Testimony

Assembly Select Committee on Biotechnology
Informational Hearing on:
“Research & Development, Manufacturing, and the Marketplace in California”

February 12th, 2014: 10:30a.m. – 12:00p.m.
State Capitol, Room 444

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Thank you for the opportunity to talk about the strategic importance of higher education to the state’s life science workforce and the entrepreneurial “ecosystem” that supports this industry.

I often quote the finding that greater than 80% of the life sciences workforce is made up of professionals with degrees at the masters’ level or below (Peters & Slotterbeck, 2007). At the California State University we focus on that 80% - the bachelors- and masters-degreed professionals.

In answer to the question, What can the State do to improve STEM education in K-12 and the universities to ensure a sufficient pipeline of individuals qualified to work in research areas?, it will probably come as no surprise that I recommend that the Assembly continue to do what it can to increase California’s investment in public higher education.

We know that improvements in science, technology, engineering and math (STEM) education require a student-centered curriculum and hands-on learning opportunities. To graduate workforce-ready biotechnology professionals, we must offer students opportunities to do science and solve real-world problems as part of our curriculum. This focus requires ongoing infrastructure investments - from buildings and facilities to faculty and equipment. As you heard in Chancellor White’s State of the CSU address a couple of weeks ago, the California State University recognizes the need to increase its investment in “high-impact” practices designed to engage and retain STEM students. He also proposed investing in new faculty hires to bring cutting-edge technologies and scholarship to the CSU’s students and campuses. We are keenly focused in closing the achievement gap that persists for students in groups underrepresented in biomedical and biotechnology-related disciplines and, thus, the workforce.

What does an effective STEM education look like? The Business-Higher Education Forum (BHEF) issued a thoughtful report in 2012 in response to the national call for greater numbers of STEM graduates (PCAST, 2013). The BHEF recommends investing in evidence-based,
high-impact practices shown to better engage, retain and graduate STEM students. These high-impact practices range from student-centered, active-learning formats to summer bridge programs to immersive, undergraduate research experiences. These are the opportunities we hope to scaffold or strand for students as they advance through a STEM curriculum on our campuses.

Based on 18 years of data from the system-wide California State University Louis Stokes Alliance for Minority Participation (CSU-LSAMP) program that uses an array of these high-impact practices, we know we can close those pernicious achievement gaps. The CSU Program for Education and Research (CSUPERB, the program I direct) has a 26-year history of supporting faculty-mentored undergraduate research experiences and innovative curriculum. Looking back over final reports from CSUPERB-supported undergraduates since 2008, over 91% continued in or completed their degree programs - a notable and clear improvement over averaged CSU and nationwide STEM student attrition and graduation rates. CSU campuses have cobbled together support for undergraduate life sciences research with grants and support from The California Institute of Regenerative Medicine, the National Science Foundation (NSF), the National Institutes of Health, the Howard Hughes Medical Institute, and smaller private funders like the Doris A. Howell Foundation for Women’s Health Research.

Why are faculty-mentored research experiences so important to these funders and the life science industry? By working with CSU faculty in the classroom and on research problems, we know students build a solid foundation for successful life science careers. Life science employers highly value the skills undergraduate students build by working on open-ended, project-focused teams. From a biotechnology industry perspective, undergraduate research experiences are the most in-demand, high-impact educational practice. I should also note research experiences are crucial for medical school and graduate school admittance, as well.

But we also know that many students interested in STEM fields as freshman switch out – or worse drop out - in the first two years of college. Bayer Corporation – a global life sciences company with significant operations here in California – has issued reports focusing attention on the need to improve the introductory STEM curriculum. In addition to funding from the NSF, the CSU has been fortunate to find strategic support from private foundations - like the W.M. Keck Foundation and the Hewlett Foundation – aimed at improving the first and second year experience for STEM students on our campuses.

Grants and strategic partnerships allow the CSU to be resilient, remain innovative and maintain momentum, especially during state budget crises like we’ve experienced these last few years. For example the CSU was fortunate to win a Volunteers in Service to America (VISTA) grant recently. The grant supports the placement of VISTAs to act as liaisons between campuses and their community partners. The goal is to support and build capacity for engaged learning experiences like service learning, internships, community-based research and undergraduate research – especially in the first two years of college.

Last week I attended the California STEM Summit and learned about networks – established and emerging – around STEM education. I heard how The Central Coast STEM Collaborative is building bridges between Dignity Health, Santa Lucia Regional Occupational Program, Allan Hancock Community College, and Cal Poly San Luis Obispo Bio-Medical Engineering Department. Collectively these organizations provide engaging hands-on service learning and community-partnered opportunities designed to bolster the entire STEM
continuum from middle-school to employment. Collaborations like these have the potential to support teachers as they adopt the Next Generation Science Standards, which also focus on hands-on engineering and science practice. The VISTA grant can hopefully grow and institutionalize more of these partnerships in support of STEM education and student success.

What are the incentives for private industry to invest in research and development?

Life science companies face long odds developing scientific discoveries into U.S. Food and Drug Administration (FDA)-approved therapeutics, medical devices and diagnostics. As a scientific community we still have only a partial understanding of human biology and diseases, making the uncertainty of moving ideas to products quite high - this is not an industry for the risk-adverse. Product ideas fail in all phases of drug discovery and development, so many voices across the industry and among patient advocacy groups are calling for ways to reduce the failure rates and engineer less expensive and faster paths to commercialization (LaMattina, 2014). None of these voices call for a reduced investment in life sciences or biomedical research and development; rather, strategic partnerships form around the need for more open innovation. The focus recently has been on increased pre-commercial data sharing, increased knowledge sharing around early phases of drug development, and greater awareness of the scientific steps needed to prove new medical entities are safe and effective. Public-private partnerships have been formed that begin to address the first two points (Collins, 2014). To the last point, CSUPERB and other academic research institutions (Roush, 2013) are working to build greater awareness of life science market needs through entrepreneurship education.

For the last three years CSUPERB has hosted a system-wide Idea-to-Product® Early-Stage Biotechnology Commercialization Challenge. We found willing corporate sponsors at Amgen and Gilead this year. They instantly recognized the advantages of developing CSU graduates better informed about life science commercialization. Sacramento State teams have won the challenge three years running now. Bioengineering and business faculty have built an amazing constellation of industry experts and supportive infrastructure through SARTA, the Sacramento Regional Technology Alliance. Our corporate and private partners see these as strategic investments.

We cannot separate the goals of building and sustaining California’s biotechnology industry from the need to educate and train professionals at all degree levels. Further, as a recent Kauffman Foundation paper points out, “the public sector can affect few significant factors to encourage entrepreneurship except investments in high school and higher education.” I hope you can commit again to increasing the strategic investment in California’s public higher education systems.

Thank you for your attention and I am happy to take any questions you may have.

References Cited:


