Virginia's STEM Report Card 2014

There's bipartisan consensus: the U.S. needs to live within its means, cut the federal deficit — and do it the smart way.

*STEM =

Science

Biology, Chemistry, Marine Biology, Physics, Science We want our children and grandchildren to have good jobs — and that means that science research & development (R&D) and STEM Education should be top priorities for federal investments.

Technology

Computer / Information Systems, Game Design, Developer, Web / Software Developer

Engineering

Chemical, Civil, Computer, Electrical / Electronics, Photonics, General & Mechanical Engineering Especially in times of fiscal austerity, we need to **SET PRIORITIES** and make wise **INVESTMENTS** that create new and high-paying jobs, keep **Virginia** and the U.S. competitive, increase our standard of living and grow the private sector.

Mathematics & Statistics Our free market economy relies heavily upon federally-supported scientific research. A National Science Foundation (NSF) study found that 73% of the scientific papers cited in commercial patents

were funded by taxpayers through the federal government, especially university research operations.¹

Virginia received **\$3.56 billion in federal R&D** contracts in FY 2013, with approximately **10,833 transactions taking place.**² Virginia universities and colleges received \$1.29 billion in federal R&D spending, including grants, in FY 2012.³

Key Reports and On-Line Resources

- The Science-Engineering-Technology Working Group (SETWG) sponsors the annual Congressional Visits Day Program. See <u>www.setcvd.org</u>
- Science & Engineering Indicators 2014, published by the National Science Board, provides a broad base of quantitative information on the U.S. and international science and engineering enterprise. It is created biennially by the National Science Foundation's Division of Science Resources Statistics (SRS) See www.nsf.gov/statistics/seind14/
- ASTRA's Web Sites include <u>www.usinnovation.org</u>. See also <u>store.usinnovation.org</u> for free downloads of all *State STEM Reports 2014*, *EdTech Revolution in Education 2013* book and our latest publications.

What's in This 2014 STEM Report Card?

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Declining Support: Federal R&D outlays as Percentage of Federal Budget 1962-2014:



Source: Budget of the U.S. Government FY 2014 Historical Tables. FY 2014 is the Presidential Budget Request. FY 2013 figures do not yet reflect final appropriations or sequester results.

Top 5 Recipients of Federal R&D Contracts (not Grants) ² Performed in Virginia FY 2013* (rounded)

| 1. | Booz Allen Hamilton Holding Corp. | \$784,370,333 |
|----|-----------------------------------|---------------|
| 2. | SAIC Inc. | \$391,882,530 |
| 3. | CACI International Inc. | \$157,977,316 |
| 4. | Mitre Corporation | \$111,010,759 |
| 5. | Lockheed Martin Corporation | \$108,816,324 |

* Note: R&D contract & grant amounts do not include management and administrative fees for the operation of Government-Owned, Contractor-Operated (GOCO) facilities under OMB definitions.

Top 5 Contracting Agencies for Virginia R&D Investments During FY 2013 ²

| 1. | Department of Defense | \$2,949,487,229 |
|----|------------------------------------|-----------------|
| 2. | Department of Transportation | \$211,346,510 |
| 3. | NASA | \$140,752,040 |
| 4. | Department of Homeland Security | \$133,148,371 |
| 5. | Dept. of Health and Human Services | \$85,501,714 |





AAAS



404,000 Virginia STEM^{*} Jobs to fill for 2018



Virginia 404,000 = the number of STEM and STEM-related jobs Virginia will need to fill by

2018.⁴ Virginia kids and parents need to know about the potential for rewarding — and high paying careers in STEM. STEM professions and occupations are among the highest paying jobs.

*STEM =

Science

Biology, Chemistry, Marine Biology, Physics, Science

Technology

Computer / Informatio stems. Game Desig Developer, Web / Software Developer

Engineering

Chemical, Civil, Computer, Electrical Electronics, Photonics, General & Mechanical Engineering

> Mathematics & Statistics

They are also the basis for a successful, globally competitive and innovative Virginia and U.S. economy. During the next decade, overall U.S. demand for scientists and engineers is expected to increase at four times the rate for all other occupations.

| | Where will Virginia's STEM Jobs be in 2018 by Occupation & Educational Level? (in thousands of job | | | | | | | |
|--------------|--|----------------------------|-----------------------------|-----------------|-----------------------|----------------------|--------------------|---------|
| | | | | | | | | |
| | | High School Dropouts | High School Graduates | Some College | Associate's Degree | Bachelor's Degree | Graduate Degree | Total |
| STEM Jobs | Computer & Mathematical Science | 1 | 15 | 40 | 20 | 109 | 67 | 253 |
| | Architects & Technicians | 0 | 2 | 4 | 3 | 7 | 4 | 20 |
| | Engineers & Technicians | 0 | 6 | 10 | 7 | 33 | 20 | 76 |
| | Life & Physical Scientists | 0 | 2 | 2 | 1 | 8 | 12 | 26 |
| | Social Scientists | 0 | 0 | 1 | 1 | 7 | 20 | 29 |
| | | | | | | | | 404,000 |
| | | | | | | | | |

| Change in Virginia Jobs | s by Educati | ion Level: 2 | 008 and 2018 |
|-------------------------|--------------|--------------|--------------|
| | | | |
| | | | |

| Educational Level | 2008 Jobs | 2018 Jobs | Difference |
|-----------------------|-----------|-----------|------------|
| High School Dropouts | 413,000 | 451,000 | 37,000 |
| High School Graduates | 1,140,000 | 1,253,000 | 113,000 |
| Postsecondary | 2,441,000 | 2,830,000 | 389,000 |

4. Source of data: Anthony Carnevale, Nicole Smith & Jeff Strohl, Georgetown University Center on Education and the Workforce publication Help Wanted: Projections of Jobs and Education Requirements Through 2018. June 2010. See www.cewgeorgetown@georgetown.edu

What Percentage of Virginia High school students are interested in STEM Careers?

The Charts ⁵ on this page represent Virginia's portion of an in-depth nationwide look at more than 6 million high school students in the MyCollegeOptions® program in 2013. Their college major/career aspirations were used to determine their interest in STEM-related fields, revealing that nearly 30% - more than 1.6 million students - who would like to pursue STEM in their futures. Keeping such students from dropping out of the STEM Talent Pipeline is essential in meeting U.S. STEM workforce demands for the future.







STEM Interest by Gender

STEM Interest by Self-Identified Ethnicity



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Why ersity ie FEM Diversity ier FEM Diversity atter Increasing the number of Underrepresented Minorities (URM's) in the U.S. STEM workforce would solve many of the skills gaps that confront our economy. Ethnic and gender disparities in STEM academic achievement carry over into lower participation by many URM's in high-paying STEM jobs. Selected charts from the National Action Council for Minorities in Engineering, Inc.'s 2013 NACME Data Book help illustrate the challenge. For more information on URMs in engineering education and engineering careers, visit www.nacme.org/research-publications.



17.5%

42.2%

Figure 1: Changing Demographics of the U.S.¹



Figure 3: Percentage of Students Meeting ACT College Readiness Benchmark Scores, 2012³



1. NACME analysis of National Population Projections from U.S. Census Bureau, 2013.

- 2. National Center for Education Statistics, 2012. Digest of Education Statistics, 2011.
- ACT Profile Report, National (Graduating Class 2012). Accessed online at www.act.org.
 NACME analysis of Integrated Postsecondary Education Data System (IPEDS) accessed via National Science Foundation's WebCASPAR database system, June 2013.



6.1%

50.0%

40.0%

30.0%

20.0%

10.0%

0.0%



Figure 2: Percentage of Public and Private High School Graduates Taking Calculus Courses in High School, 2009²

8.6%

6.3%



Endnotes

Diversity & Gendering The U.S. population is becoming more diverse each year. By 2050, URMs will represent more than 40 percent of the population, and there will be no majority race. The demand for qualified STEM professionals is high, but the supply of STEM workers to fill these positions is at risk if underrepresented groups are not engaged in these fields. The figures below show that African Americans, Latinos, American Indians, Alaska Natives, and women are underrepresented in all levels of engineering education and in the engineering workforce.

13.4%

12.3%

16.0%

12.0%

14.8%

20.0%



Figure 5: African Americans in Engineering

2.5%

3.6%

4.0%

Engineering Faculty, 2011 (1)

Engineering Workforce, 2010 (2)

Engineering Bachelor's Degrees, 2011 (3)

Total Undergraduate Enrollment, 2011 (3)

U.S. Population, 2012 (4)

0.0%

4.0%

8.0%

U.S. College-Aged Population (18-24 Year Olds), 2012 (4)









Figure 8: Women in Engineering



Endnotes

 American Society for Engineering Education, 2012. Engineering by the Numbers, 2011.
 Finamore, J., Foley, D.J., Lan, F., Milan, L.M., Proudfoot, S.L., Rivers, E.B., & Selfa, L. (2013). Employment and Educational Characteristics of Scientists and Engineers. National Center for Science and Engineering Statistics, NSF 13-311.

3. NACME Analysis of Integrated Postsecondary Education Data System (IPEDS) accessed via National Science Foundation's WebCASPAR database system, August 2013. 4. NACME Analysis of population projections from U.S. Census, 2012.



STEN JOBS DY OT A STEN JOBS DY OT A Census on 2014 Occupation 2014 What are the **STEM & STEM-Related** Jobs by Occupation in 2014?



| SOC* | STEM or STEM-Related Job Description | 2014 Jobs |
|---------|--|-----------|
| 13-2011 | Accountants and Auditors | 1,683,255 |
| 11-9199 | Managers, All Other | 1,681,417 |
| 25-1099 | Postsecondary Teachers | 1,473,473 |
| 13-1199 | Business Operations Spe- cialists, All Other | 1,015,981 |
| 35-1012 | First-Line Supervisors of Food Preparation and Serv- ing Workers | 939,613 |
| 49-3023 | Automotive Service Techni- cians and Mechanics | 806,563 |
| 35-2012 | Cooks, Institution and Cafeteria | 460,876 |
| 27-1024 | Graphic Designers | 418,474 |
| 11-9021 | Construction Managers | 469,314 |
| 11-3021 | Computer and Information Systems Managers | 356,688 |
| 19-3031 | Clinical, Counseling, and School Psychologists | 345,044 |
| 17-2051 | Civil Engineers | 306,325 |
| 13-1041 | Compliance Officers | 254,420 |
| 17-2141 | Mechanical Engineers | 266,738 |
| 13-2099 | Financial Specialists, All Other | 239,305 |
| 13-1051 | Cost Estimators | 224,995 |
| 17-2112 | Industrial Engineers | 224,600 |
| 11-9041 | Architectural and Engineer- ing Managers | 198,838 |
| 11-3051 | Industrial Production Manag- ers | 174,337 |
| 17-2071 | Electrical Engineers | 171,319 |
| 17-2199 | Engineers, All Other | 167,747 |
| 17-1011 | Architects, Except Land- scape and Naval | 161,750 |
| 17-3023 | Electrical and Electronics Engineering Technicians | 150,678 |
| 17-2072 | Electronics Engineers, Ex- cept Computer | 141,902 |
| 49-3011 | Aircraft Mechanics and Ser- vice Technicians | 128,757 |
| 19-1042 | Medical Scientists, Except Epidemiologists | 104,578 |
| 19-2041 | Environmental Scientists and Specialists, Including Health | 96,154 |
| 29-1031 | Dietitians and Nutritionists | 90,707 |
| 51-3092 | Food Batchmakers | 101,584 |
| 17-3011 | Architectural and Civil Drafters | 102,771 |
| 17-2061 | Computer Hardware Engi- neers | 86,767 |
| 19-2031 | Chemists | 87,465 |
| 17-2011 | Aerospace Engineers | 83,409 |

| SOC* | STEM or STEM-Related Job Description | 2014 Jobs |
|---------|--|-----------|
| 15-2031 | Operations Research Analysts | 77,224 |
| 45-3011 | Fishers and Related Fishing Workers | 86,373 |
| 19-4021 | Biological Technicians | 75,813 |
| 17-3022 | Civil Engineering Techni- cians | 74,830 |
| 17-3029 | Engineering Technicians, Except Drafters, All Other | 70,678 |
| 17-3026 | Industrial Engineering Tech- nicians | 69,088 |
| 19-4099 | Life, Physical, and Social Science Technicians, All Other | 63,511 |
| 19-4031 | Chemical Technicians | 62,915 |
| 19-3039 | Psychologists, All Other | 59,679 |
| 17-2081 | Environmental Engineers | 54,054 |
| 17-1022 | Surveyors | 50,058 |
| 51-9011 | Chemical Equipment Opera- tors and Tenders | 55,986 |
| 51-2023 | Electromechanical Equip- ment Assemblers | 50,756 |
| 11-9121 | Natural Sciences Managers | 50,931 |
| 19-2042 | Geoscientists, Except Hy- drologists and Geographers | 62,772 |
| 17-2171 | Petroleum Engineers | 43,234 |
| 17-3027 | Mechanical Engineering Technicians | 48,817 |
| 19-4091 | Environmental Science and Protection Technicians, Including Health | 35,836 |
| 19-3099 | Social Scientists and Re- lated Workers, All Other | 36,711 |
| 45-4022 | Logging Equipment Opera- tors | 46,587 |
| 51-8091 | Chemical Plant and System Operators | 38,412 |
| 19-1021 | Biochemists and Biophysi- cists | 29,999 |
| 17-2041 | Chemical Engineers | 33,397 |
| 19-1029 | Biological Scientists, All Other | 33,831 |
| 19-4093 | Forest and Conservation Technicians | 34,616 |
| 15-2041 | Statisticians | 28,055 |
| 17-2031 | Biomedical Engineers | 22,426 |
| 19-1031 | Conservation Scientists | 28,115 |
| 17-2161 | Nuclear Engineers | 27,010 |
| 29-2051 | Dietetic Technicians | 26,233 |
| 53-6051 | Transportation Inspectors | 26,235 |
| 15-2011 | Actuaries | 23,150 |

| SOC* | STEM or STEM-Related Job Description | 2014 Jobs |
|-----------|---|------------|
| 51-4012 | Computer Numerically Controlled Machine Tool Pro- grammers, Metal and Plastic | 24,495 |
| 17-2111 | Health and Safety Engi- neers, Except Mining Safety Engineers and Inspectors | 24,618 |
| 17-2131 | Materials Engineers | 23,395 |
| 17-3025 | Environmental Engineering Technicians | 20,400 |
| 29-2033 | Nuclear Medicine Technolo- gists | 21,355 |
| 19-1022 | Microbiologists | 20,456 |
| 19-1023 | Zoologists and Wildlife Biolo- gists | 21,026 |
| 19-4011 | Agricultural and Food Sci- ence Technicians | 21,071 |
| 19-1013 | Soil and Plant Scientists | 19,338 |
| 19-2012 | Physicists | 19,223 |
| 19-1012 | Food Scientists and Tech- nologists | 17,292 |
| 45-4011 | Forest and Conservation Workers | 16,374 |
| 25-9021 | Farm and Home Manage- ment Advisors | 15,180 |
| 43-9111 | Statistical Assistants | 15,502 |
| 19-2021 | Atmospheric and Space Scientists | 10,988 |
| 19-1032 | Foresters | 11,364 |
| 17-3021 | Aerospace Engineering and Operations Technicians | 10,124 |
| 19-4051 | Nuclear Technicians | 8,505 |
| 17-2151 | Mining and Geological Engineers, Including Mining Safety Engineers | 8,535 |
| 19-2043 | Hydrologists | 8,169 |
| 17-2121 | Marine Engineers and Naval Architects | 8,014 |
| 19-2032 | Materials Scientists | 8,100 |
| 45-4021 | Fallers | 10,348 |
| 33-3031 | Fish and Game Wardens | 6,651 |
| 19-1041 | Epidemiologists | 5,429 |
| 19-3032 | Industrial-Organizational Psychologists | 5,534 |
| 15-2021 | Mathematicians | 4,151 |
| 45-2021 | Animal Breeders | 4,155 |
| 45-4023 | Log Graders and Scalers | 3,721 |
| 17-2021 | Agricultural Engineers | 2,892 |
| 19-2011 | Astronomers | 2,563 |
| 15-2091 | Mathematical Technicians | 1,449 |
| Total (in | cluding unlisted categories) = | 15.143.595 |

*SOC = Standard Occupational Classification

Source: ASTRA Global STEM & Innovation Data Project and EMSI occupation employment data are based on final EMSI industry data and final EMSI staffing patterns 2/01/14



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Median Hourly

Earnings \$34.86

\$34.58

\$34.52

\$33.98

\$33.23

\$31 79

\$31.64

\$31.51

\$31.24

\$30.98

\$30.62

\$30.54

\$29.95

\$29.60

\$29.31

\$29.16

\$28.70

\$27.84

\$27.75

\$27.56

\$27.56

\$27.32

\$27.07

\$26.75

\$26.75

\$26.39

\$26.24

\$26.15

\$26.13

\$26.05

\$25.15

\$25.04

\$24.56

\$23.47

\$28.48

Jobs



What are the 70 **Highest Paying STEM & STEM-Related Jobs in 2014?**



| Rank | soc | Description | # 2014 Jobs | Median Hourly Earnings | Rank | SOC | Description | # 2014 Jobs |
|------|---------|--|-------------|------------------------------|-------|-----------|---|--------------------|
| 1 | 17-2171 | Petroleum Engineers | 43,234 | \$63.59 | 37 | 19-1029 | Biological Scientists, All Other | 33,831 |
| 2 | 11-9041 | Architectural and Engineering Manag- | 198,838 | \$59.55 | 38 | 15-2031 | Operations Research Analysts | 77,224 |
| 2 | 11 2021 | Computer and Information Systems | 256 699 | \$55.01 | 39 | 19-2031 | Chemists | 87,465 |
| 3 | 11-3021 | Managers | 330,000 | \$00.91 | 40 | 29-2033 | Nuclear Medicine Technologists | 21,355 |
| 4 | 11-9121 | Natural Sciences Managers | 50,931 | \$55.64 | 41 | 19-4051 | Nuclear Technicians | 8,505 |
| 5 | 19-2012 | Physicists | 19,223 | \$51.37 | 42 | 19-1022 | Microbiologists | 20,456 |
| 6 | 17-2011 | Aerospace Engineers | 83,409 | \$49.87 | 43 | 19-3031 | Clinical, Counseling, and School | 345,044 |
| 7 | 15-2021 | Mathematicians | 4,151 | \$48.73 | 44 | 19-1041 | Enidemiologists | 5 4 2 9 |
| 8 | 17-2061 | Computer Hardware Engineers | 86,767 | \$47.64 | 45 | 13-1199 | Rusiness Operations Specialists All | 1 015 081 |
| 9 | 17-2161 | Nuclear Engineers | 27,010 | \$46.53 | 40 | 10-1100 | Other | 1,015,901 |
| 10 | 19-2011 | Astronomers | 2,563 | \$46.37 | 46 | 25-1099 | Postsecondary Teachers | 1,473,473 |
| 11 | 17-2041 | Chemical Engineers | 33,397 | \$45.36 | 47 | 53-6051 | Transportation Inspectors | 26,235 |
| 12 | 15-2011 | Actuaries | 23,150 | \$45.04 | 48 | 19-2041 | Environmental Scientists and Special- ists, Including Health | 96,154 |
| 13 | 19-2042 | Geoscientists, Except Hydrologists and Geographers | 62,772 | \$44.59 | 49 | 13-1041 | Compliance Officers | 254,420 |
| 14 | 17-2072 | Electronics Engineers, Except Com- puter | 141,902 | \$44.07 | 50 | 17-3021 | Aerospace Engineering and Opera- tions Technicians | 10,124 |
| 15 | 19-2021 | Atmospheric and Space Scientists | 10,988 | \$42.91 | 51 | 17-1011 | Architects, Except Landscape and | 161,750 |
| 16 | 19-2032 | Materials Scientists | 8,100 | \$42.81 | 52 | 13 2011 | | 1 692 255 |
| 17 | 19-3032 | Industrial-Organizational Psycholo- gists | 5,534 | \$42.39 | 53 | 17-3029 | Engineering Technicians, Except | 70,678 |
| 18 | 17-2121 | Marine Engineers and Naval Architects | 8,014 | \$42.36 | 54 | 17-3023 | Electrical and Electronics Engineering | 150.678 |
| 19 | 17-2071 | Electrical Engineers | 171,319 | \$42.15 | | 17-0020 | Technicians | 150,078 |
| 20 | 11-3051 | Industrial Production Managers | 174,337 | \$42.00 | 55 | 29-1031 | Dietitians and Nutritionists | 90,707 |
| 21 | 17-2031 | Biomedical Engineers | 22,426 | \$41.81 | 56 | 13-1051 | Cost Estimators | 224,995 |
| 22 | 17-2131 | Materials Engineers | 23,395 | \$40.94 | 57 | 19-1023 | Zoologists and Wildlife Biologists | 21,026 |
| 23 | 17-2199 | Engineers, All Other | 167,747 | \$40.66 | 58 | 15-2091 | Mathematical Technicians | 1,449 |
| 24 | 17-2151 | Mining and Geological Engineers, | 8,535 | \$40.39 | 59 | 19-1012 | Food Scientists and Technologists | 17,292 |
| 25 | 19-1021 | Biochemists and Biophysicists | 20 000 | \$39.07 | 60 | 11-9021 | Construction Managers | 469,314 |
| 26 | 17-2081 | Environmental Engineers | 54.054 | \$39.07 | 61 | 17-1022 | Surveyors | 50,058 |
| 27 | 17-2141 | Mechanical Engineers | 266 738 | \$38.59 | 62 | 19-1031 | Conservation Scientists | 28,115 |
| 28 | 19-3039 | Psychologists All Other | 59.679 | \$38.48 | 63 | 49-3011 | Aircraft Mechanics and Service | 128,757 |
| 29 | 17-2112 | | 224 600 | \$37.95 | 64 | 51-8091 | Chemical Plant and System Operators | 38 / 12 |
| 30 | 19-1042 | Medical Scientists, Except Epidemi- | 104.578 | \$37.22 | 65 | 19-1013 | Soil and Plant Scientists | 19.338 |
| | | ologists | ,570 | | 66 | 19-1032 | Foresters | 11 364 |
| 31 | 17-2111 | Health and Safety Engineers, Except Mining Safety Engineers and Inspec- tors | 24,618 | \$36.97 | 67 | 13-2099 | Financial Specialists, All Other | 239,305 |
| 32 | 17-2051 | Civil Engineers | 306 325 | \$36.75 | 68 | 17-3027 | Mechanical Engineering Technicians | 48,817 |
| 33 | 19-3099 | Social Scientists and Palated Work | 36 711 | \$36.65 | 69 | 17-3026 | Industrial Engineering Technicians | 69,088 |
| 55 | 19-3099 | ers, All Other | 30,711 | φ30.05 | 70 | 11-9199 | Managers in STEM and STEM-related Occupations, All Other | 1,681,417 |
| 34 | 15-2041 | Statisticians | 28,055 | \$36.33 | Total | U.S. STEN | / & STEM-Related Jobs | 15,143,5 <u>95</u> |
| 35 | 19-2043 | Hydrologists | 8,169 | \$36.24 | | | | |
| 36 | 17-2021 | Agricultural Engineers | 2,892 | \$35.58 | | | | |

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