An American Priority

The Workforce Of Tomorrow Are Your Children Today

Word Cloud Courtesy Of NC STEM/WRAL
http://wraltechwire.com/business/tech_wire/biotech/image/10265566/?ref_id=10265520

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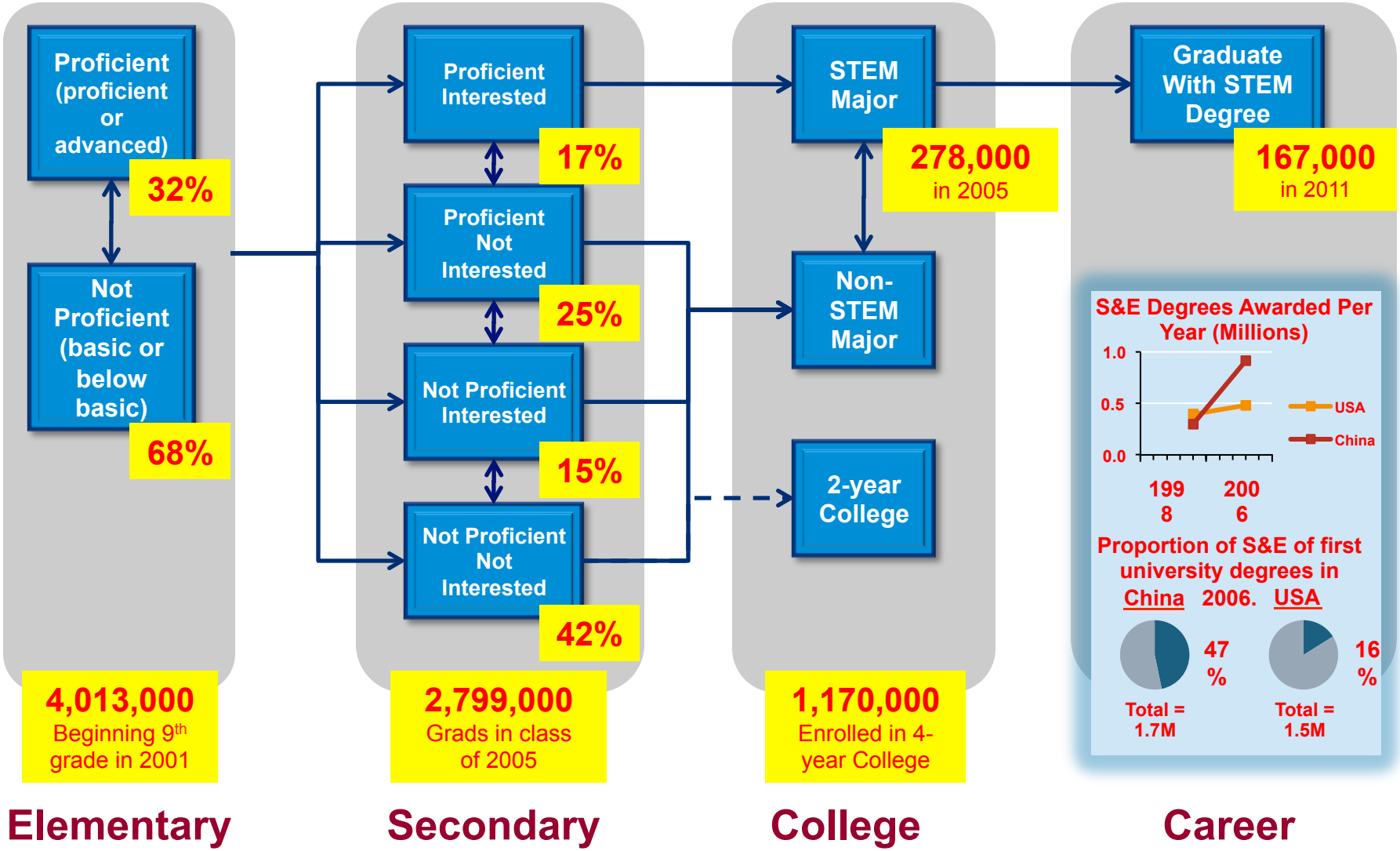
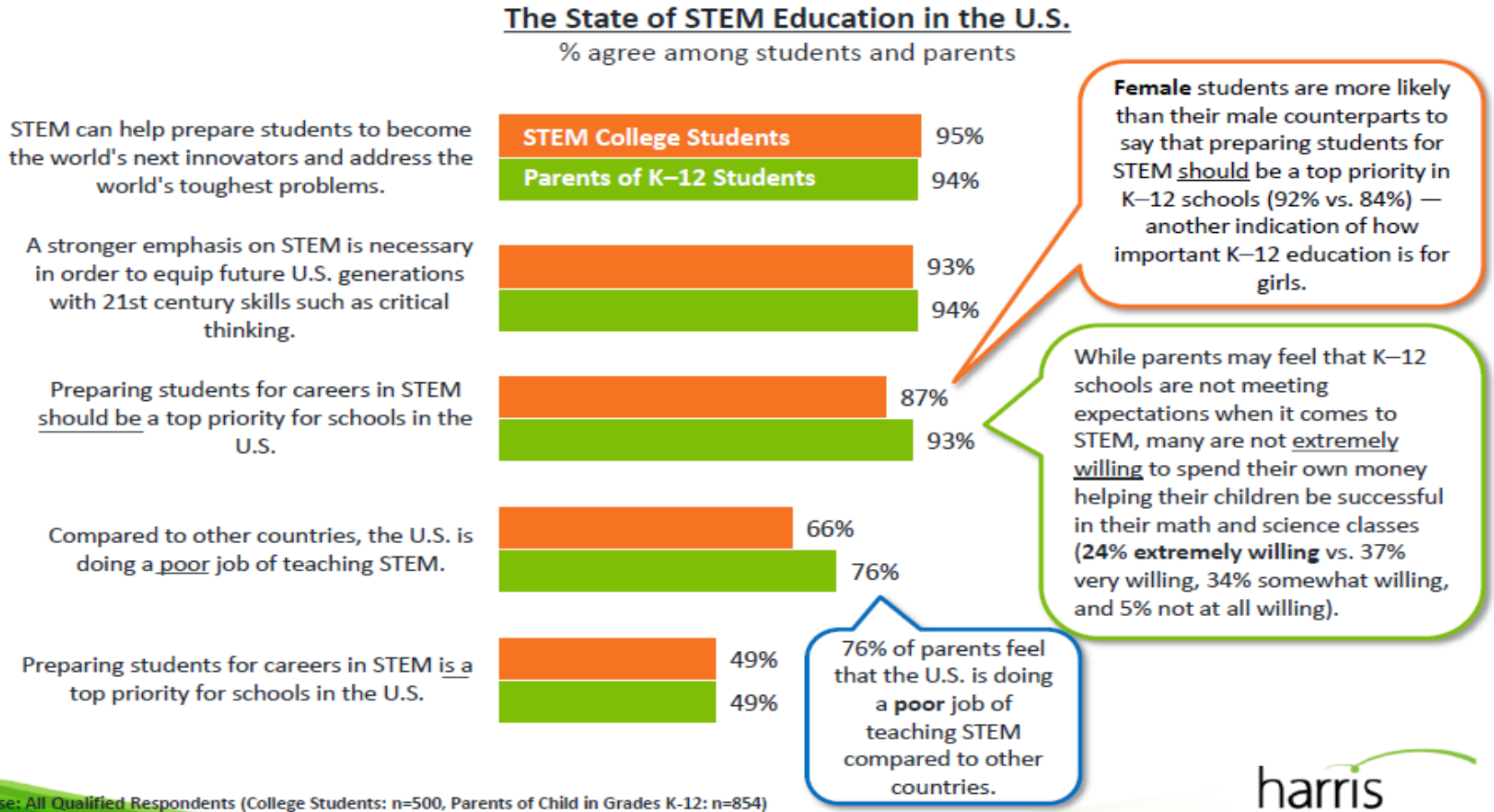
Supply Chain Model
Current STEM Graduates



Source: 2011 Department Of Education, Michael Lach, Special Assistant to Secretary for STEM

Careers In STEM – Parental Perspectives

The majority of college students and parents believe that preparing students for careers in STEM should be a priority for K–12 schools in the U.S.; however, only half believe it actually is a top priority in schools.



Base: All Qualified Respondents (College Students: n=500, Parents of Child in Grades K-12: n=854)
Q940/Q1060: How strongly do you agree or disagree with each of the following statements?
Q1050: How willing would you be to spend extra money to help your child(ren) be successful in their math and science classes?

harris INTERACTIVE

Source: Harris Interactive Report: Student & Parent Survey, Sponsored by Microsoft
May 4–11, 2011, among 854 parents of children ages 17 or younger

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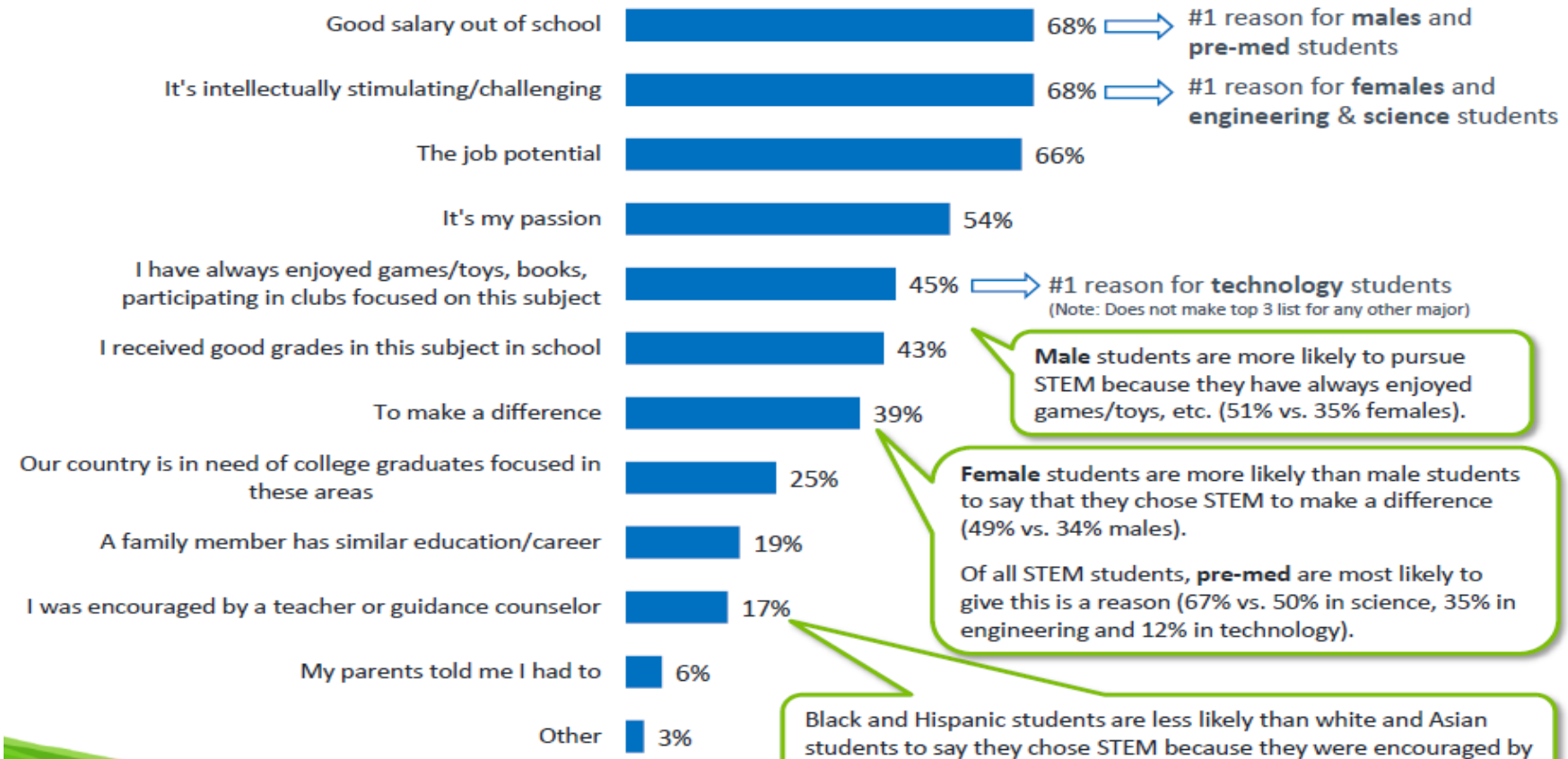
Careers In STEM – Student Perspectives

Students are choosing to pursue a STEM degree, not because someone encouraged or told them to or even because the U.S. is in need, but to secure their own futures and because they find it intellectually stimulating/challenging.

Reasons College Students Choose STEM Degrees



Source: Harris Interactive Report: Student & Parent Survey, Sponsored by Microsoft
May 4–11, 2011, among 500 college students

Careers In STEM – Student Perspectives

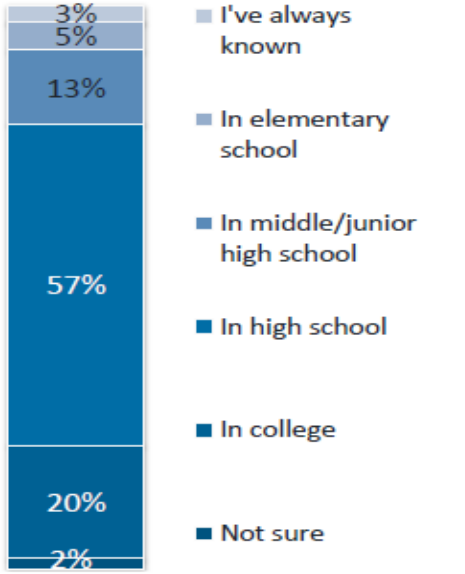
Nearly 4 in 5 STEM college students say that they decided to study STEM in high school or earlier, and parents say STEM interest begins at an early age.

Parents: What Is Your Child's Favorite Subject in School?

		Average Age INTEREST Began
STEM subject (in total)	31%	8.2
Mathematics	14%	7.2
General Science	6%	7.5
Biology	4%	*
Computer science	3%	*
Physics	2%	*
Chemistry	1%	*
Other STEM subject	1%	*
Art	13%	6.3
Reading	9%	4.9
Gym/Physical Education	8%	5.5
History	7%	9.4
Music	7%	5.2
Don't know	7%	N/A

*Base is too small to report. Note: other subjects tested include Social Studies, English, Foreign Language and Geography. All had 5% or less as favorite subject.

STEM Students: When Did You DECIDE You Wanted to Study STEM?



Students that felt they were only **somewhat or not at all prepared in K–12 for STEM courses** are more likely to have decided to pursue a STEM degree in college (26% vs. 16% students who were extremely/very well-prepared).

Base: All Parents of Child in K–12 (n=854) Q1035: What is your child's favorite subject in school?
Base: Child has a favorite subject listed (variable base by subject) Q1040: At what age did your child become interested in [FAVORITE SUBJECT]?
Base: All College Students(n=500) Q830: When did you decide that you wanted to be pre-med/to study your area or major in school?

Source: Harris Interactive Report: Student & Parent Survey, Sponsored by Microsoft
May 4–11, 2011, among 854 parents of children ages 17 or younger & 500 College Students

Careers In STEM – Results of Harris Interactive Poll 2011

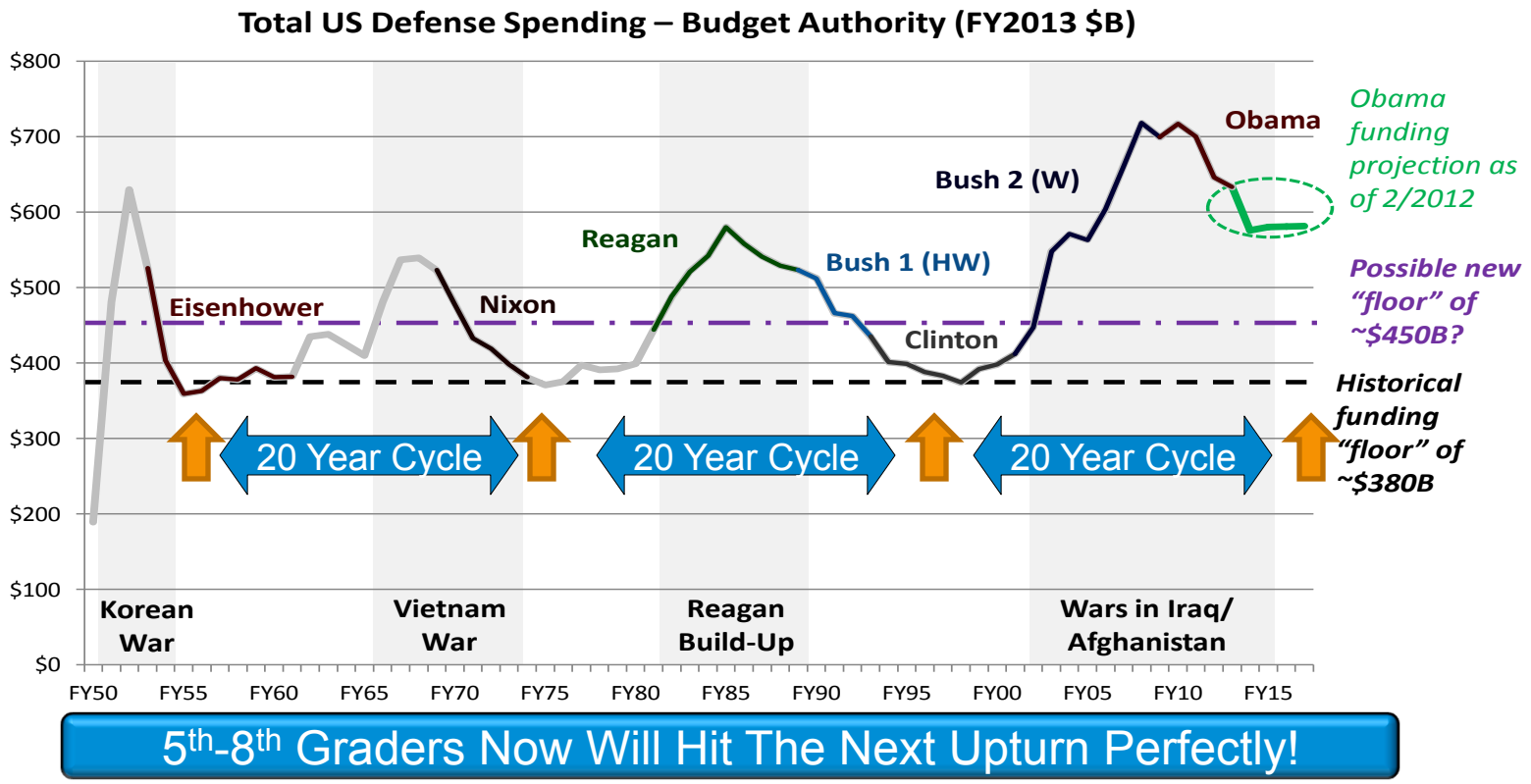
- 37% of STEM college students have a parent in STEM
- While most parents of K–12 students (93%) believe that STEM education should be a priority in the U.S., only half (49%) agree that it actually is a top priority for this country.
  - 76% of parents feel that the U.S. is doing a poor job of teaching STEM compared to other countries.
- Parents who feel that STEM should be a priority feel this way because they want to ensure the U.S. remains competitive in the global marketplace (53%) and to produce the next generation of innovators (51%);
  - Fewer say it's to enable students to have well-paying (36%) or fulfilling careers (30%).
- Even though many parents (50%) would like to see their children pursue a STEM career, only 24% are extremely willing to spend extra money helping their children be successful in their math and science classes.
- More than half (57%) of STEM college students say that, before going to college, a teacher or class got them interested in STEM.
  - Nearly 4 in 5 STEM college students (78%) say that they decided to study STEM in high school or earlier. One in five (21%) decide in middle school or earlier.
  - This is especially true of female students (68% vs. 51% males), who give "a teacher or class" as the top factor that sparked their interest.

Nearly Three-quarters Of STEM Students Report That Their Parents Had At Least Some Influence On Their Decision To Study STEM

Source: Harris Interactive Report: Student & Parent Survey, Sponsored by Microsoft
May 4–11, 2011, among 854 parents of children ages 17 or younger & 500 College Students

A&D Employment – Don't Believe The Headlines!

Perishables Related Market Assessment	**Defense spending cuts will occur, but we believe the new floor of spending will bottom out near ~$450B constant $ ($500-550B current $)**



Sources: DoD, "National Defense Budget Estimates for FY2012, FY2013 Defense Budget Fact Sheet, Center for New American Policy, RSAdvisors analysis

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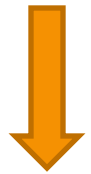
A&D Age Distributions Indicate Opportunities For Today's Middle Schoolers

Age Cohort	0-499	1,000-9,999	10,000-49,999	50,000-99,999	1000,000+	Average
22-25	7.1	3.7	3.7	3.2	3.8	4.3
26-30	11.7	8.7	9.6	8.6	8.5	9.4
31-35	10.7	9.7	10.5	9.4	8.6	9.8
36-40	12.7	9.8	9.9	8.9	7.8	9.8
41-45	9.1	11.6	10.9	9.8	9.6	10.2
46-50	13.9	16.5	14.4	15.8	17.2	15.6
51-55	16.1	17	15.5	20	20	17.7
56-60	10.4	12.3	11.6	14	14	12.5
61-64	5.7	7	6.2	7.5	6.9	6.7
65-70	2	2.7	1.9	2.4	2	2.2



39% Of Current A&D Employees Eligible To Retire in Next 10 Years

Source: Aviation Week & Space Technology Workforce Study 2012
Data as of 6/1/2012

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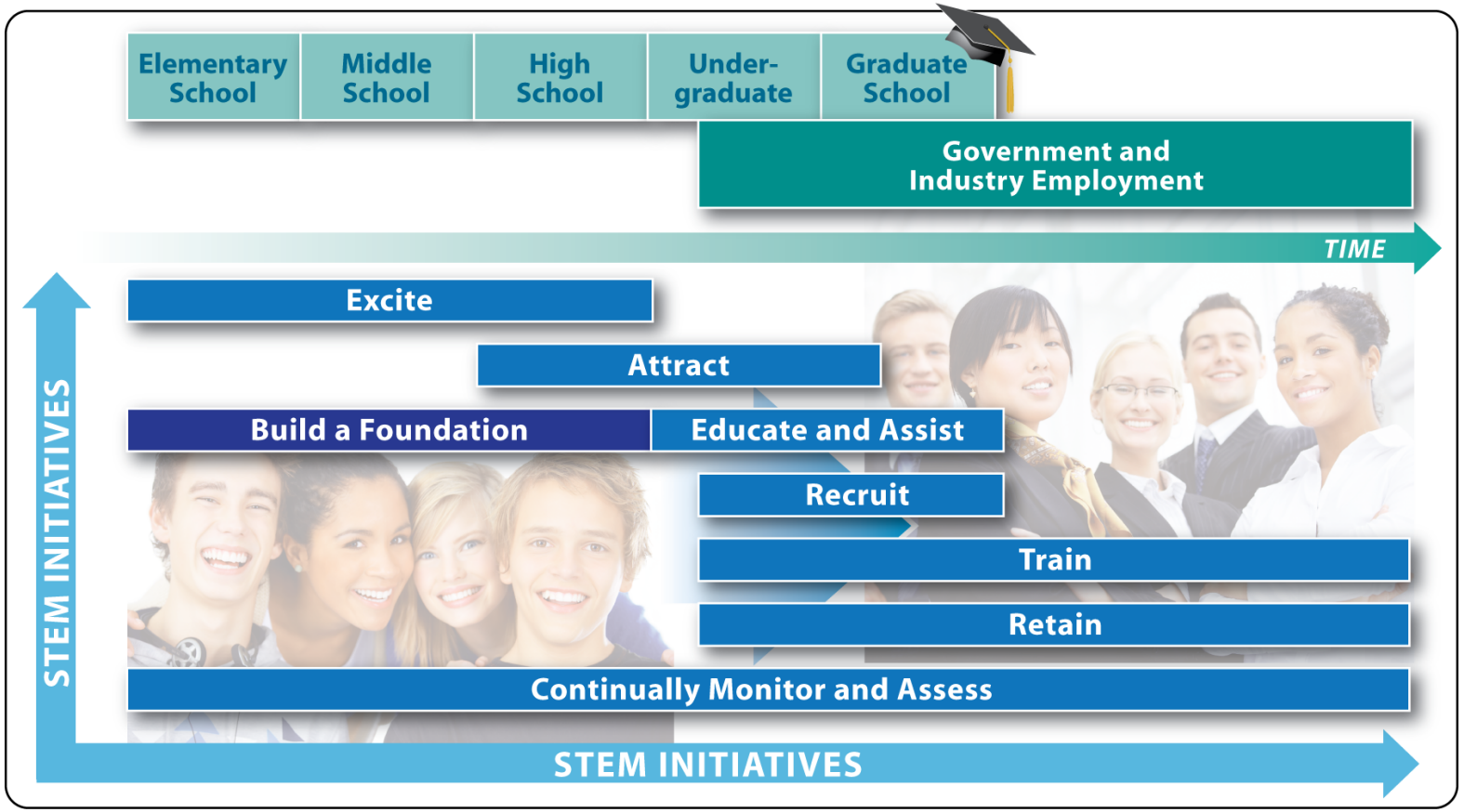
Conceptual Framework For STEM Discussions



Excitement Needs To Start Early – We Lose Them At 5th Grade!

STEM Students: What Can Parents and Schools Do to Help Kids and Teens Become Interested in STEM?

"Fun games — see how science, technology, engineering, and mathematics are actually applicable to real life." —*Engineering Student*

"Expose them at an early age, show them it is fun and interesting." —*Biomedical Sciences Student*

"Parents can be more hands on and supportive in teaching their children outside of school to help reinforce what is learned in school. Schools should also have a lot more hands on and visual learning rather than always reading from the textbook. For example, instead of reading about photosynthesis take the students outside and show them photosynthesis." —*Pre-Med Student*

Base: All College Students (n=500)
Q950: What can parents and schools do to help kids and teens become interested in science, technology, engineering and mathematics?

The word cloud illustrates keywords used by students to indicate how parents and schools can make STEM more interesting for kids. Larger words represent higher frequencies while smaller words represent lower frequencies.

BACK-UP SLIDES

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STRATEGY FOR ACTION

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NDIA's Strategy for Action

- National strategy for local action

- BISEC – Business and Industry STEM Education Coalition
  - Identifying activities that work and understand how to scale those efforts that make a difference
  - Aligning and leveraging the information and resources so others can learn about them and take advantage of them at the local level
  - Changing the public perception people have about science, technology, engineering, and mathematics

NDIA's Strategy for Action

- Local STEM workshops and quarterly meetings
  - Academia, Government, and Industry all come together to work toward actionable solutions to solve STEM education deficiencies
  - Occur all over the country
  - Wherever there is an active NDIA member chapter

NDIA's Strategy for Action

- Internships
  - Provide students with meaningful and substantive experiential activities/projects
- Mentoring
  - Give students access to professionals at all levels to help guide them on their academic and career paths

K-12 Success Story

Wheeling High School

U.S Department of Education | *Blue Ribbon School*

- STEM high school
- Developed a practical approach to education
- Embraced their 50% Hispanic population and designed many career-pathways plans of study (POS) to great success
  - 56.3% of Hispanic students at Wheeling HS met or exceeded math state standards in 2012
    - 20 points higher than the state average of Illinois Hispanic students
    - 12 points higher than Hispanics in the suburbs
- Able to place HS graduates directly into the STEM field they have been educated for – emphasis on manufacturing

Source: http://www.dailyherald.com/article/20121031/news/710319838/

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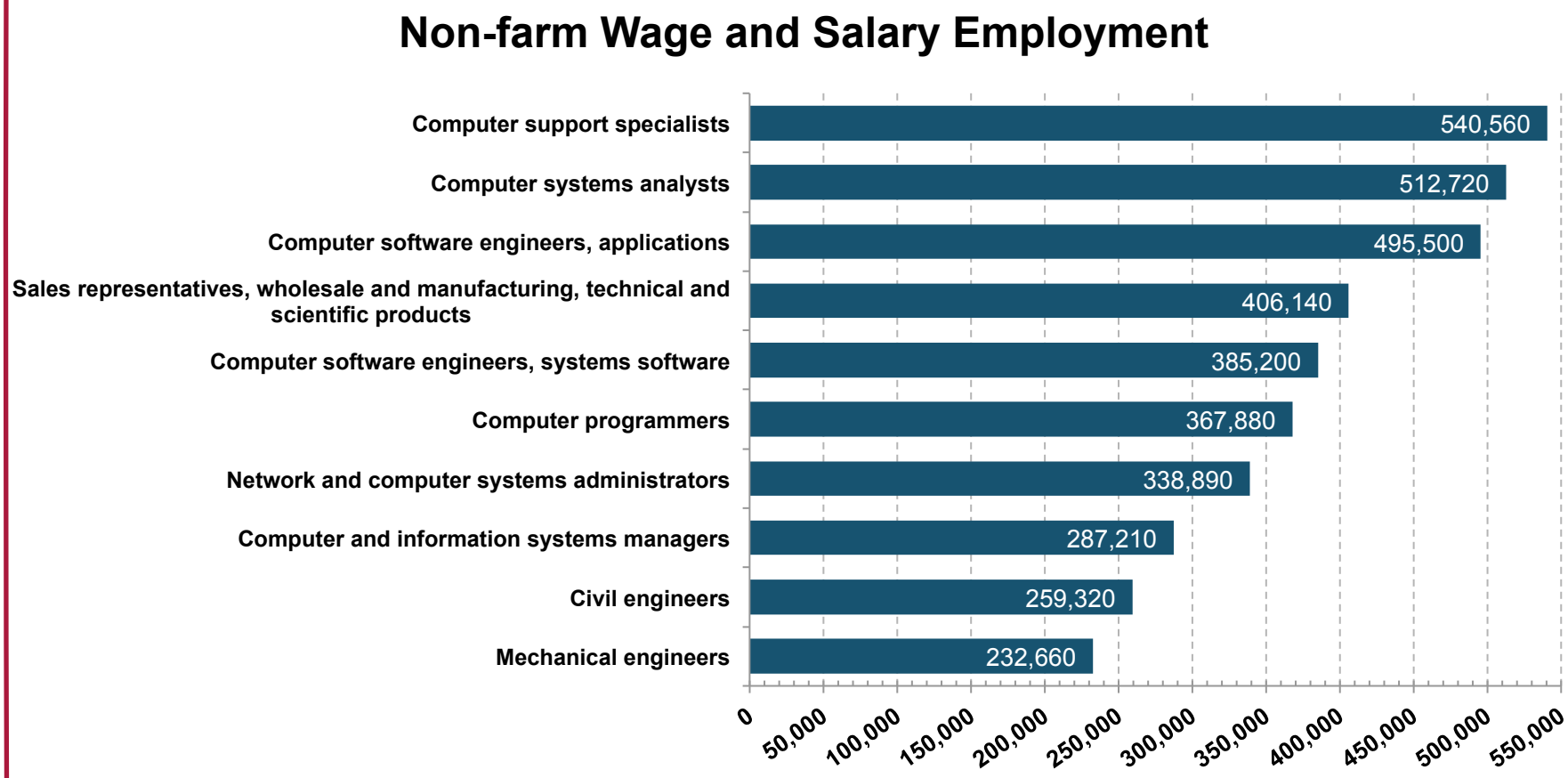
General Statistics

STEM IN AMERICA

Largest STEM occupations, May 2009



Source: BLS, Occupational Employment Statistics

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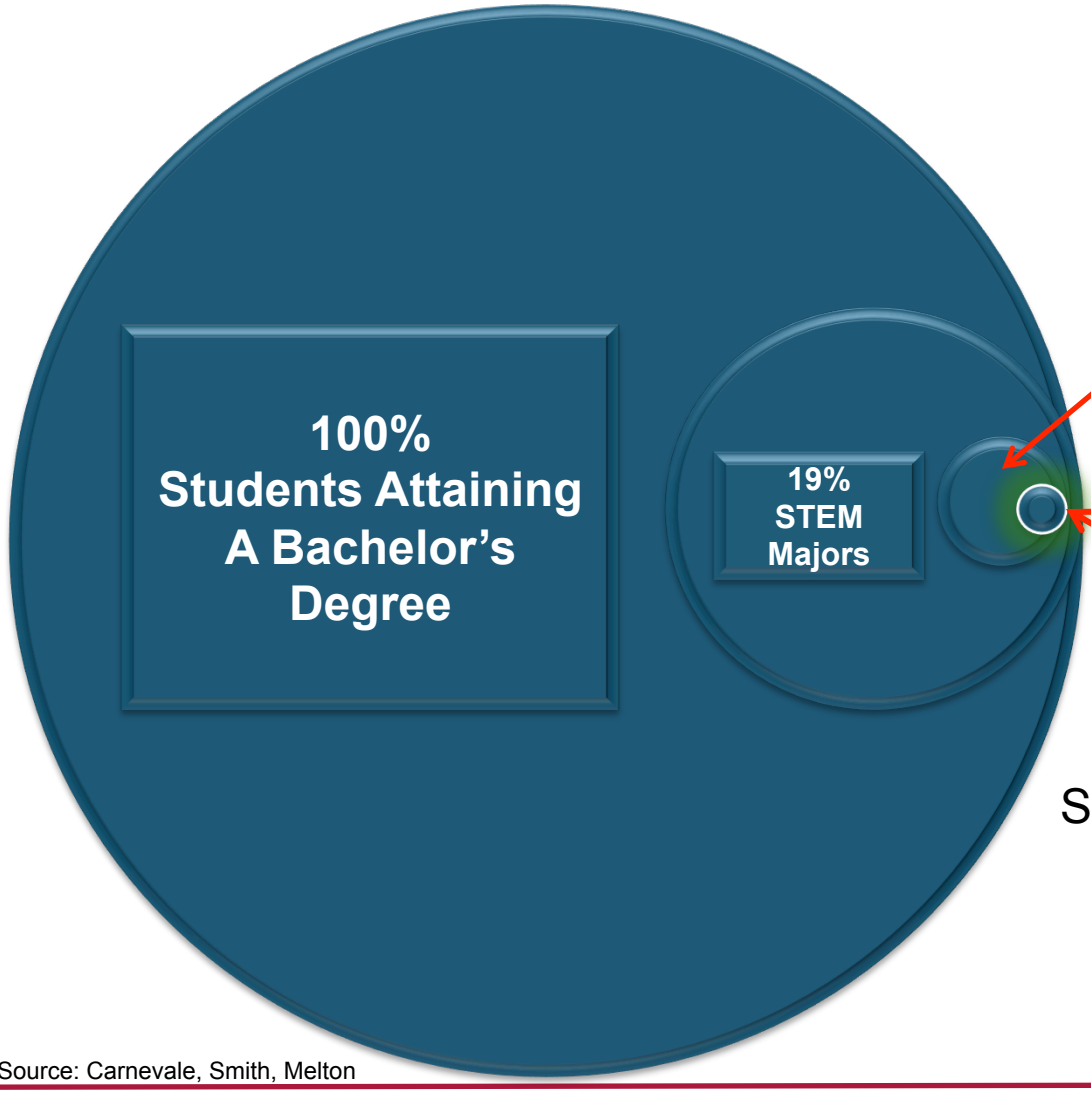
Only 8% of STEM grads actually stay in STEM fields 10 years after graduation!

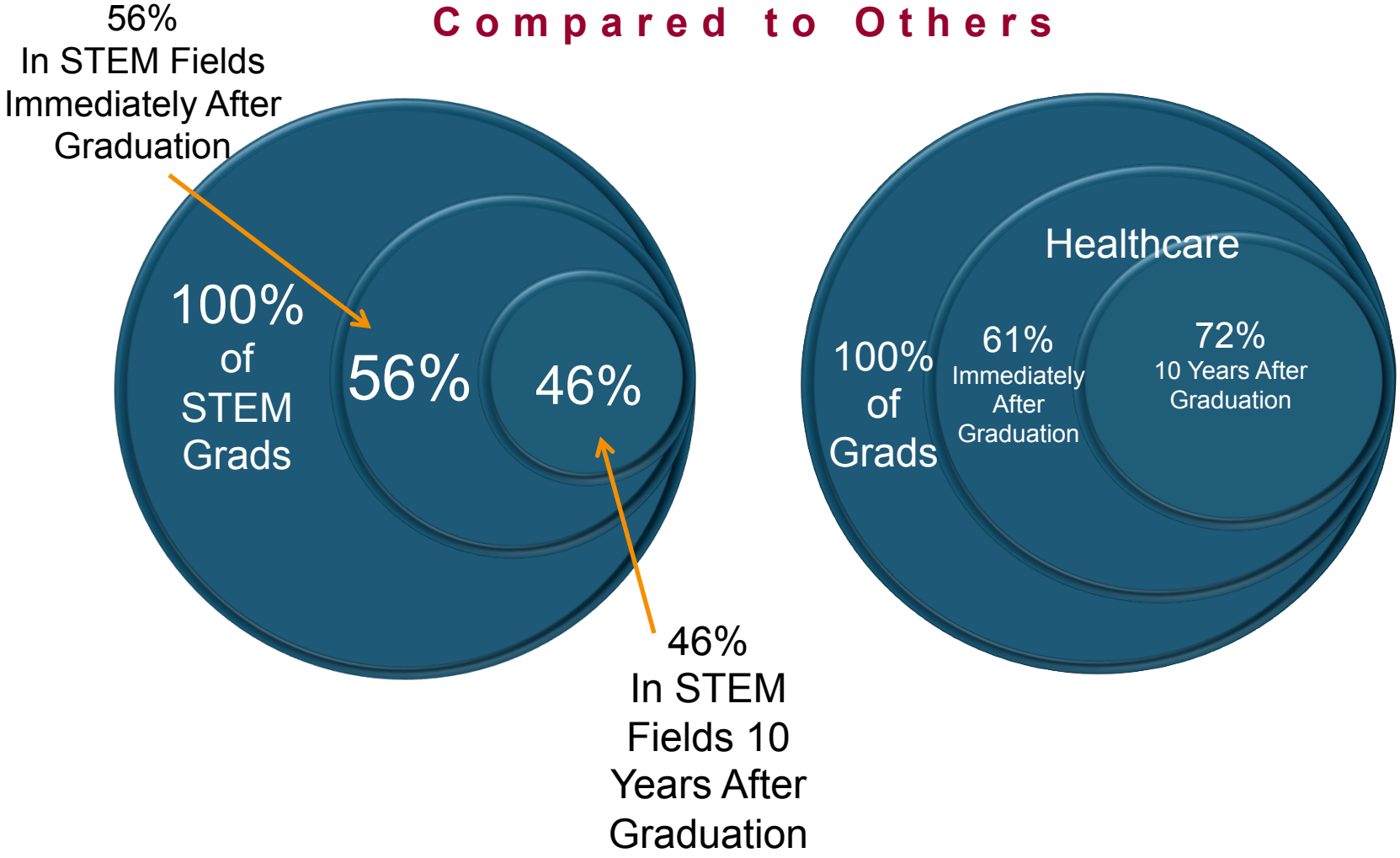


10%
STEM Grads In
STEM Workforce
(In 1993 this was
56%)

8%
STEM Grads In STEM Workforce
(after 10 years)
(In 2003 this was 46%)

Source: Carnevale, Smith, Melton

Occupation Diversion of STEM Grads Compared to Others



Source: Carnevale, Smith, Melton

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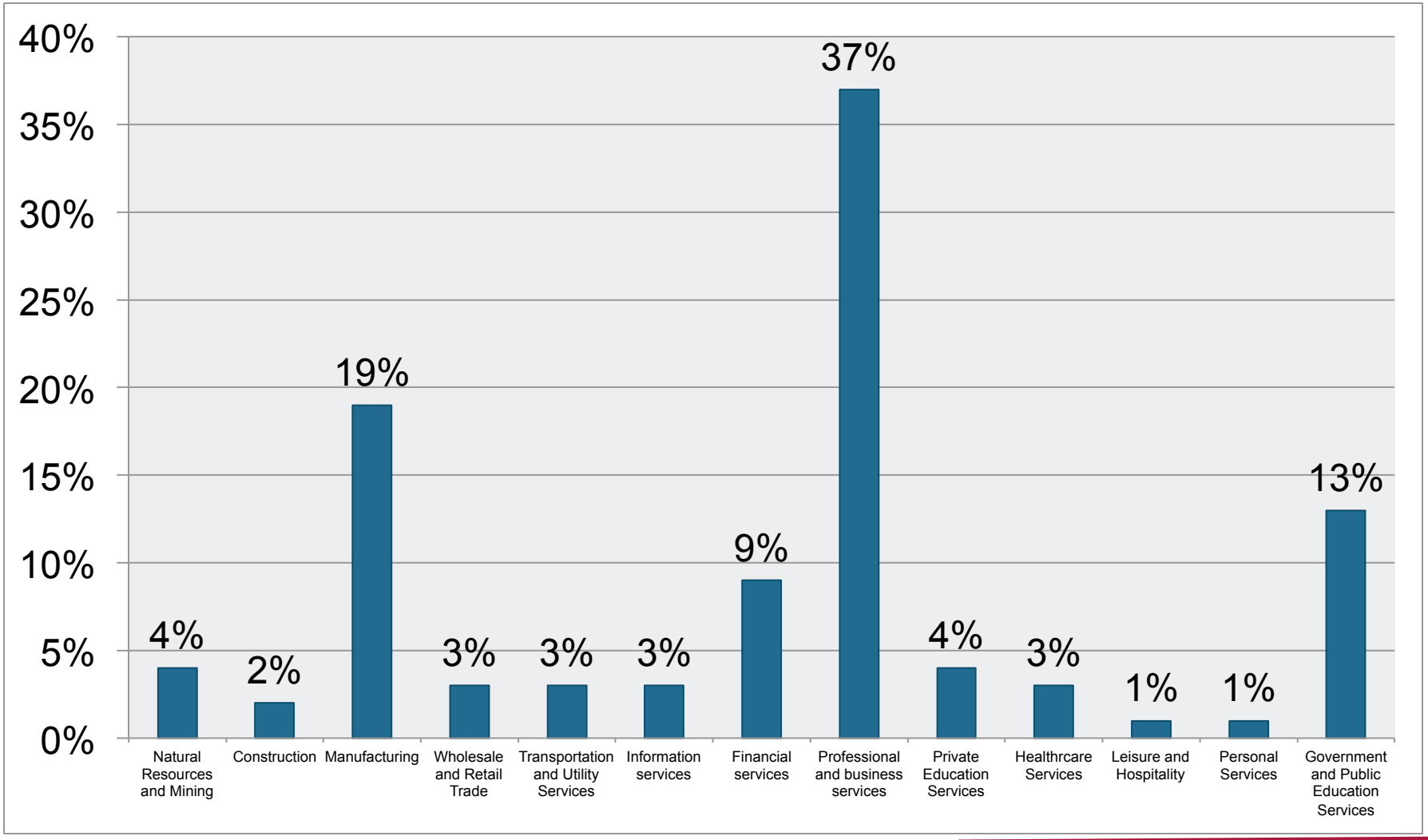
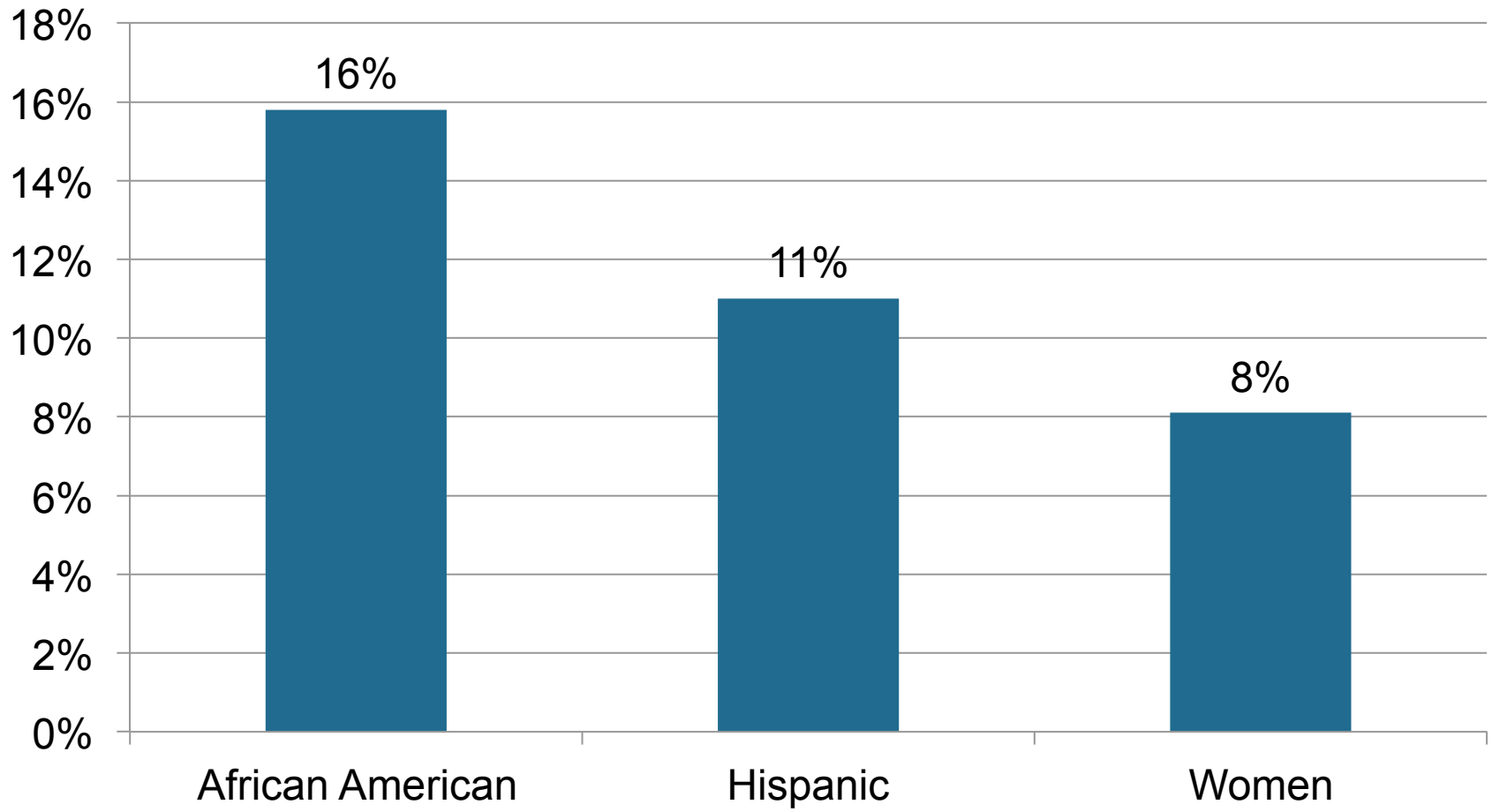
Industrial Distribution of STEM Jobs



Source: ACS, 2009

Minority and Female Unemployment, December 2011



Source: BLS

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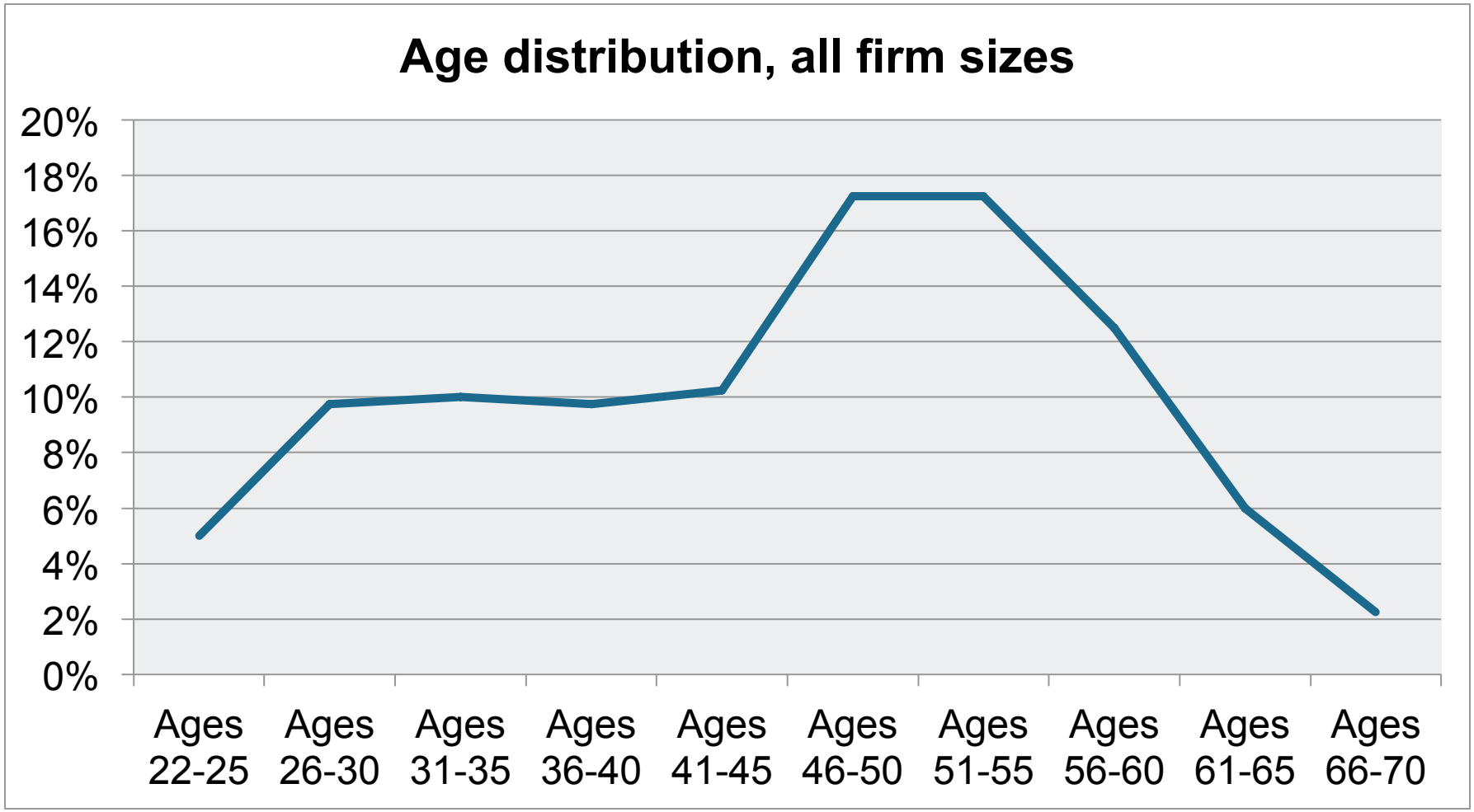
Age Distribution in A&D Workforce



Source: Aviation Week 2011 Workforce Study

Fixing the Problem

SOLUTIONS AND RECOMMENDATIONS

Solutions and Recommendations

- The industry at large must share information about new business activity with academia to allow students to team on the high demand careers are
- Identify what drives individuals to go into certain careers, and use that to encourage them to go into STEM fields
- Understand what a healthy turnover rate is – understand what causes young professionals leave A&D for fields that are viewed as “more appealing”

Source: Aviation Week 2011 Workforce Study

Solutions and Recommendations

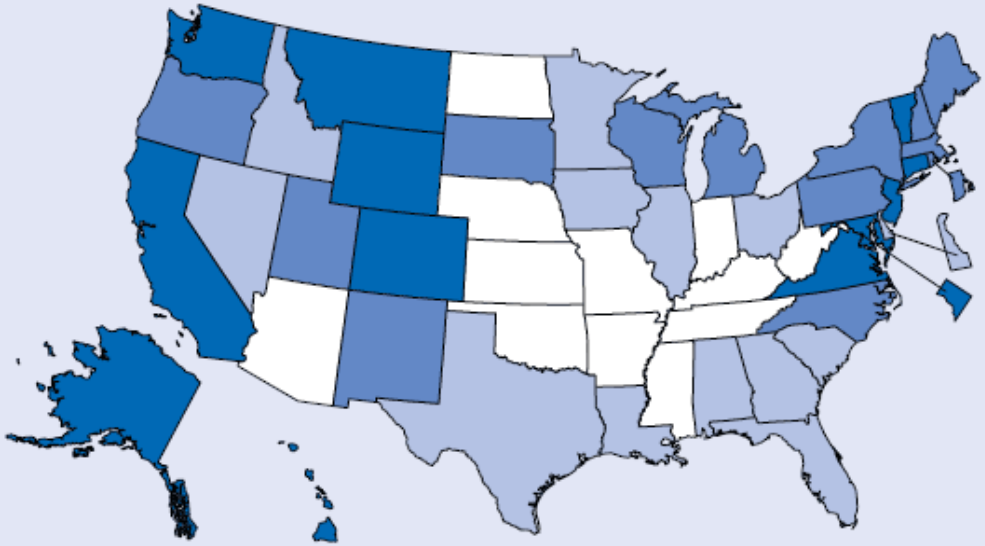
- Highlight innovation at all levels of the supply chain so young professionals know they can make a difference

- Educate and develop your line-leaders so that they may inspire their young professional coworkers

Source: Aviation Week 2011 Workforce Study

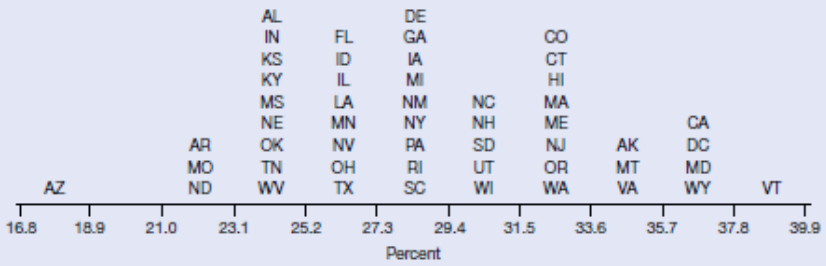
STEM Degrees Conferred, by State

Figure 8-19
Science and engineering degrees as a percentage of higher education degrees conferred: 2009



1st quartile (32.6%–39.1%)
2nd quartile (28.1%–32.1%)
3rd quartile (24.9%–27.6%)
4th quartile (18.6%–24.6%)

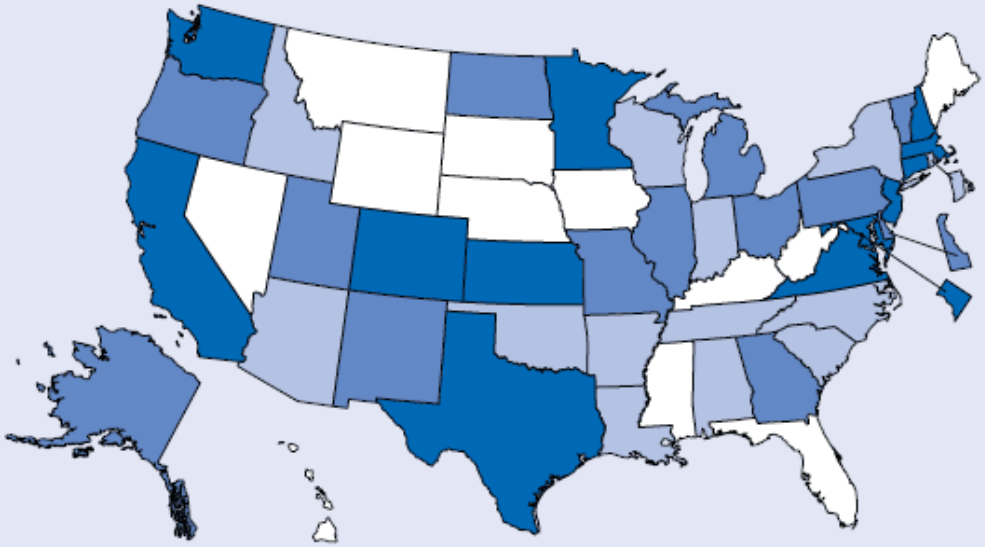
SOURCE: National Center for Education Statistics, Integrated Postsecondary Education Data System.

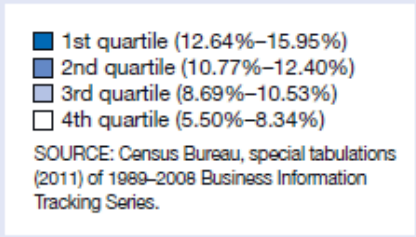


Source: NSF

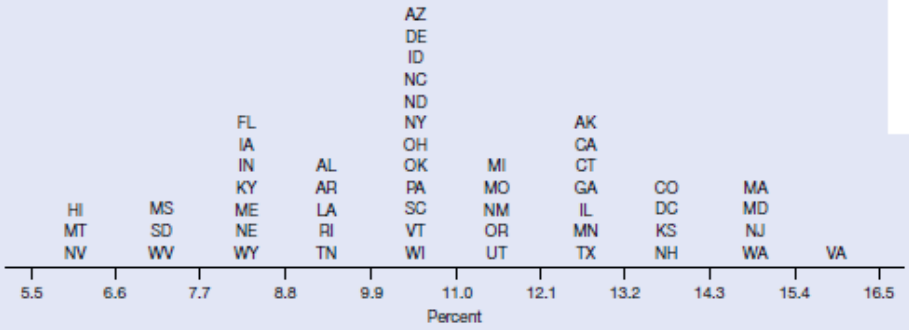
High-Tech Employment, by State

Figure 8-54
Employment in high-technology establishments as a percentage of total employment: 2008





SOURCE: Census Bureau, special tabulations (2011) of 1989–2008 Business Information Tracking Series.



Source: NSF

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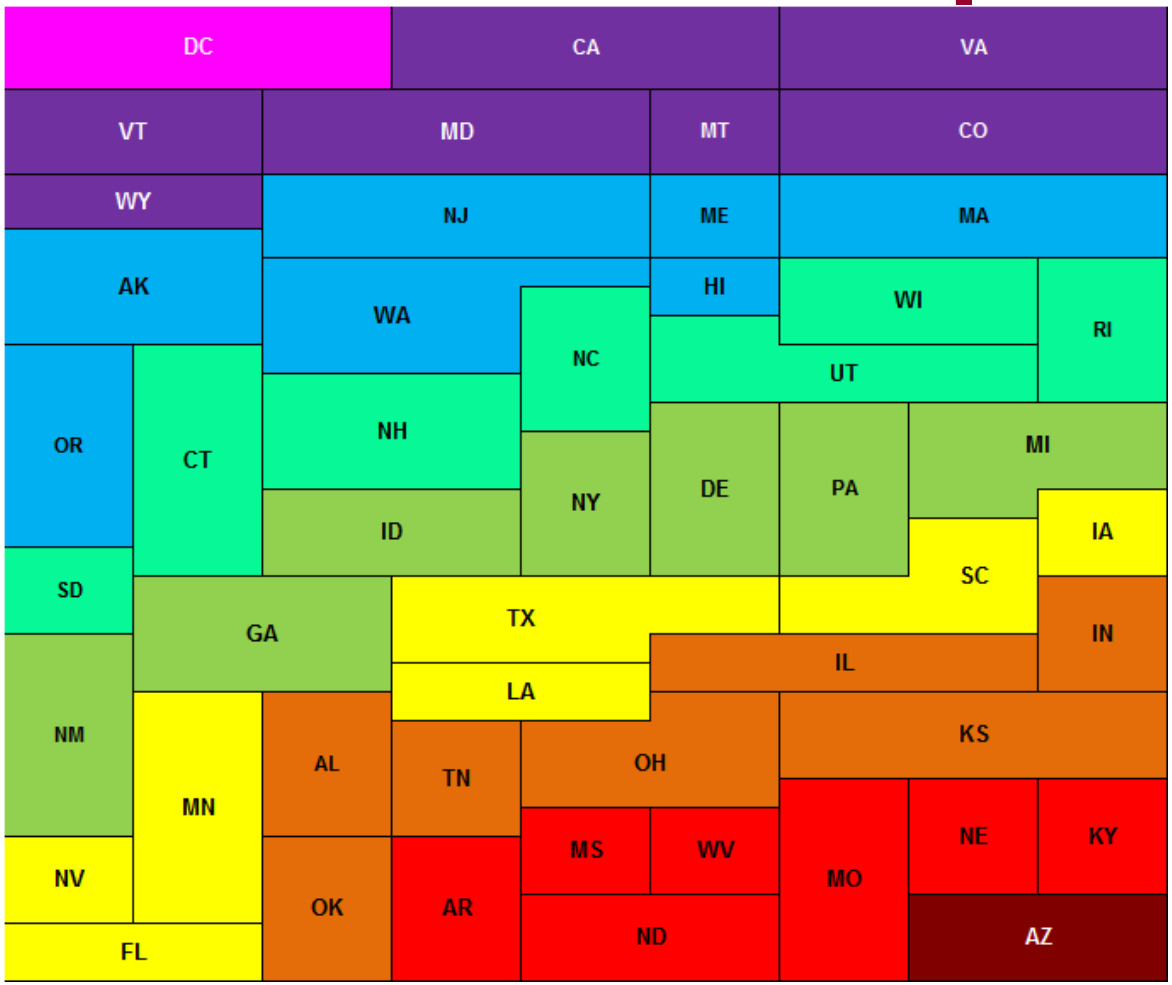
STEM Heat Map



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A&D Retirement Forecast By Labor Category & Year/Company Size

RETIREMENT	2010 Eligible	2011 Eligible	2012 Eligible	2013 Eligible	2014 Eligible	2015 Eligible
Engineers Eligible	11.6	1.23	12.4	13.8	15.65	17.84
Software	8.1	.65	9	10.02	12.31	14.42
R&D Eligible	15.55	2.48	17.02	18.1	20.4	22.6
Program Mgt	13.27	1.78	14.44	15.9	19.2	21.73
Sustainment/MRO	15.19	3.87	15.6	22.9	20	23.1
Business Development	15.08	1.97	16.5	18.6	20.3	23.6
Hourly Manufacturing	16.76	4.01	18.1	18.95	21.5	24.3
Secret Clearance	10.44	.23	14.05	13.66	15.86	18.2
Above Secret Clearance	8.05	.12	11.55	11.75	13.71	15.8

RETIREMENT	Overall	Under 499	1,000-9,999	10,000-49,999	50,000-99,999	100,000+
% Eligible Retire 2011	12.69	4	12.7	16.2	14	25.65
% Actual Retire 2011	2.16	.7	2.3	3.6	1.8	1.8
% Eligible Retire 2012	13.18	2.9	12	19.3	16.23	29.7
% Eligible Retire 2013	14.36	3.4	13.7	17.9	19.13	33.9
% Eligible Retire 2014	16.43	3.7	15.7	20.5	22.25	38.5
% Eligible Retire 2015	18.54	3.7	17.9	23.1	25.47	43
% Eligible Retire 2016	20.86	4.5	20.3	25.8	28.37	47.7

Source: Aviation Week & Space Technology Workforce Study 2012
Data as of 6/1/2012

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A&D Hiring Forecast

	2012		2013		2014		2015	
	US	Intl	US	Intl	US	Intl	US	Intl
Civil	4,508	270	4,086	317	3,605	338	3,410	396
Defense/Sec	23,080	1,267	21,999	1,215	23,257	1,584	16,660	833
Space	1,006	0	270	1	131	0	149	1
	28,594	1,537	26,355	1,533	26,993	1,922	20,219	1,230
	10% with clearance		11.3% with clearance		12% with clearance		20% with clearance	

	2012 Plan	2013	Two-year total
Engineering	4,338	3,744	8,082
Software Development	2,338	734	3,070
R&D	206	162	368
Enterprise IT	986	981	1,967
Program Management	624	572	1,196
Supply Chain	1,802	1,825	3,627
Sustain/MRO	2,254	2,552	4,806
Finance/Fin Analysis	833	789	1,622
Business Development	586	348	934
Production (Exempt)	1,847	1,468	3,315
Production History	2,397	1,917	4,314

For 2012, The Forecast Is For 28,594 Jobs, Down From 31,800 A Year Ago., 10% Or More Will Require Qualification For Secret Or Above Clearance.

Source: Aviation Week & Space Technology Workforce Study 2012
Data as of 6/1/2012, represents 80% Of Defense Company Employment

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STEM Occupational Data

Figure 1: STEM New and Replacement Occupations by Level of Education, 2018

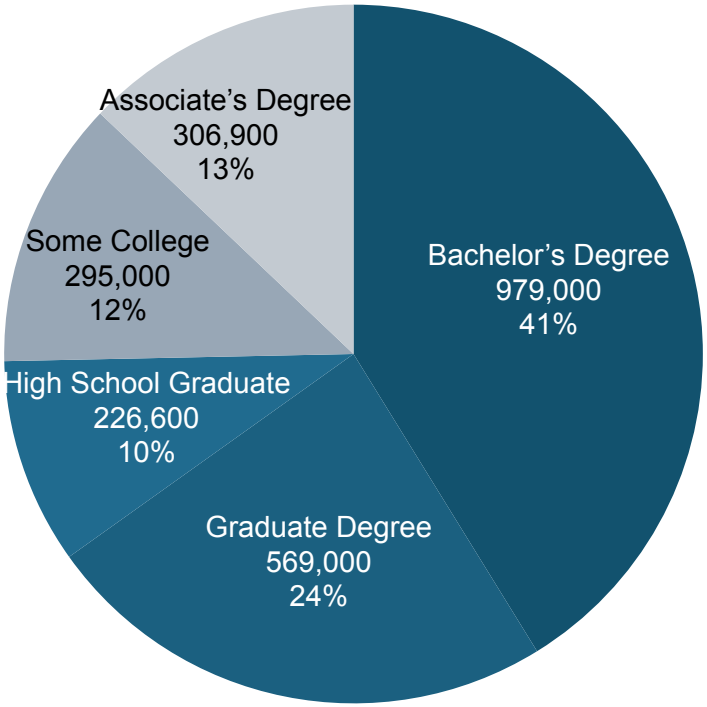
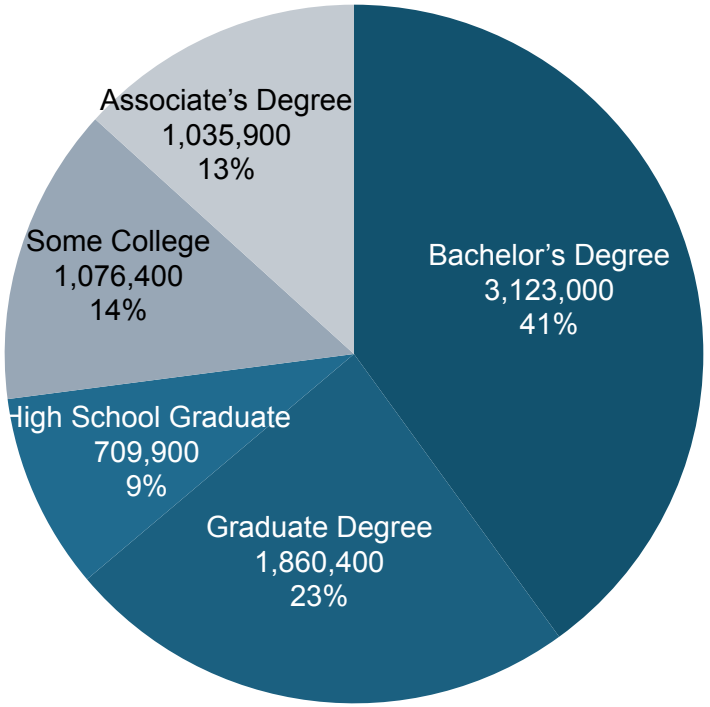


Figure 2: Distribution of all STEM occupations by level of education in 2018



Source: Georgetown University Center on Education and the Workforce forecast of occupational growth through 2018.

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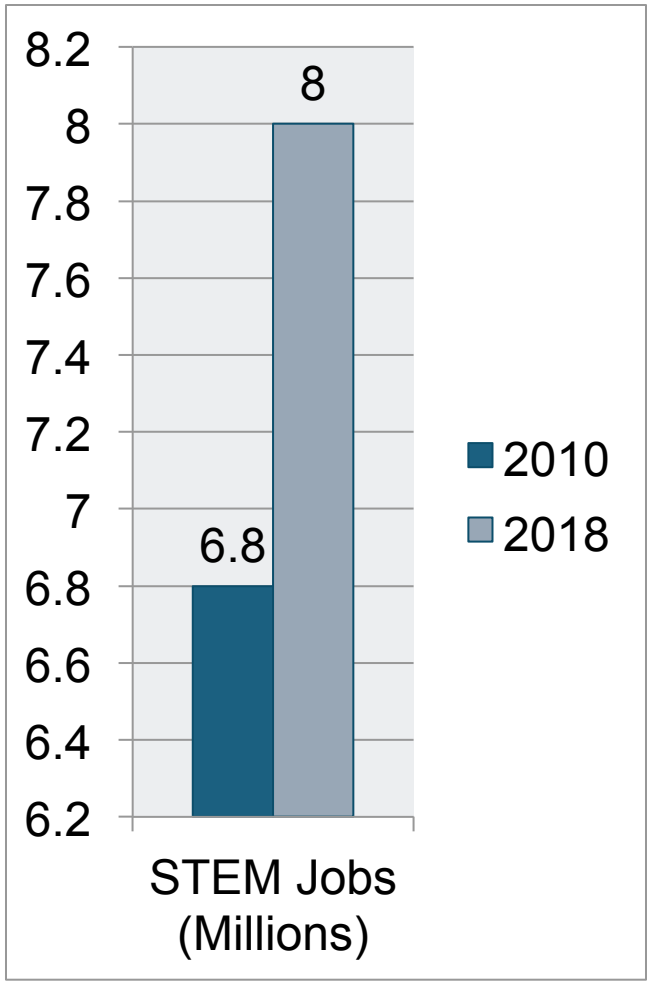
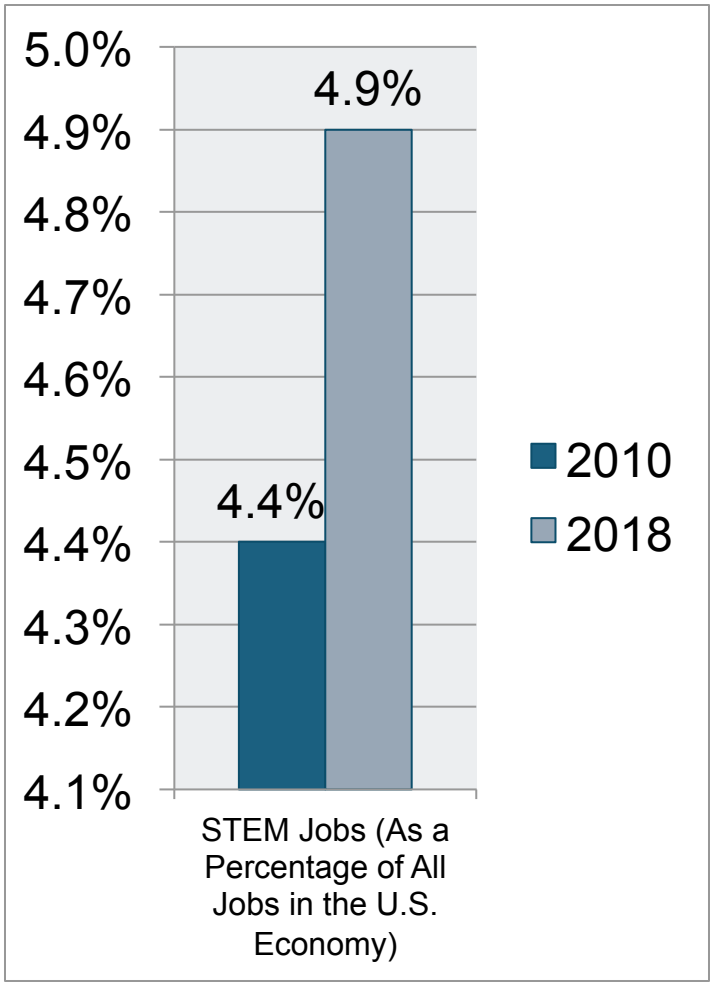
STEM Job Projections





Source: Carnevale, Smith, Melton

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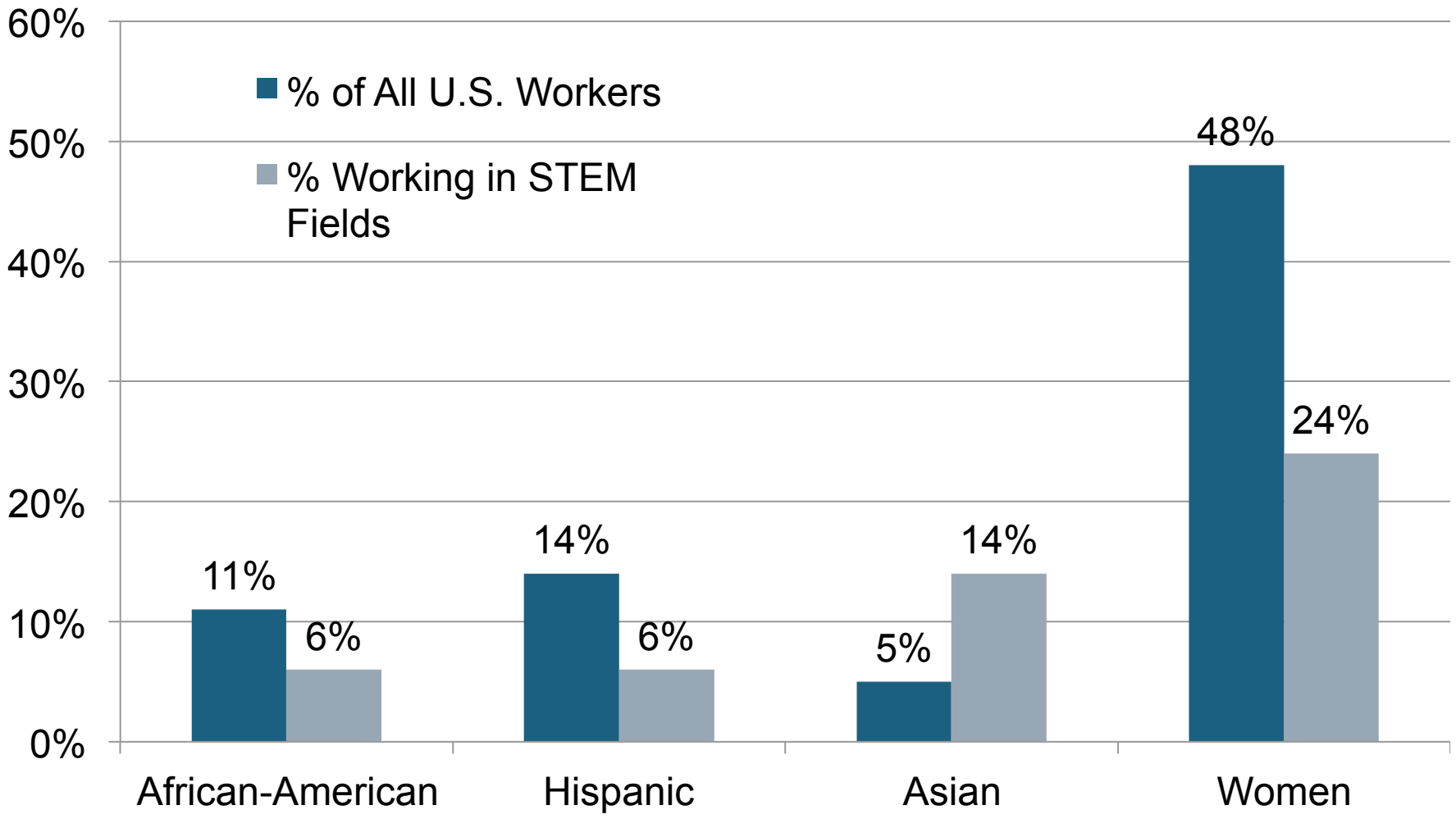
Minorities and Females in STEM Fields



Source: U.S. Department of Commerce, ACS 2009

STEM Teacher Development

- Teachers in STEM fields need to be developed professionally
  - They need to have the resources necessary to successfully engage students in the classroom in STEM fields
- Notable pieces have been written about the need to invest in quality educators
  - PCAST

PCAST

(President's Council of Advisors on Science and Technology)

- Purpose of PCAST:
  - *"This council represents **leaders from many scientific disciplines** who will bring a diversity of experience and views. I will charge PCAST with **advising me about national strategies to nurture and sustain a culture of scientific innovation**."*
    - President Barack Obama; April, 27, 2009
- The group of established scientists and engineers will work to create sound policies that promote STEM fields in ways that increase our economic competitiveness
- Summary of findings:
  - To improve STEM education, we must focus on both preparation and inspiration
    - Especially in regard to women and minorities
  - The federal government has historically lacked a coherent strategy and sufficient leadership capacity for K-12 STEM education
    - Several initiatives in different agencies, but no collaborative program

- Recommendations:
  - Support state-led movement for shared standards in math and science
  - Recruit and train 100,000 STEM teachers over the next decade
  - Recognize and reward the top 5 percent of the nation's STEM teachers
    - Create a STEM Master Teachers Corps
  - Use technology to develop learning
    - Create an advanced research projects agency for education
  - Create opportunities for student inspiration
  - Create 1000 new STEM-focused schools over the next decade
  - Ensure strong and strategic national leadership

Weightless Flights of Discovery

- Professional development program for middle school math and science teachers and college students studying to become teachers
- A total of almost 700 educators have participated since the program's inception in 2006
- 2007 Participants: Nearly 450 educators from 20 states
- 2 total parabolic flights
  - Los Angeles, CA
  - Washington, D.C.

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Two industries reliant on STEM talent

AEROSPACE AND DEFENSE

Quick Facts

- Industry is diverging into operations that blend into other industry sectors
  - Biotechnology – Biology, Information Technology
  - Cybersecurity – Security, Information Technology
- Commercial side grows, R&D side shrinks
- Young professionals see A&D as more of a "stable haven" in this turbulent economy
  - Not seen as desirable as other fields

Source: Aviation Week 2011 Workforce Study

Aerospace and Defense

- Aerospace and defense (A&D) is mainly concerned with attrition:
  - Voluntary attrition rate overall is 5.38% in 2011
    - Better than 6.71% in 2010

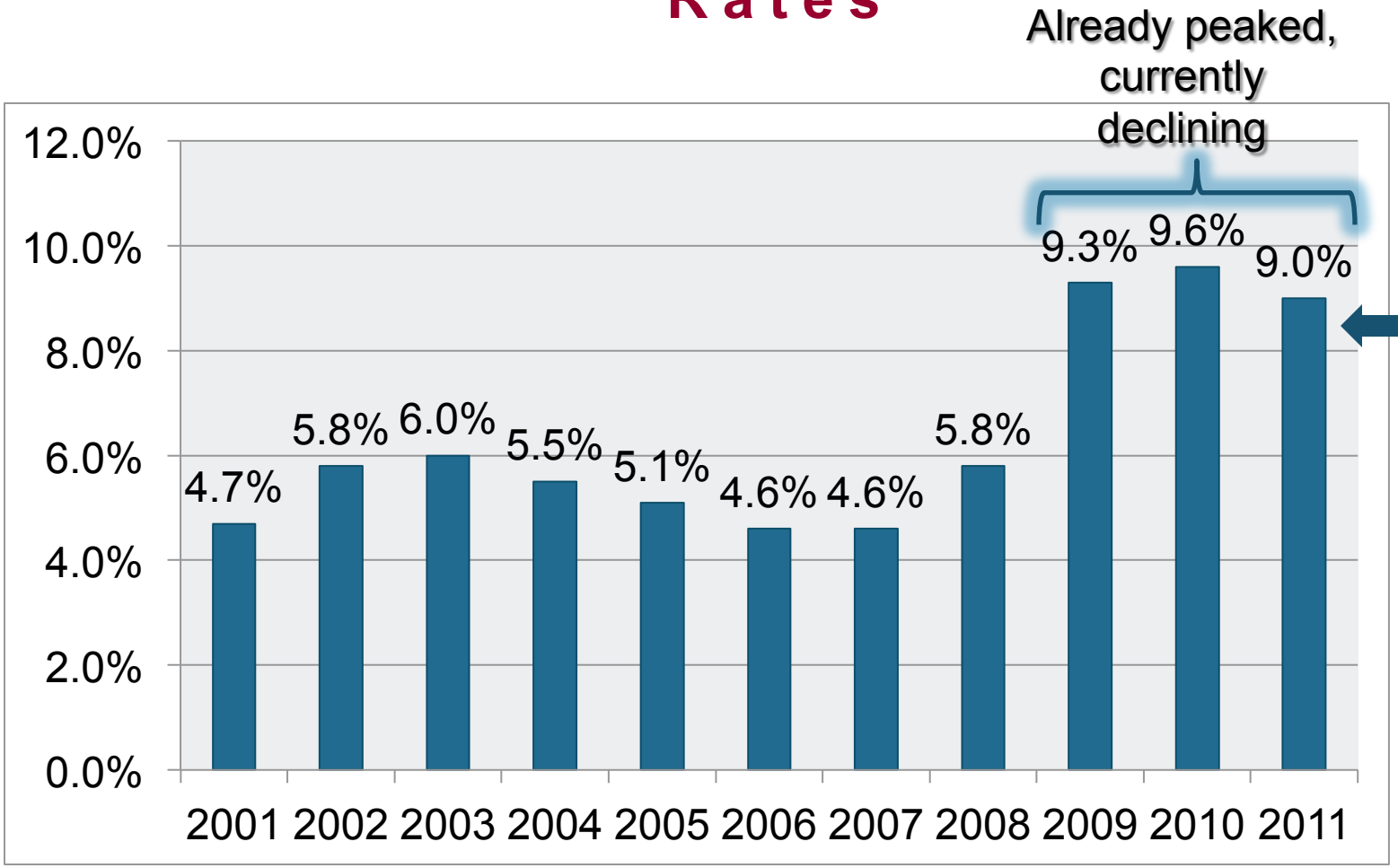
- All areas of attrition have plummeted in the wake of economic uncertainty
  - Aging workforce remaining, not allowing new talent to come in – poses a long-term problem for A&D firms

Source: Aviation Week 2011 Workforce Study

Future problems

- Economic turmoil eventually subsides
- When true economic improvement is seen by the employed, the huge amounts of eligible retirees will leave their firms
  - Leaving enormous gaps in the workforce
- The A&D industry might not be as attractive as other options for young professionals when this mass exodus happens
  - Firms could fail, damaging the U.S. economy and endangering national security

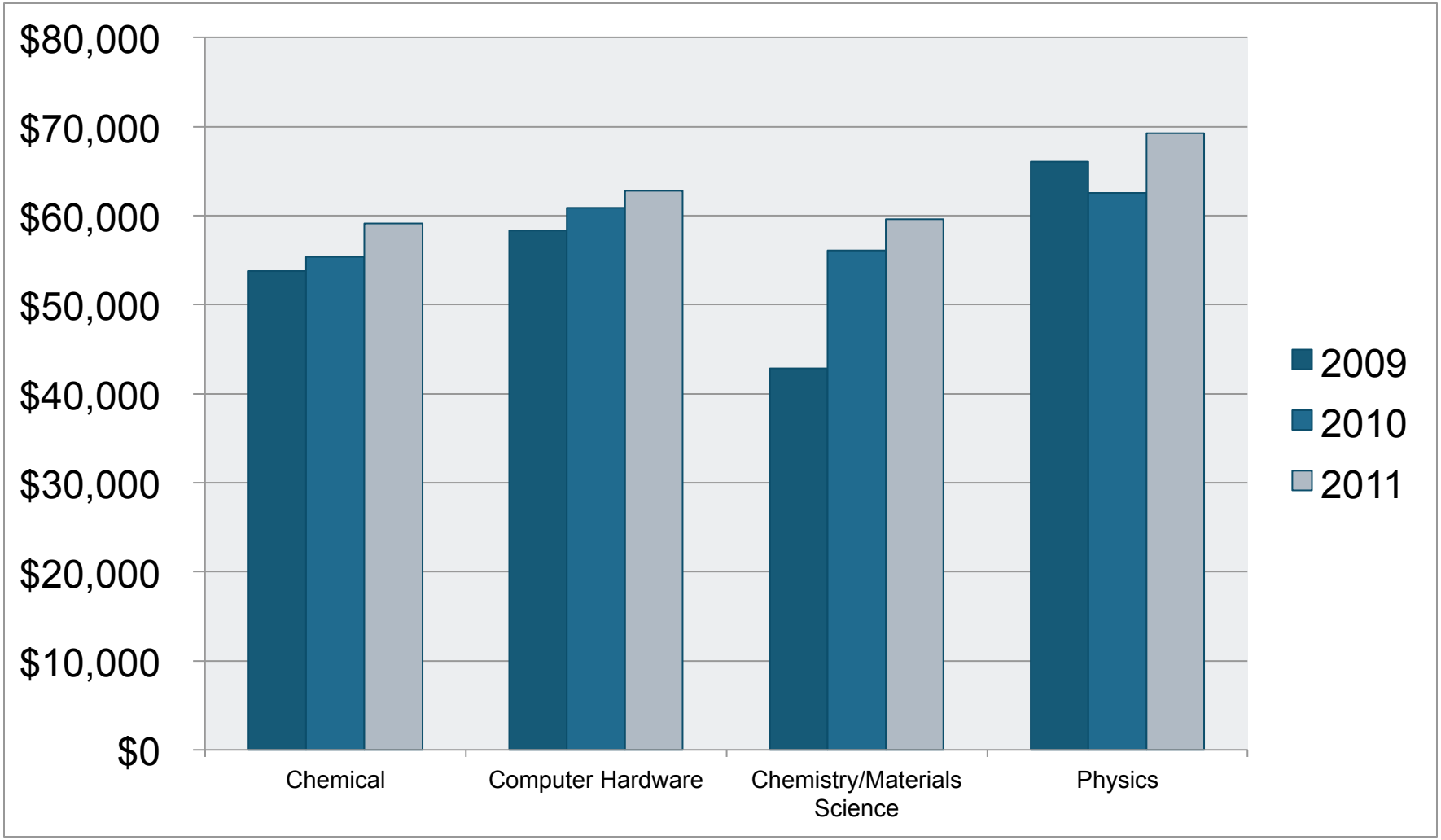
U.S. Historic Annual Unemployment Rates



Source: Bureau of Labor Statistics

National Defense Industrial Association

Salary Acceleration Indicates Looming Shortages In Key Degree Areas



Source: Carnevale, Smith, Melton

National Defense Industrial Association

Salary Acceleration Indicates Looming Shortages In Key Degree Areas

ENTRY LEVEL Positions	2009	2010	2011
Chemical Engineering	$53,790	$55,405	$59,141
Computer Hardware Engineering	$58,360	$60,878	$62,762
Materials Engineering	$56,367	$57,248	$64,729
Systems Engineering	$62,426	$60,925	$61,139
Chemistry/Materials Science	$42,865	$56,051	$59,630
Physics	$66,055	$62,517	$69,255

Source: Aviation Week 2011 Workforce Study

Aerospace and Defense – Hiring

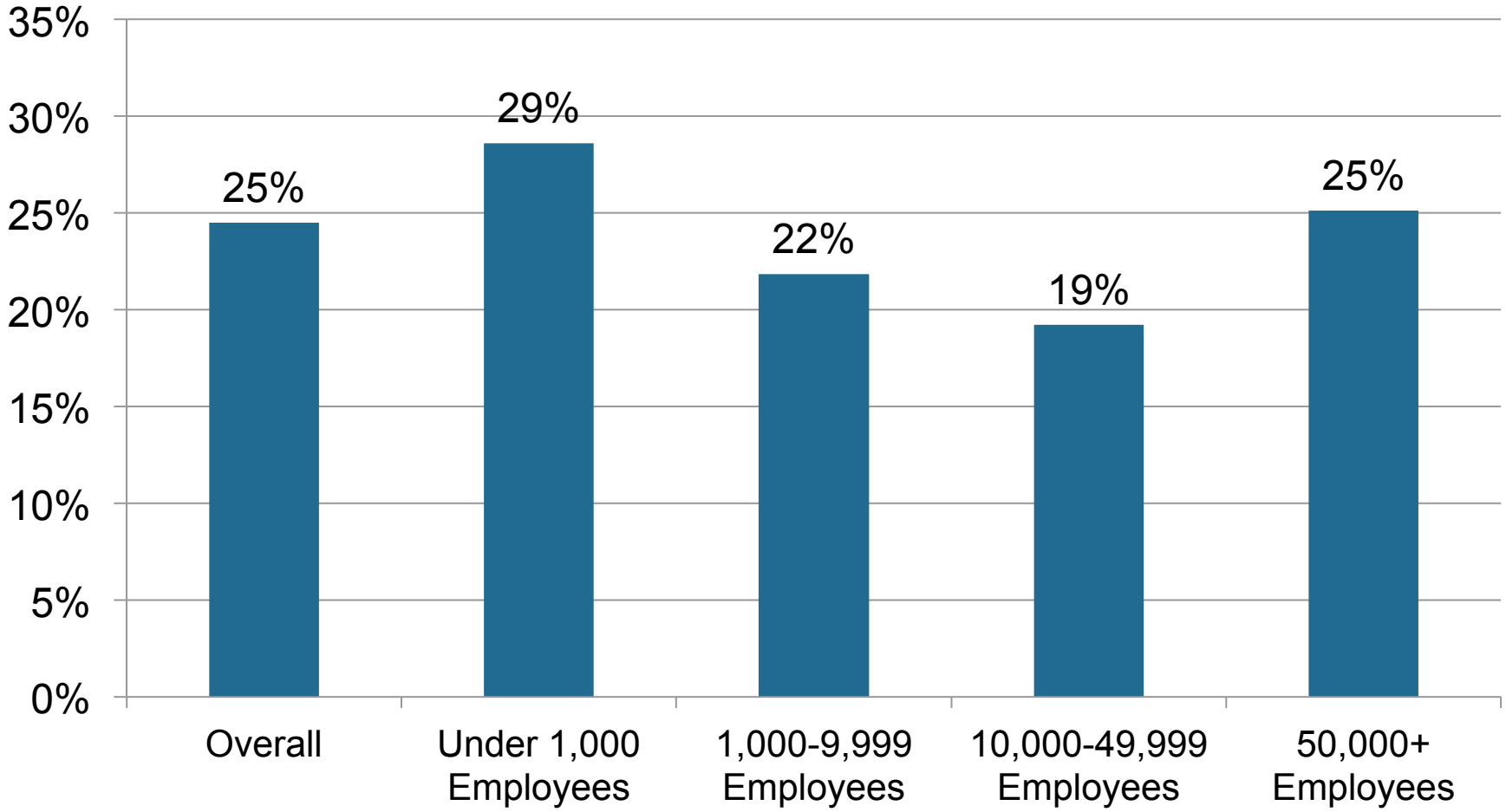
- The marketplace is getting more competitive with fewer open jobs
  - But this will change when the baby boomers retire in a few years
  - Demand for **Production and Manufacturing** is almost as high as the need for business development talent

- **28,000** new hires in 2012 – less than 2011 at 31,800 hires – replacing 56,000 employees who are retiring

- **14%** of new hires come from college campuses

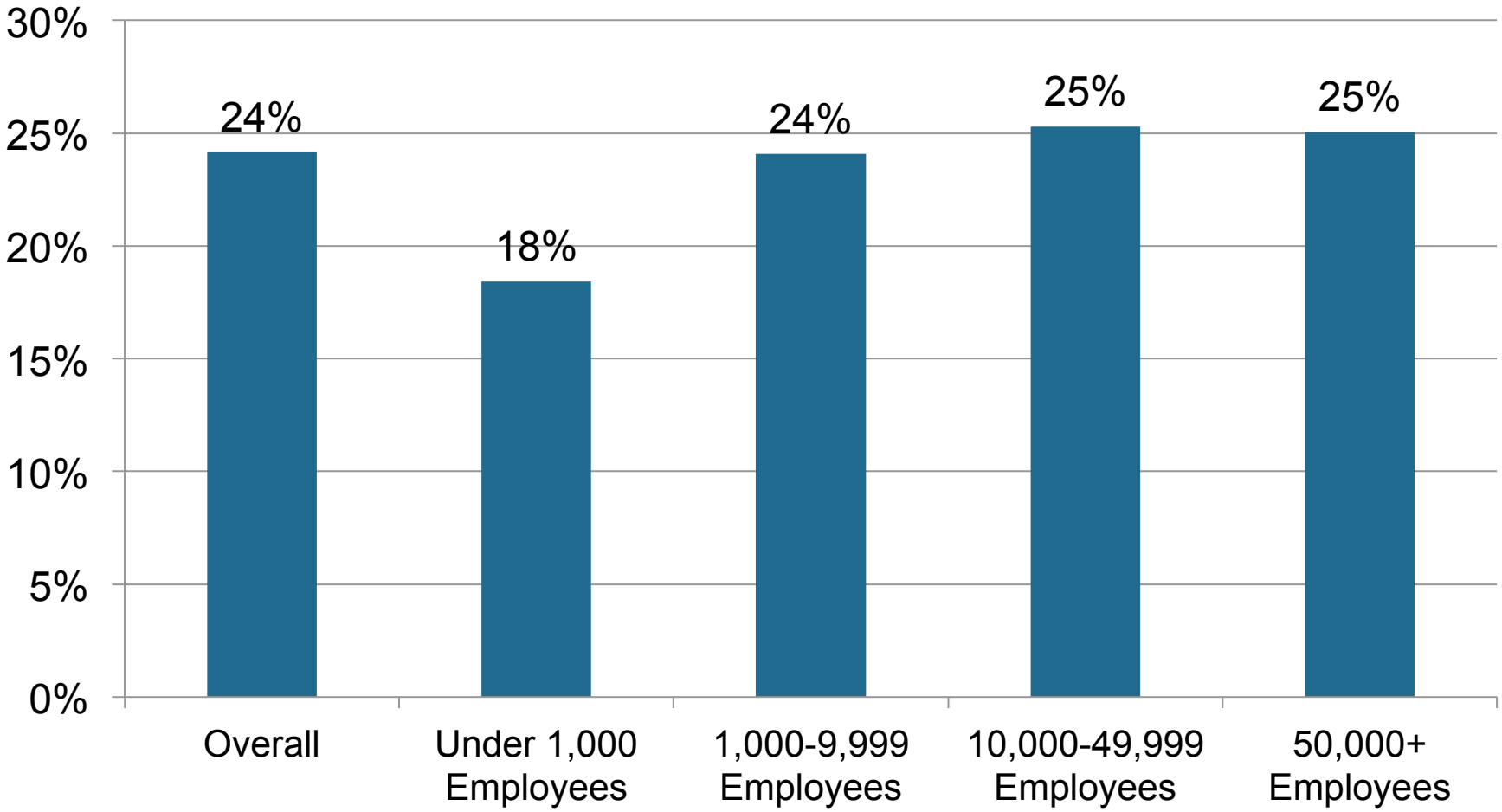
Source: Aviation Week 2012 Workforce Study

Aerospace and Defense – Minorities in the STEM Workforce



Source: Aviation Week 2011 Workforce Study

Aerospace and Defense – Women in the STEM Workforce



Source: Aviation Week 2011 Workforce Study

Aerospace and Defense – Eligible and Actual Retirements

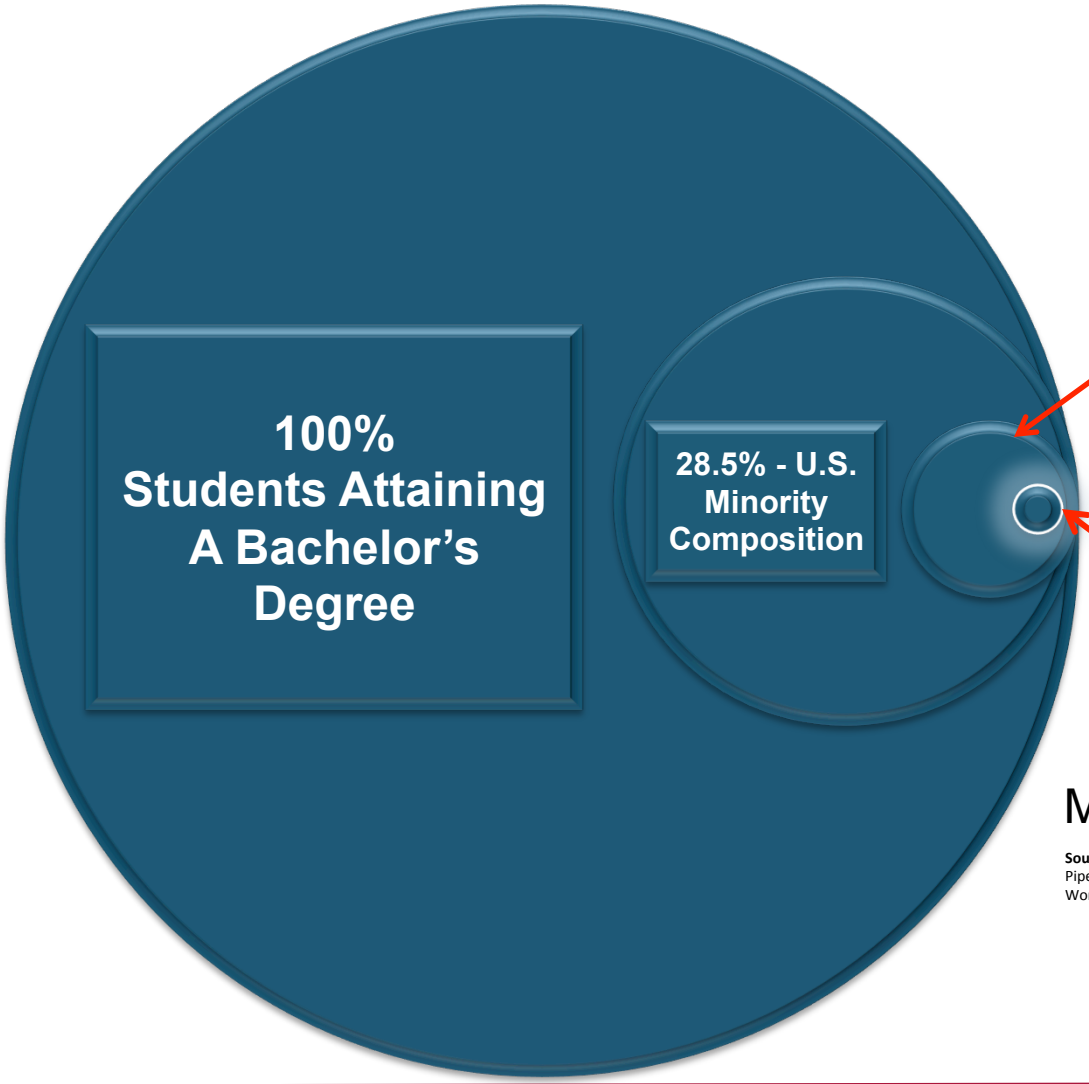
Eligible Retirements	% Overall	% Engineering	% Software Development	% R&D	% Test & Evaluation
% Eligible to Retire in 2010	13.75	10.97	5.91	13.73	12.43
% Eligible to Retire in 2011	14.71	12.51	7.89	15.7	14.45
% Eligible to Retire in 2012	17.07	14.99	8.87	7.7	16.61
% Eligible to Retire in 2014	22.84	18.29	N/A	26.54	29.38

Actual Retirements	% Overall	% Engineering	% Software Development	% R&D	% Test & Evaluation
% Actual Retirements in 2009	2.06	1.35	N/A	3.47	1.07
% Actual Retirements in 2010	1.22	0.93	0.43	0.92	0.86

Source: Aviation Week 2011 Workforce Study

National Defense Industrial Association

U.S. Minorities only have a 9.1% STEM Participation Rate!



26.2% - Minorities in an Undergraduate Degree Program

9.1%
Minorities Studying STEM Fields

Source:
Pipeline, Committee on Underrepresented Groups and the Expansion of the Science and Engineering Workforce.

"A Strong Science and Engineering Workforce." National Academy of Sciences, National Academy of Engineering, and Institute of Medicine.

Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads.
Washington, D.C.: National Academies Press, 2011. 2-3, 5.

Occupation Diversion

Major	Working in Field Immediately After Bachelor's Attainment	Working In Field After Ten Years
STEM	56%	46%
Education	84%	66%
Healthcare	61%	72%
Business	62%	53%

- From 1993-2003, STEM fields had a 56% post-grad entrance rate with a 46% sustained employment rate after working in STEM fields for 10 years

- **This has declined to 10% and 8%**, respectively

Source: NELS: 1988, BJB: 1993/2003

STEM?

- STEM – Science, Technology, Engineering, Mathematics
- A set of fields with high salaries, dynamic workplaces, and many employment opportunities
- Fields include:
  - Cybersecurity
  - Agriculture
  - Chemical engineering
  - Healthcare
  - And many more