

THE COALITION OF STATE BIOSCIENCE INSTITUTES (CSBI):

2016 LIFE SCIENCE WORKFORCE TRENDS REPORT



The life science industry continues to fuel breakthrough discoveries that are having profound impacts around the globe. In addition to improving health, securing a more sustainable food supply and promoting cleaner energy, the life sciences sector is an economic driver, accounting for 1.66 million jobs in 77,000 companies in 2014¹, up from 1.62 million jobs in 73,000 companies in 2012².

Behind this innovation and growth is a dynamic industry shaped by disruptive technologies, a growing global marketplace for healthcare, and a complex regulatory environment. To ensure their companies' success, life science employers must navigate these cyclical forces, and identify, secure and develop necessary talent.

Building on the success of its two prior workforce trends reports³, the Coalition of State Bioscience Institutes' (CSBI's) 2016 Workforce Trends Report provides insights into some of the most pressing talent needs of the life science industry and a few key trends that are driving talent acquisition. The report also sites actions that industry and academic partners can take to help ensure that employers are recruiting the best employees, sustaining growth and maintaining the nation's competitive advantage in the life sciences.

Methodology

This biennial snapshot includes insights from more than one hundred life science executives from seven regions (Figure 1). The companies interviewed span the five major subsectors as defined by the Biotechnology Innovation Organization (BIO)⁴:

- **Agriculture, Feedstock and Chemicals**
- **Drugs and Pharmaceuticals**
- **Medical Devices and Equipment**
- **Research Testing and Medical Laboratories**
- **Bioscience-related Distribution**

Interviews with over 100 life science executives across the country were conducted by CSBI between January 1 and March 31, 2016, and addressed current and future business priorities/capabilities and their implications for workforce and training. The qualitative interviews and analysis were augmented by a quantitative analysis of nearly 40,000 job postings in 2015 for life science technical jobs, drawn from representative industry NAICS codes, using Burning Glass Technologies. Non-technical positions in the industry, such as sales, accounting, purchasing, etc., are not included in this sample⁵.

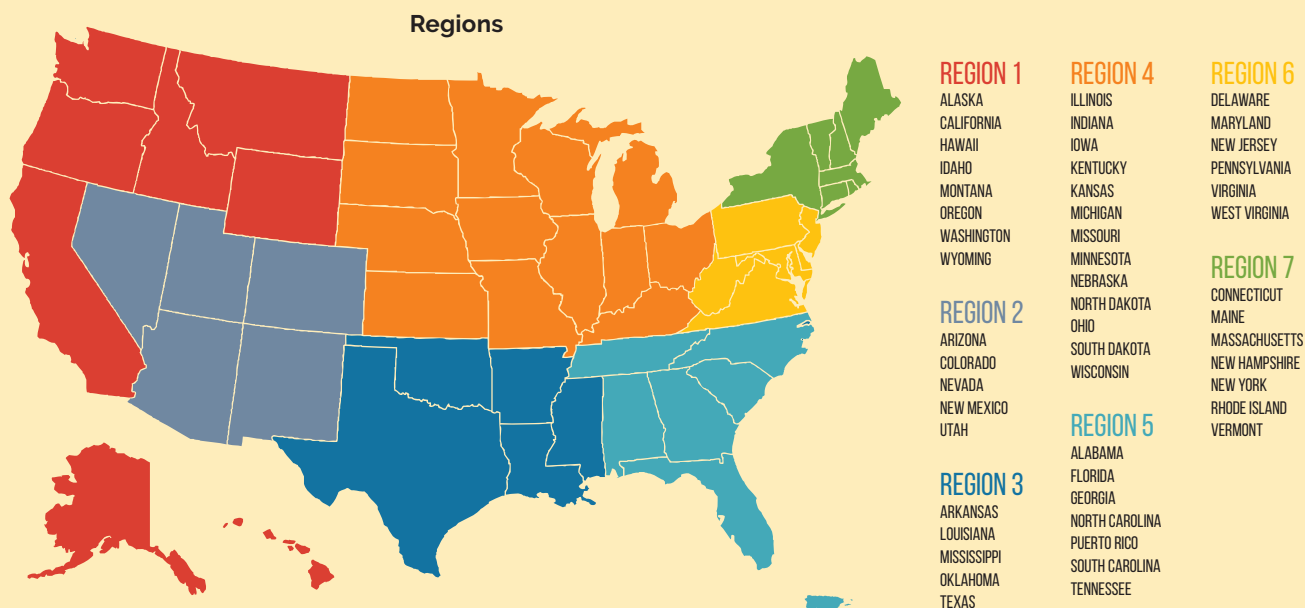


Figure 1 – Regions – Source: Burning Glass Technologies

¹TEconomy/BIO State Bioscience Industry Report 2016

²CSBI Life Sciences Workforce Trends Report 2014

³Ibid; CSBI and Booz & Company, Demand for Talent: Current & Projected Workforce Trends in the Life Science Industry 2013

⁴TEconomy/BIO

⁵ Interviews and job postings data from California included in the 2016 CSBI Report were combined with additional data to produce the 2016 California Workforce Trends in the Life Science Industry report produced by the Biocom Institute and the California Life Sciences Institute (CSBI member organizations). As appropriate, some of the analyses, recommendations and quotes can be found in both reports.

EMPLOYMENT ENGINE

The life science sector continues to experience remarkable growth, translating into steady demand for new employees⁶. While the number of job postings between 2011 and 2014 declined slightly, year over year, they remained consistently higher than the 2010 levels (Figure 2). This trend is expected to continue, as many life science leaders indicated their companies will be hiring to support projected growth.

According to job postings, the greatest demand could be found in Regions 1 (22%), 4 (21%) and 6 (18%)– which include the Northwest and California, the middle-Eastern states, and the Midwest (Figure 5).

Number of Job Postings 2010-2015

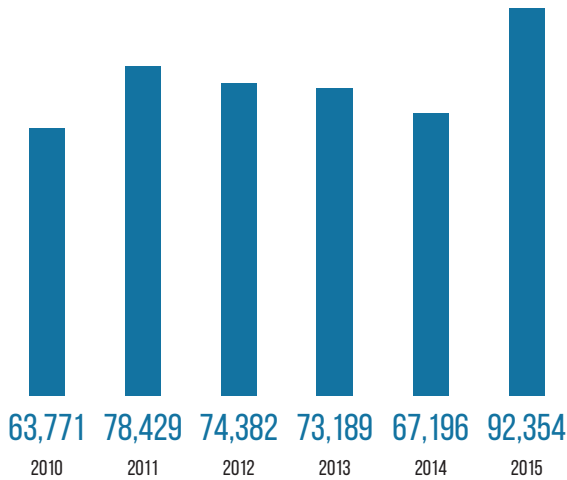


Figure 2

Source: Burning Glass Technologies

Percent of Job Postings Increase Since 2010

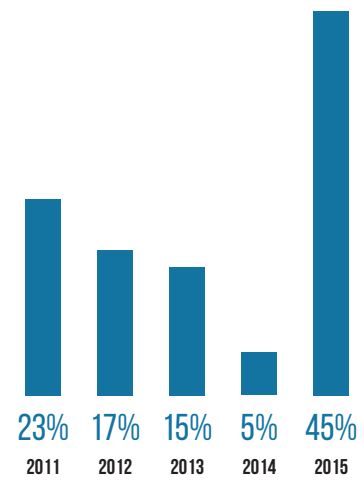


Figure 3

Source: Burning Glass Technologies

Number of Job Postings by Region, 2015

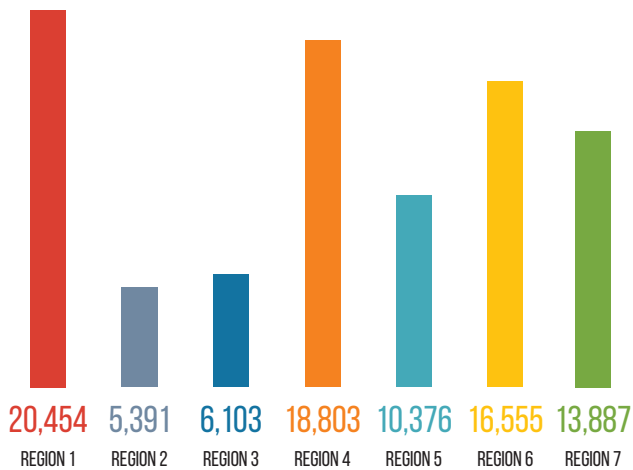


Figure 4

Source: Burning Glass Technologies

Percentage of Job Postings by Region

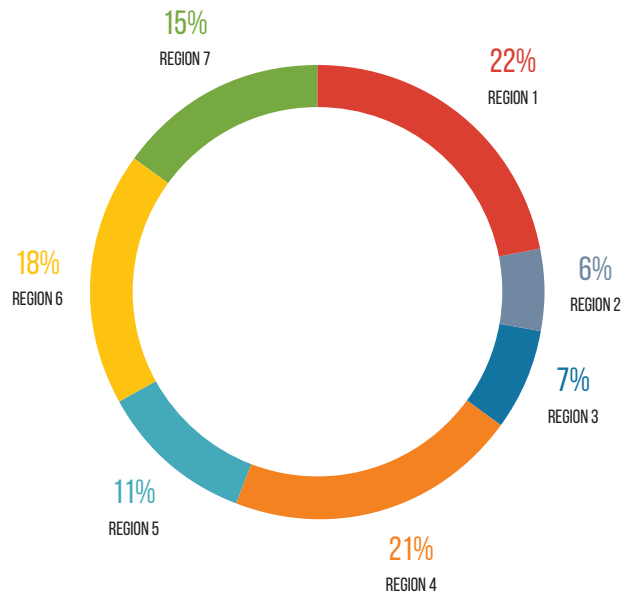


Figure 5

Source: Burning Glass Technologies

⁶ TEconomy/BIO

CHANGE IS THE NORM: EVOLVING COMPANIES REQUIRE EVOLVING SKILLS

“Science is constantly changing, with new discoveries and methodologies always on the horizon.... Across the board in every function, it’s important that our employee base is agile and able to keep up with the pace of change, regarding new ways of working, new regulations, new innovations, etc.”

A defining characteristic of the life science industry is change. Not only do life science companies exist in a rapidly fluctuating global environment, but as startups mature from concept to commercialization, their talent needs evolve. Companies still need technical expertise, but they also seek more business and operational talent: people who can help commercialize their discoveries by driving informed decision-making and managing external partners.

Corporate leaders cite the need for employees who understand their industry, who know how to develop innovative products and can manage both external and internal challenges. Increasingly, successful employees are adaptable, flexible, comfortable with ambiguity, eager to learn and transfer valuable skills to new worksites as they transition through the industry.

“A world in which scientists are trained against decision-making in the face of uncertainty creates a recruitment challenge for any emerging company that needs to remain nimble and adaptable and often must act with incomplete information. This can be very uncomfortable for some high IQ, highly analytical technical experts.”

“The technical world is evolving quickly, and we’re constantly needing to bring in new skill sets. Gene editing is a three-year-old technology and few people have practical experience. We need those people to keep up with change. Even if you have a job, your job is not safe if you can’t keep up.”

KEY TRENDS AND THE SKILLS NEEDED TO ADDRESS THEM

When asked about key developments that are impacting their current and pipeline talent needs, four key trends dominated the discussions with life science executives across the country:



TREND 1

Big Data



TREND 2

Regulation, Reimbursement
& the Shift to Value-Based
Health Care Keeping



TREND 3

Soft Skills –
Communications above all



TREND 4

Employee Development



TREND 1 - BIG DATA

“As sequencing becomes cheaper and sequencing data more manageable, clinical sequencing will become prevalent, driving the need for people who can manage and interpret this data.”

“We will need data scientists, bioinformaticians, pathologists, histologists, quality system professionals, regulatory experts, software engineers and data architects. Increasingly we will be competing with high tech companies for some of this key talent.”

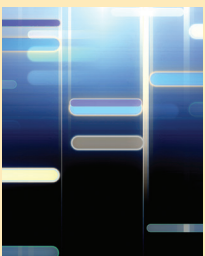
Life science companies manage enormous amounts of data. As new technologies make it possible to collect and analyze ever increasing volumes of information, big data has become the norm and has changed the way life science companies work. Big data impacts technology development, business operations and collaborations. Just some of the vast range of applications include:

- Understanding and modeling of complex systems
- Analyzing vast collections of nucleic acid sequencing data
- Developing new precision medicines, clean sources of energy, bioremediation products and biomaterials
- Monitoring and improving supply chains
- Monitoring quality systems
- Tracking customer behaviors to improve patient compliance and outcomes
- Expediting regulatory filings
- Improving employee training and compliance

As the FDA moves towards electronic regulatory submissions, and more clinical groups embrace electronic health records, security and compliance issues will move front and center. Life science companies need people who understand and can design, use or integrate technology systems into the business of life sciences, particularly experts in data management, analytics, bioinformatics, IT systems, data quality, data security and other related disciplines. Life science executives however express concern about the pipeline of technology talent and expected competition with the tech industry in hiring and retaining such talent

“We need computational biologists who are able to incorporate more big data and analytics into life sciences R&D. This requires expertise in coding, mathematics, and modeling – all areas where the pipeline of talent does not appear to be robust enough to meet the growing demand for talent.”

SUB-TRENDS



Personalized Medicine

Dramatic advancements in precision medicine and genomics have created a growing need for people who understand the complex interplay of genes in genomic systems and who can engineer whole pathways into organisms and not just single genes.

“Industry will need more people who appreciate the full range of business implications for personalized medicine: Biomarker discovery and development; developing drugs to target sub-populations; companion diagnostics; health care system cost/benefit analysis; and economic modeling.”



IT & Robotics

As technology is increasingly incorporated into the research and operations of life science companies, employers seek individuals with greater IT and robotics sophistication.

“There is new R&D, laboratory, manufacturing and packaging equipment that requires employees to have new skills in computerized systems, robotics testing systems, laser and digital tools, data acquisition systems, PLCs and NIR. Automated robots for production and packaging sites and software are a reality.”



TREND 2 - REGULATION, REIMBURSEMENT & THE SHIFT TO VALUE-BASED HEALTH CARE

“FDA expectations are among the most threatening elements of business continuity at the moment. Having key roles filled with people who have a background in current compliance expectations, balanced with how to still deliver profitable products into the market, is highly desirable and in limited supply.”

“The regulatory landscape globally is constantly changing, and we need to be able to react quickly when changes are made.”

Critical business decisions depend heavily on a company’s ability to understand and anticipate changing regulatory requirements and reimbursement trends. These factors can directly impact their ability to rapidly develop a product and move it to market.

In particular, the FDA’s regulatory process can be fraught with risk. Regardless of the technology’s merit, a single misstep can generate unacceptable delays, impacting patient access to important advances and creating funding challenges for companies.

Even with FDA approval, companies must navigate a circuitous course to gain acceptance from the

Center for Medicare and Medicaid Services (CMS) and private payers. Without reimbursement, even the best product can be dead in the water.

As payers continue to shift towards value-based care and consumers pay for more of their healthcare out of pocket, companies will need more staff who understand these changes and can help redirect corporate goals to accommodate them. Along with policy and regulatory expertise, a new generation of employees will need to understand the health care system and will be asked to develop risk-sharing programs, work more closely with hospital and healthcare administrators and manage continuous changes in reimbursement.

“We are experiencing a major transition in the way health care is delivered as we transition from fee-for-service models to value-based health care. In the past, insurance plans shielded consumers from the cost of healthcare... Consumers and health care providers are demanding outcomes, not just more drugs and medical devices.”

“Ongoing compliance scrutiny requires great diligence. Market pressure and longer approval cycles require constantly evolving skill sets.”





TREND 3 - SOFT SKILLS: COMMUNICATION ABOVE ALL

“Finding the required technical skills in new talent is easier than finding candidates with strong soft skills (e.g. leadership, communication, self-awareness, teambuilding and empathy”

“Technical skill requirements vary by job function, but generally we look for people who are agile, critical thinkers, results driven, accountable for their actions and open to change.”

Life science employers continue to seek employees with strong technical skills. A preponderance of employers, however, are willing to train for those skills, but cite a growing need to secure employees who possess a broad set of critical soft skills. In high demand are people who can also communicate effectively, solve problems, think critically, collaborate with others and thrive in multidisciplinary teams.

The ability to communicate well across disciplines in a fast-paced, global environment is, overwhelmingly, the top-ranking soft skill. Succinct, effective communication – both verbal and written –

is critical to support teamwork, problem-solving and collaboration internally, and to managing external relationships with diverse stakeholders.

In industry, even more than academia, scientists and engineers interact with a variety of non-technical people, such as sales staff and customers. While technically strong, some may not have the soft skills to excel in this environment

Companies need employees who combine expertise in science and business with greater interpersonal and leadership skills to succeed in a heavily partnered environment.



Figure 6 – Critical soft skills as reported by industry executives across the U.S.
Source: CSBI Interviews



TREND 4 - EMPLOYEE DEVELOPMENT

“The most effective thing for private industry to do is to take care of their people, as they are the best spokes[persons] for the company. By engaging our current talent and providing them rewarding career experiences, they build our reputation as an employer of choice.”

Fewer than half of interviewed executives said they have the right people in place to execute their corporate strategy. More than in prior years, life science employers discussed the importance of attracting and retaining employees, particularly in the face of increased competition with tech and other sectors for talent acquisition. Among the reasons cited for this competition is the faster pace of product development in the tech sector, as well as public perceptions associating life science companies with the rising costs of drugs.

Increasingly, life science employers stress employee development as a key strategy for securing and keeping valuable talent. Many recognize that

they can both increase productivity and reduce turnover by providing career growth opportunities for employees, and allowing them to explore career paths, create development plans and otherwise build their resumes.

In addition, as technologies and corporate environments evolve, employees must also develop new skills. Ongoing training and development are essential to keep employees' technical and business skills relevant and help companies attract the best talent. Many companies highlighted the value they place on continuous learning to develop employees' skills.

“By being successful as an organization and developing our people, we not only set standards and role models for others to follow, but we also enable our people to succeed in future roles whether at our company or elsewhere. It is important to give our employees the opportunities to grow and develop so that they build the skills they need and that we as an organization and industry will need in the future. This culture and approach to our people is a strong recruitment tool.”



TALENT DEMAND: WHAT ARE EMPLOYERS LOOKING FOR?

Job and Functional Demand: An analysis of approximately 40,000 national job postings from 2015 indicates that the highest demand is for medical scientists – consistent with findings in the 2014 report – followed by various medical and clinical laboratory and scientific functions. Regulatory and quality occupations – when taken together, constitute the fourth highest area of job demand. Similarly, when looking at top skills, GMP and GCP together constitute the second highest demand (Figures 6 and 7).

“We work in a complicated regulatory environment and will need more talent in technical manufacturing and quality-related roles that interpret and operationalize those regulatory requirements, including: quality assurance, quality control, regulatory strategy, regulatory affairs, validation, and product release. These are highly trainable skill sets that community colleges should be able to teach, although some experience is needed too.”

Burning Glass Technologies (Burning Glass) employs an expanded definition for medical scientists beyond that used by the Bureau of Labor Statistics (BLS). In the BLS definition, the typical medical scientist employed by the life science industry is an individual with a PhD, usually in biology or a related life science, or an MD degree and conducting research aimed at understanding human diseases and improving overall human health. Included in the medical scientists’ job category in Figure 7, are job postings for candidates with bachelor’s degrees as well, with a variety of job titles inclusive of Clinical Research Associates and Clinical Laboratory Scientists.

Top Occupations: National Life Sciences Job Postings

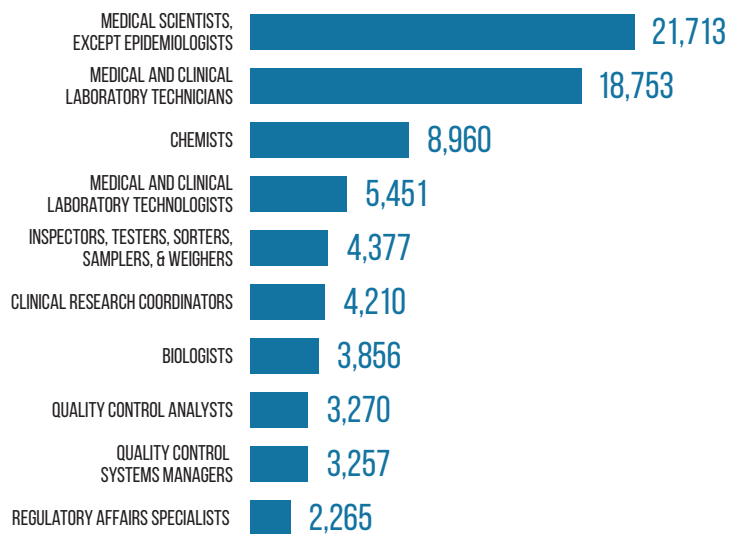


Figure 7 – Source: Burning Glass Technologies

Top Skills: Nationwide Life Science Job Postings

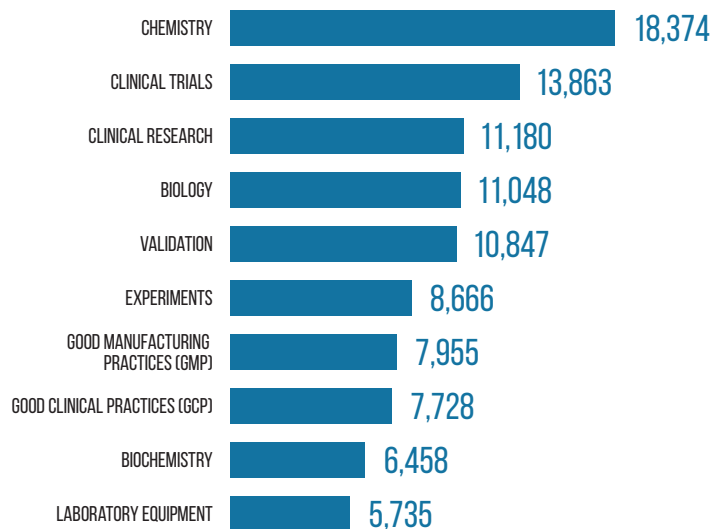


Figure 8 – Source: Burning Glass Technologies

DIVERSITY AND INCLUSION



A subset of interviewees expressed the need for diversity and inclusion in the workplace, citing trends towards a more global industry and diversity's positive impact on team dynamics.

"We strongly believe that diversity brings vast ideas, different approaches and a vibrant culture to solve complex questions. We want our employees to bring their whole selves to the workplace and throughout the organization. This allows our employees to perform at their best and gives us the best outcomes. We promote inclusion and diversity through employee affinity groups and training our leaders to promote this key culture of openness. This also drives our decision to seek talent in atypical locations."

Many of these same employers are concerned about the small pipeline of females and underrepresented minorities, and that more must be done to attract and diverse students into STEM careers:

"As a minority myself, I know first-hand what a lonely path it can be pursuing a STEM career, without role models and a community of support. As an industry, we should make it easier for these students to get excited about math/science careers and maintain that excitement through support and engagement throughout their education".

DEGREE REQUIREMENTS

As in 2014, more than half (65%) of job postings in 2015 required at least a Bachelor's Degree, up from 60 percent in 2013. This was followed by graduate/professional degrees (15%), high school diplomas (14%) and associate's degrees (7%) (Figure 9). Anecdotally, we know that some companies will consider work experience in lieu of minimum degree requirements.



National Education Requirements Based on Job Postings, 2015

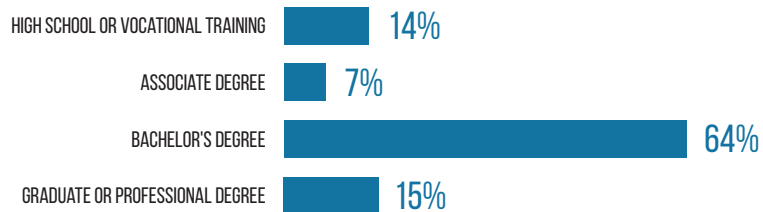


Figure 9

Source: Burning Glass Technologies

"We can help ourselves by helping the communities in which we work. One thing we should do is to reduce the strong bias around educational degrees. While degrees are important, there is a lot of untapped, local, raw talent and dedicated manpower. Many people lack the resources or opportunities to attend four-year colleges. High tech has failed at engaging this talent, but the life science industry still has the opportunity."

INDUSTRY PARTNERSHIPS WITH ACADEMIA

Many life science employers are reluctant to hire recent graduates who lack the technical and soft skills that employees develop over time, preferring candidates whose experience goes beyond university lab work. Even outstanding academic candidates have a steep learning curve when adjusting to the rapid pace of industry.

To address this talent gap, many life science companies are recognizing the importance of partnering with academic programs at the high school, (community) colleges and university-levels to co-develop talent. Not only does this encourage students - including females and minorities - to pursue STEM careers, but it ensures that more students leave school with industry-relevant experience. As students gain the opportunity to develop both hands-on practical skills and critical soft skills, they are better positioned to succeed in new and fast-paced corporate environments upon hire.

Formal partnerships with academic institutions are increasingly viewed as a way for industry to find and develop local talent. Among surveyed companies, 85 percent have an established partnership with academia. In addition to research partnerships at the university and post-graduate levels, companies are engaging with high school and (community) college programs in key ways, by:

- participating on curriculum advisory boards
- offering internships and job mentoring opportunities
- providing teacher and faculty externships
- judging science competitions
- giving career lectures and company tours, etc.

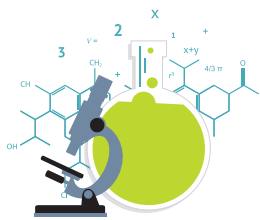


CORE SKILL STANDARDS

In one of the more ambitious undertakings of this kind, the US DOL funded a 12-community college consortium to work with industry to develop identify core skills for curriculum development in 4 key areas: Bioscience Lab Skills, Medical Devices, Biomanufacturing and Core Skill Standards across all three.

(See The Community College Consortium for Bioscience Credentials (c3bc) et al, Core Skill Standards for Bioscience Technicians, 2016).

CALL TO ACTION



“We are challenged with a huge gap between the receipt of a diploma and gaining real world job experience. I think it is important to find opportunities for students to spend time in company environments to better prepare them for their future employment.... Students with prior work experience or exposure to the workplace perform better on job interviews and better understand what to expect once they enter the work place.”

WHAT CAN ACADEMIC INSTITUTIONS DO?

Industry executives often agree that academic institutions do a good job providing technical and functional, subject-matter training, but that they could better prepare the talent pipeline in the following ways:

- Provide practical skill development and hands-on experimentation.
- Provide students with opportunities to solve complex problems in cross-functional teams involving multiple disciplines.
- Connect students to real-world research applications and work experiences, helping them to better understand how corporate organizations work. This could include internships, outsourced company research, and case studies that make the teaching more relevant to industry's needs
- Supplement technical training with training in soft skills: communication, collaboration and team-work, leadership.
- Expose and prepare graduate students for high-demand opportunities outside of the lab: regulatory, business development and other commercial functions.
- Develop students' understanding of the "business" side of the industry.

WHAT CAN INDUSTRY DO?

Industry partnerships with academia at all levels are vital for developing collaborative research and preparing and inspiring new generations of talent with industry-relevant knowledge.

The industry can:

Build enthusiasm for STEM among students by becoming actively engaged in collaborations with K-12 schools, community colleges and universities

- Reach out to peer companies and/or industry associations for help in developing meaningful and rewarding partnerships
- Define the process for building such academic partnerships, while taking time the time to listen and understand the academic partners' needs, constraints and concerns
- Provide real-world, practical opportunities for students to develop industry-relevant knowledge: career talks, informational interviews, internships, company tours, outsourced research, etc.
- Identify opportunities for students and allocate time in company environments to better prepare them for future employment

Demystify and promote the industry by highlighting its vast and diverse career opportunities

- Work with schools and (community) colleges to demonstrate the industry's positive impact on human health and other global challenges, delineating the diverse career pathways that are addressing those challenges
- Share a 5 – 10-year view of where will future job opportunities will be and what skills/training will be needed for those jobs
- Advise on curriculum development
- Work with high schools and (community) colleges to train college career counselors on the range of career choices in the life sciences

“We want [to hire] people with more than academic lab work...so we host interns to give students experience. [This] also helps us see how well they transition. One-third of our hires come through internship programs with high school students, college, MBA candidates and post-docs.”

CALL TO ACTION (CON'T)

“Industry can raise awareness of what industry is about, helping students envision themselves as future employees”

“We have provided great opportunities for students and new graduates to join this exciting organization. These employees have seen first-hand and actively participated in the process required to bring a product to approval stage with the FDA – a great opportunity for on-the-job training.”

WHAT CAN CSBI AND INDUSTRY ASSOCIATIONS DO?

As supporters of the life science industry, CSBI and our affiliate industry associations are well-positioned to encourage these industry-academic collaborations in the following ways:

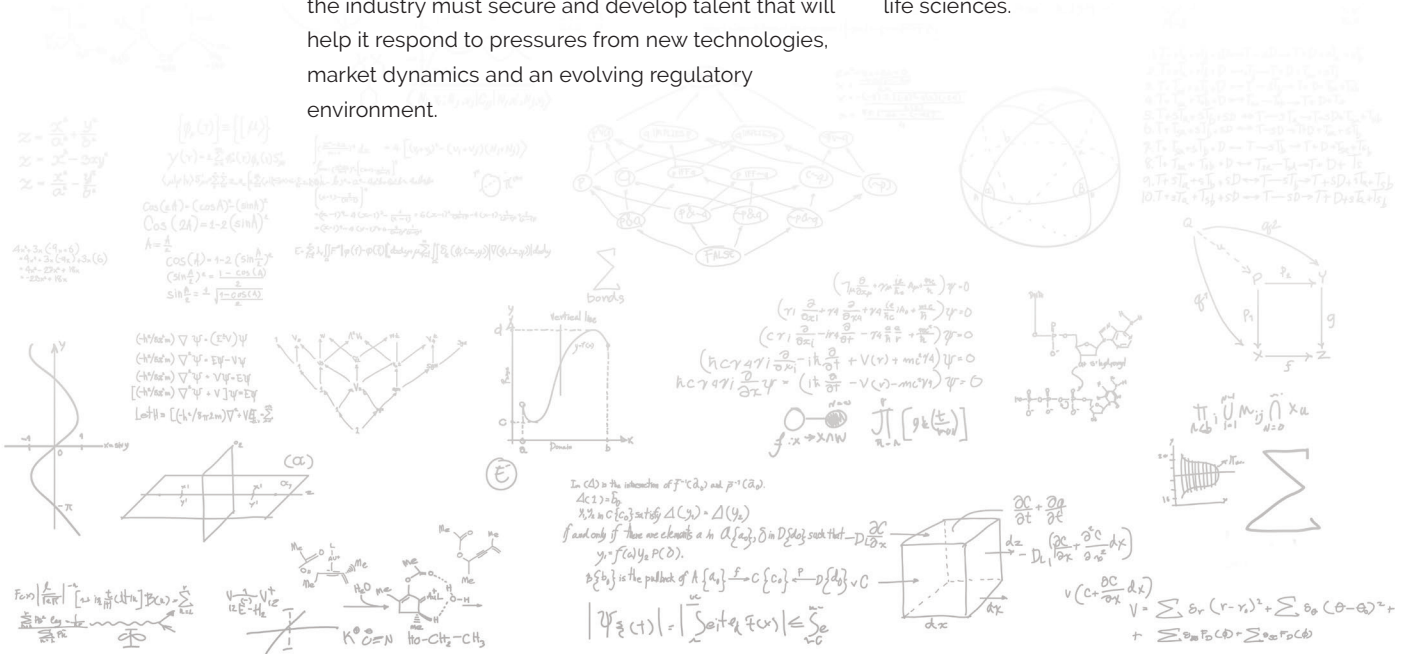
- Raise awareness among industry of the need and ROI for partnering with academic institutions at multiple levels
- Recognize quality high school, (community) college and university programs that are developing industry talent
- Share best practices and help match companies to quality academic programs
- Recognize companies that are engaged in innovative partnerships with academia to inspire and develop talent
- Help smaller under-resourced companies “piggy-back” on larger company collaborations with schools and (community) colleges



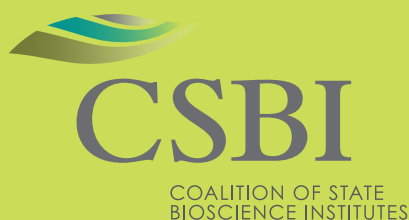
CONCLUSION

The nation's life science industry leads the globe in advancing discoveries that are addressing some of our most pressing health, agricultural and environmental challenges. This innovation is driven by the over 1.5 million people employed in the industry, a figure that grows year after year. To maintain this growth and global competitiveness, the industry must secure and develop talent that will help it respond to pressures from new technologies, market dynamics and an evolving regulatory environment.

This report aims to provide up-to-date data on the industry's talent needs and to advocate for industry-academic collaborations that will help meet them. Policymakers, companies and academic partners must work together to ensure that the industry has a well-trained workforce and a sustainable pipeline of gifted people to power ongoing innovation in the life sciences.



ABOUT CSBI



Founded in June 2012, the Coalition of State Bioscience Institutes (CSBI) is a national coalition of 42 state bioscience organizations that are working to ensure America's leadership in bioscience innovation by delivering industry-led life sciences education, workforce development, and entrepreneurship programs through a nationally coordinated effort.

WITH SPECIAL THANKS TO

AbbVie	CymaBay	Origen Biomedical
Agilent Technologies	Cytokinetics	Osmotica Pharmaceutical
Agility Clinical	CytomX Therapeutics	PACIV
ALK-Abello	Diplomat	ParaTechs
Allergan	Dow AgroSciences	Patheon P.R. Inc
Alltech	ECM Biosciences	Pfizer
Amgen	Embody, LLC	Pharmatek Laboratories
Amyris	Ferndale Laboratories	Pinnacle Transplant Technologies
Ansun Biopharma	Genencor Sciences	Rocky Mountain Biologicals
Aptinyx	Genentech	Rowpar Pharmaceuticals, Inc.
Arbor Pharmaceuticals	Genomic Health	Sanford Burnham Prebys Medical Research Institute
Arcus Biosciences	Glock Health	Sanofi
Ardelyx	Golden Helix	Shamrock Structures, LLC
ARKIOS Biodevelopment International	GoPath	Shire
Asuragen	GRI Bio	Signal Solutions, LLC
AVARA Pharmaceutical Services	Grifols	St. Jude Medical
Bayer	HemoShear Therapeutics	Stryker Puerto Rico
Billings Clinic	Horizon Pharma	Summit Biosciences
Biomedical Development Corporation	ImmunArray, Ltd.	Sutro Biopharma
BIOO Scientific	In Silico Solutions	Syngenta
Bioscience Laboratories	Innovative NeuroTechnologies	T2e Energy
Biota Pharmaceuticals	Innoviva	Terumo Cardiovascular
Boston Scientific	International Heart Institute Foundation	Therapeutic Proteins International, LLC.
Cadence, Inc.	Labtopia	Thermo Fisher Scientific
CareDx	Luminex	TherOx
Catalent Pharmaceuticals	McLaughlin Research Institute	Tioga Research, Inc.
Cavion	Medtronic	TRACT Therapeutics, Inc.
CDI Laboratories	Microbion Corp.	Validation & Engineering Group
Celgene	Molecular Imaging, Inc.	Vertex Pharmaceuticals
Clearside Biomedical	MPI Research	Vetter
Codexis	Nektar Therapeutics	XBiotech
Conatus Pharmaceuticals	Neolpharma	Zoetis
Crinetics	NSF International	
CryoLife	Oncocyte	



COALITION OF STATE
BIOSCIENCE INSTITUTES

For additional copies of the report, visit
www.csbioinstitutes.org.

