

Education Today for Tomorrow's Careers

Insights and Advice for Career Advisors, Teachers, Parents, and Students



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Since our last issue in October 2009, we have finally seen some tangible signs of the economy's improvement, especially in jobs that require knowledge in math and science. Just in the field of Information Technology, the number of job openings in North Carolina has increased by almost 200%. Similar trends are occurring in other math- and science-based disciplines such as health care, bioscience, and engineering.

For 20 years, the Tech Council of the Winston-Salem Chamber of Commerce has been the largest group in the Triad dedicated to developing our technology-based economy. One of the Tech Council's many initiatives is to educate our local students about the opportunities available to them in technology careers. An educated and vibrant workforce is vital to ensure our local technology-based economy continues to grow.

The sixth edition of *Education Today for Tomorrow's Careers* is created by the Tech Council's Science, Technology, Engineering, and Mathematics (STEM) Committee to provide insights about technology-based career opportunities in Forsyth County, the Piedmont Triad, and North Carolina. Careers in technology are some of the fastest growing and highest paid occupations. This document presents educators, counselors, parents, and students with a brief overview of employment trends and career opportunities and the skills needed for students to succeed in those positions. Most of this information is new, but some is repeated because it is particularly valuable. We hope you find it useful. We encourage you to contact us with any feedback or suggestions.

Women in Science, Technology, Engineering and Math

We have addressed the gender gap in previous issues, but its importance cannot be understated. A gender gap does exist in many STEM fields and female students should be encouraged more to enter these professions. That encouragement needs to begin in high school, if not before.

A study by the American Association of University Women found eight factors that are preventing more women from entering STEM careers: beliefs about intelligence; stereotypes; self-assessment; spatial skills; the college student experience; faculty; implicit bias; and workplace bias. This same study found that active encouragement and recruitment was crucial and successful in encouraging female students to enter these fields.

Some progress has been made. Women comprise the majority of students in undergraduate programs in biological sciences. However, those figures are much less in fields such as physics, engineering, and computer science.

To read the full report, download presentations for your own use, and get additional information visit the American Association of University Women's website: [Why So Few](http://www.aauw.org/learn/research/whysofew.cfm) :
<http://www.aauw.org/learn/research/whysofew.cfm>

Why Aren't There More Female Leaders in Technology?

Courtesy of McGraw-Hill's October 2010 IB Newsletter and Bernie Yevin at Forsyth Tech Worldwide, the Computer and Information Technology (CITY) industry is typically considered the testosterone-driven domain of men, but there is an emerging CIT industry trend. Women are entering and climbing to the top. Many women come to the CIT industry through other sides of the business, like marketing and sales, but need mentoring and encouragement to find their inner geeks. At Stanford University's AlwaysOn Summit, Marissa Mayer, Vice President of Search Product and User Experience at Google; Jasmine Kim, Chief Operating Officer of ImageSpan; Polly Sumner, President and Chief Adoption Officer at Salesforce.com; and moderator Elizabeth Tinkham, Global Lead of Management Consulting and Integrated Markets Communications and High Tech Industry Group at Accenture, discuss strategies to encourage women to join the CIT industry. [You may watch their discussion here: http://www.bnet.com/videos/why-arent-there-more-female-leaders-in-technology/328548?tag=drawer-container;load-video-river](http://www.bnet.com/videos/why-arent-there-more-female-leaders-in-technology/328548?tag=drawer-container;load-video-river)

Vacancies and Needed Skills in Information Technology

The North Carolina Technology Association tracks job openings in the state's Information Technology (IT) Industry. As mentioned above, those openings have increase a great deal over the last year. In October 2010, over 4,200 openings exist in North Carolina and many of these positions are difficult for companies to fill due to lack of applicants with relevant skills. As today's students continue with their education in the next few years, the economy is expected to improve and job opportunities in IT and related technology fields will likewise improve even further.

The table below lists which IT skills are currently in the most demand in North Carolina.

Top 15 Needed IT Skills in North Carolina October 2010	
Skill	Job Openings
Windows OS	730
Oracle DBMS	670
Business Analysis	550
SQL	500
C++/VC++	470
Java	470
Unix	470
Linux	440
Virtualization Technology	360
Large System Technologies	340
SAP	270
Perl	250
Information Assurance	250
Microsoft SQL Server	230

Source: North Carolina Technology Association

Show Me the Money! – The Value of Education

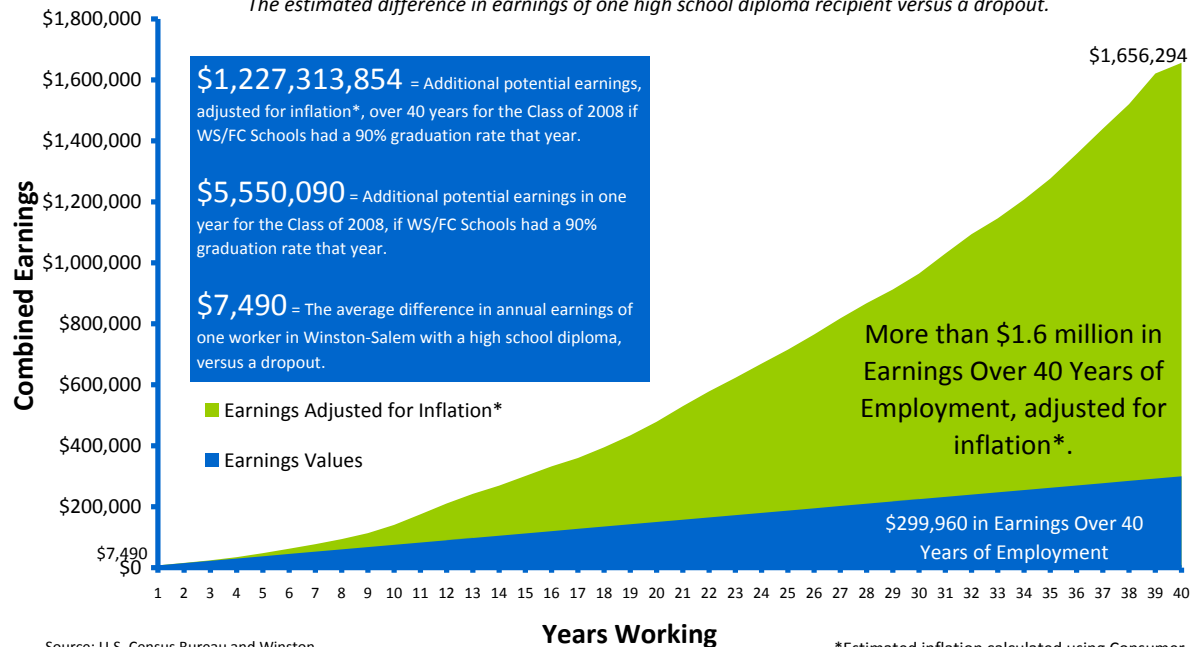
The value of education only continues to increase. In our local, national, and global economies, the skills needed for individuals to become highly productive members of the workforce are now defined by knowledge, information, analysis, and critical thinking.

Winston-Salem first became an economic powerhouse because large-scale manufacturing operations in industries such as tobacco and textiles flourished here. The skills needed in these operations were often specific, repetitive and learned on the job. Those skills were not something one would acquire in schools. Furthermore, those lesser-skilled jobs often paid relatively high wages with excellent benefits, essentially creating an incentive for high school students to drop out of school early and begin collecting a paycheck. It was a logical choice; the benefit for those individuals staying in school was minimal, at best.

Today, those options have disappeared. A high school diploma is now fundamental to succeeding in the workforce. If Winston-Salem is to become a formidable player in the global marketplace, it must increase its educational attainment levels.

The Value of a High School Diploma in Winston-Salem

The estimated difference in earnings of one high school diploma recipient versus a dropout.



Source: U.S. Census Bureau and Winston-Salem Chamber calculations.

*Estimated inflation calculated using Consumer Price Index changes from 1969-2009.

While a high school diploma is absolutely fundamental to participate in today's economy, additional postsecondary education is needed to find jobs in the fastest-growing, better paid occupations (see page 10). According to the College Board's report *Education Pays 2010*, "Median earnings of bachelor's degree recipients working fulltime year-round in 2008 were \$55,700, \$21,900 more than median earnings of high school graduates. (And) individuals with some college but no degree earned 17% more than high school graduates working full-time year-round." You may read the full report here:

http://trends.collegeboard.org/downloads/Education_Pays_2010.pdf.

BLS Career Guide to Industries¹

The U.S. Bureau of Labor Statistics' *Career Guide to Industries* supplied detailed career information on a larger number of different industries. This guide, www.bls.gov/oco/cg, includes: information about occupations in the industry; training and advancement; earnings; expected job prospects; and working conditions. Provided here are employment outlooks for three industries related to science, math, and technology.

Scientific Research and Development Services

Overall prospects for scientists and engineers should be favorable, although competition for basic and applied research funding is expected in many fields.

Employment change. Wage and salary employment in scientific research and development services is projected to increase by 25 percent between 2008 and 2018, compared with 11 percent employment growth for the economy as a whole. Demand for new R&D is expected to continue to grow across all major fields, although growth will be particularly strong in biotechnology and other life sciences research as increased demand for medical and pharmaceutical advances driven by an aging population will lead to increased R&D spending in these areas.

Significant job growth is expected among computer specialists, scientists, and engineers—particularly those in the life and medical sciences. With the aging of the population, the demand for lifesaving new drugs and procedures to cure and prevent disease will drive this demand. Biological scientists, for example, may be employed in biotechnology or pharmaceuticals, both growing areas. Many other scientists and engineers will be employed in defense and security R&D, also a growing field. As information technology continues to be an integral component of R&D, employment of computer specialists is expected to grow rapidly, particularly for those with some biological science background working in bioinformatics.

Job growth for office and administrative support occupations should be slower than growth of the industry as a whole as technology leads to greater efficiency in general office functions. Projected employment growth among professional occupations, on the other hand, is faster than overall industry growth, reflecting demand for scientists and engineers.

Job prospects. Overall prospects for scientists and engineers should be favorable, with better opportunities for scientists who have doctoral degrees, which prepare graduates for research. However, competition for basic and applied research funding is expected in all fields. Creativity is crucial, because scientists and engineers engaged in R&D are expected to propose new research or designs. For experienced scientists and engineers, it also is important to remain current and adapt to changes in technologies that may shift interest—and employment—from one area of research to another.

Most R&D programs have long project cycles that continue during economic downturns. However, funding of R&D, particularly by private industry, is closely scrutinized during these periods. Since the Federal Government provides a significant portion of all R&D funding, shifts in policy also could have a marked impact on employment opportunities, particularly in basic research and aerospace.

¹ www.bls.gov/oco/cg

Pharmaceutical and Medicine Manufacturing

Employment is expected to increase as demand for drugs continues to grow. Prospects should be favorable, particularly for life scientists with a doctoral degree.

Employment change. The number of wage and salary jobs in pharmaceutical and medicine manufacturing is expected to increase by 6 percent over the 2008-18 period, compared with 11 percent projected for all industries combined. Even during fluctuating economic conditions, demand is expected to remain strong for this industry's products, including the diagnostics used in hospitals, laboratories, and homes, the vaccines used routinely on infants and children, analgesics and other symptom-easing drugs; antibiotics and other drugs for life-threatening diseases, and "lifestyle" drugs for the treatment of nonlife-threatening conditions.

The use of drugs, particularly antibiotics and vaccines, has helped to eradicate or limit a number of deadly diseases, but many others, such as cancer, Alzheimer's, and heart disease, continue to elude cures. Ongoing research and the manufacture of new products to combat these and other diseases will continue to contribute to employment growth. Demand also is expected to increase as the population expands because many of the pharmaceutical and medicine manufacturing industry's products are related to preventive or routine healthcare, rather than just illness. The growing number of older people, who tend to consume more of all types of healthcare services, will further stimulate demand—along with the growth of both public and private health insurance programs, which increasingly cover the cost of drugs and medicines.

Another factor propelling demand is the increasing popularity of "lifestyle" drugs. These drugs treat symptoms of chronic nonlife-threatening conditions resulting from aging or genetic predisposition and can enhance one's self-confidence or physical appearance. Other factors expected to increase the demand for drugs include greater personal income and the rising health consciousness and expectations of the general public.

Despite the increasing demand for drugs, several factors will limit employment growth in the industry. Drug producers and buyers are placing more emphasis on cost effectiveness, due to the extremely high costs of developing new drugs. Competition from the producers of generic drugs also will put pressure on many firms in this industry as more brand-name drug patents expire. On the manufacturing side, continuing improvements in manufacturing processes will improve productivity in pharmaceutical plants, while many companies are also manufacturing more of their products overseas.

Strong demand is anticipated for professional occupations—especially for life and physical scientists engaged in R&D, the backbone of the pharmaceutical and medicine manufacturing industry. Much of the basic biological research done in recent years has resulted in new knowledge, including the successful identification of genes. Life and physical scientists will be needed to take this knowledge to the next stage, which is to understand how certain genes function so that gene therapies can be developed to treat diseases. Computer specialists such as systems analysts, biostatisticians, and computer support specialists also will be in demand as disciplines such as biology, chemistry, and electronics continue to converge and become more interdisciplinary, creating demand in rapidly emerging fields such as bioinformatics and nanotechnology.

Steady demand also is projected for production occupations. Employment of office and administrative support workers is expected to grow more slowly than the industry as a whole, as companies streamline operations and increasingly rely on computers.

Job prospects. Prospects should be favorable, particularly for life scientists with a doctoral degree. Unlike many other manufacturing industries, the pharmaceutical and medicine manufacturing industry is not highly sensitive to changes in economic conditions. Even during periods of high unemployment, work is likely to be relatively stable in this industry, because consumption of medicine does not vary greatly with economic conditions. Additional openings will arise from the need to replace workers who transfer to other industries, retire, or leave the workforce for other reasons.

Software Publishers

Employment in software publishing is projected to grow as firms continue to invest heavily in software and other information technology. Job prospects should be excellent, especially for computer specialists.

Employment change. Wage and salary jobs in software publishing are expected to increase by 30 percent between 2008 and 2018, almost 3 times as fast as the 11 percent growth projected for all industries combined. Growth will not be as rapid as it was during the technology boom of the 1990s, however, as the software industry continues to mature and as routine work continues to be offshored.

Demand for software publishing services will grow as a result of an increasing reliance on information technology. Individuals and organizations will continue to invest in applications and systems software to maximize the return on their investments in equipment, increase efficiency, and remain competitive.

The growing reliance on the Internet will be a major driver of job growth. The way the Internet is used is constantly changing, and so is the software required to run new and emerging computer applications. The proliferation of "mobile" technologies, has created demand for a wide variety of new products and services. The expansion of the wireless Internet brings a new aspect of mobility to information technology by allowing people to access the Internet without the constraints of physical connections. In addition, the rapid development of handheld, Internet-enabled devices is making the World Wide Web accessible from virtually anywhere. As businesses and individuals become more dependent on this technology, there will be an increasing need for new software applications that maximize the potential of wireless products.

In a growing trend, a wide variety of software services are being offered over the internet. Rather than being stored and accessed on the individual computers of businesses and users, word processing, spreadsheet, enterprise resource planning, and other types of applications can now be accessed remotely. This is attractive to many organizations, as it reduces the need for costly storage equipment. Much of the design and development of these applications will be completed by establishments in the software publishing industry.

Another significant factor contributing to growth among software publishers will be computer security. Organizations invest heavily in software to protect their information and secure their systems from attack. And, as the amount of data transmitted across the Internet increases, the

importance of maintaining computer system and network security will grow, leading to greater demand for security software.

Given the increasingly widespread use of information technology and the overall rate of growth expected for the industry, most occupations should grow, although some faster than others. Employment of computer specialists, such as computer software engineers and computer systems analysts, will be particularly strong, as they are integral to the software-design process.

Job prospects. Job opportunities in software publishing should be excellent for most workers, given the rate at which the industry is expected to grow, and the increasing integration and application of software into all sectors of the economy. Computer specialists should enjoy the best opportunities, reflecting continuing demand for workers with high-level skills to keep up with changes in technology.

Careers in Biotechnology

The North Carolina Biotechnology Center defines biotechnology as “the use of living cells and their molecules to solve problems and make useful products.”² Biotechnology is one of the fastest growing industries in North Carolina and holds great potential for the future of our economy and our society.

Career opportunities in biotechnology may appeal to a wide range of students because they can require anything from a two-year degree to a doctorate.

Listed below are some basic career types in biotechnology. By clicking on each link, you can gather a variety of useful information, including sample high schools schedules, collegiate options, and potential salaries. Click on your choice to learn more:

- **Scientist:** <http://www.ncbiotech.org/workforce-education/biotech-career-guide/scientists>
- **Laboratory Technician:** <http://www.ncbiotech.org/workforce-education/biotech-career-guide/laboratory-technicians>
- **Engineers:** <http://www.ncbiotech.org/workforce-education/biotech-career-guide/engineers>
- **Process Technicians:** <http://www.ncbiotech.org/workforce-education/biotech-career-guide/process-technicians>
- **Maintenance and Instrumentation Technicians:** <http://www.ncbiotech.org/maintenance-and-instrumentation-technicians>
- **Corporate Scientific Professionals:** <http://www.ncbiotech.org/workforce-education/biotech-career-guide/corporate-scientific-professionals>

² www.ncbiotech.org

Career OneStop Helps Students and Advisors Plan Career Paths

Career OneStop is a website sponsored by the U. S. Department of Labor, Employment and Training Administration that is targeted towards students and career advisors. The website allows students to identify their interests, explore career options, learn how to get work experience, and see what education options are available to make their dream a reality. You may visit the site here:

<http://www.careeronestop.org/StudentsandCareerAdvisors/StudentsandCareerAdvisors.aspx>

Career Pathways Posters

The North Carolina Career Resource Network has created a series of posters that emphasize the different types of careers available in the following ten different technology fields:

- Agricultural and Natural Resource Technologies
- Biological and Chemical Technologies
- Business Technologies
- Commercial and Artistic Production Technologies
- Construction Technologies
- Engineering Technologies
- Health Technologies
- Industrial Technologies
- Public Services Technologies
- Transport Systems Technologies

These posters highlight the different career paths that people with a two year degree and/or a bachelor's degree can pursue in these ten fields. They also highlight what courses high school students should take now to put them on the road to a successful career.

You may print the posters out here: www.soicc.state.nc.us/soicc/products/pathway_eng.pdf

The Income Payoff

For information on salaries and the earning potential for various careers, the best free site we recommend is the Bureau of Labor Statistics A-Z index: www.bls.gov/search/ooh.asp?ct=OOH

It is easy and helpful in that you can type in the job title you are looking for and it returns a lot of useful information in helping you or your students learn more about various careers.

The North Carolina Employment Security Commission also supplies information on salaries in a wide variety of careers. You may view that information here: eslmi23.esc.state.nc.us/oeswage/

Projecting the Future

In today's increasingly competitive and shrinking world, the importance of staying in school cannot be underestimated. An individual's level of educational attainment is directly related to their income. In general, the more education you have, the higher your salary will be.

According to the North Carolina Commission on Workforce Development, "many of the fastest growing occupations require advanced degrees and reward workers with high pay." Lawyers and pharmacists are some of the fastest growing jobs and they have average earning of over \$100,000.

Additionally, about 25% of new jobs over the next ten years will require at least a four-year degree. These jobs also offer salaries significantly higher than average. Some that require only a technical degree or some post-secondary education are also fast growing occupations. For example, many jobs in the health care industry may only require an associate degree but they pay well-above average wages.

The tables following provide detailed lists of the fastest growing and declining occupations in the United States from 2008-2018. Notice the difference between the type of postsecondary education required in the fastest growing occupations and the fastest declining occupations. Almost all the fastest growing occupations require education beyond a high school diploma and on-the-job training.

Top 30 Fastest Growing Occupations in the USA: 2008-2018 *(numbers in 1,000s)*

Occupation	Employment		Change		Most Significant Source of Postsecondary Education or Training
	2008	2018	Percent	Number	
Biomedical engineers	16	28	72.0%	12	Bachelor's degree
Network systems and data communications analysts	292	448	53.4%	156	Bachelor's degree
Home health aides	922	1,383	50.0%	461	Short-term on-the-job training
Personal and home care aides	817	1,193	46.0%	376	Short-term on-the-job training
Financial examiners	27	38	41.2%	11	Bachelor's degree
Medical scientists, except epidemiologists	109	154	40.4%	44	Doctoral degree
Physician assistants	75	104	39.0%	29	Master's degree
Skin care specialists	39	54	37.9%	15	Postsecondary vocational award
Biochemists and biophysicists	23	32	37.4%	9	Doctoral degree
Athletic trainers	16	22	37.0%	6	Bachelor's degree
Physical therapist aides	46	63	36.3%	17	Short-term on-the-job training
Dental hygienists	174	237	36.1%	63	Associate degree
Veterinary technologists and technicians	80	108	35.8%	29	Associate degree
Dental assistants	295	401	35.8%	106	Moderate-term on-the-job training
Computer software engineers, applications	515	690	34.0%	175	Bachelor's degree
Medical assistants	484	648	33.9%	164	Moderate-term on-the-job training
Physical therapist assistants	64	85	33.3%	21	Associate degree
Veterinarians	60	79	33.0%	20	First professional degree
Self-enrichment education teachers	254	335	32.1%	81	Work experience in a related occupation
Compliance officers, except agriculture, construction, health and safety, and transportation	260	341	31.1%	81	Long-term on-the-job training
Occupational therapist aides	8	10	30.7%	2	Short-term on-the-job training
Environmental engineers	54	71	30.6%	17	Bachelor's degree
Pharmacy technicians	326	426	30.6%	100	Moderate-term on-the-job training
Computer software engineers, systems software	395	515	30.4%	120	Bachelor's degree
Survey researchers	23	31	30.4%	7	Bachelor's degree
Physical therapists	186	242	30.3%	56	Master's degree
Personal financial advisors	208	271	30.1%	63	Bachelor's degree
Environmental engineering technicians	21	28	30.1%	6	Associate degree
Occupational therapist assistants	27	35	29.8%	8	Associate degree
Fitness trainers and aerobics instructors	261	338	29.4%	77	Postsecondary vocational award

Source: U.S. Bureau of Labor Statistics

Top 30 Fastest Declining Occupations in the USA: 2008-2018 *(numbers in 1,000s)*

Occupation	Employment		Change		Most Significant Source of Postsecondary Education or Training
	2008	2018	Percent	Number	
Farmers and ranchers	986	907	-79.0%	-8	Long-term on-the-job training
Sewing machine operators	212	141	-72.0%	-33.7	Moderate-term on-the-job training
Order clerks	246	182	-64.0%	-26.1	Short-term on-the-job training
Postal service mail sorters, processors, and processing machine operators	180	125	-55.0%	-30.3	Short-term on-the-job training
File clerks	212	163	-50.0%	-23.4	Short-term on-the-job training
Shipping, receiving, and traffic clerks	751	701	-49.0%	-6.6	Short-term on-the-job training
Telemarketers	342	304	-38.0%	-11.1	Short-term on-the-job training
First-line supervisors/managers of production and operating workers	681	646	-36.0%	-5.2	Work experience in a related occupation
Office and administrative support workers, all other	307	271	-36.0%	-11.6	Short-term on-the-job training
Packers and packagers, hand	759	725	-34.0%	-4.5	Short-term on-the-job training
Cutting, punching, and press machine setters, operators, and tenders, metal and plastic	237	204	-33.0%	-14.1	Moderate-term on-the-job training
Electrical and electronic equipment assemblers	213	182	-31.0%	-14.7	Short-term on-the-job training
Machine feeders and offbearers	141	110	-31.0%	-22.2	Short-term on-the-job training
Door-to-door sales workers, news and street vendors, and related workers	182	155	-27.0%	-14.8	Short-term on-the-job training
Information and record clerks, all other	227	200	-27.0%	-11.8	Short-term on-the-job training
Paper goods machine setters, operators, and tenders	103	81	-22.0%	-21.5	Moderate-term on-the-job training
Computer operators	110	90	-21.0%	-18.6	Moderate-term on-the-job training
Machinists	422	402	-19.0%	-4.6	Long-term on-the-job training
Laborers and freight, stock, and material movers, hand	2,317	2,299	-19.0%	-0.8	Short-term on-the-job training
Miscellaneous agricultural workers	807	789	-18.0%	-2.3	Short-term on-the-job training
Data entry keyers	284	267	-17.0%	-6.1	Moderate-term on-the-job training
Inspectors, testers, sorters, samplers, and weighers	465	448	-17.0%	-3.6	Moderate-term on-the-job training
Switchboard operators, including answering service	155	138	-17.0%	-10.9	Short-term on-the-job training
Mail clerks and mail machine operators, except postal service	141	125	-17.0%	-11.8	Short-term on-the-job training
Lathe and turning machine tool setters, operators and tenders, metal and plastic	56	41	-15.0%	-26.7	Moderate-term on-the-job training
Grinding, lapping, polishing, and buffing machine tool setters, operators, and tenders, metal and plastic	93	78	-15.0%	-15.9	Moderate-term on-the-job training
Textile winding, twisting, and drawing out machine setters, operators, and tenders	35	21	-14.0%	-40.7	Moderate-term on-the-job training
Postal service clerks	76	62	-14.0%	-18	Short-term on-the-job training
Multiple machine tool setters, operators, and tenders, metal and plastic	86	73	-13.0%	-14.7	Moderate-term on-the-job training
Photographic processing machine operators	51	39	-13.0%	-24.3	Short-term on-the-job training

Source: U.S. Bureau of Labor Statistics

Additional Information and Acknowledgements

If you would like additional information about technology careers, please contact the Winston-Salem Chamber of Commerce's Tech Council at 336-728-9200.

We would like to acknowledge the Tech Council's Science, Technology, Engineering, and Mathematics (STEM) Committee for helping to create this document, particularly the Committee's co-chair Bernie Yevin, Dean of Forsyth Technical Community College's Business & Information Technologies Division, and Bret Marchant, Director of Research and Economic Development at the Winston-Salem Chamber of Commerce.

About the Technology Council

The Chamber's Technology Council is the largest group in the Triad dedicated to developing high-technology businesses. The Council has played a vital role in establishing and expanding the Piedmont Triad Research Park, bringing the state's first satellite office of the North Carolina Biotech Center to Winston-Salem, developing technology-specific curriculum for workforce training, and more. Working closely with other community leaders, the Council is dedicated to promoting this area as a center for technology and fostering collaboration among the many groups involved in technology initiatives.

About the Chamber of Commerce

The Greater Winston-Salem Chamber of Commerce is the leading business organization in Winston-Salem and Forsyth County, representing more than 1,800 area businesses that are committed to increased economic development in the region. The Chamber is dedicated to establishing Winston-Salem as a technology-driven economic center, and provides services to strengthen existing businesses, support entrepreneurs, and encourage small business creation. The Chamber supports public school student achievement, workforce, and higher education development.

