont-Triad			North Central			South Central			Eastern		
		ASU	UNC-A	WCU	NCA&T	UNC-G	WSSU	NCCU	NCSU	UNC-CH	FSU	UNC-P	UNC-C	ECU	ECSU	UNC-W
27.0101	Mathematics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
27.0301	Applied Mathematics, General				✓				✓	✓						
27.0501	Statistics, General								✓							✓
27.9999	Mathematics and Statistics												✓			
52.1301	Management Science												✓			
52.1304	Actuarial Science	✓														
52.1701	Insurance	✓														
	Institution Totals	**3**	**1**	**1**	**2**	**1**	**1**	**1**	**3**	**2**	**1**	**1**	**3**	**1**	**1**	**2**
	Regional Totals	**5**			**4**			**6**			**5**			**4**		

Source: UNC System Office, 2019; STEM Program Listings by CIP.

Exhibit 4-23 displays the Math CIP codes offered through the UNC System, along with their associated occupational SOC codes. In many cases, CIPs are associated with multiple SOCs and vice versa. Note that

this crosswalk references only occupations which require either an associate or bachelor's degree at the entry level. CIP 27.9999 was not associated with any SOC codes at either the associate or bachelor's levels.

EXHIBIT 4-23
MATH PROGRAM CIP-SOC CROSSWALK

Occupational Descriptor →			Insurance Underwriters	Actuaries	Operations Research Analysts	Secondary School Teachers, Except Special and Career/Technical Education
		SOC Code	13-2053	15-2011	15-2031	25-2031
		Occupational Projections	162	32	238	1901
CIP Code	CIP Title	Annual Degree Awards at Year				
52.1701	Insurance	144	✓			
27.0101	Mathematics	574				✓
52.1304	Actuarial Science	25	✓	✓		
27.0301	Applied Mathematics	295		✓		
27.0501	Statistics	101		✓		
27.9999	Mathematics and Statistics	54				
52.1301	Management Science	34			✓	

Source: CIP codes from UNC System Office, 2019; Crosswalk with SOC Codes developed via the U.S. Bureau of Labor Statistics.

Exhibit 4-24 provides a summary of projected degree awards at the 10-year horizon and associated occupational openings available to those entry level bachelor's degree candidates. In order to incorporate most occupations for which recent bachelor's graduates might apply, we have also chosen to include occupations for which an associate's degree is acceptable at the entry level. It is important to note when reviewing these data that the occupational openings are in no way cumulative. There is rarely a one-to-one correlation between degree awards and occupational openings. A graduate with a degree in Mathematics and Statistics, for example, could be a qualified candidate for a number of occupational titles. Similarly, a job of Insurance Underwriter could be an appropriate position for graduates from several different degree programs. It's also important to remember that degree awards do not reflect an absolute pipeline that is guaranteed to produce candidates who enter the profession directly, immediately, or within North Carolina.

Finally, some CIP designations match only with occupational categories which are so broad they are screened out entirely. An occupational category, for example, which includes jobs requiring a different educational level than a bachelor's degree, or more experience than most recent bachelor's graduates already possess.

As a result, these comparisons shown in **Exhibit 4-24** should be understood as a broad summary of the occupational market (demand) and the UNC System's ability to meet the state's needs through production of qualified Math graduates (supply).

EXHIBIT 4-24
MATH SUPPLY/DEMAND GAP
OCCUPATIONAL OPENINGS VS. 10-YEAR DEGREE PROJECTIONS

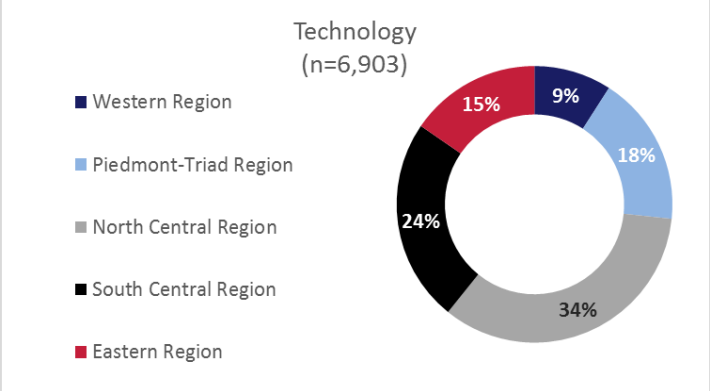
CIP	CIP Title	10-Year Degree Awards	Occupational Openings	Supply: Demand Ratio
27.0101	Mathematics	574	1,901	30%
27.0301	Applied Mathematics	295	32	919%
52.1701	Insurance	144	162	89%
27.0501	Statistics	101	32	314%
52.1301	Management Science	34	238	14%
52.1304	Actuarial Science	25	194	13%

Source: North Carolina Department of Commerce occupation data. Degree award projections were calculated based on UNC System historical degree award and applied to 10-year enrollment projections provided by institutions.
Notes: Annual occupational openings are derived by equally distributing total projected openings provided by the state across the time period (2017-2026).

TECHNOLOGY SUPPLY AND DEMAND ANALYSIS

Of the nearly 7,000 Technology enrollments in the System in Fall 2018, the largest share (34%) were enrolled in the North Central Region, as shown in **Exhibit 4-25.**

EXHIBIT 4-25
TECHNOLOGY ENROLLMENT* BY REGION, FALL 2018



* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

The Technology category evidenced the strongest growth over the last five years of the five STEM categories. Technology program enrollments among juniors and seniors increased 44% since Fall 2014 across the System. While enrollments increased in every region, the count increases were most significant in the North Central Region (an increase of 625 upper-division students or 36%), while the Piedmont-Triad Region demonstrated the strongest percentage growth (486 enrollments, or a 62% increase).

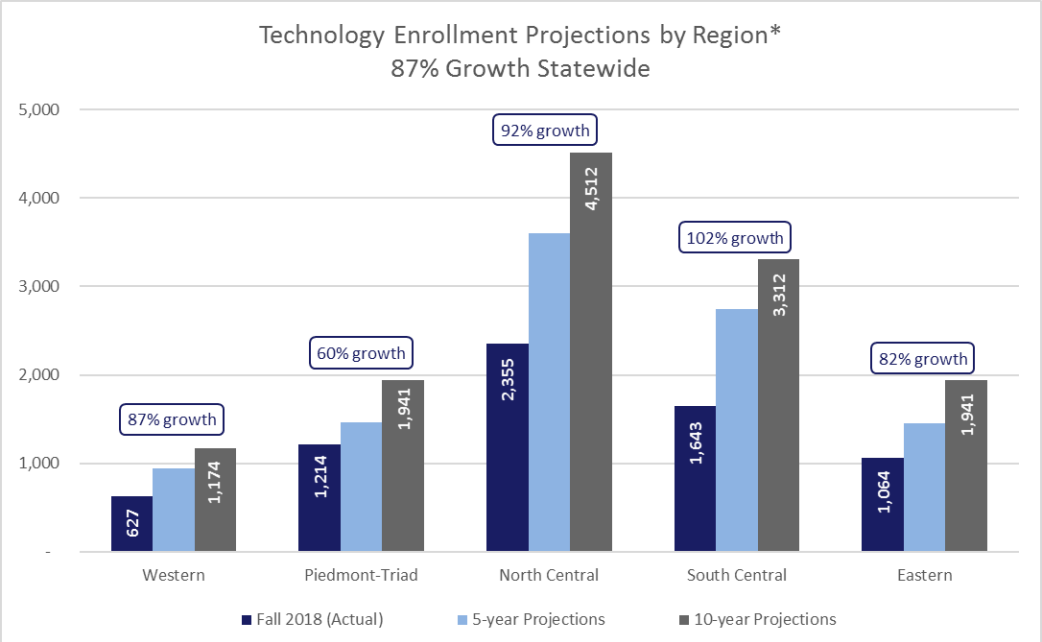
EXHIBIT 4-26
TECHNOLOGY ENROLLMENT* GROWTH BY REGION
FALL 2014 TO FALL 2018

Technology	Fall 2014		Fall 2018		# change	% change
	#	%	#	%		
Western Region	448	9%	627	9%	179	40%
Piedmont-Triad Region	728	15%	1,214	18%	486	67%
North Central Region	1,730	36%	2,355	34%	625	36%
South Central Region	1,034	22%	1,643	24%	609	59%
Eastern Region	856	18%	1,064	15%	208	24%
Technology Group Subtotal	**4,796**	**100%**	**6,903**	**100%**	**2,107**	**44%**

* STEM enrollment figures include only upper division first majors.
Source: UNC System Office, 2019.

As shown in **Exhibit 4-27**, the System projects 87% growth in Technology program enrollments over the next ten years across the state, but growth rates vary somewhat by region. The most significant growth is predicted in the South Central Region (102%), while the most modest growth is anticipated in the Piedmont-Triad (60%). The North Central Region has the largest share of Tech enrollments, and that is anticipated to continue into the next decade.

EXHIBIT 4-27
TECHNOLOGY FALL 2018 ENROLLMENTS AND 5-YEAR & 10-YEAR PROJECTIONS BY REGION



* STEM enrollment figures include only upper division first majors.
Source: Fall 2018 enrollment data provided by the UNC System, five-year and ten-year projections provided by institutions.

The majority of Technology program offerings are available in the Piedmont-Triad Region (as shown in **Exhibit 4-28**), primarily through NC A&T (six program options).

EXHIBIT 4-28
TECHNOLOGY PROGRAM DISTRIBUTION

CIP	Program Description	Western			Piedmont-Triad			North Central			South Central			Eastern		
		ASU	UNC-A	WCU	NCA&T	UNC-G	WSSU	NCCU	NCSU	UNC-CH	FSU	UNC-P	UNC-C	ECU	ECSU	UNC-W
11.0103	Information Technology				✓		✓					✓	✓	✓		✓
11.0199	Computer Science and Business							✓								
11.0401	Information Science/Studies						✓			✓				✓		
11.0701	Computer Science	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
11.0803	Computer Graphics															✓
11.0901	Computer Systems Networking and Telecommunications				✓	✓										
13.1303	Business Education – Information Technology				✓											
45.0601	Data Science*				✓											
49.0101	Aviation Science/Unmanned Aircraft Systems													✓		
52.0201	Management Information Systems				✓											
52.1201	Information Systems and Business Analytics	✓		✓							✓			✓		
	Institution Totals	**2**	**1**	**2**	**6**	**2**	**3**	**1**	**1**	**2**	**2**	**2**	**2**	**5**	**1**	**3**
	Regional Totals	**5**			**11**			**4**			**6**			**9**		

Source: UNC System Office, 2019; STEM Program Listings by CIP.
*Data Science is a new program to be offered at NC A&T, which is not currently available.

Exhibit 4-29 provides a summary of projected degree awards at the 10-year horizon and associated occupational openings available to those entry level bachelor's degree candidates. It is important to note when reviewing these data that the occupational openings are in no way cumulative. There is rarely a one-to-one correlation between degree awards and occupational openings. A graduate with a degree in Computer Science, for example, could be a qualified candidate for a number of occupational titles. Similarly, a job of Computer Systems Analyst could be an appropriate position for graduates from several different degree programs. It's also important to remember that degree awards do not reflect an absolute pipeline that is guaranteed to produce candidates who enter the profession directly, immediately, or within North Carolina.

Finally, some CIP designations match only with occupational categories which are so broad they are screened out entirely. An occupational category, for example, which includes jobs requiring a different educational level than a bachelor's degree, or more experience than most recent bachelor's graduates already possess.

As a result, these comparisons shown in **Exhibit 4-29** should be understood as a broad summary of the occupational market (demand) and the UNC System's ability to meet the state's needs through production of qualified Technology graduates (supply).

EXHIBIT 4-29
TECHNOLOGY SUPPLY/DEMAND GAP
OCCUPATIONAL OPENINGS VS. 10-YEAR DEGREE PROJECTIONS

CIP	CIP Title	10-Year Degree Awards	Occupational Openings	Supply: Demand Ratio
11.0701	Computer Science	2,634	5,993	44%
45.0601	Data Science (Economics)	676	2,463	27%
52.1201	Management Information Systems, General	355	432	82%
11.0103	Information Technology	294	6,280	5%
11.0401	Information Science/Studies	263	1,157	23%
11.0901	Computer Systems Networking and Telecommunications	188	3,036	6%
13.1303	Business Education – Information Technology	43	1,040	4%
52.0201	Management Information Systems	37	8,448	0%
11.0803	Computer Graphics	27	1,323	2%
11.0101	Data Science (new program)	-	3,672	0%

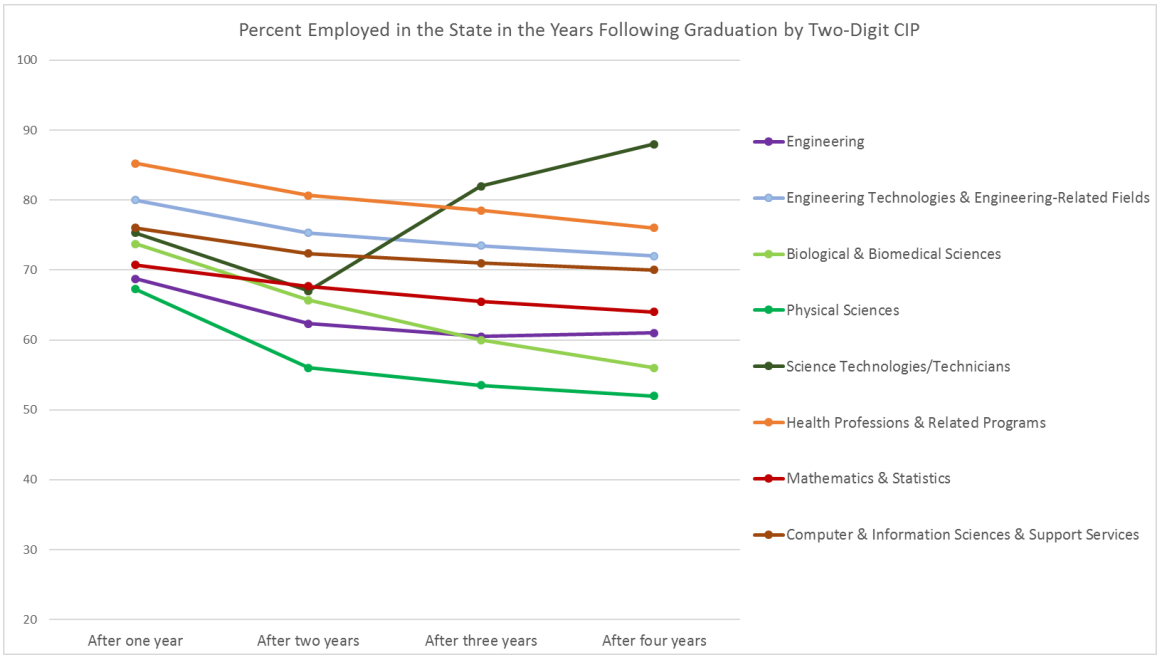
Source: North Carolina Department of Commerce occupation data. Degree award projections were calculated based on UNC System historical degree award and applied to 10-year enrollment projections provided by institutions.
Notes: Annual occupational openings are derived by equally distributing total projected openings provided by the state across the time period (2017-2026).

Data available through NC Tower, and shown in **Exhibit 4-30** report the rates with which recent UNC System bachelor's degree recipients remain employed in the state following graduation. The data are aggregated at the two-digit CIP level and so, are broadly generalizable to that level of discipline groupings. A few STEM programs with CIPS in non-STEM categories (like business) would not fall into any of the categories displayed below.

The estimated employment retention rates are derived from U.S. Census American Community Survey data, and include four annual points in time beyond graduation as the metric.

There are multiple reasons why a UNC System graduate might not be employed at any of the four annual time points including; pursuit of additional education, employment out of state, unemployment status (including taking time away from the workforce for family obligations). Furthermore, the data do not distinguish between persons employed in-state in STEM vs. non-STEM occupations.

EXHIBIT 4-30
EMPLOYMENT IN STEM IN NC FOLLOWING GRADUATION



Source: NC Tower, 2019.

5.0: SUMMARY OF FINDINGS

This final chapter of the STEM Needs Assessment study report highlights key findings and relevant information that was collected by the consultant team related to current versus projected expansion of STEM undergraduate enrollments across the UNC System. It is intended to inform and support further System review and analysis of STEM related physical space capacity needs, related support needs, operational efficiencies, and capital resource requirements, given the finite nature of the latter.

Our team has compiled and reviewed a significant amount of STEM related data and institutional input across the System and the state as it relates to program capacity, access and supply. Key findings are presented: (1) with a System-wide perspective, (2) by region-based on Prosperity Zone boundaries and UNC institution location as defined elsewhere in this report, or (3) by the five STEM category groupings of Engineering, Hard Science (Physical Science), Health Science, Math, and Technology.

Finally, we offer our observations of issues or areas of concern that may require further review by System officials and institutional leaders which may in turn, lead to improved STEM program capacities and resource allocations.

KEY FINDINGS:

It is well documented that STEM industries are a significant contributor to the nation's economic well-being, and that is clearly the case for North Carolina's economy.

- The State of North Carolina is duly recognized as a prime location for STEM related industries and employment opportunities, and thus producing the skilled workforce to meet those needs. The UNC System's reputation is a key factor of economic growth resulting in this national status.
- Across the U.S., STEM employment is predicted to grow more quickly (10.8%) than employment as a whole (7.4%) through 2026. In addition, STEM workers enjoy a significant wage advantage, earning 29% to 39% more per hour than their non-STEM counterparts, depending upon education level.
- In 2015, STEM positions accounted for 6.2% of all job openings across the U.S. In North Carolina, a number of areas offer employment opportunities that meet or exceed that share, including Durham-Chapel Hill (13.1%) Raleigh (10.3%), and Charlotte (6.4%). In addition, Wilmington (5.4%) and New Bern (5.3%) host substantial shares of STEM jobs, as compared to total jobs.

As a natural result of these trends across the country and North Carolina's reputation as a leader in STEM industry sectors, the UNC System, as requested by the Legislature, has undertaken this assessment of its current and future STEM offerings and capacities. The following bullets reflect the current situation and future opportunities identified by institutional stakeholders through the process of this study.

- As of Fall 2018, undergraduate STEM enrollments (upper division majors) across the System were approximately 40,500.

- Over the last five academic years (2014-2018), the UNC System has increased STEM undergraduate upper division majors by approximately 6,100, a growth rate of 17.8%. For the most part, institutional commentary shared with the consulting team, indicates the existence of current capacity issues based on that historical five-year growth in STEM enrollments.
- During the study period, the System office and the consultant team identified nearly 270 undergraduate STEM programs across 15 UNC institutions for this analysis. Roughly one-third (90) of the STEM programs were associated with the Hard Sciences, while Technology (36) and Math (24) were the fewest in number. Health Sciences (64) and Engineering (55) round out the STEM program distribution.
- Cumulative projections of STEM enrollment growth (upper division majors) across the UNC System approximates a 22,500 headcount increase in majors, or a 55% growth rate over the next 10 years. Institutions provided their best estimate of undergraduate enrollments, along with a number of caveats or contingencies (classroom facilities, lab space, faculty capacity, research opportunities and additional operating or capital resources) that need to be addressed in order to realize their 10-year targets. The consultant team recognizes that not all resource needs required to achieve such lofty undergraduate STEM targets will likely be accommodated in full, but does acknowledge the projections as optimistic and desirable goals.
- When further breaking those 10-year projections down by STEM categories across the System, Health Sciences would lead the way with an increase of roughly 6,600 majors (+62%), Technology would be close behind with an additional 6,000 majors (+87%), Hard Science would grow by 5,100 enrollments (+45%), and Engineering would gain nearly 3,500 (+36%), while Math is expected to add only 1,200 majors, a resulting growth rate of 63%.
- For analysis purposes, we collapsed the State's eight Prosperity Zones into five geographic regions to examine STEM supply and demand. STEM program distribution across the regions ranged from the fewest (44 programs) in the South Central Region to the most (66) concentrated in the North Central region.
- Between 14% and 32% of System STEM enrollments come from each of the five regions designated in the study (three System institutions are located within each region). The Western and Piedmont-Triad regions each comprise 14% of STEM enrollments, and the South Central and Eastern regions each comprise 20% of such enrollments, while North Central enrollments constitute approximately 32% of all UNC System STEM undergraduate enrollments (upper division majors). The North Central Region is home to NC State, NC Central, and UNC Chapel Hill. While the distribution generally reflects the population density across North Carolina, those students residing in the far western and far eastern sectors of the state have more limited options for pursuing STEM degree programs, if they are unable to relocate to attend school elsewhere.
- Geographic concentrations (largest number of programs in region) included: Health Sciences and Hard Sciences in both the Western and Eastern regions, Engineering and Hard Sciences in the

North Central region, and Hard Sciences in the South Central region. The Piedmont-Triad Region had a more distributive mix across four STEM categories with the exception of Math (lowest).

- In Fall 2018, undergraduate Biology programs enrolled the most STEM majors (upper division) across the UNC System, constituting 15% of STEM enrollments. They were followed by Nursing/BSN (13%), and Computer Science (10%), each having between 4,000 to 6,000 upper division enrollments. Additionally, these three programs are among the five projected to grow the most in terms of headcount over the next ten years, along with Health Care Administration and Public Health. Each of these five STEM programs are projected to add between 1,000 to 4,000 enrollments into the System over the coming decade.
- With the exception of NC A&T, the HBCUs have experienced far more limited undergraduate STEM enrollment growth since 2014 than most of the other System institutions. Single digit growth at NC Central (7%), stagnant enrollment at FSU (0%), and declines at WSSU (-16%) and ECSU (-33%) indicate that support from the System may be warranted in order to make STEM opportunities more readily available to their students**.** Across all 15 institutions, only NC State STEM enrollments show a similar limited growth pattern, and the institution leadership indicate that pattern was planned. Improved STEM program access and enrollment at HBCUs in the System are particularly critical to students of color, especially since more than half of the African American students enrolled in the System attend an HBCU (and nearly one-third are attending one of the four HBCUs struggling with STEM enrollment growth).
- Every one of the fifteen UNC System institutions included in the study offer baccalaureate degree programs (considered STEM) in one or more of the basic physical sciences of Biology, Chemistry, or Physics, as well as Math. These programs are primarily driven by the typical general education science and math requirements of lower division degree seeking undergraduates. However, from that point on, the STEM program distribution and specialization options are far less uniform which may be a limiting factor for place-bound students.
- Projected 10-year undergraduate STEM enrollment growth (majors) across the individual UNC institutions ranges from a high of 5,600 at UNC-Charlotte to a very small expansion of approximately 200 additional STEM majors at UNC Asheville. Five institutions anticipate adding between 1,500 to 2,000 STEM majors, while UNC Chapel Hill expects they could add just over 4,000 in 10 years.
- The disparity of access is more acute in some regions for some STEM categories. For example, the Western Region enrolls the smallest shares of Technology and Engineering students in the System. As a result, students from that region who are interested in those STEM fields, but who are unable to relocate to pursue a degree have more limited opportunities. This being said, institutions in the Western Region project their most significant STEM program growth in the Technology and Engineering categories (87% and 72%, respectively).

- Three quarters of the 55 undergraduate Engineering programs in the System are offered at three institutions: NC State, NC A&T, and UNC Charlotte. The Western and Eastern regions have only five programs each, and all but four are housed at either WCU or ECU.
- Within the Technology STEM grouping, every institution has some form of Computer Science program, 32 in all across the system (led by NC A&T with 6). However, eleven institutions have two or fewer undergraduate programs designated as a Technology discipline. Ten-year enrollment growth projections for Technology programs are quite high (82% to 102%) across four of the five regions. More modest growth (62%) is predicted in the Piedmont-Triad region, home to NC A&T.
- While all five regions project increases in their overall population over the next 20 years, two regions project degreases in the traditional 18-24 year old college-going age cohort (Piedmont-Triad and Western) which may impact their overall pipeline for undergraduate enrollments.

Twelve of the 15 System institutions offer at least one **Nursing** program, and these programs present unique challenges. In addition, the Registered Nursing field offers the most substantial occupational openings in every region of the state, in many cases dwarfing the next largest industry/occupation need. Consequently, we present the following observations relative to that particular discipline.

- Nearly all UNC System institutions have an undergraduate nursing program (approximately 5,100 upper division enrollments in Fall 2018), yet the cumulative System output (BSN degree awards) by far, does not meet the annual demand (occupational openings through 2026) across the state. Program expansion based on institution provided projections, is anticipated to add 1,031 additional enrollments (upper division majors) in nursing programs in five years and that would grow by an additional 693 ten years out (for a total of 1,724 additional enrollments, a 34% growth rate, over the Fall 2018 count). However, several factors may work against achieving such enrollment increases (growth at five year and 10 year beyond Fall 2018 Nursing majors).
- Many students enter an institution with a desire or goal to complete a four-year degree in nursing, yet admission into those programs is quite competitive. Furthermore, the academic pathway to enter and complete is extremely difficult. Retention and completion rates for nursing programs are extremely high, but could be negatively impacted by aggressive program expansion without consideration for the quality of the basic sciences curriculum as well.
- Rigorous accreditation requirements impact faculty/student ratios, space needs, instructional equipment (particularly simulation technology), and support staff. However, most problematic is the growing competition (and potential fees) for limited numbers of required clinical experience slots in areas adjacent to each program.
- Leadership at Winston-Salem State University noted several examples of creative and efficient approaches to these challenges raised above, including the use of mobile clinics to serve as practicum sites and simultaneously provide health care to communities in need. Upgrades to instructional equipment (simulation) may provide additional capacity and efficiency to program delivery.

REGIONAL DIFFERENTIATION:

WESTERN REGION

- Biology, Nursing, Management Information Systems, and Computer Science are expected to constitute the largest shares of STEM enrollments (reaching between 500 and 1,200 students in each program in the next 10 years).
- As noted earlier, undergraduate Engineering academic options are fairly limited in the Western part of the state, with only seven available programs located at Western Region institutions. This region does offer 18 Hard Science programs. More Health Science program options are available in the Western Region than anywhere else in the state (Eastern has 16), with 17 programs offered primarily through App State and Western Carolina. Five Math programs are available, while five Technology programs are available in the Western Region.
- Nursing positions dominate the projected openings across North Carolina through 2026, including in the Western Region. Other Top 20 STEM focused annual occupational openings across this region with significant need include; four other health related professions, three engineering fields and construction management.

PIEDMONT-TRIAD REGION

- Programs in Biology, Nursing, Computer Science, and Kinesiology are expected to constitute the largest shares of STEM enrollments (reaching between 500 and 1,400 students in each program in 10 years).
- The Piedmont-Triad Region offers substantial Engineering academic options with 14 available programs located in the Region, although all are offered only through NC A&T. This region offers the most limited number of Hard Science programs in the state (10). Twelve Health Sciences programs are available in the Piedmont-Triad Region, with four Math programs also available. Technology programs are most prevalent in this region, with 11 programs offered, primarily at NC A&T.
- As with the rest of the state, Nursing positions comprise the bulk of anticipated occupational openings in the Piedmont-Triad Region. Other Top 20 STEM focused annual occupational openings across this region with significant need include four other health related professions, three engineering fields and construction management, and two technology/IT related occupations.

NORTH CENTRAL REGION

- Based on institutional projections, Biology, Computer Science, Mathematics, Financial Informatics, Mechanical Engineering and Neuroscience are expected to constitute the largest shares of STEM majors (enrolling between 800 and 3,000 students in each program in 10 years).
- Engineering academic options are most prevalent in the North Central region, with 18 available programs located at the three local institutions. Similarly, this region offers the largest number of Hard Sciences programs (28). Ten Health Science programs are available in the North Central Region,

all at NC Central or UNC Chapel Hill. Six Math programs are available in this region. Technology programs are least prevalent in this region, with only four programs available at these three institutions.

- Among the Top 20 STEM focused annual occupational openings across this region with significant need through 2026, Nursing again leads the openings, but close behind is Software Applications Developers. Additionally, this Top 20 group includes four engineering and construction management, and three other technology/IT categories.

SOUTH CENTRAL REGION

- Computer Science, Health Care Administration, Exercise Science, Biology are expected to constitute the largest shares of STEM enrollments (reaching between 1,100 and 3,000 students in each program in 10 years). In 2018, most of the employment opportunities in the region were in the areas of health care and social assistance, retail trade, manufacturing, and accommodation and food services.
- Engineering academic options are somewhat limited in the South Central region, with nine available programs located at the three South Central Region institutions. The region offers 15 Hard Science programs, and nine Health Sciences programs, the latter being fewest in the state. Most of these programs are offered at UNC Charlotte. Five Math programs are available in this region. Six Technology programs are also available in the South Central Region.
- Nursing leads the STEM related annual occupational openings in the South Central Region through 2026, but several other categories project over 1,000 annual openings. Top 20 STEM focused annual occupational openings across this region with significant need include four other health related occupations, two technology/IT occupations, and three engineering fields and construction management.

EASTERN REGION

- Nursing, Biology, Public Health, and Industrial Technology are expected to constitute the largest shares of STEM majors (enrolling between 1,000 and 3,000 in each program in 10 years).
- Engineering academic options are fairly limited in the Eastern region, with only seven available programs located at the three Eastern Region institutions. The region offers 19 Hard Science programs. Sixteen Health Science program options are available in the Eastern Region, primarily through East Carolina. None are offered at Elizabeth City State University. Four Math programs are available in this region. The Eastern Region offers nine Technology programs, the second largest program count in the state.
- As with North Carolina's other five regions, Nursing positions dominate the projected openings from 2018 through 2026 in the Eastern Region. Other Top 20 STEM focused annual occupational openings across this region with significant need include four other health related professions, three engineering fields and construction management.

POINTS FOR UNC SYSTEM CONSIDERATION

DATA CONSISTENCY ISSUES:

- It should be noted that the System gives its institutions some latitude in defining their STEM program CIPs, which resulted in some inconsistencies across the data set. This presented challenges aligning similar programs across the state, some of which shared similar names and descriptions, but different CIPS, or vice-versa. The consulting team worked with the System data team to minimize any inconsistencies. For future reference, in order to provide for a cleaner understanding of program distribution and capacities within disciplines, the System may want to encourage more consistency and uniformity in the classification of STEM programs at the institution level.
- Additionally, alignment of STEM program production to occupational capacity and vice-versa is a complex process and more often than not, a less than perfect representation of supply vs. demand. Program (CIP codes) and market occupations (SOC codes) are not typically a clean one-to-one correspondence. Many CIP programs could supply a single SOC, and many SOCs could utilize degree recipients from the same CIP program. Particularly problematic are occupations that do not require a STEM degree, per se, but do attract qualified candidates who have earned a STEM degree. For example, an entry level management position with a pharmaceutical company may not require a health science degree, but such a credential may make a candidate more attractive. Using an established crosswalk system reduces some of the variance and overlap, but caution should be exercised when attempting to draw conclusions of under- or over-supply without acknowledging the multiple pathways between degree/credential and job opportunities.

APPROACH TO PROGRAM PLACEMENT:

- Distribution of STEM programs and capacity across the System can and should be influenced by a variety of internal and external factors both historical and emerging. Two somewhat competing "need-based" perspectives were encountered by the consultant team during discussions with institutional representatives:

  - Some advocate introduction or expansion of STEM programs in geographic markets based on where corresponding industry and job opportunities are prevalent.
  - Others advocate for introduction of selected STEM programs from a student access philosophy bringing such programs to areas where significant population segments cannot relocate to attend traditional host institutions.

  All institutional leaders acknowledge resources to improve access or balance STEM supply and demand pressures across the state are not unlimited. However, they caution against an "either/or" solution. A balance of both approaches is paramount to supporting economic competitiveness and responding to workforce needs well into the future. Opportunities for efficiencies and sharing of programmatic resources are already in place between some institutions and programs, and could be expanded to address additional regional access disparities.

- In general, institutional leaders recognize that initiating new programs requires significant investment in both time and resources. So, they have been strategic in the new STEM programs which they have proposed, often aligning them with existing programs at other institutions in the System.
- Leaders did not advocate a complete duplication of programming across all regions. Rather, they suggest that strategic decisions on program placement be made with both resources and student needs in mind. Some suggested that while they need not "own" their academic disciplines, it would not necessarily be cost effective for the System to independently replicate programs at sites where they do not currently exist. They encourage collaboration and "out of the box" thinking to expand access while relying on established STEM programs.

PROGRAM ACCESS EQUITY:

- While STEM programs are available across the state, access issues are more acute in some regions for some disciplines (e.g., limited programming options for students interested in Technology and Engineering in the Western region). A number of institutions plan to expand programs to offer greater access to students over the next ten years. The System is encouraged to support planned growth efforts to provide greater access to programming in selected disciplines to those regions which are more isolated from urban centers. Students from these areas may not have the financial flexibility to relocate to pursue an education, so efforts should be made to leverage existing program expertise in other regions through the use of distance education and technologies to provide opportunities to more remote parts of the state.
- In addition to geographic disparities, the consultant team noted that STEM program options were more limited at most HBCUs in the System, and that some of these institutions have had difficulties growing STEM enrollments in recent years. Given that more than half of the African American students enrolled in UNC institutions are students at HBCUs, more supports from the System may be warranted to make more STEM opportunities available to those students**.**

PHYSICAL CAPACITY CONCERNS:

- A common concern during our campus visits and conversations was the lack of adequate classroom, lab, and faculty office space. Most institutions believe their facilities constrain their ability to increase enrollments. While many indicated that more classrooms are needed overall, of particular concern was classroom and other instructional space to house expanded STEM programs. Often the desire was simply for larger spaces, or ones configured for flexibility. Small group discussions and team engagements are becoming standard learning practices for today's students, and existing classrooms with traditional static lecture halls are not designed to easily facilitate those activities.
- Current STEM lab space is already at a premium on many campuses. Additional enrollment growth will inevitably tax the existing physical resources of the institutions. Some STEM programs will require additional specialized lab space even to adequately maintain the status quo, and cannot be shared interchangeably with other programs even within the same STEM category. Some STEM-related programs are so unique they require specially dedicated instructional/lab space (e.g., avionics, coastal/marine science, and virtual reality programs).

- In some cases, outdated buildings are problematic. Stakeholders at a number of institutions noted that "new equipment still looks old when it's in a dated facility." Some believed that infrastructure updates would be more costly than building new for some STEM spaces. The consultant team was reminded in several stakeholder meetings that the cost of specialized instructional spaces can vary widely depending on a number of factors, including program type, size, infrastructure needs, and geographic location.
- On occasion, stakeholders expressed interest in acquiring/developing off-campus space which would meet a specific need. Faculty at UNC Charlotte, for example, indicated that spaces needed for some engineering programs does not conform to state building standards, and that it would be cheaper to build or acquire warehouse/garage style facilities to solve this issue. They need concrete flooring, good lighting, and plenty of outlets with room for large equipment. They noted that a nearby abandoned big box store would be ideal for their use, with parking readily available. In another example, ECSU owns 15 acres of land at the local airport, but has no building on the property. Development of an on-site facility would allow aviation science and unmanned drone classes to go inside after demonstrations to continue discussions.

FACULTY/STAFFING CONCERNS

- Strength of faculty lines and limited start-up funds available to recruit promising faculty candidates was also cited as a challenge, particularly at HBCUs and more rural campuses. These institutions often struggle to secure outstanding faculty who can receive better compensation packages (both financially and in terms of research and office space) at other institutions.
- It is a challenge to attract quality faculty when institutions are competing within the system, and the struggle is particularly acute in STEM disciplines. Research stipends and release time for research and adequate lab space varies across the System. Initiation and/or expansion of programs will be, in large part, driven by the ability of each institution to recruit and retain strong faculty in a highly competitive marketplace. In addition, there exists a need for support staff depending on how quickly a program intends to grow – including instructional, research, and administrative personnel.
- To remain competitive with faculty candidates, institutions must ensure that faculty will have reasonable enrollment levels in their programs.
- Faulty will be asked to teach at both the undergraduate and graduate level at most institutions, so this should be of concern when recruiting faculty. UNC Wilmington is a good example, with their new emphasis on graduate program growth. They are seeking STEM-related faculty to enhance their research portfolio at the graduate level but with undergraduate teaching and research responsibilities as well. Part of their recruitment efforts are to provide research stipends for new faculty and appropriate laboratory access, both being problematic given the limited financial resources and already high demand for lab utilization.
- The significant growth in projected STEM enrollments across most institutions will likely drive the need for additional faculty lines which have implications for budget increases.

In conclusion, while every effort was made by the institutions to present realistic STEM enrollment projections, the consultant team acknowledges that projecting these counts five and ten years in the future without a definitive awareness of funding and resources which might be available is difficult, at best. That being said, the magnitude of projected growth in STEM enrollments exceeds the historical patterns at most institutions, which prompts the reader to consider those projections with caution. Though most institutions attempted to be conservative in their estimates, much is dependent on market trends and budgetary decisions, and therefore may be overly optimistic.

Given the reputation and nature of STEM-related industries and STEM education across the state of North Carolina, it is imperative for UNC System institutions to advance access to, and outcomes of, corresponding instructional programs at the undergraduate and graduate level. Projected STEM enrollment expansion identified in the study should move the System in the appropriate direction, but this will require strategic allocation of resources and implementation of new and collaborative efficiencies across institutions.

The findings and conclusions of this effort related to future STEM enrollments and distribution are meant to inform the next step in this process – a detailed identification of needed STEM-related space and capital resources.

The MGT Consulting Group team would like to express their gratitude to the many UNC System staff and institutional stakeholders who planned and participated in interviews, provided and confirmed data, and offered candid feedback throughout this study. Given the magnitude of the study's scope and timing of our requests (coming at the end of the academic year), your cooperation and persistence in providing accurate data and thoughtful insight was greatly appreciated. The assistance of many made this report possible.

APPENDIX A: UNC SYSTEM STEM PROGRAM LIST

EXHIBIT A-1
LIST OF UNC SYSTEM UNDERGRADUATE STEM PROGRAMS
FALL 2018

STEM Category	CIP	CIP Title
Engineering	TBA	Coastal Engineering
	04.0401	Environmental Design in Architecture
	14.0101	Engineering, General
	14.0201	Aerospace, Aeronautical and Astronautical/Space Engineering
	14.0301	Biological/Agricultural Engineering
	14.0401	Architectural Engineering
	14.0501	Bioengineering and Biomedical Engineering
	14.0701	Chemical Engineering
	14.0801	Civil Engineering, General
	14.0901	Computer Engineering, General
	14.1001	Electrical and Electronics Engineering
	14.1401	Environmental/Environmental Health Engineering
	14.1801	Materials Engineering
	14.1901	Mechanical Engineering
	14.2301	Nuclear Engineering
	14.2701	Systems Engineering
	14.2801	Textile Sciences and Engineering
	14.3301	Construction Engineering
	14.3501	Industrial Engineering
	14.3801	Geomatics
	15.0000	Engineering Technology, General
	15.0201	Civil Engineering Technology/Technician
	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician
	15.0399	Electrical and Electronic Engineering Technologies/Technicians, Other
	15.0507	Sustainable Technology
	15.0612	Industrial Technology/Technician
	15.0613	Manufacturing Engineering Technology/Technician
	15.0805	Mechanical Engineering/Mechanical Technology/Technician
	15.1001	Construction Engineering Technology/Technician
	15.1301	Drafting and Design Technology/Technician, General
	15.9999	Engineering Technologies, Engineering Related Fields, Other

EXHIBIT A-1 (CONTINUED)
LIST OF UNC SYSTEM UNIVERSITY UNDERGRADUATE STEM PROGRAMS
FALL 2018

STEM Category	CIP	CIP Title
Hard Science	03.0103	Environmental Studies
	03.0104	Environmental Sciences
	03.0201	Natural Resource Conservation and Management
	26.0101	Biology/Biological Sciences, General - BA
	26.0102	Pharmaceutical Sciences
	26.0202	Biochemistry
	26.0301	Botany/Plant Biology
	26.0502	Microbiology, General
	26.0701	Zoology/Animal Biology
	26.0801	Genetics, General
	26.0908	Exercise Physiology
	26.1102	Biostatistics
	26.1201	Biotechnology
	26.1302	Marine Biology and Biological Oceanography
	26.1501	Neuroscience
	30.3301	Sustainability Studies (Pending BOG and SACSCOC approval)
	40.0401	Atmospheric Sciences and Meteorology, General
	40.0404	Meteorology
	40.0499	Atmospheric Sciences and Meteorology, Other
	40.0501	Chemistry, General - BA
	40.0510	Forensic Chemistry
	40.0601	Geology/Earth Science, General - BA
	40.0607	Oceanography, Chemical and Physical
	40.0801	Physics, General - BA
	40.9999	Physical Sciences, Other
	41.9999	Science Technologies/Technicians, Other
	43.0106	Forensic Science

EXHIBIT A-1 (CONTINUED)
LIST OF UNC SYSTEM UNIVERSITY UNDERGRADUATE STEM PROGRAMS
FALL 2018

STEM Category	CIP	CIP Title
Health Science	19.0501	Nutrition
	26.0908	Exercise Physiology
	31.0501	Exercise Science
	31.0504	Kinesiology
	31.0505	Exercise Science
	51.0201	Communication Sciences and Disorders, General
	51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist
	51.0602	Dental Hygiene/Hygienist
	51.0701	Health/Health Care Administration/Management
	51.0706	Health Information/Medical Records Administration/Administrator
	51.0904	Emergency Medical Technology/Technician (EMT Paramedic)
	51.0907	Medical Radiologic Technology/Science - Radiation Therapist
	51.0908	Respiratory Care Therapy/Therapist
	51.0913	Athletic Training/Trainer - BA
	51.1005	Clinical Laboratory Science/Medical Technology/Technologist
	51.2201	Public Health, General
	51.2202	Environmental Health
	51.2206	Environmental Health and Safety
	51.2207	Public Health Education and Promotion
	51.2305	Music Therapy/Therapist
	51.2309	Therapeutic Recreation/Recreational Therapy
	51.2310	Vocational Rehabilitation Counseling/Counselor
	51.3101	Dietetics/Dietitian
	51.3801	Registered Nursing/Registered Nurse
	TBA	Health Informatics
	51.0000	Integrated Heath Sciences
	51.0999	Allied Health Diagnostics, Health Intervention and Treatment Professions, Other
	51.9999	Health Professions and Related Clinical Services

EXHIBIT A-1 (CONTINUED)
LIST OF UNC SYSTEM UNIVERSITY UNDERGRADUATE STEM PROGRAMS
FALL 2018

STEM Category	CIP	CIP Title
Math	27.0101	Mathematics, General - BA
	27.0301	Applied Mathematics, General
	27.0501	Statistics, General
	27.9999	Mathematics and Statistics, Other - BA
	52.1301	Management Science
	52.1304	Actuarial Science
	52.1701	Insurance
Technology	11.0101	Data Science
	11.0103	Information Technology
	11.0199	Computer Science and Business
	11.0401	Information Science/Studies
	11.0701	Computer Science
	11.0803	Computer Graphics - BA
	11.0901	Computer Systems Networking and Telecommunications
	13.1303	Business Education – Information Technology
	45.0601	Data Science (Economics)
	49.0101	Aviation Science
	52.0201	Management Information Systems
	52.1201	Management Information Systems, General

APPENDIX B: DETAILED ENROLLMENT AND DEGREE AWARD DATA

Historical program enrollments (upper division majors only) and degree awards provided by the UNC System Office for STEM programs from Fall 2014 through 2018 at each institution are provided in the tables which follow. In addition, corresponding 5-year and 10-year enrollment projections upper division majors only) offered by each institution are displayed along with calculated degree award projections based on historical degree award conversion per program enrollments modeled for each of the five STEM categories within individual institutions.

Efficiency was calculated individually for each academic year of data received. Each Degree Efficiency metric was weighted based on its recency. The 2017-2018 year was weighted at 40%, 2016-2017 at 30%, 2015-2016 was weighted at 20% and 2014-2015 was weighted at 10%. In any circumstance where there was a missing degree award or enrollment value for any particular year, the total four-year average was used in its place, then weighted accordingly. This calculation was done across all programs and universities and then rolled up to the major STEM categories, for a bottom-up approach as opposed to a top-down approach.

EXHIBIT B-1
APPALACHIAN STATE UNIVERSITY
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM
FALL 2014 THROUGH 2018

Appalachian State University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	# change	Average % change
Engineering	15.0507	Sustainable Technology			112	128	144	32	29%	0	56	61	39	-17	-30%
Hard Science	03.0103	Environmental Studies	192	180	176	186	197	5	3%	80	90	80	83	3	4%
	03.0104	Environmental Sciences	40	45	51	44	49	9	23%	10	15	16	15	5	50%
	26.0101	Biology/Biological Sciences, General	275	299	391	430	443	168	61%	80	89	125	150	70	88%
	40.0501	Chemistry, General	147	164	151	143	166	19	13%	47	48	68	35	-12	-26%
	40.0601	Geology/Earth Science, General	59	64	67	86	80	21	36%	26	21	24	24	-2	-8%
	40.0801	Physics, General	85	100	103	86	80	-5	-6%	27	32	43	23	-4	-15%
Health Science	31.0505	Exercise Science	446	459	448	449	458	12	3%	190	201	222	208	18	9%
	51.0201	Communication Sciences and Disorders, General	113	113	123	135	155	42	37%	52	53	64	55	3	6%
	51.0701	Health/Health Care Administration/Management	118	105	108	109	100	-18	-15%	54	53	50	53	-1	-2%
	51.2201	Public Health, General				23	83	60	261%	0	0	0	6	6	100%
	51.2305	Music Therapy/Therapist	26	38	38	34	37	11	42%	3	10	8	9	6	200%
	51.3101	Dietetics/Dietitian	150	163	134	128	134	-16	-11%	45	55	68	70	25	56%
	51.3801	Registered Nursing/Registered Nurse	281	249	286	254	267	-14	-5%	122	144	192	201	79	65%
Math	27.0101	Mathematics, General	70	75	92	102	97	27	39%	30	31	33	29	-1	-3%
	52.1304	Actuarial Science	25	32	35	44	46	21	84%	10	9	11	13	3	30%
	52.1701	Insurance	103	114	115	118	138	35	34%	54	47	71	48	-6	-11%
Technology	11.0701	Computer Science	149	202	201	230	230	81	54%	48	55	70	63	15	31%
	52.1201	Management Information Systems, General	127	128	152	169	196	69	54%	53	51	66	65	12	23%
		Institutional STEM Total	**2,406**	**2,530**	**2,783**	**2,898**	**3,100**			**931**	**1,060**	**1,272**	**1,189**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-2
APPALACHIAN STATE UNIVERSITY
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

Appalachian State University			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	15.0507	Sustainable Technology	172	192	83	92
Hard Science	03.0103	Environmental Studies	214	229	98	105
	03.0104	Environmental Sciences	53	57	17	18
	26.0101	Biology/Biological Sciences, General	578	722	187	234
	40.0501	Chemistry, General	198	220	64	71
	40.0601	Geology/Earth Science, General	87	93	29	30
	40.0801	Physics, General	87	93	28	30
Health Science	31.0505	Exercise Science	477	492	221	228
	51.0201	Communication Sciences and Disorders, General	193	215	89	99
	51.0701	Health/Health Care Administration/Management	112	122	54	59
	51.2201	Public Health, General	175	250	46	65
	51.2305	Music Therapy/Therapist	40	43	9	10
	51.3101	Dietetics/Dietitian	176	221	82	104
	51.3801	Registered Nursing/Registered Nurse	270	280	183	190
Math	27.0101	Mathematics, General	105	113	37	39
	52.1304	Actuarial Science	63	82	19	25
	52.1701	Insurance	254	299	123	144
Technology	11.0701	Computer Science	303	382	91	115
	52.1201	Management Information Systems, General	405	529	164	215
		Institutional STEM Total	**3,962**	**4,634**	**1,624**	**1,874**

* STEM enrollment figures include only upper division first majors.
Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-2** to calculate degree award projections based on enrollment projections provided by the institution. For Appalachian State University, the conversion rates were as follows: Engineering – 48%, Hard Science – 20.8%, Health Science – 43.5%, Math – 28.5%, and Technology – 35.3%.

EXHIBIT B-3
EAST CAROLINA UNIVERSITY
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

East Carolina University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	# change	Average % change
Engineering	14.0101	Engineering, General	317	375	398	403	393	76	24%	78	101	115	125	47	60%
	15.0612	Industrial Technology/Technician	557	598	646	644	689	132	24%	135	140	136	170	35	26%
	15.0613	Manufacturing Engineering Technology/Technician	45	58	59	74	81	36	80%	16	24	20	27	11	69%
	15.1301	Drafting and Design Technology/Technician, General	27	31	37	42	35	8	30%	12	13	11	13	1	8%
	15.9999	Engineering Technologies and Engineering-Related Fields, Other	123	145	193	254	334	211	172%	47	54	68	80	33	70%
Hard Science	26.0101	Biology/Biological Sciences, General	426	497	426	397	422	-4	-1%	174	191	223	173	-1	-1%
	26.0202	Biochemistry	36	49	49	58	65	29	81%	17	17	18	16	-1	-6%
	40.0499	Atmospheric Sciences and Meteorology, Other	10	12	13	11	10	0	0%	1	4	4	7	6	600%
	40.0501	Chemistry, General	146	177	142	158	160	14	10%	73	76	69	64	-9	-12%
	40.0601	Geology/Earth Science, General	41	52	41	29	32	-9	-22%	12	24	18	17	5	42%
	40.0801	Physics, General	30	41	47	34	19	-11	-37%	5	9	15	13	8	160%
Health Science	26.0908	Exercise Physiology	200	190	191	179	159	-41	-21%	99	91	87	99	0	0%
	51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist	62	68	61	61	72	10	16%	32	37	29	27	-5	-16%
	51.0701	Health/Health Care Administration/Management	143	145	128	140	131	-12	-8%	65	63	59	50	-15	-23%
	51.0706	Health Information/Medical Records Administration/Administrator				14	26	12	86%	0	0	0	0	0	0%
	51.1005	Clinical Laboratory Science/Medical Technology/Technologist	35	27	22	20	12	-23	-66%	16	16	10	8	-8	-50%
	51.2202	Environmental Health	21	29	29	21	19	-2	-10%	9	14	13	11	2	22%
	51.2207	Public Health Education and Promotion	271	296	408	460	506	235	87%	155	200	264	288	133	86%
	51.2309	Therapeutic Recreation/Recreational Therapy	115	125	122	129	119	4	3%	41	64	63	71	30	73%
	51.2310	Vocational Rehabilitation Counseling/Counselor	38	53	36	30	17	-21	-55%	23	30	34	20	-3	-13%
	51.3101	Dietetics/Dietitian	49	82	99	80	78	29	59%	44	56	48	42	-2	-5%
	51.3801	Registered Nursing/Registered Nurse	706	665	592	608	671	-35	-5%	394	336	310	300	-94	-24%
Math	27.0101	Mathematics, General	45	43	58	57	62	17	38%	21	14	18	23	2	10%
Technology	11.0103	Information Technology	124	136	140	156	146	22	18%	38	32	40	47	9	24%
	11.0401	Information Science/Studies	6	10	9	8	10	4	67%	1	3	0	7	6	600%
	11.0701	Computer Science	127	148	189	194	221	94	74%	24	35	32	47	23	96%
	45.0601	Data Science (Economics)	133	138	144	152	146	13	10%	91	77	79	89	-2	-2%
	52.1201	Management Information Systems, General	186	168	98	103	116	-70	-38%	57	57	56	69	12	21%
Institutional STEM Total			**4,019**	**4,358**	**4,377**	**4,516**	**4,751**			**1,680**	**1,778**	**1,839**	**1,903**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-4
EAST CAROLINA UNIVERSITY
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

East Carolina University			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	14.0101	Engineering, General	491	614	142	178
	15.0612	Industrial Technology/Technician	861	1077	206	258
	15.0613	Manufacturing Engineering Technology/Technician	101	127	37	46
	15.1301	Drafting and Design Technology/Technician, General	44	55	15	19
	15.9999	Engineering Technologies and Engineering-Related Fields, Other	418	522	144	180
Hard Science	26.0101	Biology/Biological Sciences, General	480	550	216	247
	26.0202	Biochemistry	95	110	32	37
	40.0499	Atmospheric Sciences and Meteorology, Other	15	15	6	6
	40.0501	Chemistry, General	185	212	82	94
	40.0601	Geology/Earth Science, General	45	45	22	22
	40.0801	Physics, General	28	30	9	9
Health Science	26.0908	Exercise Physiology	165	179	83	90
	51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist	92	110	44	53
	51.0701	Health/Health Care Administration/Management	160	170	66	70
	51.0706	Health Information/Medical Records Administration/Administrator	52	70	22	29
	51.1005	Clinical Laboratory Science/Medical Technology/Technologist	22	30	10	14
	51.2202	Environmental Health	21	23	10	11
	51.2207	Public Health Education and Promotion	541	558	345	355
	51.2309	Therapeutic Recreation/Recreational Therapy	123	127	63	65
	51.2310	Vocational Rehabilitation Counseling/Counselor	30	40	22	29
	51.3101	Dietetics/Dietitian	110	140	64	81
	51.3801	Registered Nursing/Registered Nurse	700	735	358	376
Math	27.0101	Mathematics, General	78	91	29	33
Technology	11.0103	Information Technology	183	228	52	65
	11.0401	Information Science/Studies	18	25	8	11
	11.0701	Computer Science**	332	497	71	106
	45.0601	Data Science (Economics)	150	160	87	93
	52.1201	Management Information Systems, General	140	180	75	97
		Institutional STEM Total	**5,680**	**6,720**	**2,319**	**2,675**

* STEM enrollment figures include only upper division first majors.

**Note: The Computer Science projections include a BS in Software Engineering.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-4** to calculate degree award projections based on enrollment projections provided by the institution. For East Carolina University, the conversion rates were as follows: Engineering – 31.6%, Hard Science – 27.2%, Health Science – 18.3%, Math – 18.3%, and Technology – 34%.

EXHIBIT B-5
ELIZABETH CITY STATE UNIVERSITY
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

Elizabeth City State University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Engineering	15.9999	Engineering Technologies and Engineering-Related Fields, Other	25	15	21	18	20	-5	-20%	8	7	4	5	-3	-38%
Hard Science	26.0101	Biology/Biological Sciences, General	108	90	84	66	67	-41	-38%	24	16	19	19	-5	-20%
	26.0101	Pharmaceutical Science	38	36	30	18	19	-19	-50%	8	6	7	5	-3	-38%
	30.3301	Sustainability Studies (Pending BOG and SACSCOC approval)													
	40.0501	Chemistry, General	21	14	5	7	9	-12	-57%	6	10	3	1	-5	-83%
Math	27.0101	Mathematics, General	21	18	17	15	10	-11	-52%	12	6	6	7	-5	-42%
Technology	11.0701	Computer Science	26	26	29	27	18	-8	-31%	10	6	10	14	4	40%
	49.0101	Aviation Science	24	22	15	18	33	9	38%	0	0	0	0	0	0%
	49.0101	Unmanned Aircraft Systems (proposed													
Institutional STEM Total			**263**	**221**	**201**	**169**	**176**			**68**	**51**	**49**	**51**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-6
ELIZABETH CITY STATE UNIVERSITY
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

Elizabeth City State University			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	15.9999	Engineering Technologies and Engineering-Related Fields, Other	35	50	10	15
Hard Science	26.0101	Biology/Biological Sciences, General	100	120	24	29
	26.0101	Pharmaceutical Science	23	33	6	8
	30.3301	Sustainability Studies (Pending BOG and SACSCOC approval)	17	25	5	7
	40.0501	Chemistry, General	20	25	8	10
Math	27.0101	Mathematics, General	21	27	9	11
Technology	11.0701	Computer Science	26	33	10	13
	49.0101	Aviation Science	60	110	16	29
	49.0101	Unmanned Aircraft Systems	25	65	7	17
Institutional STEM Total			**327**	**488**	**94**	**139**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-6** to calculate degree award projections based on enrollment projections provided by the institution. Elizabeth City State University, the conversion rates were as follows: Engineering – 29.4%, Hard Science – 22.2%, Health Science – N/A, Math – 41.6%, and Technology – 13.2%.

EXHIBIT B-7
FAYETTEVILLE STATE UNIVERSITY
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

Fayetteville State University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Hard Science	26.0101	Biology/Biological Sciences, General	162	174	177	175	166	4	2%	35	38	60	49	14	40%
	40.0501	Chemistry, General	45	41	31	40	39	-6	-13%	13	7	7	12	-1	-8%
	43.0106	Forensic Science	28	35	34	48	52	24	86%	0	0	0	0	0	0%
Health Science	51.0701	Health/Health Care Administration/Management			57	81	77	20	35%	0	0	12	31	19	158%
	51.3801	Registered Nursing/Registered Nurse - BS in Nursing	501	388	381	377	394	-107	-21%	137	153	205	203	66	48%
Math	27.0101	Mathematics, General	28	28	28	25	26	-2	-7%	12	7	8	7	-5	-42%
Technology	11.0701	Computer Science	64	84	77	67	74	10	16%	7	18	17	26	19	271%
	52.1201	Information Systems and Business Analytics	24	40	20	21	22	-2	-8%	15	11	8	5	-10	-67%
		Institutional STEM Total	**852**	**790**	**805**	**834**	**850**			**219**	**234**	**317**	**333**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-8
FAYETTEVILLE STATE UNIVERSITY
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

Fayetteville State University			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Hard Science	26.0101	Biology/Biological Sciences, General	169	186	47	52
	40.0501	Chemistry, General	41	47	10	12
	43.0106	Forensic Science	60	75	22	28
Health Science	51.0701	Health/Health Care Administration/Management	85	106	26	33
	51.3801	Registered Nursing/Registered Nurse - BS in Nursing	591	650	285	314
Math	27.0101	Mathematics, General	30	33	9	10
Technology	11.0701	Computer Science	101	111	28	31
	52.1201	Information Systems and Business Analytics	23	26	8	9
		Institutional STEM Total	**1,100**	**1,234**	**436**	**487**

*STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-8** to calculate degree award projections based on enrollment projections provided by the institution. For Fayetteville State University, the conversion rates were as follows: Engineering – N/A, Hard Science – 13.2%, Health Science – 19.8%, Math – 29.1%, and Technology – 20.3%.

EXHIBIT B-9
NORTH CAROLINA A&T
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

North Carolina A&T University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Engineering	14.0301	Biological/Agricultural Engineering	24	22	17	21	22	-2	-8%	9	7	5	8	-1	-11%
	14.0401	Architectural Engineering	66	49	47	49	56	-10	-15%	25	18	18	14	-11	-44%
	14.0501	Bioengineering and Biomedical Engineering	26	32	43	50	76	50	192%	7	10	10	12	5	71%
	14.0701	Chemical Engineering	52	56	52	46	49	-3	-6%	15	22	21	18	3	20%
	14.0801	Civil Engineering, General	84	79	69	62	74	-10	-12%	31	32	26	25	-6	-19%
	14.0901	Computer Engineering, General	55	61	71	70	76	21	38%	13	17	15	17	4	31%
	14.1001	Electrical and Electronics Engineering	79	88	87	105	99	20	25%	25	32	18	42	17	68%
	14.1901	Mechanical Engineering	143	152	160	168	214	71	50%	38	54	57	41	3	8%
	14.3501	Industrial Engineering	81	83	76	82	86	5	6%	33	33	22	28	-5	-15%
	14.3801	Geomatics	6	12	10	12	22	16	267%	1	1	4	2	1	100%
	15.0399	Electrical and Electronic Engineering Technologies/Technicians	97	96	98	76	37	-60	-62%	40	32	29	32	-8	-20%
	15.0612	Automotive Engineering Technology	18	19	16	13	17	-1	-6%	3	7	4	3	0	0%
	15.0613	Applied Engineering Technology	54	68	83	97	99	45	83%	14	21	37	31	17	121%
	15.9999	Construction Management	37	41	44	38	34	-3	-8%	14	17	13	13	-1	-7%
Hard Science	26.0101	Biology/Biological Sciences, General	161	180	166	152	192	31	19%	51	50	53	47	-4	-8%
	40.0401	Atmospheric Sciences and Meteorology, General	3	5	4	4	8	5	167%	2	0	2	0	-2	-100%
	40.0501	Chemistry, General	21	25	30	38	31	10	48%	4	7	3	11	7	175%
	40.0801	Physics, General	15	13	20	20	20	5	33%	1	4	4	4	3	300%
Health Science	31.0504	Kinesiology	254	308	341	328	322	68	27%	67	102	115	154	87	130%
	51.2206	Environmental Health and Safety	34	19	40	49	43	9	26%	17	9	9	15	-2	-12%
	51.3801	Registered Nursing/Registered Nurse	96	31	32	68	97	1	1%	13	26	21	40	27	208%
Math	27.0101	Mathematics, General	10	15	11	33	47	37	370%	7	9	8	8	1	14%
	27.0301	Applied Mathematics, General	10	3	19			-10	-100%	4	8	0	0	-4	-100%
Technology	11.0103	Information Technology			28	71	132	104	371%	0	0	3	17	14	467%
	11.0701	Computer Science	83	87	97	88	97	14	17%	34	33	31	41	7	21%
	13.1303	Business Education – Information Technology	48	61	95	102	105	57	119%	12	9	18	20	8	67%
	52.0201	Management Information Systems	164	170	203	243	261	97	59%	52	46	66	63	11	21%
Institutional STEM Total			**1,721**	**1,775**	**1,959**	**2,085**	**2,316**			**532**	**606**	**612**	**706**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-10
NORTH CAROLINA A&T
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

North Carolina A&T University			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	14.0301	Biological/Agricultural Engineering	25	30	9	10
	14.0401	Architectural Engineering	66	75	22	26
	14.0501	Bioengineering and Biomedical Engineering	100	143	26	36
	14.0701	Chemical Engineering	49	49	19	19
	14.0801	Civil Engineering, General	90	105	35	41
	14.0901	Computer Engineering, General	80	85	19	20
	14.1001	Electrical and Electronics Engineering	105	115	34	38
	14.1901	Mechanical Engineering	214	250	65	76
	14.3501	Industrial Engineering	86	86	30	30
	14.3801	Geomatics	40	60	9	13
	15.0399	Electrical and Electronic Engineering Technologies/Technicians, Other	47	60	17	22
	15.0612	Automotive Engineering Technology	25	50	6	13
	15.0613	Applied Engineering Technology	200	300	70	105
	15.9999	Construction Management	50	75	17	26
Hard Science	26.0101	Biology/Biological Sciences, General	220	240	67	74
	40.0401	Atmospheric Sciences and Meteorology, General	20	30	4	7
	40.0501	Chemistry, General	50	60	11	13
	40.0801	Physics, General	32	50	7	10
Health Science	31.0504	Kinesiology	500	650	191	248
	51.2206	Environmental Health and Safety	55	70	18	23
	51.3801	Registered Nursing/Registered Nurse	130	210	80	129
Math	27.0101	Mathematics, General	60	75	30	38
	27.0301	Applied Mathematics, General			0	0
Technology	11.0103	Information Technology	260	400	49	75
	11.0701	Computer Science	150	200	60	80
	13.1303	Business Education – Information Technology	203	225	39	43
	52.0201	Management Information Systems	85	130	24	37
		Institutional STEM Total	**2,942**	**3,823**	**959**	**1,251**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-10** to calculate degree award projections based on enrollment projections provided by the institution. For North Carolina A&T, the conversion rates were as follows: Engineering – 31.9%, Hard Science – 23.8%, Health Science – 44.3%, Math – 61.4%, and Technology – 26.6%.

EXHIBIT B-11
NORTH CAROLINA CENTRAL UNIVERSITY
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

North Carolina Central University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Hard Science	03.0104	Environmental and Geographic Sciences	0	4	15	15	20	16	400%	0	0	0	0	0	0%
	26.0101	Biology/Biological Sciences, General	178	177	157	145	150	-28	-16%	50	61	68	43	-7	-14%
	26.0102	Pharmaceutical Sciences	83	83	68	69	59	-24	-29%	21	33	26	23	2	10%
	40.0501	Chemistry, General	32	33	26	33	36	4	13%	13	5	6	7	-6	-46%
	40.0801	Physics, General	12	15	16	19	13	1	8%	4	6	3	10	6	150%
Health Science	51.2207	Public Health Education and Promotion	127	131	114	90	85	-42	-33%	46	43	55	35	-11	-24%
	51.3801	Registered Nursing/Registered Nurse	88	129	39	39	145	57	65%	57	71	80	66	9	16%
Math	27.0101	Mathematics, General	21	27	18	16	15	-6	-29%	5	7	9	4	-1	-20%
Technology	11.0199	Computer Science and Business	0	17	32	49	56	39	229%	0	15	3	4	-11	-73%
Institutional STEM Total			**541**	**616**	**485**	**475**	**579**			**196**	**241**	**250**	**192**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-12
NORTH CAROLINA CENTRAL UNIVERSITY
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

North Carolina Central University			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Hard Science	03.0104	Environmental and Geographic Sciences	39	64	17	28
	26.0101	Biology/Biological Sciences, General	172	195	59	67
	26.0102	Pharmaceutical Sciences	69	75	24	26
	40.0501	Chemistry, General	41	46	9	10
	40.0801	Physics, General	18	23	7	9
Health Science	51.2207	Public Health Education and Promotion	93	105	37	42
	51.3801	Registered Nursing/Registered Nurse	195	221	286	324
Math	27.0101	Mathematics, General	30	45	10	15
Technology	11.0199	Computer Science and Business	161	178	42	46
Institutional STEM Total			**818**	**952**	**492**	**568**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-12** to calculate degree award projections based on enrollment projections provided by the institution. For North Carolina Central University, the conversion rates were as follows: Engineering – N/A, Hard Science – 26.1%, Health Science – 93.5%, Math – 32.6%, and Technology – 26%. Nursing degree award projections are artificially high because of the inclusion by NCCU of pre-majors in historical graduation counts who were not included in the original enrollment data for each year.

EXHIBIT B-13
NORTH CAROLINA STATE UNIVERSITY
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

North Carolina State University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Engineering	04.0401	Environmental Design in Architecture	73	62	64	70	81	8	11%	33	26	26	27	-6	-18%
	14.0101	Engineering, General	149	139	142	133	164	15	5%	21	31	36	28	7	17%
	14.0201	Aerospace, Aeronautical and Astronautical/Space Engineering	155	160	174	185	212	57	37%	53	51	55	50	-3	-6%
	14.0301	Agricultural Engineering	179	162	138	120	112	-67	-37%	58	54	58	38	-20	-34%
	14.0501	Bioengineering and Biomedical Engineering	150	159	175	192	197	47	31%	50	70	56	125	75	150%
	14.0701	Chemical Engineering	524	502	470	415	401	-123	-23%	175	177	178	177	2	1%
	14.0801	Civil Engineering, General	375	394	391	394	374	-1	0%	121	140	127	131	10	8%
	14.0901	Computer Engineering, General	375	416	421	388	399	24	6%	99	133	155	127	28	28%
	14.1001	Electrical and Electronics Engineering	545	575	584	548	519	-26	-5%	176	209	211	190	14	8%
	14.1401	Environmental/Environmental Health Engineering	71	80	82	101	101	30	42%	24	26	22	27	3	13%
	14.1801	Materials Engineering	108	106	119	118	106	-2	-2%	34	38	44	47	13	38%
	14.1901	Mechanical Engineering	482	527	612	697	742	260	54%	173	175	185	234	61	35%
	14.2301	Nuclear Engineering	111	96	93	85	75	-36	-32%	43	22	38	28	-15	-35%
	14.2801	Textile Sciences and Engineering	591	612	609	567	507	-84	-14%	224	270	265	250	26	12%
	14.3301	Construction Engineering	64	50	49	55	59	-5	-8%	29	14	13	15	-14	-48%
	14.3501	Industrial Engineering	225	227	223	227	228	3	1%	73	94	82	98	25	34%
	15.0507	Environmental Engineering Technology/Environmental Technology	134	99	70	68	53	-81	-60%	61	54	35	34	-27	-44%
Hard Science	03.0104	Environmental Sciences	124	149	160	174	181	57	46%	47	55	55	74	27	57%
	26.0101	Biology/Biological Sciences, General	928	811	681	664	731	-197	-11%	374	361	340	266	-108	-14%
	26.0202	Biochemistry	218	203	191	187	170	-48	-22%	62	70	76	64	2	3%
	26.0301	Botany/Plant Biology	39	47	51	51	59	20	51%	12	27	20	24	12	100%
	26.0502	Microbiology, General	82	79	81	94	114	32	39%	18	33	20	32	14	78%
	26.0701	Zoology/Animal Biology	155	140	111	124	130	-25	-16%	60	68	38	58	-2	-3%
	26.0801	Genetics, General	41	43	58	72	70	29	71%	15	10	22	24	9	60%
	40.0401	Atmospheric Sciences and Meteorology, General	59	53	38	44	44	-15	-25%	21	25	10	19	-2	-10%
	40.0501	Chemistry, General	135	137	133	114	114	-21	-16%	39	44	44	36	-3	-8%
	40.0601	Geology/Earth Science, General	55	75	67	62	48	-7	-13%	14	22	22	25	11	79%
	40.0607	Oceanography, Chemical and Physical	48	42	39	40	44	-4	-8%	19	18	16	12	-7	-37%
	40.0801	Physics, General	119	121	114	97	113	-6	-5%	32	29	38	27	-5	-16%
	41.9999	Science Technologies/Technicians, Other	31	36	32	38	44	13	42%	9	11	12	16	7	78%
Math	27.0101	Mathematics, General	128	131	141	117	126	-2	-2%	50	42	53	56	6	12%
	27.0301	Applied Mathematics, General	72	56	63	78	76	4	6%	32	20	24	24	-8	-25%
	27.0501	Statistics, General	92	108	123	131	132	40	43%	38	45	44	57	19	50%
Technology	11.0701	Computer Science	519	516	520	575	631	112	22%	171	193	174	200	29	17%
		Institutional STEM Total	**7,156**	**7,113**	**7,019**	**7,025**	**7,157**			**2,460**	**2,657**	**2,594**	**2,640**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-14
NORTH CAROLINA STATE UNIVERSITY
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

North Carolina State University			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	04.0401	Environmental Design in Architecture	92	97	37	39
	14.0101	Engineering, General	173	179	38	39
	14.0201	Aerospace, Aeronautical and Astronautical/Space Engineering	271	306	81	92
	14.0301	Agricultural Engineering	121	127	42	45
	14.0501	Bioengineering and Biomedical Engineering	251	284	120	136
	14.0701	Chemical Engineering	432	465	168	181
	14.0801	Civil Engineering, General	413	445	138	148
	14.0901	Computer Engineering, General	431	466	143	155
	14.1001	Electrical and Electronics Engineering	559	602	197	212
	14.1401	Environmental/Environmental Health Engineering	120	129	34	37
	14.1801	Materials Engineering	117	126	44	47
	14.1901	Mechanical Engineering	860	973	282	319
	14.2301	Nuclear Engineering	79	83	27	28
	14.2801	Textile Sciences and Engineering	533	560	231	243
	14.3301	Construction Engineering	64	67	18	19
	14.3501	Industrial Engineering	246	265	98	105
	15.0507	Environmental Engineering Technology/Environmental Technology	56	59	28	30
Hard Science	03.0104	Environmental Sciences	231	261	89	101
	26.0101	Biology/Biological Sciences, General	801	865	352	380
	26.0202	Biochemistry	183	192	65	68
	26.0301	Botany/Plant Biology	67	72	30	32
	26.0502	Microbiology, General	132	146	42	46
	26.0701	Zoology/Animal Biology	140	147	60	63
	26.0801	Genetics, General	83	90	27	30
	40.0401	Atmospheric Sciences and Meteorology, General	47	51	18	19
	40.0501	Chemistry, General	120	125	38	40
	40.0601	Geology/Earth Science, General	48	48	17	17
	40.0607	Oceanography, Chemical and Physical	46	49	17	18
	40.0801	Physics, General	123	132	35	38
	41.9999	Science Technologies/Technicians, Other	47	51	18	19
Math	27.0101	Mathematics, General	132	139	54	57
	27.0301	Applied Mathematics, General	82	86	29	30
	27.0501	Statistics, General	168	191	68	77
Technology	11.0701	Computer Science	768	890	267	309
		Institutional STEM Total	**8,036**	**8,769**	**2,951**	**3,218**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-14** to calculate degree award projections based on enrollment projections provided by the institution. For North Carolina State University, the conversion rates were as follows: Engineering – 34%, Hard Science – 26.5%, Health Science – N/A, Math – 38.9%, and Technology – 34.7%.

EXHIBIT B-15
UNIVERSITY OF NORTH CAROLINA - ASHEVILLE
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

UNC Asheville			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Engineering	14.0101	Engineering (with a concentration in Mechatronics)	60	78	74	103	105	45	75%	15	27	28	22	7	47%
Hard Science	03.0103	Environmental Science/Studies	125	125	103	130	139	14	11%	59	57	59	54	-5	-8%
	26.0101	Biology/Biological Sciences, General	104	101	113	127	130	26	25%	49	44	43	41	-8	-16%
	40.0401	Atmospheric Science	17	21	30	26	20	3	18%	8	9	10	11	3	38%
	40.0501	Chemistry, General	46	43	49	59	60	14	30%	19	27	29	30	11	58%
	40.0801	Physics, General	17	15	17	25	19	2	12%	9	7	3	8	-1	-11%
Health Science	51.2207	Public Health Education and Promotion	91	100	101	90	98	7	8%	46	46	53	46	0	0%
Math	27.0101	Mathematics, General - BA	65	65	58	56	51	-14	-22%	30	30	27	32	2	7%
Technology	11.0701	Computer Science	55	70	66	68	90	35	64%	13	26	26	25	12	92%
		Institutional STEM Total	**580**	**618**	**611**	**684**	**712**			**248**	**273**	**278**	**269**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-16
UNIVERSITY OF NORTH CAROLINA - ASHEVILLE
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

UNC Asheville			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	14.0101	Engineering (with a concentration in Mechatronics)	110	210	32	62
Hard Science	03.0103	Environmental Science/Studies	146	160	70	76
	26.0101	Biology/Biological Sciences, General	143	156	54	59
	40.0401	Atmospheric Science	22	24	9	10
	40.0501	Chemistry, General	65	71	36	39
	40.0801	Physics, General	21	23	7	7
Health Science	51.2207	Public Health Education and Promotion	108	118	54	59
Math	27.0101	Mathematics, General - BA	54	56	27	28
Technology	11.0701	Computer Science	99	108	36	39
		Institutional STEM Total	**768**	**926**	**325**	**380**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-16** to calculate degree award projections based on enrollment projections provided by the institution. For University of North Carolina – Asheville, the conversion rates were as follows: Engineering – 29.3%, Hard Science – 35.5%, Health Science – 50.4%, Math – 50.7%, and Technology – 36.3%.

EXHIBIT B-17
UNIVERSITY OF NORTH CAROLINA - CHAPEL HILL
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

UNC Chapel Hill			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Engineering	14.0501	Bioengineering and Biomedical Engineering			144	177	174	30	21%	0	0	50	60	10	20%
Hard Science	03.0103	Environmental Studies	76	87	94	116	130	54	71%	32	42	40	58	26	81%
	03.0104	Environmental Sciences	95	118	129	134	160	65	68%	43	44	55	61	18	42%
	26.0101	Biology/Biological Sciences, General	1210	1182	1250	1275	1316	106	9%	547	531	530	510	-37	-7%
	26.1102	Biostatistics	30	32	41	48	56	26	87%	12	16	18	16	4	33%
	26.1501	Neuroscience					62	62	100%	0	0	0	0	0	0%
	40.0501	Chemistry, General	428	452	477	430	371	-57	-13%	164	161	187	206	42	26%
		Geology/Earth Science, General*	50	48	45	38	39	-11	-22%	18	20	26	12	-6	-33%
	40.0801	Physics, General	93	106	107	95	104	11	12%	24	37	43	32	8	33%
	40.9999	Physical Sciences, Other	90	119	1	1		-90	-100%	30	7	0	0	-30	-100%
Health Science	19.0501	Nutrition	47	49	57	54	61	14	30%	23	23	26	27	4	17%
	51.0602	Dental Hygiene/Hygienist	66	63	60	62	67	1	2%	30	31	31	27	-3	-10%
	51.0701	Health/Health Care Administration/Management	81	85	86	84	86	5	6%	42	36	42	43	1	2%
	51.0907	Medical Radiologic Technology/Science - Radiation Therapist	28	36	27	26	22	-6	-21%	15	16	17	10	-5	-33%
	51.1005	Clinical Laboratory Science/Medical Technology/Technologist	37	30	37	42	38	1	3%	18	15	13	21	3	17%
	51.2202	Environmental Health	48	49	57	51	39	-9	-19%	22	23	28	31	9	41%
	51.3801	Registered Nursing/Registered Nurse	276	275	271	282	283	7	3%	165	168	155	173	8	5%
	TB.TBD	Health Informatics (new program)						0	0%	0	0	0	0	0	0%
Math	27.0101	Mathematics, General	240	222	258	235	243	3	1%	116	122	129	113	-3	-3%
	27.0301	Applied Mathematics, General	143	185	207	267	235	92	64%	51	78	70	118	67	131%
Technology	11.0401	Information Science/Studies	60	62	76	104	102	42	70%	46	44	41	60	14	30%
	11.0701	Computer Science (proposed Data Science)	315	390	497	636	787	472	150%	121	139	201	233	112	93%
	45.0601	Financial informatics (Economics)	836	828	821	798	779	-57	-7%	460	457	406	438	-22	-5%
		Institutional STEM Total	4,249	4,418	4,742	4,955	5,154			1,979	2,010	2,108	2,249		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-18
UNIVERSITY OF NORTH CAROLINA - CHAPEL HILL
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

UNC Chapel Hill			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	14.0501	Bioengineering and Biomedical Engineering	174	174	60	60
Hard Science	03.0103	Environmental Studies	164	199	76	93
	03.0104	Environmental Sciences	200	246	86	106
	26.0101	Biology/Biological Sciences, General	1577	1757	666	742
	26.1102	Biostatistics	65	75	26	30
	26.1501	Neuroscience	400	800	181	362
	40.0501	Chemistry, General	371	371	155	155
		Geology/Earth Science, General*	39	39	16	16
	40.0801	Physics, General	104	104	36	36
	40.9999	Physical Sciences, Other	80	240	4	11
Health Science	19.0501	Nutrition	80	80	38	38
	51.0602	Dental Hygiene/Hygienist	56	48	26	23
	51.0701	Health/Health Care Administration/Management	82	82	40	40
	51.0907	Medical Radiologic Technology/Science - Radiation Therapist	40	40	19	19
	51.1005	Clinical Laboratory Science/Medical Technology/Technologist	40	44	18	20
	51.2202	Environmental Health	80	100	42	53
	51.3801	Registered Nursing/Registered Nurse	352	432	211	259
	TB.TBD	Health Informatics	50	100	23	45
Math	27.0101	Mathematics, General	243	243	122	122
	27.0301	Applied Mathematics, General	479	665	191	265
Technology	11.0401	Information Science/Studies	250	400	153	244
	11.0701	Computer Science (proposed Data Science)	1451	1950	548	736
	45.0601	Financial informatics (Economics)	972	1094	518	583
		Institutional STEM Total	**7,349**	**9,283**	**3,257**	**4,060**

* STEM enrollment figures include only upper division first majors.
Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-18** to calculate degree award projections based on enrollment projections provided by the institution. For University of North Carolina - Chapel Hill, the conversion rates were as follows: Engineering – 34.3%, Hard Science – 22.7%, Health Science – 43.9%, Math – 30%, and Technology – 38.1%

EXHIBIT B-19
UNIVERSITY OF NORTH CAROLINA - CHARLOTTE
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

UNC Charlotte			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Engineering	14.0801	Civil Engineering, General	255	281	285	284	302	47	18%	86	86	99	95	9	10%
	14.0901	Computer Engineering, General	116	105	131	151	189	73	63%	41	26	30	35	-6	-15%
	14.1001	Electrical and Electronics Engineering	186	216	217	229	250	64	34%	42	63	63	67	25	60%
	14.1901	Mechanical Engineering	569	652	686	644	623	54	9%	150	184	196	228	78	52%
	14.2701	Systems Engineering	88	102	120	111	137	49	56%	30	37	50	47	17	57%
	15.0201	Civil Engineering Technology/Technician	76	59	74	83	72	-4	-5%	37	17	20	22	-15	-41%
	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	92	92	90	107	103	11	12%	19	18	22	23	4	21%
	15.0805	Mechanical Engineering/Mechanical Technology/Technician	143	156	174	188	215	72	50%	46	53	44	50	4	9%
	15.9999	Engineering Technologies and Engineering-Related Fields, Other	66	79	96	107	187	121	92%	14	23	21	34	20	71%
Hard Science	03.0103	Environmental Studies	108	113	139	158	167	59	55%	40	42	40	57	17	43%
	26.0101	Biology/Biological Sciences, General	345	460	553	580	638	293	85%	128	132	175	193	65	51%
	40.0404	Meteorology	24	31	33	32	38	14	58%	9	6	13	10	1	11%
	40.0501	Chemistry, General	179	163	150	160	148	-31	-17%	45	43	43	37	-8	-18%
	40.0601	Geology/Earth Science, General	108	113	139	158	167	59	55%	40	42	40	57	17	43%
	40.0801	Physics, General	79	86	94	81	86	7	9%	25	17	23	20	-5	-20%
Health Science	31.0501	Exercise Science - Not found	477	526	357	382	394	-83	-17%	88	161	162	159	71	81%
	51.0701	Health/Health Care Administration/Management					415	415	100%	0	0	0	0	0	0%
	51.0908	Respiratory Care Therapy/Therapist	181	195	224	215	185	4	2%	67	67	86	78	11	16%
	51.0999	Allied Health Diagnostic, Intervention, and Treatment Professions	12	15	12	11	20	8	67%	14	11	11	7	-7	-50%
	51.2201	Public Health, General	190	168	84	95	83	-107	-56%	47	38	35	46	-1	-2%
	51.3801	Registered Nursing/Registered Nurse	316	333	363	340	315	-1	0%	239	237	269	246	7	3%
Math	27.0101	Mathematics, General	243	233	228	252	214	-29	-12%	100	72	70	96	-4	-4%
	27.9999	Mathematics and Statistics, Other	51	70	74	86	93	42	82%	16	22	31	39	23	144%
	52.1301	Management Science					10	10	100%	0	0	0	0	0	0%
Technology	11.0103	Information Technology	75	96	83	111	135	60	80%	21	28	25	38	17	78%
	11.0701	Computer Science	780	901	989	1118	1319	539	69%	221	267	295	381	160	72%
		Institutional STEM Total	**4,759**	**5,245**	**5,395**	**5,683**	**6,505**			**1,565**	**1,692**	**1,863**	**2,065**		

* STEM enrollment figures include only upper division first majors.

Note: MGT calculated estimated Information Tech degree awards based on the degree award trend from the other tech program (Computer Science).

EXHIBIT B-20
UNIVERSITY OF NORTH CAROLINA - CHARLOTTE
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

UNC Charlotte			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	14.0801	Civil Engineering, General	330	360	110	120
	14.0901	Computer Engineering, General	225	260	55	64
	14.1001	Electrical and Electronics Engineering	300	350	86	100
	14.1901	Mechanical Engineering	660	720	205	223
	14.2701	Systems Engineering	165	200	66	80
	15.0201	Civil Engineering Technology/Technician	75	80	22	23
	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	115	150	25	33
	15.0805	Mechanical Engineering/Mechanical Technology/Technician	250	275	71	78
	15.9999	Engineering Technologies and Engineering-Related Fields, Other	215	280	59	76
Hard Science	03.0103	Environmental Studies	241	316	82	108
	26.0101	Biology/Biological Sciences, General	787	944	254	304
	40.0404	Meteorology	46	55	15	18
	40.0501	Chemistry, General	178	213	46	55
	40.0601	Geology/Earth Science, General	215	277	74	95
	40.0801	Physics, General	103	124	25	30
Health Science	31.0501	Exercise Science - Not found	693	1220	265	466
	51.0701	Health/Health Care Administration/Management	1500	2000	511	682
	51.0908	Respiratory Care Therapy/Therapist	100	100	37	37
	51.0999	Allied Health Diagnostic, Intervention, and Treatment Professions, Other	40	50	32	40
	51.2201	Public Health, General	160	200	62	78
	51.3801	Registered Nursing/Registered Nurse	350	400	255	292
Math	27.0101	Mathematics, General	257	308	89	107
	27.9999	Mathematics and Statistics, Other	112	134	45	54
	52.1301	Management Science	100	100	34	34
Technology	11.0103	Information Technology	150	150	51	51
	11.0701	Computer Science	2300	2850	721	893
		Institutional STEM Total	**9,667**	**12,116**	**3,295**	**4,140**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-20** to calculate degree award projections based on enrollment projections provided by the institution. For University of North Carolina – Charlotte, the conversion rates were as follows: Engineering – 26.4%, Hard Science – 18.3%, Health Science – 44.3%, Math – 15%, and Technology – 10.4%.

EXHIBIT B-21
UNIVERSITY OF NORTH CAROLINA - GREENSBORO
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

UNC Greensboro			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Hard Science	26.0101	Biology/Biological Sciences, General	536	574	700	599	611	75	14%	138	128	171	158	20	14%
	26.0202	Biochemistry	123	164	177	133	125	2	2%	30	27	39	24	-6	-20%
	40.0501	Chemistry, General	73	69	79	59	98	25	34%	9	8	17	13	4	44%
	40.0801	Physics, General	31	32	29	18	28	-3	-10%	8	3	12	5	-3	-38%
Health Science	51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist	98	101	94	85	102	4	4%	20	26	47	25	5	25%
	51.2207	Public Health Education and Promotion	287	263	129	127	140	-147	-51%	69	70	59	56	-13	-19%
	51.3801	Registered Nursing/Registered Nurse	362	396	458	465	405	43	12%	145	189	202	257	112	77%
Math	27.0101	Mathematics, General	47	48	73	71	67	20	43%	19	18	20	13	-6	-32%
Technology	11.0701	Computer Science	180	193	206	238	225	45	25%	19	45	43	60	41	216%
	11.0901	Computer Systems Networking and Telecommunications	166	219	241	294	307	141	85%	59	64	74	231	172	292%
		Institutional STEM Total	**1,903**	**2,059**	**2,186**	**2,089**	**2,108**			**516**	**578**	**684**	**842**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-22
UNIVERSITY OF NORTH CAROLINA - GREENSBORO
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

UNC Greensboro			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Hard Science	26.0101	Biology/Biological Sciences, General	673	932	168	232
	26.0202	Biochemistry	139	153	27	30
	40.0501	Chemistry, General	108	120	20	23
	40.0801	Physics, General	32	37	9	10
Health Science	51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist	142	162	48	55
	51.2207	Public Health Education and Promotion	210	250	82	98
	51.3801	Registered Nursing/Registered Nurse	438	468	214	229
Math	27.0101	Mathematics, General	74	79	20	21
Technology	11.0701	Computer Science	338	500	75	110
	11.0901	Computer Systems Networking and Telecommunications	340	375	170	188
		Institutional STEM Total	**2,494**	**3,076**	**833**	**996**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-22** to calculate degree award projections based on enrollment projections provided by the institution. For University of North Carolina – Greensboro, the conversion rates were as follows: Engineering – N/A, Hard Science – 13%, Health Science – 40.6%, Math – 13.5%, and Technology – 36.1%.

EXHIBIT B-23
UNIVERSITY OF NORTH CAROLINA - PEMBROKE
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

UNC Pembroke			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Hard Science	03.0103	Geo-Environmental Studies	0	0	7	10	13	6	86%	3	4	2	2	-1	-33%
	03.0104	Environmental Science	18	22	18	28	27	9	50%	7	10	7	10	3	43%
	26.0101	Biology	215	257	268	280	283	68	32%	79	87	112	115	36	46%
	26.1201	Biotechnology	2	5	6	7	7	5	250%	1	1	0	1	0	0%
	40.0501	Chemistry	71	72	75	77	73	2	3%	19	21	24	24	5	26%
	40.0801	Applied Physics	7	5	6	11	13	6	86%	3	3	2	4	1	33%
Health Science	51.3801	Nursing	151	115	130	134	123	-28	-19%	49	50	47	58	9	18%
Math	27.0101	Mathematics	7	15	8	16	9	2	29%	2	5	5	5	3	150%
Technology	11.0103	Information Technology	43	42	28	41	47	4	9%	15	19	10	16	1	7%
	11.0701	Computer Science	48	48	51	51	46	-2	-4%	10	19	21	15	5	50%
		Institutional STEM Total	**562**	**581**	**597**	**655**	**641**			**188**	**219**	**230**	**250**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-24
UNIVERSITY OF NORTH CAROLINA - PEMBROKE
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

UNC Pembroke			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Hard Science	03.0103	Geo-Environmental Studies	37	37	13	13
	03.0104	Environmental Science	60	60	23	23
	26.0101	Biology	491	491	194	194
	26.1201	Biotechnology	36	36	5	5
	40.0501	Chemistry	103	103	31	31
	40.0801	Applied Physics	45	45	18	18
Health Science	51.3801	Nursing	183	183	73	73
Math	27.0101	Mathematics	33	33	13	13
Technology	11.0103	Information Technology	100	100	39	39
	11.0701	Computer Science	75	75	26	26
		Institutional STEM Total	**1,163**	**1,163**	**437**	**437**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-24** to calculate degree award projections based on enrollment projections provided by the institution. For University of North Carolina – Pembroke, the conversion rates were as follows: Engineering – 33.4%, Hard Science – 20.1%, Health Science – 20.1%, Math – 40.8%, and Technology – 36.5%.

EXHIBIT B-25
UNIVERSITY OF NORTH CAROLINA - WILMINGTON
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

UNC Wilmington			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Engineering	TBD	Coastal Engineering - BA (starting Fall 2019)						0	0%	0	0	0	0	0	0%
Hard Science	26.0101	Biology/Biological Sciences, General	420	388	402	372	367	-53	-13%	180	216	182	200	20	11%
	26.1302	Marine Biology and Biological Oceanography	200	189	168	175	174	-26	-13%	95	96	84	88	-7	-7%
	30.0103	Environmental Studies	51	36	34	34	34	-17	-33%	21	19	14	11	-10	-48%
	30.0104	Environmental Sciences	153	173	197	224	242	89	58%	77	65	78	100	23	30%
	40.0501	Chemistry, General	177	171	163	162	133	-44	-25%	54	54	48	64	10	19%
	40.0601	Geology/Earth Science, General	47	50	47	50	44	-3	-6%	10	21	22	23	13	130%
	40.0607	Oceanography, Chemical and Physical	26	25	22	24	21	-5	-19%	13	9	12	6	-7	-54%
	40.0801	Physics, General	48	55	48	38	33	-15	-31%	9	18	15	13	4	44%
Health Science	51.0913	Athletic Training/Trainer - BA	25	27	29	19	17	-8	-32%	10	9	16	11	1	10%
	51.2201	Public Health, General					11	11	100%	0	0	0	0	0	0%
	51.2309	Therapeutic Recreation/Recreational Therapy	124	129	114	109	108	-16	-13%	51	52	54	47	-4	-8%
	51.3801	Registered Nursing/Registered Nurse	548	890	1172	1440	1548	1000	91%	163	306	451	625	462	142%
	51.9999	Health Professions and Related Clinical Sciences, Other - BS	94	91	101	92	90	-4	-4%	42	47	54	46	4	10%
Math	27.0101	Mathematics, General	72	85	81	89	80	8	11%	35	29	31	43	8	23%
	27.0501	Statistics, General	23	25	33	45	29	6	26%	9	17	15	21	12	133%
Technology	11.0103	Information Technology	50	77	95	100	96	46	92%	5	23	40	43	38	760%
	11.0701	Computer Science	180	181	191	227	256	76	42%	59	53	47	66	7	12%
Institutional STEM Total			**2,238**	**2,592**	**2,897**	**3,200**	**3,334**			**833**	**1,034**	**1,163**	**1,407**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-26
UNIVERSITY OF NORTH CAROLINA - WILMINGTON
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

UNC Wilmington			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	TBD	Coastal Engineering - BA (starting Fall 2019)	75	100	31	41
Hard Science	26.0101	Biology/Biological Sciences, General	393	452	198	228
	26.1302	Marine Biology and Biological Oceanography	187	234	94	117
	30.0103	Environmental Studies	37	43	15	17
	30.0104	Environmental Sciences	327	377	138	159
	40.0501	Chemistry, General	148	185	50	63
	40.0601	Geology/Earth Science, General	49	62	21	27
	40.0607	Oceanography, Chemical and Physical	57	69	22	27
	40.0801	Physics, General	44	55	14	17
Health Science	51.0913	Athletic Training/Trainer - BA	0	0	0	0
	51.2201	Public Health, General	425	550	176	227
	51.2309	Therapeutic Recreation/Recreational Therapy - BA	110	110	48	48
	51.3801	Registered Nursing/Registered Nurse	2000	2250	775	872
	51.9999	Health Professions and Related Clinical Sciences, Other - BS	100	125	51	64
Math	27.0101	Mathematics, General	85	107	36	45
	27.0501	Statistics, General	37	47	18	23
Technology	11.0103	Information Technology	126	158	46	58
	11.0701	Computer Science	336	420	95	118
		Institutional STEM Total	**4,536**	**5,344**	**1,828**	**2,153**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-26** to calculate degree award projections based on enrollment projections provided by the institution. For University of North Carolina - Wilmington the conversion rates were as follows: Engineering – N/A, Hard Science – 27.5%, Health Science – 30.6%, Math – 30.8%, and Technology – 21.7 %.

EXHIBIT B-27
WESTERN CAROLINA UNIVERSITY
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM, FALL 2014 THROUGH 2018

Western Carolina University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Engineering	14.0101	Engineering, General	19	30	63	96	100	81	426%	0	0	8	24	16	200%
	14.1001	Electrical and Electronics Engineering	37	52	50	51	72	35	95%	10	14	28	10	0	0%
	15.0000	Engineering Technology, General	133	148	137	141	143	10	8%	41	59	46	55	14	34%
	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	39	44	43	44	50	11	28%	9	13	17	15	6	67%
	15.1001	Construction Engineering Technology/Technician	60	75	86	73	70	10	17%	19	23	34	39	20	105%
Hard Science	03.0104	Environmental Science	33	33	35	33	28	-5	-15%	19	14	11	17	-2	-11%
	03.0201	Natural Resource Conservation and Management	53	52	51	48	47	-6	-11%	18	24	21	18	0	0%
	26.0101	Biology/Biological Sciences, General	175	201	224	235	249	74	42%	59	80	88	90	31	53%
	40.0501	Chemistry, General	60	59	58	61	79	19	32%	22	17	33	21	-1	-5%
	40.0510	Forensic Chemistry	11	12	22	27	19	8	73%	6	6	8	10	4	70%
		Forensic Science	11	12	22	26	19	8	73%	6	6	8	10	4	64%
	40.0601	Geology/Earth Science, General	23	26	26	25	26	3	13%	7	8	13	10	3	43%
Health Science	51.0000	Health Services/Allied Health/Health Sciences, General					16	16	100%	0	0	0	0	0	0%
	51.0000	Integrated Health Sciences					29	29	100%	0	0	0	0	0	0%
	51.0201	Communication Sciences and Disorders, General	54	69	69	82	89	35	65%	23	31	32	31	8	35%
	51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	176	176	183	171	186	10	6%	57	38	41	58	1	2%
	51.0913	Athletic Training/Trainer	44	45	57	51	45	1	2%	20	12	21	26	6	30%
	51.2202	Environmental Health	43	48	43	37	48	5	12%	12	20	22	20	8	67%
	51.2309	Therapeutic Recreation/Recreational Therapy	81	63	73	75	64	-17	-21%	43	39	29	47	4	9%
	51.3101	Dietetics/Dietitian	52	44	40	42	42	-10	-19%	26	24	21	19	-7	-27%
	51.3801	Registered Nursing/Registered Nurse	444	415	392	401	353	-91	-20%	199	191	219	206	7	4%
Math	27.0101	Mathematics, General	52	45	44	59	64	12	23%	19	17	14	16	-3	-16%
Technology	11.0701	Computer Science	46	34	35	31	38	-8	-17%	19	17	18	14	-5	-26%
	52.1201	Management Information Systems, General	71	89	80	71	73	2	3%	22	38	34	34	12	55%
Institutional STEM Total			**1,717**	**1,772**	**1,833**	**1,880**	**1,949**			**656**	**691**	**766**	**790**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-28
WESTERN CAROLINA UNIVERSITY
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

Western Carolina University			Enrollments		Degree Awards	
STEM Category	CIP	Programs	5-year Projections	10-year Projections	5-year Projections	10-year Projections
Engineering	14.0101	Engineering, General	150	200	21	28
	14.1001	Electrical and Electronics Engineering	100	125	33	41
	15.0000	Engineering Technology, General	175	225	64	83
	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	75	100	25	34
	15.1001	Construction Engineering Technology/Technician	100	125	43	53
Hard Science	03.0104	Environmental Science	35	40	15	18
	03.0201	Natural Resource Conservation and Management	50	55	20	22
	26.0101	Biology/Biological Sciences, General	270	300	104	115
	40.0501	Chemistry, General	84	90	34	36
	40.0510	Forensic Chemistry	24	30	10	12
		Forensic Science	25	30	10	12
	40.0601	Geology/Earth Science, General	32	40	13	16
Health Science	51.0000	Health Services/Allied Health/Health Sciences, General*			0	0
	51.0000	Integrated Health Sciences *	200	300	82	123
	51.0201	Communication Sciences and Disorders, General	93	98	39	41
	51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	195	205	54	57
	51.0913	Athletic Training/Trainer	47	50	19	21
	51.2202	Environmental Health	50	53	24	25
	51.2309	Therapeutic Recreation/Recreational Therapy	67	70	37	38
	51.3101	Dietetics/Dietitian	44	46	22	23
	51.3801	Registered Nursing/Registered Nurse	371	388	189	198
Math	27.0101	Mathematics, General	75	90	24	28
Technology	11.0701	Computer Science	55	75	26	36
	52.1201	Management Information Systems, General	77	80	34	35
		Institutional STEM Total	**2,394**	**2,815**	**942**	**1,096**

* STEM enrollment figures include only upper division first majors.

Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-28** to calculate degree award projections based on enrollment projections provided by the institution. For Western Carolina University, the conversion rates were as follows: Engineering – 31.9%, Hard Science – 40.9%, Health Science – 35%, Math – 31.6%, and Technology – 45.6%.

EXHIBIT B-29
WINSTON-SALEM STATE UNIVERSITY
UPPER DIVISION STEM ENROLLMENTS* AND DEGREE AWARDS BY PROGRAM,
FALL 2014 THROUGH 2018

Winston-Salem State University			Enrollments							Degree Awards					
STEM Category	CIP	Programs	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	# change	Average % change	2014-2015	2015-2016	2016-2017	2017-2018	Award # change	Average Award % change
Hard Science	26.0101	Biology/Biological Sciences, General	71	59	77	110	134	63	89%	16	29	31	32	16	100%
	40.0501	Chemistry, General	21	13	4		17	-4	-19%	11	7	3	8	-3	-27%
Health Science	31.0505	Exercise Science/Physiology	78	86	106	120	139	61	78%	30	48	48	47	17	57%
	51.0701	Health/Health Care Administration/Management	98	106	128	132	139	41	42%	39	65	75	62	23	59%
	51.1005	Clinical Laboratory Science/Medical Technology/Technologist	119	90	94	98	105	-14	-12%	38	30	37	36	-2	-5%
	51.2309	Therapeutic Recreation/Recreational Therapy	69	62	86	72	70	1	1%	20	29	36	56	36	180%
	51.2310	Vocational Rehabilitation Counseling/Counselor	58	41	55	55	36	-22	-38%	35	29	29	32	-3	-9%
	51.3801	Registered Nursing/Registered Nurse	865	613	550	508	508	-357	-41%	631	447	433	307	-324	-51%
Math	27.0101	Mathematics, General	9	6	11	6	5	-4	-44%	5	4	6	4	-1	-20%
Technology	11.0103	Information Technology	19	15	22	19	21	2	11%	9	7	8	3	-6	-67%
	11.0401	Information Science/Studies	17	12	12	16	11	-6	-35%	5	3.5	2.5	4.5	-0.5	-10%
	110401	Management Information Systems	17	12	12	16	11	-6	-35%	5	3.5	2.5	4.5	-0.5	-10%
	11.0701	Computer Science	34	32	34	46	44	10	29%	10	18	14	10	0	0%
Institutional STEM Total			**1,475**	**1,147**	**1,191**	**1,198**	**1,240**			**854**	**720**	**725**	**606**		

* STEM enrollment figures include only upper division first majors.

EXHIBIT B-30
WINSTON-SALEM STATE UNIVERSITY
FIVE- AND TEN-YEAR ENROLLMENT* AND DEGREE AWARD PROJECTIONS BY PROGRAM

Winston-Salem State University			Enrollments		Degree Awards	
STEM Category	**CIP**	**Programs**	**5-year Projections**	**10-year Projections**	**5-year Projections**	**10-year Projections**
Hard Science	26.0101	Biology/Biological Sciences, General	126	214	45	77
	40.0501	Chemistry, General	10	6	7	4
Health Science	31.0505	Exercise Science/Physiology	145	160	64	71
	51.0701	Health/Health Care Administration/Management	150	200	79	105
	51.1005	Clinical Laboratory Science/Medical Technology/Technologist	115	120	42	44
	51.2309	Therapeutic Recreation/Recreational Therapy	75	75	42	42
	51.2310	Vocational Rehabilitation Counseling/Counselor	50	50	30	30
	51.3801	Registered Nursing/Registered Nurse	560	616	390	429
Math	27.0101	Mathematics, General	9	9	6	6
Technology	11.0103	Information Technology	17	18	5	6
	11.0401	Information Science/Studies	16	15	4	4
	11.0401	Management Information Systems	10	16	3	4
	11.0701	Computer Science	45	62	16	22
		Institutional STEM Total	**1,328**	**1,561**	**732**	**842**

* STEM enrollment figures include only upper division first majors.
Note: Degree conversion rates were calculated for each of the five STEM groupings at each institution based on historical degree awards per enrollment. These rates have been applied in **Exhibit B-30** to calculate degree award projections based on enrollment projections provided by the institution. For Winston-Salem State University the conversion rates were as follows: Engineering – N/A, Hard Science – 52.4%, Health Science – 53%, Math – 61.9%, and Technology – 29.8%

APPENDIX C: STEM OCCUPATIONAL PROJECTIONS

A CIP to SOC crosswalk was provided by the System Office, to associate each academic program under the study scope with one or more occupations. Using this crosswalk, MGT developed a list of occupations associated with at least one undergraduate STEM program within the study scope which require a bachelor's degree for job entry. Occupations requiring a bachelor's degree plus more than five years of experience were removed from the list. The occupational projections and median salary information for the resulting occupations are shown in the chart that follows.

EXHIBIT C-1
PROJECTIONS FOR OCCUPATIONS REQUIRING A STEM BACHELOR'S DEGREE IN NORTH CAROLINA, 2017-2026

SOC	Occupation Title	2017	2026	Net Growth	Total Openings	Annualized Growth Rate	2018 Median Wage
11-2022	Sales Managers	7,028	7,687	659	6,182	1.0%	$ 131,600
11-3011	Administrative Services Managers	4,770	5,282	512	4,079	1.1%	$ 98,260
11-9021	Construction Managers	15,958	17,837	1,879	12,123	1.2%	$ 97,290
11-9111	Medical and Health Services Managers	9,206	10,879	1,673	8,537	1.9%	$ 101,020
11-9151	Social and Community Service Managers	2,951	3,528	577	3,057	2.0%	$ 64,360
11-9199	Managers, All Other	26,297	29,010	2,713	19,888	1.1%	$ 113,560
13-1051	Cost Estimators	7,061	7,769	708	7,143	1.1%	$ 59,750
13-1111	Management Analysts	18,981	22,129	3,148	18,651	1.7%	$ 83,700
13-2053	Insurance Underwriters	2,152	2,145	(7)	1,524	0.0%	$ 71,570
15-1121	Computer Systems Analysts	25,957	28,923	2,966	18,507	1.2%	$ 90,230
15-1122	Information Security Analysts	4,108	5,275	1,167	3,971	2.8%	$ 103,470
15-1131	Computer Programmers	7,258	7,019	(239)	3,749	-0.4%	$ 91,340
15-1132	Software Developers, Applications	27,527	36,309	8,782	26,814	3.1%	$ 100,560
15-1133	Software Developers, Systems Software	8,269	9,200	931	5,866	1.2%	$ 104,710
15-1199	Computer Occupations, All Other	*	*	*	4,052	1.2%	$ 86,770
15-2011	Actuaries	349	448	99	313	2.8%	$ 110,510
15-2031	Operations Research Analysts	2,563	3,245	682	2,203	2.7%	$ 81,130
17-2011	Aerospace Engineers	645	696	51	404	0.8%	$ 98,900
17-2021	Agricultural Engineers	26	26	-	14	0.0%	*
17-2031	Biomedical Engineers	433	466	33	296	0.8%	$ 87,320
17-2041	Chemical Engineers	995	1,134	139	740	1.5%	$ 97,700
17-2051	Civil Engineers	8,470	9,351	881	6,565	1.1%	$ 80,480
17-2061	Computer Hardware Engineers	1,709	1,841	132	1,120	0.8%	$ 108,440
17-2071	Electrical Engineers	5,617	6,244	627	3,969	1.2%	$ 91,680
17-2072	Electronics Engineers, Except Computer	3,375	3,691	316	2,307	1.0%	$ 92,940
17-2081	Environmental Engineers	1,389	1,504	115	951	0.9%	$ 74,900
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	573	629	56	399	1.0%	$ 74,950
17-2112	Industrial Engineers	9,350	10,379	1,029	6,670	1.2%	$ 82,900
17-2131	Materials Engineers	415	438	23	290	0.6%	*
17-2141	Mechanical Engineers	8,267	9,187	920	5,783	1.2%	$ 82,730
17-2161	Nuclear Engineers	768	838	70	599	1.0%	$ 115,590
17-2199	Engineers, All Other	1,663	1,824	161	1,156	1.0%	$ 85,110
19-1022	Microbiologists	424	469	45	386	1.1%	$ 61,330
19-1023	Zoologists and Wildlife Biologists	493	533	40	431	0.9%	$ 53,630
19-1029	Biological Scientists, All Other	1,125	1,215	90	982	0.9%	$ 79,580
19-1099	Life Scientists, All Other	173	192	19	154	1.2%	$ 91,080
19-2021	Atmospheric and Space Scientists	130	139	9	93	0.7%	$ 81,210
19-2041	Environmental Scientists and Specialists, Including Health	3,902	4,365	463	3,822	1.3%	$ 58,600
19-2042	Geoscientists, Except Hydrologists and Geographers	544	633	89	567	1.7%	$ 70,160
19-2043	Hydrologists	181	188	7	157	0.4%	$ 62,630
19-2099	Physical Scientists, All Other	709	747	38	539	0.6%	$ 94,930
19-4092	Forensic Science Technicians	523	613	90	676	1.8%	$ 44,720
21-1091	Health Educators	1,199	1,321	122	1,475	1.1%	$ 51,620
25-1194	Vocational Education Teachers, Postsecondary	6,861	6,805	(56)	4,541	-0.1%	$ 53,200
25-2023	Career/Technical Education Teachers, Middle School	1,217	1,273	56	841	0.5%	$ 49,420
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	23,104	24,199	1,095	15,557	0.5%	$ 46,760
25-2032	Career/Technical Education Teachers, Secondary School	4,844	5,032	188	3,207	0.4%	$ 50,140
27-1024	Graphic Designers	7,994	8,570	576	7,400	0.8%	$ 45,210
27-2022	Coaches and Scouts	6,837	7,705	868	9,452	1.3%	$ 34,990
29-1031	Dietitians and Nutritionists	2,126	2,422	296	1,523	1.5%	$ 54,620
29-1125	Recreational Therapists	476	492	16	255	0.4%	$ 44,960
29-1128	Exercise Physiologists	486	549	63	311	1.4%	$ 46,200
29-1129	Therapists, All Other	503	593	90	353	1.8%	$ 46,450
29-1141	Registered Nurses	103,171	119,789	16,618	67,155	1.7%	$ 62,940
29-9011	Occupational Health and Safety Specialists	2,293	2,465	172	1,234	0.8%	$ 68,790
29-9091	Athletic Trainers	701	841	140	484	2.0%	$ 44,720
	Occupations Requiring a Bachelor's Degree in NC associated with STEM CIPs	**384,146**	**436,083**	**51,937**	**299,517**	**n/a**	**$ 77,062**

Note: Occupations included on this list resulted from being associated with the STEM CIPs identified through a SOC-CIP "crosswalk" data set provided by the UNC system.

Western Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	12,759	14,016	1,257	7,327	916	Top 20 - Annual Openings
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	2,548	2,601	53	1,627	203	
11-9199	Managers, All Other	1,507	1,637	130	1,310	164	
11-9021	Construction Managers	1,310	1,452	142	980	123	
27-2022	Coaches and Scouts	722	801	79	977	122	
11-9111	Medical and Health Services Managers	1,024	1,159	135	881	110	
15-1132	Software Developers, Applications	894	1,155	261	840	105	
17-2112	Industrial Engineers	1,209	1,307	98	818	102	
13-1111	Management Analysts	687	792	105	763	95	
27-1024	Graphic Designers	856	889	33	752	94	
29-2010	Clinical Laboratory Technologists and Technicians	1,111	1,199	88	718	90	
13-1051	Cost Estimators	586	644	58	592	74	
25-1194	Vocational Education Teachers, Postsecondary	721	699	(22)	573	72	
17-2141	Mechanical Engineers	840	901	61	546	68	
29-2034	Radiologic Technologists	907	969	62	538	67	
29-2021	Dental Hygienists	707	761	54	478	60	
17-3026	Industrial Engineering Technicians	567	572	5	459	57	
19-2031	Chemists	399	442	43	436	55	
11-2202	Sales Managers	457	487	30	427	53	
11-3011	Administrative Services Managers	458	488	30	366	46	
25-2032	Career/Technical Education Teachers, Secondary School	576	584	8	364	46	20+ Annual Openings
17-2051	Civil Engineers	468	511	43	355	44	
29-1126	Respiratory Therapists	465	565	100	340	43	
11-9151	Social and Community Service Managers	327	372	45	313	39	
19-2041	Environmental Scientists and Specialists, Including Health	298	328	30	283	35	
17-3022	Civil Engineering Technicians	244	258	14	282	35	
17-2071	Electrical Engineers	399	419	20	275	34	
15-1131	Computer Programmers	326	310	(16)	188	24	
15-1134	Web Developers	198	228	30	188	24	
17-3023	Electrical and Electronics Engineering Technicians	213	212	(1)	176	22	
15-1152	Computer Network Support Specialists	217	243	26	175	22	
29-1031	Dietitians and Nutritionists	267	293	26	175	22	
17-3011	Architectural and Civil Drafters	-	-	-	174	22	
21-1091	Health Educators	115	124	9	170	21	
19-4091	Environmental Science and Protection Technicians, Including Health	61	73	12	169	21	

Western Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
15-1122	Information Security Analysts	24	29	5	138	17	
17-2072	Electronics Engineers, Except Computer	168	175	7	119	15	
19-4099	Life, Physical, and Social Science Technicians, All Other	-	-	-	110	14	
29-9011	Occupational Health and Safety Specialists	220	230	10	109	14	
25-2023	Career/Technical Education Teachers, Middle School	100	103	3	105	13	
17-1011	Architects, Except Landscape and Naval	68	74	6	101	13	
17-3027	Mechanical Engineering Technicians	123	123	-	100	13	
15-1133	Software Developers, Systems Software	64	70	6	99	12	
17-3013	Mechanical Drafters	97	103	6	80	10	
17-2199	Engineers, All Other	78	85	7	64	8	
19-1023	Zoologists and Wildlife Biologists	-	-	-	64	8	
19-4092	Forensic Science Technicians	16	18	2	61	8	
19-1031	Conservation Scientists	53	57	4	54	7	
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	62	66	4	52	7	
17-2011	Aerospace Engineers	-	-	-	47	6	
29-1128	Exercise Physiologists	34	38	4	45	6	
15-2031	Operations Research Analysts	19	25	6	44	6	
13-2053	Insurance Underwriters	-	-	-	43	5	
29-1124	Radiation Therapists	37	43	6	42	5	
29-1129	Therapists, All Other	47	54	7	42	5	
29-9091	Athletic Trainers	52	61	9	41	5	
17-2041	Chemical Engineers	-	-	-	37	5	
17-2081	Environmental Engineers	22	23	1	37	5	
19-1022	Microbiologists	-	-	-	34	4	
29-1125	Recreational Therapists	29	30	1	33	4	
17-3012	Electrical and Electronics Drafters	36	36	-	31	4	
17-2131	Materials Engineers	18	19	1	30	4	
17-2161	Nuclear Engineers	-	-	-	27	3	
17-1012	Landscape Architects	-	-	-	26	3	
19-1032	Foresters	36	35	(1)	26	3	
19-1029	Biological Scientists, All Other	17	17	-	23	3	
29-2051	Dietetic Technicians	12	13	1	20	3	
19-2042	Geoscientists, Except Hydrologists and Geographers	-	-	-	16	2	
17-2031	Biomedical Engineers	-	-	-	15	2	
19-2099	Physical Scientists, All Other	-	-	-	14	2	
17-3025	Environmental Engineering Technicians	-	-	-	13	2	
17-3019	Drafters, All Other	-	-	-	10	1	
15-2011	Actuaries	-	-	-	9	1	
19-2043	Hydrologists	-	-	-	9	1	
17-2061	Computer Hardware Engineers	-	-	-	8	1	
19-2021	Atmospheric and Space Scientists	-	-	-	3	0	
17-2021	Agricultural Engineers	-	-	-	2	0	
19-1099	Life Scientists, All Other	-	-	-	1	0	
29-2054	Respiratory Therapy Technicians	-	-	-	-	-	
	Grand Total	**35,875**	**39,018**	**3,143**	**27,019**	**3,377**	

<20 Annual Openings

Piedmont-Triad Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	17,668	18,731	1,063	9,313	1,164	Top 20 - Annual Openings
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	3,660	3,660	-	2,238	280	
11-9199	Managers, All Other	2,548	2,658	110	1,726	216	
11-9021	Construction Managers	1,757	1,866	109	1,207	151	
13-1111	Management Analysts	1,348	1,468	120	1,183	148	
15-1132	Software Developers, Applications	1,436	1,721	285	1,176	147	
27-2022	Coaches and Scouts	923	971	48	1,167	146	
17-2112	Industrial Engineers	1,644	1,798	154	1,139	142	
11-9111	Medical and Health Services Managers	1,391	1,522	131	1,127	141	
27-1024	Graphic Designers	1,273	1,271	(2)	1,046	131	
29-2010	Clinical Laboratory Technologists and Technicians	1,560	1,617	57	923	115	
13-1051	Cost Estimators	921	953	32	845	106	
17-2141	Mechanical Engineers	1,297	1,381	84	831	104	
25-1194	Vocational Education Teachers, Postsecondary	1,315	1,245	(70)	791	99	
11-2022	Sales Managers	874	917	43	715	89	
29-2034	Radiologic Technologists	1,411	1,442	31	683	85	
29-2021	Dental Hygienists	1,052	1,089	37	601	75	
17-3026	Industrial Engineering Technicians	717	723	6	554	69	
11-3011	Administrative Services Managers	707	740	33	546	68	
19-2031	Chemists	608	628	20	509	64	
25-2032	Career/Technical Education Teachers, Secondary School	830	823	(7)	498	62	20+ Annual Openings
29-1126	Respiratory Therapists	746	858	112	445	56	
17-2051	Civil Engineers	585	596	11	388	49	
11-9151	Social and Community Service Managers	363	417	54	353	44	
19-2041	Environmental Scientists and Specialists, Including Health	339	354	15	296	37	
17-2071	Electrical Engineers	461	475	14	278	35	
17-3023	Electrical and Electronics Engineering Technicians	336	347	11	272	34	
15-1152	Computer Network Support Specialists	383	400	17	270	34	
15-1134	Web Developers	362	387	25	259	32	
17-3022	Civil Engineering Technicians	320	318	(2)	241	30	
15-1131	Computer Programmers	618	536	(82)	240	30	
15-1122	Information Security Analysts	291	341	50	238	30	
17-2072	Electronics Engineers, Except Computer	368	385	17	229	29	
17-3011	Architectural and Civil Drafters	311	307	(4)	229	29	
19-4091	Environmental Science and Protection Technicians, Including Health	199	209	10	220	28	
21-1091	Health Educators	98	103	5	216	27	
29-1031	Dietitians and Nutritionists	330	348	18	201	25	
15-1133	Software Developers, Systems Software	299	311	12	185	23	
19-4099	Life, Physical, and Social Science Technicians, All Other	83	89	6	163	20	

Piedmont-Triad Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
13-2053	Insurance Underwriters	263	239	(24)	155	19	
17-3027	Mechanical Engineering Technicians	176	186	10	148	19	
25-2023	Career/Technical Education Teachers, Middle School	229	229	-	144	18	
29-9011	Occupational Health and Safety Specialists	275	280	5	128	16	
17-1011	Architects, Except Landscape and Naval	223	213	(10)	126	16	
17-3013	Mechanical Drafters	149	157	8	123	15	
17-2199	Engineers, All Other	95	97	2	96	12	
15-2031	Operations Research Analysts	108	128	20	82	10	
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	101	107	6	65	8	
19-4092	Forensic Science Technicians	50	55	5	59	7	
29-1128	Exercise Physiologists	50	51	1	57	7	
17-2011	Aerospace Engineers	66	66	-	56	7	
29-9091	Athletic Trainers	91	104	13	56	7	
17-2041	Chemical Engineers	53	55	2	55	7	
19-1023	Zoologists and Wildlife Biologists	-	-	-	54	7	
29-1124	Radiation Therapists	110	114	4	52	7	
29-1129	Therapists, All Other	-	-	-	52	7	
19-1031	Conservation Scientists	58	63	5	50	6	
17-3012	Electrical and Electronics Drafters	63	64	1	49	6	
17-2131	Materials Engineers	66	68	2	44	6	
17-2161	Nuclear Engineers	-	-	-	43	5	
19-1022	Microbiologists	37	37	-	43	5	
15-2011	Actuaries	56	63	7	38	5	
17-2081	Environmental Engineers	60	61	1	36	5	
17-1012	Landscape Architects	-	-	-	33	4	
29-1125	Recreational Therapists	42	38	(4)	32	4	
29-2051	Dietetic Technicians	40	42	2	30	4	
19-1029	Biological Scientists, All Other	33	35	2	28	4	
17-2031	Biomedical Engineers	11	12	1	26	3	
19-1032	Foresters	14	14	-	23	3	
19-2042	Geoscientists, Except Hydrologists and Geographers	-	-	-	21	3	
17-3019	Drafters, All Other	16	16	-	20	3	
17-2061	Computer Hardware Engineers	22	21	(1)	19	2	
17-3025	Environmental Engineering Technicians	17	16	(1)	19	2	
19-2099	Physical Scientists, All Other	10	11	1	14	2	
19-2021	Atmospheric and Space Scientists	-	-	-	7	1	
19-2043	Hydrologists	-	-	-	7	1	
19-1099	Life Scientists, All Other	-	-	-	2	0	
29-2054	Respiratory Therapy Technicians	-	-	-	-	-	
	Grand Total	**54,016**	**56,647**	**2,631**	**35,633**	**4,454**	

<20 Annual Openings

North Central Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	26,870	31,602	4,732	17,985	2,248	Top 20 - Annual Openings
15-1132	Software Developers, Applications	13,664	17,505	3,841	12,645	1,581	
11-9199	Managers, All Other	8,984	9,774	790	6,615	827	
13-1111	Management Analysts	5,582	6,450	868	5,405	676	
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	6,358	6,597	239	4,200	525	
11-9021	Construction Managers	4,685	4,926	241	3,154	394	
27-2022	Coaches and Scouts	2,173	2,438	265	2,987	373	
15-1133	Software Developers, Systems Software	4,214	4,462	248	2,699	337	
17-2051	Civil Engineers	3,581	3,891	310	2,694	337	
11-9111	Medical and Health Services Managers	2,558	3,039	481	2,393	299	
29-2010	Clinical Laboratory Technologists and Technicians	2,923	3,275	352	2,039	255	
27-1024	Graphic Designers	2,187	2,344	157	2,024	253	
17-2112	Industrial Engineers	2,773	3,064	291	1,961	245	
15-1152	Computer Network Support Specialists	2,465	2,704	239	1,909	239	
13-1051	Cost Estimators	1,968	2,079	111	1,867	233	
17-2141	Mechanical Engineers	2,522	2,854	332	1,830	229	
11-2022	Sales Managers	2,013	2,172	159	1,730	216	
19-2031	Chemists	2,000	2,105	105	1,728	216	
17-2071	Electrical Engineers	2,389	2,613	224	1,633	204	
19-2041	Environmental Scientists and Specialists, Including Health	1,546	1,734	188	1,570	196	
15-1131	Computer Programmers	2,835	2,718	(117)	1,435	179	50+ Annual Openings
15-1134	Web Developers	1,712	1,946	234	1,376	172	
11-3011	Administrative Services Managers	1,386	1,514	128	1,157	145	
29-2034	Radiologic Technologists	1,822	2,071	249	1,138	142	
17-2072	Electronics Engineers, Except Computer	1,419	1,527	108	1,006	126	
17-3022	Civil Engineering Technicians	1,157	1,236	79	990	124	
29-2021	Dental Hygienists	1,492	1,631	139	963	120	
17-3026	Industrial Engineering Technicians	908	975	67	944	118	
17-2061	Computer Hardware Engineers	1,448	1,495	47	872	109	
15-1122	Information Security Analysts	937	1,142	205	827	103	
25-2032	Career/Technical Education Teachers, Secondary School	1,148	1,181	33	745	93	
19-1029	Biological Scientists, All Other	850	914	64	740	93	
25-1194	Vocational Education Teachers, Postsecondary	1,095	1,073	(22)	708	89	
19-4099	Life, Physical, and Social Science Technicians, All Other	568	622	54	684	86	
29-1126	Respiratory Therapists	888	1,144	256	678	85	
11-9151	Social and Community Service Managers	649	743	94	627	78	
17-3023	Electrical and Electronics Engineering Technicians	762	785	23	613	77	
17-3011	Architectural and Civil Drafters	695	751	56	600	75	
15-2031	Operations Research Analysts	819	941	122	583	73	
17-2081	Environmental Engineers	766	835	69	538	67	
29-1031	Dietitians and Nutritionists	655	749	94	473	59	
21-1091	Health Educators	392	419	27	462	58	
17-2199	Engineers, All Other	641	695	54	441	55	
17-1011	Architects, Except Landscape and Naval	612	642	30	437	55	
17-3013	Mechanical Drafters	464	513	49	417	52	

North Central Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-9011	Occupational Health and Safety Specialists	719	779	60	395	49	<50 Annual Openings
19-2099	Physical Scientists, All Other	497	534	37	393	49	
13-2053	Insurance Underwriters	585	559	(26)	392	49	
19-4091	Environmental Science and Protection Technicians, Including Health	240	268	28	317	40	
17-2041	Chemical Engineers	404	452	48	290	36	
17-3027	Mechanical Engineering Technicians	276	306	30	251	31	
17-3012	Electrical and Electronics Drafters	252	280	28	228	29	
17-2031	Biomedical Engineers	324	343	19	223	28	
25-2023	Career/Technical Education Teachers, Middle School	317	329	12	216	27	
19-2042	Geoscientists, Except Hydrologists and Geographers	196	229	33	206	26	
19-4092	Forensic Science Technicians	144	168	24	197	25	
19-1022	Microbiologists	209	220	11	184	23	
29-9091	Athletic Trainers	201	244	43	148	19	
17-1012	Landscape Architects	190	205	15	142	18	
19-1099	Life Scientists, All Other	155	172	17	138	17	
29-2051	Dietetic Technicians	146	170	24	136	17	
19-1023	Zoologists and Wildlife Biologists	122	132	10	116	15	
19-1031	Conservation Scientists	126	139	13	115	14	
17-3025	Environmental Engineering Technicians	97	113	16	98	12	
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	160	163	3	96	12	
19-2043	Hydrologists	105	108	3	91	11	
29-1124	Radiation Therapists	131	155	24	87	11	
29-1129	Therapists, All Other	111	129	18	80	10	
17-2131	Materials Engineers	102	106	4	77	10	
29-1128	Exercise Physiologists	110	124	14	76	10	
19-1032	Foresters	78	80	2	66	8	
29-1125	Recreational Therapists	115	120	5	66	8	
17-3019	Drafters, All Other	41	46	5	40	5	
17-2161	Nuclear Engineers	61	59	(2)	39	5	
19-2021	Atmospheric and Space Scientists	39	44	5	31	4	
15-2011	Actuaries	-	-	-	17	2	
17-2011	Aerospace Engineers	-	-	-	10	1	
17-2021	Agricultural Engineers	-	-	-	5	1	
29-2054	Respiratory Therapy Technicians	-	-	-	1	0	
	Grand Total	**133,828**	**150,666**	**16,838**	**103,489**	**12,936**	

South Central Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	30,375	34,183	3,808	18,440	2,305	Top 20 - Annual Openings
15-1132	Software Developers, Applications	8,756	11,645	2,889	8,731	1,091	
13-1111	Management Analysts	8,286	9,921	1,635	8,567	1,071	
11-9199	Managers, All Other	10,516	11,929	1,413	8,513	1,064	
11-9021	Construction Managers	6,285	7,403	1,118	5,267	658	
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	6,955	7,379	424	5,001	625	
27-2022	Coaches and Scouts	2,112	2,492	380	3,098	387	
13-1051	Cost Estimators	2,408	2,883	475	2,770	346	
27-1024	Graphic Designers	2,691	2,946	255	2,576	322	
11-2022	Sales Managers	2,771	3,088	317	2,547	318	
11-9111	Medical and Health Services Managers	2,740	3,171	431	2,452	307	
15-1133	Software Developers, Systems Software	3,038	3,539	501	2,370	296	
15-1122	Information Security Analysts	2,148	2,907	759	2,284	286	
17-2051	Civil Engineers	2,725	3,109	384	2,245	281	
17-2141	Mechanical Engineers	2,557	2,916	359	1,885	236	
17-2112	Industrial Engineers	2,501	2,806	305	1,822	228	
25-1194	Vocational Education Teachers, Postsecondary	2,207	2,211	4	1,562	195	
11-3011	Administrative Services Managers	1,634	1,841	207	1,440	180	
15-1131	Computer Programmers	2,553	2,527	(26)	1,394	174	
15-1134	Web Developers	1,608	1,901	293	1,388	174	
29-2021	Dental Hygienists	2,085	2,226	141	1,277	160	50+ Annual Openings
15-1152	Computer Network Support Specialists	1,436	1,677	241	1,263	158	
29-2034	Radiologic Technologists	2,161	2,345	184	1,214	152	
15-2031	Operations Research Analysts	1,215	1,617	402	1,146	143	
19-2041	Environmental Scientists and Specialists, Including Health	1,055	1,221	166	1,123	140	
17-2071	Electrical Engineers	1,442	1,670	228	1,105	138	
17-1011	Architects, Except Landscape and Naval	1,443	1,560	117	1,070	134	
25-2032	Career/Technical Education Teachers, Secondary School	1,467	1,541	74	1,035	129	
11-9151	Social and Community Service Managers	1,005	1,193	188	1,029	129	
29-1126	Respiratory Therapists	1,269	1,552	283	934	117	
29-2010	Clinical Laboratory Technologists and Technicians	1,290	1,383	93	923	115	
19-2031	Chemists	848	932	84	789	99	
17-3011	Architectural and Civil Drafters	840	945	105	775	97	
13-2053	Insurance Underwriters	879	873	(6)	639	80	
17-3023	Electrical and Electronics Engineering Technicians	622	682	60	569	71	
17-3026	Industrial Engineering Technicians	629	655	26	540	68	
17-3022	Civil Engineering Technicians	611	656	45	527	66	
17-2072	Electronics Engineers, Except Computer	678	769	91	499	62	
17-3013	Mechanical Drafters	541	602	61	494	62	
19-4091	Environmental Science and Protection Technicians, Including Health	348	409	61	467	58	
19-4099	Life, Physical, and Social Science Technicians, All Other	82	87	5	413	52	

South Central Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
21-1091	Health Educators	298	332	34	393	49	<50 Annual Openings
17-2161	Nuclear Engineers	-	-	-	389	49	
17-2199	Engineers, All Other	480	549	69	368	46	
29-1031	Dietitians and Nutritionists	490	542	52	353	44	
29-9011	Occupational Health and Safety Specialists	606	663	57	340	43	
19-4092	Forensic Science Technicians	208	253	45	290	36	
17-3012	Electrical and Electronics Drafters	276	314	38	269	34	
17-3027	Mechanical Engineering Technicians	259	287	28	263	33	
19-2042	Geoscientists, Except Hydrologists and Geographers	-	-	-	255	32	
17-2081	Environmental Engineers	313	348	35	228	29	
25-2023	Career/Technical Education Teachers, Middle School	286	300	14	211	26	
15-2011	Actuaries	174	238	64	179	22	
29-9091	Athletic Trainers	251	300	49	177	22	
17-2011	Aerospace Engineers	123	139	16	162	20	
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	115	132	17	106	13	
17-2061	Computer Hardware Engineers	126	145	19	102	13	
17-2041	Chemical Engineers	115	125	10	92	12	
29-1128	Exercise Physiologists	34	37	3	92	12	
19-1031	Conservation Scientists	103	111	8	91	11	
17-2131	Materials Engineers	94	102	8	87	11	
19-1029	Biological Scientists, All Other	27	29	2	75	9	
19-1022	Microbiologists	76	77	1	72	9	
29-1124	Radiation Therapists	119	129	10	67	8	
29-1125	Recreational Therapists	107	113	6	67	8	
19-1023	Zoologists and Wildlife Biologists	61	64	3	64	8	
19-1032	Foresters	27	28	1	55	7	
17-3025	Environmental Engineering Technicians	42	51	9	53	7	
17-1012	Landscape Architects	51	55	4	51	6	
29-1129	Therapists, All Other	38	45	7	49	6	
17-3019	Drafters, All Other	39	46	7	41	5	
19-2099	Physical Scientists, All Other	14	17	3	40	5	
29-2051	Dietetic Technicians	-	-	-	33	4	
19-2043	Hydrologists	24	27	3	30	4	
19-2021	Atmospheric and Space Scientists	9	11	2	26	3	
17-2031	Biomedical Engineers	-	-	-	12	2	
19-1099	Life Scientists, All Other	-	-	-	6	1	
17-2021	Agricultural Engineers	-	-	-	4	1	
29-2054	Respiratory Therapy Technicians	9	5	(4)	1	0	
	Grand Total	**131,806**	**151,006**	**19,200**	**107,376**	**13,422**	

Eastern Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-1141	Registered Nurses	14,808	16,647	1,839	8,968	1,121	Top 20 - Annual Openings
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	2,570	2,732	162	2,144	268	
11-9199	Managers, All Other	2,101	2,279	178	1,537	192	
11-9021	Construction Managers	1,576	1,711	135	1,132	142	
11-9111	Medical and Health Services Managers	1,283	1,460	177	1,115	139	
27-2022	Coaches and Scouts	548	617	69	1,079	135	
13-1111	Management Analysts	1,131	1,284	153	1,065	133	
15-1132	Software Developers, Applications	856	1,151	295	932	117	
29-2010	Clinical Laboratory Technologists and Technicians	1,083	1,201	118	849	106	
25-1194	Vocational Education Teachers, Postsecondary	869	828	(41)	751	94	
27-1024	Graphic Designers	777	839	62	728	91	
29-2034	Radiologic Technologists	1,137	1,252	115	692	87	
13-1051	Cost Estimators	691	755	64	691	86	
17-2112	Industrial Engineers	802	925	123	617	77	
29-2021	Dental Hygienists	885	937	52	560	70	
17-2141	Mechanical Engineers	778	859	81	537	67	
17-2051	Civil Engineers	626	687	61	480	60	
25-2032	Career/Technical Education Teachers, Secondary School	350	381	31	477	60	
11-2022	Sales Managers	497	546	49	441	55	
19-2031	Chemists	171	198	27	419	52	
29-1126	Respiratory Therapists	444	569	125	415	52	20+ Annual Openings
19-2041	Environmental Scientists and Specialists, Including Health	407	449	42	391	49	
11-3011	Administrative Services Managers	457	505	48	389	49	
17-3022	Civil Engineering Technicians	393	421	28	379	47	
17-3026	Industrial Engineering Technicians	281	287	6	356	45	
11-9151	Social and Community Service Managers	344	383	39	316	40	
17-2071	Electrical Engineers	309	340	31	289	36	
29-1031	Dietitians and Nutritionists	294	332	38	226	28	
17-3023	Electrical and Electronics Engineering Technicians	209	226	17	221	28	
15-1152	Computer Network Support Specialists	239	276	37	219	27	
15-1134	Web Developers	190	226	36	212	27	
19-4091	Environmental Science and Protection Technicians, Including Health	137	162	25	209	26	
17-3011	Architectural and Civil Drafters	216	243	27	208	26	
15-1131	Computer Programmers	353	344	(9)	198	25	
21-1091	Health Educators	122	135	13	191	24	
17-2072	Electronics Engineers, Except Computer	207	237	30	181	23	
19-4099	Life, Physical, and Social Science Technicians, All Other	83	94	11	174	22	
15-1122	Information Security Analysts	112	145	33	162	20	

Eastern Region							
SOC*	Occupational Title	2018	2026	Net Growth	Total Openings	One Year Openings	
29-9011	Occupational Health and Safety Specialists	300	313	13	151	19	<20 Annual Openings
25-2023	Career/Technical Education Teachers, Middle School	81	91	10	137	17	
17-1011	Architects, Except Landscape and Naval	115	126	11	122	15	
15-1133	Software Developers, Systems Software	77	87	10	110	14	
17-2011	Aerospace Engineers	110	117	7	108	14	
17-2199	Engineers, All Other	136	144	8	107	13	
19-1023	Zoologists and Wildlife Biologists	78	83	5	97	12	
19-1031	Conservation Scientists	98	111	13	92	12	
17-3027	Mechanical Engineering Technicians	-	-	-	84	11	
19-4092	Forensic Science Technicians	14	17	3	77	10	
17-3013	Mechanical Drafters	52	59	7	69	9	
13-2053	Insurance Underwriters	-	-	-	65	8	
19-1029	Biological Scientists, All Other	55	59	4	65	8	
17-2081	Environmental Engineers	58	63	5	55	7	
29-1128	Exercise Physiologists	25	29	4	53	7	
15-2031	Operations Research Analysts	41	57	16	52	7	
19-1032	Foresters	41	42	1	49	6	
29-1129	Therapists, All Other	-	-	-	47	6	
29-9091	Athletic Trainers	18	25	7	47	6	
29-1124	Radiation Therapists	15	15	-	46	6	
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	40	47	7	40	5	
29-1125	Recreational Therapists	-	-	-	39	5	
19-1022	Microbiologists	-	-	-	37	5	
19-2099	Physical Scientists, All Other	-	-	-	36	5	
17-2161	Nuclear Engineers	21	22	1	32	4	
17-2131	Materials Engineers	14	16	2	31	4	
17-1012	Landscape Architects	19	21	2	30	4	
29-2051	Dietetic Technicians	-	-	-	27	3	
17-3012	Electrical and Electronics Drafters	10	12	2	26	3	
19-2042	Geoscientists, Except Hydrologists and Geographers	9	11	2	23	3	
17-2041	Chemical Engineers	-	-	-	22	3	
19-2021	Atmospheric and Space Scientists	-	-	-	22	3	
17-3025	Environmental Engineering Technicians	7	8	1	17	2	
15-2011	Actuaries	-	-	-	14	2	
19-2043	Hydrologists	-	-	-	14	2	
17-2031	Biomedical Engineers	-	-	-	11	1	
17-3019	Drafters, All Other	-	-	-	11	1	
17-2061	Computer Hardware Engineers	-	-	-	10	1	
17-2021	Agricultural Engineers	-	-	-	1	0	
19-1099	Life Scientists, All Other	-	-	-	1	0	
29-2054	Respiratory Therapy Technicians	-	-	-	-	-	
	Grand Total	**39,770**	**44,238**	**4,468**	**32,027**	**4,003**	

APPENDIX D: STEM PROGRAMS AT PRIVATE INSTITUTIONS IN NC

In order to understand the potential magnitude of North Carolina STEM degree awards outside the UNC System, the consulting team reviewed the most recent academic year degree completion data through *College Navigator* for two-dozen private (for-profit and not-for-profit), institutions in North Carolina which offer four-year STEM degrees including:

- Belmont Abbey College
- Campbell University
- Catawba College
- Chowan University
- Davidson College
- Duke University
- Elon University
- Gardner-Webb University
- Guilford College
- High Point University
- Johnson C Smith University
- Lenoir-Rhyne University
- Livingstone College
- Mars Hill University
- Meredith College
- Methodist University
- North Carolina Wesleyan College
- Platt College-Miller-Motte-Wilmington
- Queens University of Charlotte
- Shaw University
- Strayer University (NC)
- University of Mount Olive
- Wake Forest University
- Wingate University

As shown in **Exhibit D-1**, programs with significant numbers (reporting more than 100) STEM undergraduate degree awards from private institutions in the state include majors in Biology, Kinesiology, Nursing, Mathematics, and Chemistry.

EXHIBIT D-1
BACHELOR'S DEGREES IN STEM PROGRAMS CONFERRED BY PRIVATE INSTITUTIONS IN NORTH CAROLINA, 2017-2018

Program	Bachelor's Degree Awards	Program	Bachelor's Degree Awards
Biology/Biological Sciences, General	743	Environmental Biology	10
Kinesiology and Exercise Science	386	Dietetics/Dietitian	9
Registered Nursing/Registered Nurse	349	Biochemistry and Molecular Biology	8
Mathematics, General	143	Health and Wellness, General	8
Chemistry, General	129	Music Therapy/Therapist	8
Neuroscience	85	Environmental Control Technologies/Technicians, Other	6
Environmental Studies	80	Environmental Engineering Technology/Environmental Technology	5
Computer and Information Sciences, General	78	Chemistry, Other	4
Computer Science	63	Geology/Earth Science, General	4
Physics, General	55	Health Professions and Related Clinical Sciences, Other	4
Parks, Recreation and Leisure Facilities Management, General	53	Health/Medical Preparatory Programs, Other	4
Health and Physical Education/Fitness, General	48	Information Science/Studies	4
Anatomy	37	Therapeutic Recreation/Recreational Therapy	4
Clinical and Industrial Drug Development	37	Biological and Biomedical Sciences, Other	3
Exercise Physiology	36	Information Technology Project Management	0
Adult Health Nurse/Nursing	33	Computer and Information Systems Security/Information Assurance	3
Statistics, General	32	Engineering Physics/Applied Physics	3
Biochemistry	30	Geological and Earth Sciences/Geosciences, Other	3
Environmental Science	27	Information Technology	3
Athletic Training/Trainer	23	Bioengineering and Biomedical Engineering	2
Parks, Recreation and Leisure Studies	19	Computer Engineering, General	2
Biophysics	18	Biostatistics	1
Health Services/Allied Health/Health Sciences, General	18	Clinical Nurse Specialist	1
Health/Health Care Administration/Management	17	Computer Engineering, Other	1
Health and Physical Education/Fitness, Other	13	Engineering Chemistry	1
Public Health, General	13	Engineering, Other	1
Community Health Services/Liaison/Counseling	12	Pre-Medicine/Pre-Medical Studies	1
Applied Mathematics, General	11	Zoology/Animal Biology	1
		STEM Degree Award Total	**2,692**

Source: College Navigator, 2019.

APPENDIX E: INSTITUTIONAL PROFILES

In order to thoroughly understand the unique issues facing each campus, and their specific needs as they relate to future STEM programming, members of the MGT team, along with representatives from the UNC System Office conducted a series of meetings with institutional representatives of 15 UNC System universities which offer STEM programming. Over the course of four weeks in April and May 2019, the consultant team conducted on-site visits with 10 UNC institutions offering the largest number of STEM programs at the undergraduate level. Conversations focused on each institution's anticipated or aspirational projections for enrollments over the next five to ten years, any new programs they had in the planning stages, and the current and future needs of the institution as they relate to serving students in STEM disciplines. Institutions which hosted site-visit teams on campus, included:

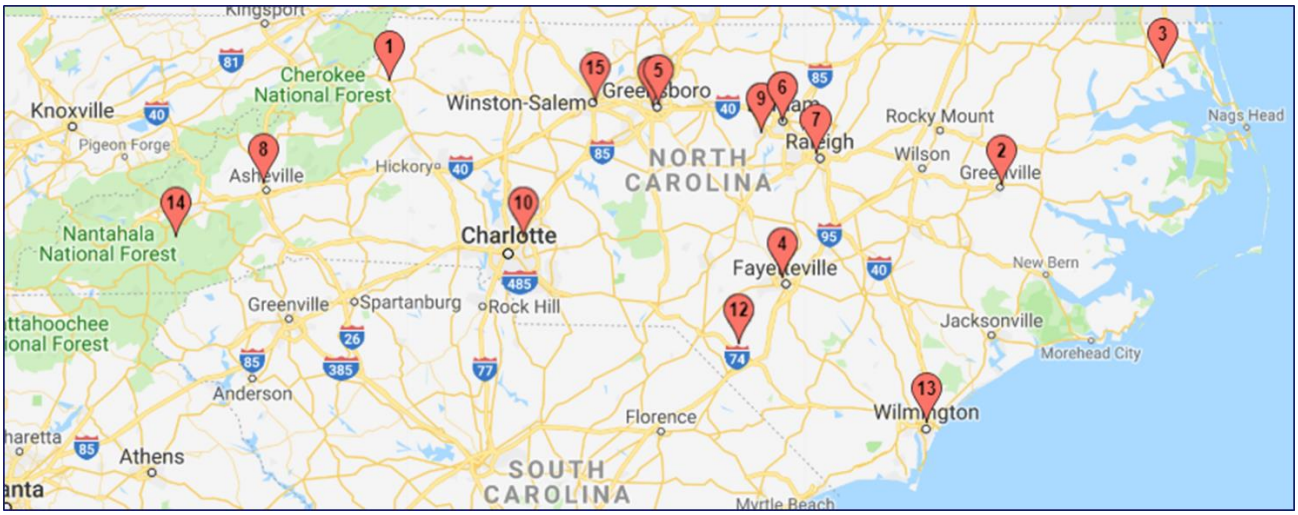
- Appalachian State University
- East Carolina University
- North Carolina A&T University
- North Carolina State University
- University of North Carolina - Charlotte
- University of North Carolina - Chapel Hill
- University of North Carolina - Greensboro
- University of North Carolina - Wilmington
- Western Carolina University
- Winston-Salem State University

Phone interviews were conducted with an additional five institutions which offer a more limited portfolio of STEM programs, including:

- Elizabeth City State University
- Fayetteville State
- North Carolina Central University
- University of North Carolina - Asheville
- University of North Carolina - Pembroke

Exhibit E-1 illustrates the location of each institution within the study scope across the state of North Carolina.

EXHIBIT E-1
LOCATION OF STUDY INSTITUTIONS ACROSS THE STATE



Source: BatchGeo, 2019.

1. Appalachian State University - Boone, NC
2. East Carolina University - Greenville, NC
3. Elizabeth City State University - Elizabeth City, NC
4. Fayetteville State University - Fayetteville, NC
5. NC A&T University - Greensboro, NC
6. NC Central University 1801 Fayetteville St., Durham, NC
7. NC State University - Raleigh, NC
8. UNC Asheville - Asheville, NC
9. UNC Chapel Hill - Chapel Hill, NC
10. UNC Charlotte - Charlotte, NC
11. UNC Greensboro - Greensboro, NC (behind #5 on map)
12. UNC Pembroke One University Drive, Pembroke, NC
13. UNC Wilmington - Wilmington NC
14. Western Carolina University - Cullowhee, NC
15. Winston-Salem State University - Winston-Salem, NC

Summaries of the consultant team's meetings and discussions along with data pertaining to historical enrollment trends at each institution are offered in the following sections to provide the reader with additional context regarding each institution's situation relevant to their current STEM programs and plans for the future.

APPALACHIAN STATE UNIVERSITY

Located in the Blue Ridge Mountains, Appalachian State University (ASU) has an enrollment of more than 19,100 students, including nearly 17,400 undergraduate students. Founded in 1899 as Watauga Academy it evolved into a training grounds for educators, later becoming the four-year Appalachian State Teachers College in 1929. The institution became Appalachian State University in 1967, transforming from a single-purpose teacher's college to a multipurpose regional university.

ASU now offers more than 150 undergraduate and graduate degree programs through its College of Arts and Sciences, College of Fine and Applied Arts, Reich College of Education, Walker College of Business, Hayes School of Music, Beaver College of Health Sciences and Cratis D. Williams School of Graduate Studies. ASU also offers a Doctor of Education. It boasts a 16:1 student/faculty ratio, an average class size of 27. Its 1,200-acre campus has 30 academic buildings with 20 resident hall housing about 5,600 students on campus.

Overall the University has seen steady growth, primarily in undergraduate programs. The Provost anticipates growth to continue and is projecting a 9% increase in the next five years. More than 90% of the enrollment is in-state students, and their strategic focus is on recruiting NC residents.

Appalachian State enrolls 3,100 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at App State between 2014 and 2018 are displayed below by STEM category:

ENGINEERING

- Sustainable Technology

HARD SCIENCES

- Biology/Biological Sciences
- Chemistry
- Geology/Earth Science
- Physics
- Environmental Studies
- Environmental Sciences

HEALTH SCIENCES

- Exercise Science
- Communication Sciences and Disorders
- Health/Health Care Administration/ Management
- Public Health, General
- Music Therapy/Therapist
- Dietetics/Dietitian
- Registered Nursing/Registered Nurse

MATH

- Mathematics
- Actuarial Science
- Insurance

TECHNOLOGY

- Computer Science
- Management Information Systems

The project team conducted a campus visit on April 24, 2019, and held meetings with Provost Darrell Kruger, along with representatives from Enrollment; Institutional Research, Assessment and Planning; the College of Arts and Sciences; the Beaver College of Health Sciences; the Department of Fine and Applied Arts; the Department of Sustainable Technology and the Built Environment; the Hayes School of Music; the Walker College of Business; and the Brantley Risk & Insurance Center at Appalachian State University. What follows is a summary of some of the points of pride offered by the App State leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at Appalachian State University.

POINTS OF PRIDE

- ASU's historically strong footprint in K-12 education is well-known, but the university envisions growth in STEM to fall primarily to the health sciences. A new Public Health building has generated significant interest. The new building offers new labs and has generated a new level of excitement which in turn, helped drive development strategies for the program. ASU's Exercise Science program is currently the largest STEM offering.
- The College of Business provides STEM programs in Insurance and Computer Information Science, and overall data analytics has become a priority for the school. Recently, at least one Business Analytics course has become a prerequisite for admission to every department of the college. The Insurance program has a privately funded Brantley Risk & Insurance Center. The Center brings innovative efforts such as small scholarships to drive students to the intro class and serve as a feeder for the program. Currently, AppState RISE (Risk Initiative for Student Engagement) consisting of Dr. Lori Medders and a team of students conducts four or five research projects annually, providing valuable experiential learning. The Computer Information Science program has developed a Women in IT initiative and is working to inspire elementary age girls to pursue technology through a summer learning camp.
- ASU's Sustainable Technology and Built Environment program is answering growing demand in renewable energy fields, despite limited resources. It has courses approved by the North American Board of Certified Energy Practitioners as prerequisites to sit for their Photovoltaics, Solar Heating, and Small Wind Associates certification.
- The Music Therapy program has been in existence for 22 years and turns down more students than it accepts each year. Acceptance requirements were recently raised to assist with these capacity issues on current faculty and clinical space.

AREAS OF CONCERN

- While research funding is strong, ASU has laboratory space capacity issues campus wide. In several schools, adequate space has been made for current levels but could not accommodate the projected demand.
- The greatest barriers for growth at ASU are the multifaceted expenses related to increased faculty demand. Beyond salary and benefits, faculty startup funds and research space capacity are limited. Additional barriers to program expansion are found in faculty recruitment. ASU's rural location limits faculty lines outside of tenure track.

- Class sizes are currently limited by physical fixed spaces in older buildings. The Master Plan calls for a multi-story science building which would alleviate the bulk of this concern should that building come to fruition. Research space in the hard sciences will be needed with growth.
- The Sustainable Technology and Built Environment have unique technical and space needs. They have a bold vision for innovative experiential learning but lack the needed resources and space to carry them out fully.

EAST CAROLINA UNIVERSITY

East Carolina Teaching College was founded in 1907 and enrolled 123 students when it opened in Fall 1909. Now, East Carolina University (ECU) enrolls more than 23,000 undergraduates and nearly 6,000 graduate students in 84 bachelor's, 71 master's, 13 research doctoral, five professional doctoral, and two intermediate programs (CAS, EdS). The university also offers 84 certificates, and over 100 online degrees and certificate programs. More than 2,000 full-and part-time faculty serve the campus in Greenville, NC.

In discussion with the ECU Provost, growth is a central component of the ECU master plan. The disciplines that appear to have the greatest potential for significant growth are in the STEM and Health Science areas. Currently over 40% of graduate and undergraduate students at ECU are enrolled or intend to enroll in a STEM or Health Science major.

ECU is pivoting toward applied STEM research with an emphasis upon analytical based problem-solving approach to STEM. Economics will likely play a significant role as it is subject to the demands of interpreting and analyzing large quantities of data (i.e., Big Data Analytics).

East Carolina University enrolls more than 4,750 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at East Carolina University between 2014 and 2018 are displayed below by STEM category:

ENGINEERING

- Drafting and Design Technology/Technician, General
- Engineering
- Engineering Technologies and Engineering-Related Fields
- Industrial Technology/Technician
- Manufacturing Engineering Technology/Technician

HARD SCIENCES

- Atmospheric Sciences and Meteorology
- Biology/Biological Sciences
- Biochemistry
- Chemistry
- Geology/Earth Science
- Physics

HEALTH SCIENCES

- Audiology/Audiologist and Speech-Language Pathology/Pathologist
- Clinical Laboratory Science/Medical Technology/Technologist
- Dietetics/Dietitian
- Environmental Health
- Exercise Physiology
- Health/Health Care Administration/Management
- Health Information/Medical Records Administration/Administrator
- Public Health Education and Promotion
- Therapeutic Recreation/Recreational Therapy
- Registered Nursing/Registered Nurse
- Vocational Rehabilitation Counseling/Counselor

MATH

- Mathematics

TECHNOLOGY

- Computer Science
- Data Science (Economics)
- Information Technology
- Information Science/Studies
- Management Information Systems

The project team conducted a campus visit on April 17, 2019, and held meetings with Provost, Ron Mitchelson, and representatives from Enrollment Management, the Thomas Harriot College of Arts and Sciences, College of Allied Health Sciences, College of Engineering and Technology, College of Business, College of Health and Human Performance,, and College of Nursing at East Carolina University. What follows is a summary of some of the points of pride offered by the ECU leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at East Carolina University.

POINTS OF PRIDE

- The Provost indicated that he believes the areas for significant university growth are primarily in the health sciences and engineering/technology disciplines.
- ECU was about to break ground for a new Life Sciences and Biotechnology building which will house the Department of Biology and researchers in related fields. The largest research greenhouse east of I-95 is located at ECU.
- The University has formed four Pan-University Research Clusters in Biomaterials, Health Behavior, Natural Resources and Environment, and Big Data and Analytics.
- A new Van and Jennifer Isley Innovation Hub will be established, which provides space for business, engineering, technology and art students to collaborate on product innovation and entrepreneurship.
- ECU is developing a relationship between the local agriculture sector and both the Life Sciences and Engineering (Bioprocessing) programs at the university.
- The field of chemistry has been targeted as a growth opportunity, as ECU seeks to train more analytical chemists for careers in pharmaceutical manufacturing.

- The region around Greenville is fairly diverse with a significant presence of manufacturing, agriculture, distribution, health, and military sectors. ECU is positioning itself to be the primary supplier of talent for these industry sectors.
- Rural health is another regional concern that ECU has identified as a focus for its growing medical and medical science programs. ECU is in the process of establishing a new School of Rural Public Health in August of 2020.
- Biology can be a growth area, as it is linked to and driven by growth in the medical sciences disciplines. Other areas identified for growth are biochemistry; mathematics; and chemistry.
- Engineering and Technology are experiencing significant growth and demand for talent. Engineering is expected to continue its growth trajectory over the next 5-10 years. New programs coming on board are generally at the graduate level. Engineering, in particular industrial technology, is poised for growth as the advanced manufacturing sector continues to expand. Areas identified for growth include: computer science, software engineering, construction management, GIS, transportation management, and atmospheric sciences.
- Two other BS programs that are believed to have tremendous growth potential include Information and Computer Technology and Industrial Technology.
- There is a significant growth potential for Nutrition Sciences by taking an interprofessional collaboration approach.

AREAS OF CONCERN

- Currently, ECU has a shortage of office space, lab space, and research space. The new Life Science building will alleviate some space constraints in certain STEM disciplines but will not resolve all issues.
- Howell building currently houses Physics and Biology. This building will need significant modifications to meet State Building Codes. The cost will be substantial given the size of the building (107,569 GSF) and year of construction (1969). This construction will drastically affect the limited amount of research space available at the University.
- The growth of Nursing, and Auditory and Speech Pathology is limited by available practicum locations, instructional space, as well as instructors.
- Any significant growth at ECU will be constrained/impacted by available space to house new programs, and faculty and staff needs to facilitate the increased enrollment.
- Faculty are currently sharing office space, and some departments house faculty/teaching space in buildings with other external departments. Consequently, space to house new instructional faculty and support staff, along with teaching and research lab space will be required if anticipated growth in the above-mentioned disciplines is to be realized.

ELIZABETH CITY STATE UNIVERSITY

Founded in 1891 to train African Americans as teachers in North Carolina, Elizabeth City State University (ECSU) now enrolls nearly 1,700 students in 26 baccalaureate and four master's degree programs. As of May 2018, degrees have been conferred upon more than 20,000 students.

The Provost and University leadership team indicate that enrollments have grown double digits for last two years after years of decline (enrollment in fall 2011 was 2,900). The institution expects another increase next year, anticipating 7% to 10.5% growth annually in the coming years. Areas of major growth are in STEM programs, including Biology, Pharmacy, and Aviation Science.

ECSU benefits from the NC Promise program, under which in-state undergraduate tuition is $500 per semester ($2,500 for out-of-state students). The State of North Carolina supplements this cost by matching dollar for dollar the difference between ECSU's previous tuition and the NC Promise Tuition Plan, so that students pay less for a high-quality education. This has allowed ECSU to provide greater access. However, uncertainty about how long the program will continue to be funded make it challenging to predict the long-term impact of the program on enrollments at ECSU.

The university is becoming more intentional about partnerships with community colleges which can help students strengthen their skills before enrolling at ECSU. As a result, they saw a 57% increase in transfers last Fall (184 students) and are expecting another increase in Fall 2019.

ECSU enrolls approximately 175 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at ECSU between 2014 and 2018 are displayed below by STEM category:

ENGINEERING
- Aviation Science
- Engineering Technologies and Engineering-Related Fields
- Unmanned Aircraft Systems

HARD SCIENCES
- Biology/Biological Sciences
- Chemistry
- Pharmaceutical Science

MATH
- Mathematics

TECHNOLOGY
- Computer Science

The project team conducted a phone interview on April 26, 2019 with Provost Farrah Ward, along with representatives from Enrollment/University Registrar, Admissions, Academic Affairs, the Department of Mathematics and Computer Science, the Department of Natural Sciences, and the Department of Technology at Elizabeth City State University. What follows is a summary of some of the points of pride

offered by the ECSU leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at Elizabeth City State University.

POINTS OF PRIDE

- A five-year accelerated BS/MS program in Math and Biology has, and will continue to, contribute to enrollment growth. The first class of bachelor's students are in the master's year now and will graduate in 2020 from the accelerated program with a master's. Engineering tech will be added to this accelerated program soon.
- Education and teacher training are ECSU's foundation, and the institution anticipates growing this program. Education has been neglected in rural communities in the state but is critical to the region's success. The state no longer gives a pay increase for teachers who earn a master's degree, but they do offer more money for National Board Certification. So, ECSU plans on incorporating NBC into its programs, which can result in 13% increase in salaries.
- An Unmanned Aircraft program has been approved by the System and SACS, and faculty are developing a lab structure for this program. An outdoor lab/enclosure is available to fly test drones, but it's not on campus. The university owns 15 acres of land at the airport, but there is no building on the site where classes could meet for discussion following testing. The institution predicts the program will launch with 20 students and see 10% growth every year for next five years.
- A Sustainability Studies program will be introduced at the university, pending BOG and SACSCOC approval.
- The institution has focused on advising and getting students engaged, and this intentionality has improved retention in many programs.

AREAS OF CONCERN

- Rural health is a big concern for the region, and faculty are working in teams to develop multi-disciplinary partnerships and programs to address these needs.
- Classroom and lab space in particular are scarce on campus and needs to be increased/expanded for STEM programs to grow.
- The Aviation Science program offered at ECSU is the only four-year program of its kind in the state, and growth is anticipated in the coming years. But the program doesn't have a permanent home and is infiltrating other STEM spaces at the moment. Significant classroom alterations are needed to make the program functional. ECSU is the most cost-effective place in the area to learn to fly, so the program attracts many out-of-state students.
- Faculty losses have been significant, and many STEM programs are focused on recruitment. Lab techs are also needed, as those positions were eliminated when enrollment declined in recent years.

FAYETTEVILLE STATE UNIVERSITY

Fayetteville State University (FSU) began as the Howard School, founded in 1867 by the black community of Fayetteville for educating black children. Since that time, FSU has grown into a comprehensive regional institution serving a diverse population of more than 6,500 students (approximately 1,100 are graduate students). The university employs more than 800 faculty and staff and offers more than 60 degrees at the baccalaureate and master's levels, and the doctorate in educational leadership. Noted for excellence in teacher education, FSU has been accredited by the National Council for Accreditation of Teacher Education (NCATE) since 1954.

FSU has experienced overall enrollment growth in recent years, with the biggest growth is in, Computer Science, and Biology. Lots of interest in Chemistry, and we're trying to build the capacity of our students to succeed in these rigorous programs through adaptive learning.

Fayetteville State enrolls more than 800 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at FSU between 2014 and 2018 are displayed below by STEM category:

HARD SCIENCES
- Biology/Biological Sciences
- Chemistry
- Forensic Science

HEALTH SCIENCES
- Health/Health Care Administration/Management
- Registered Nursing/Registered Nurse

MATH
- Mathematics

TECHNOLOGY
- Computer Science
- Information Systems and Business Analytics

The project team conducted a phone interview on April 26, 2019 with Provost Pamela Jackson, representatives from Institutional Research and Effectiveness, the Registrar, the College of Arts and Sciences, the College of Business and Economics, the Department of Math and Computer Science, the Department of Chemistry and Physics, the Department of Nursing, and the Department of Biological Sciences at Fayetteville State University. What follows is a summary of some of the points of pride offered by the FSU leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at Fayetteville State University.

POINTS OF PRIDE

- FSU puts a strong emphasis on STEM, and has developed an accelerator in summer for students, which has garnered strong interest especially among homeschoolers. As the institution publicizes student success and these programs gain traction, they anticipate growth in STEM disciplines.
- There is lots of student interest in Chemistry, and FSU is trying to build the capacity for students to succeed in this and other rigorous STEM programs through adaptive learning.
- FSU's Forensic Science program has a very active advisory board which provides great input, and connection with the employer community.
- Health Care Administration is fast growing program, and graduates will serve a critical workforce need in the region.
- A $10 million renovation of the Science building (one of the oldest on campus) will provide much needed classroom and lab space for STEM programs when it's complete in 2021.
- FSU maintains a number of articulation agreements with local community colleges, and receives the largest numbers of transfers of the other System schools by a wide margin.

AREAS OF CONCERN

- New faculty lines are needed in most STEM programs to deal with anticipated growth.
- The acceptance rate for the Nursing program is 33% based on clinical availability. Many who don't gain admission want to go into some kind of healthcare program, and the university is considering a program in Allied Health as an option for these students.
- FSU indicates that they have trouble competing with larger institutions for good faculty. Though they've received retention funds from the System office, FSU has lost some great faculty due to the lack of startup funds.
- Housing for students in the area is limited, and while many students live on campus, some residence halls are currently off-line. This inhibits growth as students are unable to find adequate housing on/near campus.
- The institution noted the need to develop gap funding and new partnerships for revenue sources.
- FSU is making efforts to better track graduates and their employment. They've instituted a student research project using LinkedIn to track where students are going and their salaries. Many graduates remain in-state, but in often live in city centers like Charlotte, Raleigh, and Winston-Salem, rather than rural communities.

NORTH CAROLINA A&T STATE UNIVERSITY

North Carolina Agricultural and Technical State University (NC A&T) was founded in 1890 as a land-grant institution, and now enrolls more than 12,000 students, in both undergraduate and graduate programs. The university employs nearly 2,000, of whom more than 700 are instructional faculty (in 2017). With 55,000 alumni of record, NC A&T graduates serve in leadership roles around the world.

Among its STEM field distinctions, NC A&T graduates the largest number of African American engineers at the undergraduate, master's, and doctoral levels in the nation.

The institution's overall enrollment has grown 2% per year for the last five years with most of the growth at the undergraduate level. By 2023, the university hopes to grow to 14,000 students. Growth isn't all in STEM, but significant increases have been evidenced in a number of STEM programs, including Information Technology, Bioengineering, Kinesiology, and Management Information Systems.

NC A&T enrolls more than 2,300 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at NC A&T between 2014 and 2018 are displayed below by STEM category:

ENGINEERING

- Applied Engineering Technology
- Architectural Engineering
- Automotive Engineering Technology
- Bioengineering and Biomedical Engineering
- Biological/Agricultural Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Construction Management
- Electrical and Electronics Engineering
- Electrical and Electronic Engineering Technologies/Technicians
- Geomatics
- Industrial Engineering
- Mechanical Engineering

HARD SCIENCES

- Atmospheric Sciences and Meteorology
- Biology/Biological Sciences
- Chemistry
- Physics

HEALTH SCIENCES

- Environmental Health and Safety
- Kinesiology
- Registered Nursing/Registered Nurse

MATH

- Applied Mathematics
- Mathematics

TECHNOLOGY

- Computer Science
- Information Technology

◆ Business Education – Information Technology	◆ Management Information System

The project team conducted a campus visit on May 1, 2019, and held meetings with Provost Beryl McEwen, and representatives from Enrollment Management, the Registrar, The Graduate College, the College of Science and Technology, the College of Engineering, the College of Agricultural and Environmental Sciences, the College of Business and Economics, and the College of Health and Human Sciences at North Carolina A&T University. What follows is a summary of some of the points of pride offered by the NC A&T leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at North Carolina A&T University.

POINTS OF PRIDE

- Graduate faculty in Nanoengineering (NC A&T) and Nanoscience (UNCG) do an excellent job of sharing lab spaces, and the institution hopes to help other programs understand the benefits of this model.
- A&T just broke ground on the Engineering Research and Innovation Center (ERIC) which will be the home of engineering and computer science programs once the building is complete in three years.
- A 30% increase in applications resulted from the first year using the common app at NC A&T. While most students are in-state, the institution enrolls students from 38 states specifically in STEM, and competes primarily with NC State and UNC Charlotte.
- The institutional goal is to have 500 undergrads and 500 graduate students enrolled exclusively online. Currently, nearly 400 grad students and 800 undergraduates are enrolled in some distance education courses.
- A&T hosts a three-week summer camp for minority middle-school boys with a focus on 3-D printing and robotics, led by Verizon Innovative Learning. The institution is looking for ways that the System could support these pipeline programs and serve as partners.
- Large shares of STEM graduates are hired out of state and are offered better packages to do so. The university is trying to partner with local companies so they can better compete for A&T students/graduates. A&T has 90% employment placement rate for their graduates.
- NC A&T is investing in the way they teach and support mathematics, since success there is fundamental to so many STEM programs. Supplemental instructors sit in classes of the students they will be tutoring so that they can hear what the professor has said and how concepts are taught, to better prepare them to assist students later. The institution is looking at DFW rates for the classes that had supplemental instruction to determine if the effort had the desired positive effect.
- The university makes sure students get a great academic experience, but also experience in the business environments in which they will work. As a result of these partnerships, students become more aware of career options, and often receive job offers or other financial support. The career fair last year needed to be expanded to two weeks to accommodate all the companies who wanted to participate.

- Only 20% of the FTIC freshmen who think they want to be in nursing get in, as they compete with students who are coming in for degree competition. The program is growing, but is limited by both facilities and faculty along with clinical placements.

AREAS OF CONCERN

- The Engineering program struggles with enrollment, and the dean is working to determine reasons for the stagnation and program declines.
- NC A&T has limited lab space for both teaching and research. Many Chemistry and Physics labs are full all day, especially intro levels that are taken by non-majors. Lab classes will soon be offered in the evenings and Saturdays to accommodate demand.
- The institution noted that it needs to think strategically about what to register students for (especially in sciences) based on facility capacity. More/larger facilities would help with that effort.
- Only 50% of students can achieve at the necessary levels of math at NC A&T. The Center for Academic Excellence will be piloting a bridge program with a small group this summer to help tutor them in math and bring up their skills to the levels needed for success.
- More lines for faculty are needed in STEM areas – both to teach but also to serve as advisors, especially in the larger programs. Faculty positions sometimes haven't been filled, or don't align with the academic growth areas. Most of the engineering programs aren't growing faster because they don't have the faculty lines to hire them.
- As the state's largest HBCU, developing qualified minority candidates, stakeholders at the institution feel strongly that the System should be more supportive with funding. There is a perception that faculty salaries are lower than those at UNCG, despite being in the same classification and geography. Institutional leaders believe this disparity is a result of historical bias against the institution.

NORTH CAROLINA CENTRAL UNIVERSITY

North Carolina Central University (NC Central), located in Raleigh, was founded in 1910 as the National Religious Training School for black students. Within 15 years the state legislature appropriated funds to buy the school, dedicating it to liberal arts education and the preparation of teachers and principals. In so doing, the college became the nation's first state-supported liberal arts college for black students.

NC Central now enrolls more than 8,000 students in graduate and undergraduate programs, and offers 32 bachelor's degrees, 27 master's, 20 certificates, and one doctoral program (in Integrated Biosciences). With 578 faculty, the university has a student to faculty ratio of 16:1.

The institution projects 4% to 5% overall annual enrollment growth in the immediate future, but housing constraints will require NC Central to limit that growth. A shift to significant growth in online learning is one way they plan to address that issue. The majority of students are from NC, primarily in and around Durham, but they have strategic partnerships in a number of rural areas.

NC Central enrolls nearly 600 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at NC Central between 2014 and 2018 are displayed below by STEM category:

HARD SCIENCES

- Biology/Biological Sciences
- Chemistry
- Environmental and Geographic Sciences
- Pharmaceutical Sciences
- Physics

HEALTH SCIENCES

- Public Health Education and Promotion
- Registered Nursing/Registered Nurse

MATH

- Mathematics

TECHNOLOGY

- Computer Science and Business

The project team conducted a phone interview on May 6, 2019 with Provost Felecia Nave, and representatives from Enrollment Management and Academic Affairs, the School of Library and Information Sciences, the College of Behavioral and Social Sciences, the School of Graduate Studies, and the College of Arts and Sciences at North Carolina Central University. What follows is a summary of some of the points of pride offered by the NC Central leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at North Carolina Central University.

POINTS OF PRIDE

- NC Central has tried different approaches to raising awareness of the fields available to students as careers, particularly in Chemistry, Physics, and Math. Growth in these disciplines is consistent with national trends, but students need supports to start earlier (financial and academic) to help them be successful.
- The university has an ongoing partnership with Halifax County, to better prepare high school and middle school students in those communities to go to college. NC Central is looking at the educational infrastructure to address the educational gap, along with the health concerns of the community, as well.
- The DREAM STEM program (Driving Research, Entrepreneurship and Academics through Mastering STEM) funded by a grant from the National Science Foundation's Historically Black Colleges and Universities Undergraduate Program is designed to provide support in and outside of the classroom. NC Central uses the program to identify students as scientists early, create entrepreneurship in science education, and provide STEM faculty development through teaching and learning research mini grants.

- The institution offers a STEM living learning community in its residence halls.
- The Aspiring Eagles Academy starts five weeks before the semester begins, and serves as a bridge to help students understand what to expect from their college experience so they can be more successful.
- Graduates from NC Central are in high demand by employers, particularly from STEM programs. The university is creating 3+2 accelerated programs to address employer needs.

AREAS OF CONCERN

- The Math program isn't where the institution wants it to be in terms of solid preparation and foundation for other coursework. But the department has made changes in the math curriculum which should get it where it needs to be.
- Computer Science and Business programs are growing significantly, but won't have the faculty to keep up with the growth.
- Additionally, office space and lab space are needed for faculty, and needs to be part of the start-up package.
- Additional labs and classrooms are needed, in addition to more common space in academic buildings, which most facilities currently lack. Ideally, the university would like to see more flexibility in their academic spaces, eliminating theater classrooms and designing more interactive spaces for teaching and learning. The goal is to encourage and facilitate collaboration in the classroom.
- The university is examining the workload for faculty as the institution continues to grow, ensuring that they have enough flexibility to have a robust research profile. Most faulty are a four-four plan, but some could be three-three. Leadership noted the need for a research start-up package, to be competitive in attracting and retaining faulty. Competitive salary and mentoring opportunities are important so that faculty receive professional development themselves.

NORTH CAROLINA STATE UNIVERSITY

North Carolina State University (NC State) was founded in 1887 as North Carolina College of Agriculture and Mechanic Arts at a time when beliefs about education were changing. The new college offered the children of farmers, mechanics and other workers access to higher education previously afforded only to the wealthy and well-connected. From just 72 students and six faculty members in 1889, the institution has grown to enroll more than 35,000 undergraduate and graduate students today along with 8,000 faculty and staff.

NC State considers itself a heavily STEM-oriented institutions, 55-60% of graduates are in STEM disciplines. A decade ago, the institutional focus was growth in an effort to be the biggest. However, retention was low, and the institution wasn't graduating students at the rate one would expect based on the incoming

class' strength. In an effort to address these issues, NC State dropped admittance from 4,800 FTIC to 4,250, and emphasized student success in its strategic plan. As a result of innovative programming and an emphasis on supports/success, the university retention rate improved from 80s to mid-90s. All measures of success increased, and the institution developed a reputation for competitiveness and quality, which in turn increased the number of students interested in applying. So, for a time, the university dramatically curtailed admissions to focus on quality, but saw a rise in their graduation counts went up. By focusing on quality, and retaining and graduating more students, NC State became a more efficient and effective institution.

The university is acutely aware of the impacts of changes in their faculty to student ratio. Deans indicate that if more students are admitted without subsequent increases in faculty, research dollars will dry up.

Faculty at NC State carry heavy teaching loads and are very heavily research oriented – especially in engineering. Many faculty are ready to retire, could turn over 2/3 of the faculty very soon.

The institution expects steady sustained growth in the coming years, especially in STEM, but indicates that they don't need to "own" everything. While they could grow significantly in some disciplines, they would need more resources for faculty, and would outgrow their space quickly. NC State would like to examine where they are at capacity and identify other institutions to help carry the load in some programs. Leadership indicates that students who don't get into NC State go to Virginia Tech, Purdue, Georgia Tech, and Clemson for STEM. They suggest the System find ways to direct those students, so they are going somewhere else in the state, perhaps by growing existing programs in other parts of the state. They caution against efforts to start new programs because the cost can be so high.

NC State enrolls more than 7,000 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at NC State between 2014 and 2018 are displayed below by STEM category:

ENGINEERING

- Aerospace, Aeronautical and Astronautical/Space Engineering
- Agricultural Engineering
- Bioengineering and Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Construction Engineering
- Electrical and Electronics Engineering
- Environmental Engineering Technology/Environmental Technology
- Environmental/Environmental Health Engineering
- Industrial Engineering
- Materials Engineering
- Mechanical Engineering
- Nuclear Engineering
- Textile Sciences and Engineering

HARD SCIENCES

- Atmospheric Sciences and Meteorology
- Biochemistry
- Biology/Biological Sciences
- Botany/Plant Biology
- Genetics
- Geology/Earth Science
- Microbiology
- Oceanography, Chemical and Physical
- Physics

- Chemistry
- Environmental Design in Architecture
- Environmental Sciences
- Science Technologies/Technicians
- Zoology/Animal Biology

HEALTH SCIENCES

- Public Health Education and Promotion
- Registered Nursing/Registered Nurse

MATH

- Applied Mathematics
- Mathematics
- Statistics

TECHNOLOGY

- Computer Science

The project team conducted a campus visit on May 10, 2019, and held meetings with Provost Warwick Arden, and representatives from Enrollment Management and Services, the College of Engineering, the College of Sciences, the College of Textiles, the College of Agriculture and Life Sciences at North Carolina State University. What follows is a summary of some of the points of pride offered by the NC State leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at North Carolina State University.

POINTS OF PRIDE

- While some institutions receive more applications than NC State does, State gets more from North Carolina, and the institution prides themselves in addressing state needs.
- Differences between non-minority and minority graduation rates, and rural vs non-rural counties are greatly improved. NC State has seen between a 12.5% and 14% increase in STEM degrees granted over the last five years (depending on the definition of STEM – the system office vs. DHS).
- Engineering has done a great job of streamlining students, not focusing on weeding them out, but on directing every student where they are a best fit and helping them get through.
- NC State indicates that the Deans work well together across disciplines, and students can build great cross-disciplinary programs for themselves. The university intentionally hires faculty with interest in interdisciplinary focus on specific problems. NC State indicates that all enrollment growth will be in interdisciplinary programs from now on.
- Issues and interest in sustainability, energy, health, and cybersecurity are driving growth in STEM programs.
- The Wilson College of Textiles is the only one in North America, has model manufacturing facilities, and can make anything that's textile based. It's doubled enrollments in recent years, but not doubled faculty. The College partners extensively with the engineering department and wants to continue to grow since textiles are such an important part of the NC economy.
- The Goodnight Scholars Program has been extended to a cohort of transfer students.

AREAS OF CONCERN

- NC State believes that resources per FTE is critical, and if they accelerate admittance without subsequent increases in resources, they could lose ground in the areas of retention and graduation.
- Leadership identified "glaring problems" with physical resources, noting that facilities are sufficient for growth in engineering, and fairly in stats and math. However, core basic sciences including chemistry, biochemistry, biology, and to some extent physics significant improvements need to be made. It is a challenge to build cutting edge programs and attract faculty into 75-year-old buildings.
- Major limitation in terms of faculty is lack of modern state-of-the-art facilities and equipment. One issue that is unique to NC State is the large amount of instructional space that the institution rents - enough to justify an entirely new building.
- There's a serious downstream impact when STEM enrollments increase. It puts lots of pressure on the entry level math and sciences, which everyone takes. The institution has maxed out its lab and classroom space all over.
- It is a challenge recruiting students from the rural areas, because they often don't have the AP classes available in high school. The university works with community colleges in the state to ensure that bright students have a path to a four-year degree.
- The general public has lost a good bit of connection to the land, and that's been reflected in enrollment decreases in plant biology, microbiology, bioengineering, and animal sciences. But the university is starting to turn that around. Animal sciences indicates that they have lots of square footage that's poor quality.

UNIVERSITY OF NORTH CAROLINA - ASHEVILLE

The University of North Carolina – Asheville (UNC Asheville) is the only dedicated liberal arts institution in the University of North Carolina system, and ranks seventh in the nation among public liberal arts college. UNCA enrolls nearly 4,000 undergraduate students from 37 states and 28 countries. UNC Asheville has approximately 330 full- and part-time faculty and offers more than 30 different majors. The university currently engaged in the middle of a strategic planning process, which will include a facilities master plan.

Leadership indicates that the functional interest in STEM is larger than UNC Asheville's brand in the market. They note that the interdisciplinary focus at the university is a real advantage. Students receive quality personal attention in their campus experience.

UNC Asheville enrolls more than 700 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at NC State between 2014 and 2018 are displayed below by STEM category:

ENGINEERING
- Engineering (with a concentration in Mechatronics)

HARD SCIENCES
- Atmospheric Science
- Biology/Biological Sciences
- Chemistry
- Environmental Science/Studies
- Physics

HEALTH SCIENCES
- Public Health Education and Promotion

MATH
- Mathematics

TECHNOLOGY
- Computer Science

The project team conducted a phone interview on May 7, 2019 with Interim Provost Brian Butler, and representatives from the Registrar, Institutional Planning, Strategy & Information Analytics, the College of Social Sciences, and the College of Natural Sciences at UNC Asheville. What follows is a summary of some of the points of pride offered by the UNC Asheville. leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at UNC Asheville.

POINTS OF PRIDE

- The ABED accredited Engineering program (which has a concentration in Mechatronics) is a cooperative effort with NC State, but it is a residential program located in Asheville. This program has shown strong growth and tremendous promise. UNCA recently graduated 20 majors and is projecting 20-30 in the coming years.
- Rural health access is a real concern, as there are significant disparities in some counties in the region. The health sciences programs at UNCA help address those needs for regional communities. In particular, the university maintains a close partnership with NC Center for Health and Wellness, which offers a number of research opportunities. This collaboration allows UNCA to more directly meet local needs.
- STEM programs are popular with transfer students (top two programs for transfers are Engineering and Computer Science, and fourth is Chemistry).

AREAS OF CONCERN

- UNCA noted that they don't have enough space for the growth they anticipate. Classroom and lab space are primary issues and limit some options for growth in hard sciences.
- Faculty load is another concern, growth won't be sustainable without increases in faculty lines.
- Some computer labs aren't wired as such, and the largest has 20 seats, which limits capacity substantially.
- Even the newest buildings on campus (hard sciences) can't sustain growth (20% in Chemistry for example).

- Maker space and engineering shop equipment is relatively new, but the university is already having to fund maintenance, and in some cases replacement, of some equipment. Similarly, some equipment is wearing out in health and wellness. Grant funded support for those programs is available, but that funding isn't permanent. Stakeholders noted, however, that new equipment in a dated/rundown space isn't ideal either - first impressions matter

UNIVERSITY OF NORTH CAROLINA – CHAPEL HILL

The University of North Carolina – Chapel Hill (UNC Chapel Hill), established in 1789, was the first public university in the nation. The university now enrolls nearly 19,000 undergraduates and 11,000 graduate & professional students, and has nearly 4,000 faculty. Seventy-seven bachelor's degrees are offered, along with 111 master's programs, 65 doctoral programs and seven professional degrees.

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

UNC Chapel Hill conducts a need blind admissions process and receives 45,000 applications for approximately 4,200 spots. University enrollment is predicted to be flat in the future, because of residential limitations. UNC Chapel Hill's growth, however, is on par with public peers (although not evenly distributed across years). The university is becoming more competitive (from admission of 2/3 of NC applicants to 40%). Students are admitted to a common first year class, rather than into a specific school/college. Ten programs require a separate application, including business, nursing, public health, and PharmD.

Growth in STEM major enrollments come at a cost to arts and sciences, which will decline as a result. Digital learning programs have great potential for continued expansion.

The University enrolls nearly 5,200 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at UNC Chapel Hill between 2014 and 2018 are displayed below by STEM category:

ENGINEERING

- Bioengineering and Biomedical Engineering

HARD SCIENCES

- Biology/Biological Sciences
- Biostatistics
- Chemistry
- Environmental Sciences
- Environmental Studies
- Geology/Earth Science
- Neuroscience
- Physical Sciences
- Physics

HEALTH SCIENCES

- Clinical Laboratory Science/Medical Technology/Technologist
- Dental Hygiene/Hygienist
- Medical Radiologic Technology/Science - Radiation Therapist

- Environmental Health
- Health/Health Care Administration/Management
- Nutrition
- Registered Nursing/Registered Nurse

MATH

- Applied Mathematics
- Mathematics

TECHNOLOGY

- Computer Science
- Financial informatics (Economics)
- Information Science/Studies

The project team conducted a campus visit on April 15, 2019, and held meetings with Provost Bob Blouin, and representatives from Enrollment & Undergrad Admissions, the Registrar, the School of Public Health, the College of Arts and Sciences, the Department of Allied Health, the School of Nursing, the School of Information & Library Sciences, and the Department of Biomedical Engineering at UNC Chapel Hill. What follows is a summary of some of the points of pride offered by the UNC Chapel Hill. leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at UNC Chapel Hill.

POINTS OF PRIDE

- Reconfiguration of classroom space is happening (as in the Genome Sciences building). A large lecture hall (400 seats) doesn't work anymore for the kind of instruction designed with high impact practices, Redesign incorporates seats that spin, etc. allowing for the ability to work in groups to accommodate the shift in how students are learning, and faculty are teaching.
- UNC Chapel Hill is starting to use undergraduate learning assistants in lieu of graduate TAs in some courses. It's a pedagogically sound approach to do more with the same dollars.
- Biomedical Engineering is a unique interdisciplinary program with two campuses (School of Med and Arts and Sciences at UNC Chapel Hill and NC State College of Engineering). Currently, there are 174 students enrolled at Chapel Hill, and another 150 at NC State in this program. Ideally, they'd like to grow to take 240 from each campus. But the program can't grow without further funding – for hiring faculty, staff, capital equipment – it's a resource intensive educational program. Campus leaders suggested that BME could be a model for similar partnerships between System institutions who have specializations that make good partnerships.
- The University envisions a new building near the center of campus to bring together scientists of various disciplines into a Conversion Science facility to attack problems in a collaborative way. This has been submitted as a capital request and is awaiting approval.

AREAS OF CONCERN

- Deans noted the need for state-of-the-art labs, including wet lab space and equipment to maintain the institution's competitive edge. They indicate that maintaining, planning, and investment in computer systems is needed to manage analytics.

- Leadership indicated that the institution is heavily residential at the undergraduate level, so there are space constraints that go beyond classrooms and labs (lack of student housing on campus and in the community with rentals).
- Physical spaces for tutoring and student engagement really need to be updated. The Student Success Hub was developed in response to the hurricanes but also an effort to do a better job of designing space designed for collaboration.
- Science labs are at capacity, so the university is considering Saturday and evening use to fully utilize those spaces. Enrollments can't grow without more seats or different day/time options.
- Programs which require clinical placements struggle to find enough spots. When sites have a bad experience with a student (even from another education provider) that reflects poorly on teaching in general and increased the challenges finding clinical opportunities.
- Some preceptors are requiring the university to pay for clinical experiences, and that has huge budget implications.
- Stakeholders indicated an increase in students coming to the university who are interested in STEM, but many can't get the pre-requisite courses because of limited capacity.
- Some Deans believe they can hire the faculty to support that level of enrollment growth, but can't build new buildings/add spaces required to support them.

UNIVERSITY OF NORTH CAROLINA – CHARLOTTE

The University of North Carolina – Charlotte (UNC Charlotte) got its start in response to rising education demands immediately after World War II. To serve returning veterans, North Carolina opened 14 evening college centers in communities across the state, including The Charlotte Center which opened in 1946. Less than 20 years later, the North Carolina legislature approved bills creating the University of North Carolina at Charlotte, the fourth campus of the statewide university system. In 1969, UNC Charlotte began offering programs leading to master's degrees. In 1992, it was authorized to offer programs leading to doctoral degrees. UNC Charlotte is now the third largest institution in the UNC System and the largest public institution in the Charlotte region.

The University offers 18 doctoral programs, 62 master's degree programs, and 90 bachelor's degrees. UNC Charlotte enrolls more than 26,500 students, and employs more than 3,000 faculty and staff, and graduates 4,000 to 4,500 new alumni each year.

University leadership indicate that enrollments will likely reach 35,000 students by 2025. The institution's academic programs are aligned with both community and employer needs. Energy production and engineering, construction/civil engineering, health systems, and finance are all prominent industry sectors in Charlotte.

UNC Charlotte considers itself "at the bottom in terms of space," with least amount of space per FTE and per credit hour of all the institutions in the System. The institution is selective, but not highly selective. As a result, it is growing rapidly, and is behind in hiring faculty and advisors to serve a larger number of students. Classroom size is another constraint; the largest classroom holds 300. Larger classrooms and spaces for active learning are much needed. It's generally not a challenge to find faculty, as long as lines/funding are available.

Online and hybrid classes have been a focus at UNCC for some time. Most online programs are degree completion programs, or programs in education or health, although a number of courses at the undergraduate level are offered in an online/hybrid format. Approximately 1,000 students at UNCC are enrolled fully online. The institution is examining how fully online courses might help address the space needs and provide an opportunity to increase access to local students.

UNC Charlotte enrolls more than 6,500 juniors and seniors in STEM programs, as shown in **Appendix B**. A number of programs have seen significant growth in the last five years, including Computer Science, Information Technology, Engineering Technologies and Engineering-Related Fields, Biology, Mathematics and Statistics. The programs offered at UNC Charlotte between 2014 and 2018 are displayed below by STEM category:

ENGINEERING

- Civil Engineering Technology/Technician
- Civil Engineering
- Computer Engineering, General
- Electrical and Electronics Engineering
- Electrical, Electronic and Communications Engineering Technology/Technician
- Engineering Technologies and Engineering-Related Fields
- Mechanical Engineering
- Mechanical Engineering/Mechanical Technology/Technician
- Systems Engineering

HARD SCIENCES

- Biology/Biological Sciences
- Chemistry
- Environmental Studies
- Geology/Earth Science
- Meteorology
- Physics

HEALTH SCIENCES

- Allied Health Diagnostic, Intervention, and Treatment Professions
- Exercise Science
- Health/Health Care Administration/Management
- Public Health
- Registered Nursing/Registered Nurse
- Respiratory Care Therapy/Therapist

MATH

- Mathematics
- Mathematics and Statistics

TECHNOLOGY

- Computer Science
- Information Technology
- Management Science

The project team conducted a campus visit on April 24, 2019, and held meetings with Provost Joan Lorden, representatives from Enrollment Management, the College of Liberal Arts and Sciences, the Belk College of Business, the College of Computing & Informatics, the College of Health and Human Services, and the College of Engineering at UNC Charlotte. What follows is a summary of some of the points of pride offered by the UNC Charlotte. leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at UNC Charlotte.

POINTS OF PRIDE

- Both the graduation rate for FTIC students and the six-year rate across enrollments has increased in recent years.
- The institution tries to redirect students who can't compete in the program they've chosen into a similar field which suits their skill sets.
- The institution has developed seven-week short semesters (some of them online), and nearly 600 have enrolled the first year. UNCC plans to incorporate those more into the schedule. Other sequenced courses could use short semesters too (Fall 1 & 2, Spring 1 & 2). Transfer students and those coming for degree completion are a good fit for these short semesters.
- The STEM Academy is embedded tutoring with Chemistry and Physics, which operates out of the Center for Teaching and Learning (CTL). The Chemistry department is particularly committed to student success, and they collaborate with CTL to engage with more active learning/project based learning and adaptive learning to promote student engagement. The STEM Academy is reducing DFW rates.
- A STEM Learning Community – cohort is starting for the fall 2020.
- UNCC is growing their internship program. It is not required, but utilizes many industry partners. Some students get college credit for them, and more opportunities are in development. Bank of America, for example, offers an 18-month internship which allow for students to remain in school the entire time.
- The institution is looking at methods of increasing section sizes to address the dramatic growth in some areas, and applying active learning methods. UNCC is examining how to make facilities and spaces more efficient - conducive to more students in less space - but remain high functioning in terms of efficiency and innovation.
- The healthcare admin management program is projected to grow tremendously. With 415 enrollments in Fall 2018, it's likely to have 1,000 next year.
- Computer Science has created online sections to help meet demand, and they are studying those to see how it's working. While contact is still needed, the institution is evaluating how much can be online to allow for greater reach.

- Quality Matters is a national framework for online courses. Health faculty have gotten certified with QM, which requires that curriculum is structured in a way that promotes student learning.

AREAS OF CONCERN

- Numerous campus academic buildings serving STEM disciplines need improvements and this has been built into the institution's long-range plans, but funding is needed to support it. Bigger classrooms are a necessity, in addition to large maker spaces. Safety is a concern when these spaces get too crowded.
- Financial concerns drive students to not complete their degree. UNCC has instituted an internship program on campus to help pay for the college experience.
- Student to faculty ratio is an issue for programs with accreditation, as some of these have caps. Clinical site placements are also a challenge for many health professions programs.
- The institution is concerned with how to address underserved populations, and what supports are needed for those who come from high schools without significant tech courses and access.
- The Nursing program faces the same challenges as others across the state. Seats are available for 200 students. They could seat 40 more, but need clinical placements and faculty with those specialties. Atrium (local healthcare provider) is starting to charge for those clinical spots, but so far others are not. UNCC is using more simulations to address this issue and has hired a simulation coordinator.

UNIVERSITY OF NORTH CAROLINA – GREENSBORO

With more than 20,000 students and 2,700 faculty and staff, The University of North Carolina – Greensboro (UNCG) is the largest state university in the Piedmont Triad and has an annual economic impact of more than $1 billion. The campus has grown to include 30 residence halls and 30 academic buildings on 210 acres. The College of Arts & Sciences and seven professional schools offer more than 100 undergraduate areas of study and over 100 masters and doctoral programs.

During the past century the university's mission has evolved, as suggested with its sequence of names. It was known first as the State Normal and Industrial School, and after 1897 as the State Normal and Industrial College until 1919. During the period 1919-1931, it was known as the North Carolina College for Women, and became the Woman's College of the University of North Carolina from 1932 to 1963. In 1962, the Board of Trustees recommended that the Greensboro campus become coeducational at all levels of instruction. Subsequently, by act of the General Assembly in the spring of 1963, the name of the institution was changed to The University of North Carolina at Greensboro. The first African American students were admitted in 1956 and men were first admitted as part of the general student body in 1964.

The university holds two classifications from the Carnegie Foundation for the Advancement of Teaching — as a "doctoral university with higher-research activity" and for deep "community engagement" in curriculum, outreach and partnerships. More than $30 million in research and creative activity grants and contracts are awarded to faculty members annually. The campus is known for its focus on enhancing health and wellness, promoting vibrant communities and translating scholarly findings into programs, policy and practice. Some of UNCG's most prominent research collaborations include the North Carolina Research Campus and Gateway University Research Park, which includes the Joint School of Nanoscience and Nanoengineering.

According to the Provost, the recent rapid growth UNCG has experienced is now hitting a plateau. Several new fall program launches may change that trend. The University is projecting an overall 1% annual growth projection in the near future with online enrollment and community college transfers leading the growth.

The University enrolls more than 2,100 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at UNC Greensboro between 2014 and 2018 are displayed below by STEM category:

HARD SCIENCES

- Biochemistry
- Biology/Biological Sciences
- Chemistry
- Physics

HEALTH SCIENCES

- Audiology/Audiologist and Speech-Language Pathology/Pathologist
- Public Health Education and Promotion
- Registered Nursing/Registered Nurse

MATH

- Mathematics

TECHNOLOGY

- Computer Science
- Computer Systems Networking and Telecommunications
- Management Science

The project team conducted a campus visit on April 16, 2019, and held meetings with Provost Dana Dunn, and representatives from Enrollment Management, the School of Health and Human Sciences, the College of Arts and Sciences, the School of Nursing, the Bryan School of Business and Economics, and the School of Education at UNC Greensboro. What follows is a summary of some of the points of pride offered by the UNC Greensboro. leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at UNC Greensboro.

POINTS OF PRIDE

- UNCG has been investing in limited STEM programs for the past five years. A new bond-funded Nursing building, highlighted by innovations in flexible learning space and new technology, is set to open in Spring 2020.

- Heavy infrastructure investments have created new opportunities in research funding.
- Health-related fields have become the largest area of growth.
- The growth seen in mathematics is hypothesized as related to an increase in career opportunities in the data and analytics fields as well as the University's investment in STEM, and graduate level programs.
- The Information Science program boasts a unique interdisciplinary approach, focused on a multidiscipline collaborative model.
- Biology and chemistry are strong programs that have seen a lot of growth and anticipate that growth to continue. The faculty are seen as superb and the student connection through undergraduate research is noteworthy. Chemistry has a strong balance of women scholars and diversity inclusiveness has been a strong focus of the department.
- The University deems their articulation agreements with community colleges as a best practice, that could be further enhanced through more collaboration between UNC advisors and community college advisors.
- The School of Business engages the community through their capstone project requirements. Additionally, they overcome space and scheduling challenges through a hybrid approach, where classes alternate between labs, classrooms and online.
- The University's Public Health programs provide unique experiential approaches by aligning students directly with faculty research areas.

AREAS OF CONCERN

- The library was designed and built at a time when the campus was approximately half its current size. This has been identified as the primary needs and is the next capital project in the queue. The library will include needed meeting space as well as updates for modern student learning experiences.
- The old nursing building is envisioned to be repurposed for data science; however, it will need significant renovations. This building is the final renovation they can foresee to accommodate growth. Overall the campus is out of physical space for future renovation.
- One of the two major science buildings, Everhardt built in 1971, is antiquated. Despite seeing growth in research, the labs are insufficient for current needs, in addition to future growth needs.
- If growth projections materialize, the University foresees a need for an entirely new STEM building. Additionally, If the Institution moves forward with a bio informatics program, more computing power and flexible space will be mandatory.
- Information science does not have the classroom space for future growth projections. Faculty space is also an issue, as well lab space, where they are already feeling constraints with existing programs. There are currently two classrooms, and the smaller 25-seat classroom will not accommodate major classes. They see heavy demands for the 60-student lab. Students need the lab for intensive programs where running on the cloud would generate network issues.
- Health and Human Sciences seek clinical faculty, faculty offices and space for advisors for Public Health Education.

- In order to expand Speech Pathology and Audiology, a major graduate program feeder and a high demand field locally at Cone Health, more clinical type spaces and testing center space would be required. The space requirements for this type of program are robust.

UNIVERSITY OF NORTH CAROLINA – PEMBROKE

As "North Carolina's Historically American Indian University," The University of North Carolina – Pembroke (UNC Pembroke) was founded in 1887 as the Croatan Normal School to educate American Indian teachers. It is the nation's only four-year public institution founded by American Indians for American Indians. In the 1930s, the college rose to a senior college rating and the first four-year degrees were conferred in 1940. In 1943, non-teaching baccalaureate degrees were added, and in the 1950s the school was opened to all qualified applicants without regard to race.

Today, with an enrollment of more than 7,100, including more than 6,000 undergraduate students, the University offers 41 undergraduate programs and 17 graduate programs. The student to faculty ration is 16:1 and their average class size is 20. UNCP is one of three institutions benefitting from the NC Promise program. According to the Provost, the University overall has seen significant growth in enrollment recently a result of the NC Promise program as well as extensive retention efforts conducted by the University.

The University enrolls more than 600 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at UNC Pembroke between 2014 and 2018 are displayed below by STEM category:

HARD SCIENCES
- Applied Physics
- Biology
- Biotechnology
- Chemistry
- Environmental Science
- Geo-Environmental Studies

HEALTH SCIENCES
- Biology, Medical Technology
- Nursing

MATH
- Mathematics

TECHNOLOGY
- Computer Science
- Information Technologies

The project team conducted a phone interview on May 9, 2019 with Provost David Ward, and representatives from Enrollment, the College of Arts and Sciences, and the College of Health Sciences at

UNC Pembroke. What follows is a summary of some of the points of pride offered by the UNC Pembroke. leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at UNC Pembroke.

POINTS OF PRIDE

- UNC Pembroke is recognized as one of the most diverse campuses in the nation, as well as one of the safest.
- Fall 2018 enrollment increased by 800 undergraduate and graduate students combined. The University expects to see similar increases this fall bringing total enrollment to 8,000 students with 6,435 of those being undergraduates.
- Over the past three years, the University has made significant efforts to build its retention of existing students. Retention increased from 63 to 68% for Fall 2018. They are slightly ahead of that based on registrations for Fall 2019. They anticipate 73% retention of undergrad students, or 640-650 more continuing students than previous years. Additionally, specific initiatives build retention on a student by student basis. For example, a homeless student initiative identified 17 students and connected them with assistance and resources.
- The new School of Business building will encompass a greater number of multi-use classrooms to accommodate the 8,000-student forecast.
- A Cybersecurity track was added to Information Technology last year, and the track will be added to Computer Sciences as well. A new lab renovation is expected to be ready in Fall 2019 that will support these students. A "State of STEM" faculty summit held in 2018 has helped guide them in this direction.
- UNCP has developed partnerships with NC State in Applied Physics and engineering to create five-year tracks (three years at UNCP followed by two at NC State).
- The Health Careers Access Program has resulted in more UNCP graduates entering graduate health programs.
- Most of the STEM undergrad programs are taught by full-time professors, not graduate students. Smaller class sizes, mentoring relationships with professors, and summer off-campus lab experiences are points of pride. The Pembroke Undergraduate Research and Creativity Center prepares participants with real research experience.
- The Nursing program will continue to max out its 200-student (undergraduate and graduate) cap. It is a well-recognized program with high passing rates on the nursing exam.

AREAS OF CONCERN

- The Provost's most pressing concern are STEM lab facilities. The Oxendine Science Building has been renovated and expanded once, but there are limitations on the institution's ability to renovate this space again. UNCP has requested a new STEM/health science building with specialized lab and teaching space. Their labs are running very full, into the evenings four nights a week.
- Many UNCP students are first generation college students coming from an economically challenged region. These students arrive at UNCP without the educational curriculum in high

school to prepare them for college. The university spends significant resources on skill-building for underclassmen and retention efforts.

- The institution draws primarily from a 9-10 county region that is predominantly rural and lacks broadband. The region's economy was traditionally dominated by the tobacco and textiles industries, which are no longer viable industries. The region is primarily agricultural, and the University has developed programs around agricultural sciences.
- The region seeks to attract high-tech industries and the University has been challenged to help build the workforce in that area.
- Clinical partnerships are a challenge for the Nursing program.

UNIVERSITY OF NORTH CAROLINA – WILMINGTON

The University of North Carolina – Wilmington (UNC Wilmington) began in 1946 as a college center established under the direction of the North Carolina College Conference and under the administration of the Directorate of Extension of the University of North Carolina at Chapel Hill. Initially, the college offered freshman level courses to 238 students. Today, UNCW offers a full range of undergraduate and master's programs, as well as doctoral degrees in educational leadership, marine biology, nursing practice and psychology. Nearly 17,000 students were enrolled in 2018, primarily in undergraduate programs (14,500). Fifty-five bachelor's and 35 master's programs are offered at UNCW (or are pending approval by the Southern Association of Colleges and Schools Commission on Colleges). Nearly 1,400 staff and 1,000 faculty serve UNCW, the North Carolina System's only coastal campus.

UNC Wilmington enrolls more than 3,300 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at UNC Wilmington between 2014 and 2018 are displayed below by STEM category:

HARD SCIENCES

- Biology/Biological Sciences
- Chemistry
- Geology/Earth Science
- Marine Biology and Biological Oceanography
- Oceanography, Chemical and Physical
- Physics
- Environmental Sciences
- Environmental Studies

HEALTH SCIENCES

- Athletic Training/Trainer
- Health Professions and Related Clinical Sciences
- Public Health
- Registered Nursing/Registered Nurse
- Therapeutic Recreation/Recreational Therapy

MATH
- Mathematics
- Statistics

TECHNOLOGY
- Computer Science
- Information Technology

The project team conducted a campus visit on April 16, 2019, and held meetings with Provost Marilyn Sheerer, and representatives from the University Registrar, Undergraduate Studies, the College of Arts and Sciences, the College of Health and Human Services, the Watson College of Education, and the Cameron School of Business at UNC Wilmington. What follows is a summary of some of the points of pride offered by the UNC Wilmington. leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at UNC Wilmington.

POINTS OF PRIDE

- The University has made efforts to advance research and has earned the designation of *Doctoral Universities: High Research Activity* institution, according to the Carnegie Classification of Institutions of Higher Education, one of only eight institutions nationally to elevate its status from *Master's Colleges & Universities: Larger Program*.
- The Strategic Plan for the University focuses on its diverse doctoral programs in education, nursing, marine biology and psychology. UNCW faculty collaborate with students through research to explore various fields including drug development; aquaculture; coastal and marine environments; the arts and humanities; educational leadership; health and wellness; and data sciences.
- The new Veterans Hall, currently under construction, will house the College of Health and Human Services; the Center for Healthy Living; existing academic programs in Health and Applied Human Sciences and Social Work; support space for military-affiliated students; and related labs and classrooms. This new facility will be critical to UNCW's ability to produce more health care professionals and expand services to rural areas of the region.

AREAS OF CONCERN

- The campus is still feeling the aftermath from flooding and damage related to Hurricane Florence in September 2018. Dobo Hall, a science building was unusable following the storm. Temporary reassignment or sharing of instructional, lab space, office and support space continues to be of concern until repairs, renovations, and new space comes fully online. Restoration will only partially meet current space needs and will not completely accommodate program expansion at the undergraduate or graduate level.
- As expansion of graduate programming continues, the demand for added faculty office space, classroom capacity, and labs will increase.
- To be competitive in attracting top faculty in STEM disciplines requires additional dollars for salaries, research stipends, and appropriate laboratory space and equipment for their research endeavors.

WESTERN CAROLINA UNIVERSITY

As the westernmost institution in the UNC System, Western Carolina University (WCU) serves more than 11,500 students, including more than 10,000 undergraduates. Originally founded as a teaching college in 1889, WCU now provides comprehensive educational opportunities and attracts students from around the globe. In addition to its main campus in Cullowhee, North Carolina, WCU operates an instructional site at Biltmore Park Towne Square in Asheville, offering degree programs in nursing and engineering as well as graduate programs in accounting, business administration, entrepreneurship, and education. WCU offers a student/faculty ratio of 17 to 1.

As of Fall of 2018, all undergraduate students at WCU received reduced student tuition costs as part of NC Promise. Under this program, the cost of tuition for in-state students is $500 per fall and spring semesters, and $2,500 for out-of-state students. The State of North Carolina is supplementing this cost by matching dollar for dollar the difference between WCU's previous tuition and the NC Promise Tuition Plan, so that students pay less while WCU continues to deliver the highest quality education. Institutional leaders indicate the NC Promise program is contributing to enrollment growth. It is unclear how long the program will continue to be funded, however, so the long-term impact and benefit of the program for the institution and its students are difficult to predict.

The provost indicates that overall enrollments have been trending upwards (300+ per year) and gained approximately 600 this year. The admissions metrics are designed to capture first-generation, rural, and low-socioeconomic status students, and WCU doesn't want to grow so quickly that they can't provide supports for those students.

WCU students are often employer outside the state. It was noted that Western is geographically closer to five other state capitals than it is to Raleigh, and that needs to be considered when defining the institution's "regional reach."

Western Carolina enrolls nearly 2,000 juniors and seniors in STEM programs, as shown in **Appendix B**. The programs offered at WCU between 2014 and 2018 are displayed below by STEM category:

ENGINEERING

- Construction Engineering Technology/Technician
- Electrical and Electronics Engineering
- Electrical, Electronic and Communications Engineering Technology/Technician
- Engineering Technology
- Engineering

HARD SCIENCES

- Biology/Biological Sciences
- Chemistry
- Geology/Earth Science
- Environmental Science

- Forensic Chemistry
- Forensic Science
- Natural Resource Conservation and Management

HEALTH SCIENCES

- Athletic Training/Trainer
- Communication Sciences and Disorders
- Dietetics/Dietitian
- Emergency Medical Technology/Technician
- Environmental Health
- Health Services/Allied Health/Health Sciences
- Integrated Health Sciences
- Registered Nursing/Registered Nurse
- Therapeutic Recreation/Recreational Therapy

MATH

- Mathematics

TECHNOLOGY

- Computer Science
- Management Information System

The project team conducted a campus visit on April 22, 2019, and held meetings with Acting Provost Carol Burton, and representatives from the Registrar's Office, the College of Engineering and Technology, the College of Business, the College of Health and Human Sciences, and the College of Arts and Sciences at Western Carolina University. What follows is a summary of some of the points of pride offered by the WCU leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at Western.

POINTS OF PRIDE

- WCU has increased freshman retention and graduation rates significantly by focusing on advising. A new transfer adviser works with community colleges and has leveraged a Comprehensive Articulation Agreement.
- Majority of Western's growth in the last 12-15 years has been in STEM (in large part because of the engineering addition).
- The institution is working to address courses with high DFW rates (percentage of students who receive grades of D or F, or withdraw from class), which is especially critical for college algebra (minimum necessary for most STEM programs). WCU is looking forward to a grant from UNC system to redesign college algebra.
- The institution has developed capstone projects tied to regional employers, and tries to create opportunities for project-based learning which, reinforces communication and professional skills.
- While enrollments have grown in many STEM programs, there have not been subsequent increased in classroom facilities/lab space.
- WCU would like to have a data analytics program (with a focus on both analytics and visualization) in place by 2020, although a track within existing majors could be developed more quickly. This is an interdisciplinary effort with the math, IT, and business faculty.
- The integrated health program has no clinical requirement, which was a strong reason to start it.

AREAS OF CONCERN

- Access to broadband in the region is limiting for many students. More than 2,000 students are enrolled exclusively online. Some of the graduate programs are hybrid, but few hybrid courses are available at the undergraduate level.
- Internships can be difficult to find because of the rural location of the main campus. Programs requiring clinical placements are also challenging, and becoming more so because of the looming threat of charging for clinical sites. WCU is seeking the ability to use simulations for clinical experience. The clinics on campus are used as teaching/clinical sites as well.
- Campus master plan does not yet accommodate for our planned growth.
- WCU has the ability to offer courses as often as needed, but scheduling is a big issue. Classroom space is packed from 9:00 – 2:00 pm, but scheduling late afternoon classes (particularly on Friday) is a challenge.
- Some STEM programs could grow more if students received more academic support for math. Math is the first hurdle students must get over, and many will leave the institution if they fail it. So, success in this is key to their success in STEM majors.
- Hiring adjuncts is nearly impossible, so full-time faculty are necessary. It is a challenge to recruit because of the isolated nature of the community. WCU indicates that it relies on "truth in advertising" when recruiting faculty, so candidates understand what the community is like.
- A major limitation in some buildings is electrical outlets – so growth may come from hybrid or online programs, because it's too costly to rewire the facilities.
- Many students from the region are hindered by the lack of AP programs in their high schools, and a strong teaching base in science and math.
- One faculty leader noted that opportunity in rural North Carolina is not equal to that of other urban communities. He suggested that if the system office invests more heavily in HBCUs and places like Western they will dramatically change lives of communities these institutions serve.

WINSTON-SALEM STATE UNIVERSITY

Winston-Salem State University (WSSU) was founded in 1892 and enrolled 25 students with a single instructor. Since that time, WSSU has grown from a one-room frame structure to more than 39 buildings located on in the heart of Winston-Salem. WSSU now enrolls approximately 5,200 students and offers more than 40 bachelor's programs, nine master's programs and two professional doctoral programs, along with two certificates.

In recent years, the institution has been putting more emphasis on transfers and graduate/professional programs, along with growing their online program options. Growth in STEM programs is constrained by lab and classroom space, and faculty capacity.

Many degrees offered through community colleges are AAS degrees not covered by the articulation agreements. So, WSSU is working to develop those for transfers. In the near future, the university would like to create an orthotics/prosthetics program, as there isn't one in North Carolina currently available, and the only other one through an HBCU is in Alabama.

Winston-Salem State University enrolls more than 1,200 juniors and seniors in STEM programs as shown in **Appendix B**. The programs offered at UNC Wilmington between 2014 and 2018 are displayed below by STEM category:

HARD SCIENCES

- Chemistry

HEALTH SCIENCES

- Clinical Laboratory Science/Medical Technology/Technologist
- Exercise Science/Physiology
- Health/Health Care Administration/Management
- Registered Nursing/Registered Nurse
- Therapeutic Recreation/Recreational Therapy
- Vocational Rehabilitation Counseling/Counselor

MATH

- Mathematics

TECHNOLOGY

- Computer Science
- Information Science/Studies
- Information Technology
- Management Information System

Some programs have shown substantial growth in recent years (e.g., Biology, Health Care Administration/Management, and Exercise Science), while others have experienced declines, most significantly in nursing. In the early 90s, WSSU was one of only two or three Nursing programs in the state, but increased competition has resulted in declines wince 2014. Additionally, the institution's teaching model has changed. Before, they taught at various sites throughout the state. But many students prefer to learn virtually now.

The project team conducted a campus visit on April 23, 2019, and held meetings with Provost Anthony Graham, representative from Enrollment and Registrar, the School of Health Sciences, and the College of Arts, Sciences, Business, and Education at Winston-Salem State University. What follows is a summary of some of the points of pride offered by the WSSU leadership team, as well as their primary areas of concern as they relate to the future of STEM programming at Winston-Salem State.

POINTS OF PRIDE

- WSSU is working to make it easier for students to switch into alternative health professions majors if they don't do well in biology/chemistry, etc. Health care management, exercise science, etc. are popular alternatives.
- There is strong employer demand for STEM graduates of WSSU.

- Admissions is not selective at WSSU – the focus is on access. So, it's important to provide students with the academic supports they need to be successful in their chosen field.
- The university is in discussions with UNCSA about a joint program in Virtual Reality and/or Gaming.
- WSSU has a strong focus on community service. There are many lots of uninsured and underinsured in the local area, so the university operates two mobile lab units to provide point of care testing. United Health Care and Discount Pharmacy partner with the nursing school to get medication to the community along with education about their medication so it's taken properly.
- The institution developed a learning assistant model which allows non-graduate students to serve as TAs, this has helped financially, as well as been a benefit to the learning assistants who serve in this capacity.

AREAS OF CONCERN

- One quarter of the freshman class doesn't return; while others come back, but are not earning enough hours to sustain their enrollment long-term. Finances/fees and social engagement are the primary reasons students leave. Many have to repeat intro science courses. Using data to see why students aren't coming back/completing. Getting more deliberate about that.
- Another big obstacle for completion is lack of courses. WSSU loses faculty slots every year – and faculty are already overloaded. Gen Ed courses are particularly problematic (biology, anatomy and physiology), as these are gateway courses to rest of the degree.
- The biggest pain point is the pre-nursing pool; 300 of the 1,100 freshmen are pre-nursing, with only 90 spaces in the nursing program. Some of the growth seen in the biology program may be fall back from those who don't get into nursing.
- Clinical programs – challenges with finding clinical placements. The institution is at capacity in the on-site nursing program, in large part because of the clinical placement limitations.
- The nursing program relies heavily on adjuncts because of challenges finding full-time faculty.
- Not much growth is projected in IT and computer science, as the coursework is dated. For the next accreditation, the coding and programming skills needed for occupations today will need to be updated.