September 8, 2020

Testimony from Dr. Joel S. Bloom, President New Jersey Institute of Technology to New Jersey’s Senate Budget and Appropriations Committee and Assembly Budget Committee

Thank you for the opportunity to provide written testimony to the Senate Budget and Appropriations Committee and the Assembly Budget Committee regarding Governor Murphy’s nine-month Fiscal Year 2021 budget proposal. I have said on multiple occasions that, on the behalf of New Jersey Institute of Technology (NJIT), we are appreciative of the efforts by Governor Murphy and New Jersey’s state legislative leaders to strengthen New Jersey’s innovation economy and to improve funding for higher education.

For our state to prosper, particularly in the face of the challenges presented by COVID-19, New Jersey’s institutions of higher education must fill critical roles that include both scientific breakthroughs and preparing a workforce that can thrive within and lead an economy driven by technological innovation. NJIT has been highly successful in achieving each of those goals, but the current budget proposal for Outcomes Based Allocation (OBA) threatens that success and should be adjusted to consider the increased cost of providing STEM education when determining the OBA, similar to that which has been done for the NJIT base operating appropriation.

Historically, NJIT has been among the top three public universities for the receipt of state operating funds, but the current budget proposal for OBA places NJIT eighth. Such a shift in funding fails to recognize the significant and necessary additional costs associated with STEM education, particularly engineering, and will hurt New Jersey’s economic future by stunting workforce development, critical research, and economic growth. NJIT, due to its disciplines, is over 90% STEM and, therefore, a more costly university to operate.

Workforce Development

NJIT is a launching pad for its students, because we prepare them to excel in the fields and jobs that are in high demand and that are at the core of what is unquestionably a technology economy. NJIT is #1 in the entire nation, according to Forbes, for the upward economic mobility of students from low-income families. Our students have an average of nearly
three job offers prior to graduation, and the demand for computer scientists, engineers and technologists far exceeds the supply in our state and nation.

As New Jersey’s public polytechnic university, NJIT educates approximately one-third of our state’s engineers and scientists and is a top 20 national university producing African American and Hispanic engineers. We are home to colleges of architecture, computing, and engineering that are among the largest in the region, and we recently launched the School of Applied Engineering and Technology. Much of the diverse STEM workforce desperately needed to serve New Jersey’s key industrial sectors is educated at NJIT, and many of the students we enroll come to us from low-income households with great need of support programs in order to navigate our challenging curriculum. Despite these challenges, our students succeed and, once they graduate, assume high-paying positions that have a multiplier effect on job creation and factor heavily into our state’s economic prosperity and tax base. Without an adjustment to the proposed state appropriation for OBA that reflects NJIT’s critical role in preparing New Jersey’s technology workforce, the success I have noted will be jeopardized.

Applied and Practical Research

In addition to its role in preparing the tech workforce of our state, NJIT is a research powerhouse. Last year, NJIT earned R1 status from the Carnegie Classification, making us one of the 131 most productive research universities in the nation. NJIT is one of just three New Jersey universities to earn this distinction, which is significant because it attracts external funding and brings promising research activity to our state.

This is critically important, because more than $160 million in research conducted by NJIT each year is practical or applied in nature, solving real-world problems in areas that include health care and medical devices, civil infrastructure, advanced manufacturing, cybersecurity, transportation, nanotechnology, clean energy, clean water, resilient design, national defense, financial services, materials science, and many other fields. Some examples of NJIT projects include traumatic brain injury research that improves diagnostics and care for members of the U.S. Armed Forces, solar weather research that impacts satellites and communication networks, lead abatement work that protects clean water supplies, cybersecurity research that protects the privacy of elections and our financial systems, sensor technology that can improve healthcare and critical infrastructure, and many more that directly impact and improve lives. Most recently, NJIT has received two National Science Foundation grants related to COVID-19 research. The first is a RAPID Grant in the amount of $200,000 that will enhance contact tracing and predicting the environmental spread of the virus. The second is a grant in the amount $140,000 to develop next generation functional carbon nanotube technology (fCNT) for manufacturing scalable membranes for water purification to produce virus-free medical grade
water. The fCNT technology also is aimed at the development of adsorbents for air purification and decontamination of PPE to prevent the spread of the virus.

For NJIT to continue developing critical lines of research, resources for facilities and equipment must be made available. Governors and the New Jersey legislature have done so in the recent past through supplemental budget allocations to NJIT and through the 2012 Higher Education Building Our Future Facilities Bond Act. Without these allocations, NJIT would not have been able to increase its high-demand STEM enrollment by 50% and nearly triple its applied research.

Economic Growth and Impact

NJIT also is a catalyst for economic growth. A recent study showed that NJIT’s annual economic impact on the State of New Jersey is more than $2.8 billion, among the highest of any university in our state. Our New Jersey Innovation Institute (NJII), VentureLink, and Makerspace at NJIT, which is among the largest academic Makerspaces in the United States, to provide direct linkages to industry and foster partnerships that lead to new products, business solutions, and the application of shared resources and expertise toward solving complex problems. One recent example is a collaboration between NJIT, University Hospital in Newark, and The Tuchman Foundation to develop modular, mobile medical care facilities that can be deployed to areas of surging disease outbreaks and natural disasters, as well as to regions that lack health care infrastructure. Particularly noteworthy during this pandemic, NJII manages the state’s Health Information Network (NJHIN), making it possible for health care providers to share electronic health records across an expansive network, even when providers use dissimilar electronic healthcare information systems. NJII quickly partnered with the New Jersey Department of Health to integrate several statewide databases to support COVID-19 related communications and notifications to providers and health care organizations.

STEM Cost Factor

The successes NJIT has produced for its students and for the State of New Jersey have been recently called “extraordinary,” but they will not continue if sufficient support and funding are not provided by the State. NJIT is particularly hard-pressed because of the cost-factor of providing STEM education, especially to a student population that has a high percentage of low-income and first-generation college students. Studies by the Center for STEM Education and Innovation as well as the National Bureau of Economic Research (NBER) have documented the higher costs associated with providing STEM programs, particularly those in the disciplines of engineering, architecture, computing, and the physical and biological sciences. For example, the NBER study found that, in comparison to degree programs such as English, History, Psychology, and Economics, the costs of offering Engineering programs are more than 100% greater. The Center for STEM Education and Innovation determined that
Engineering programs are more than 60% more costly to deliver than the average degree program. These higher costs are driven by multiple factors:

**Faculty Costs**
- NJIT full/associate professor faculty salaries on average are 33% higher than the overall average faculty salaries at doctoral universities. This is due to the limited supply and highly competitive recruitment process for faculty in STEM fields, such as engineering and computer science, as well as the marketplace for such professionals outside of academia.
- In a typical year NJIT recruits 15-20 new faculty at an average annual salary of approximately $102,000.
- Because of the technical nature of their teaching disciplines and their lines of research, new faculty are provided with start-up funds for equipment and supplies. These packages cost an average of $265,700.
- Start-up packages do not include lab renovations associated with their teaching and research, or the salary of lab technicians.

**Doctoral Student Costs**
- Support for doctoral students is necessary at an R1 research university for the conduct of the critically needed research and for the future workforce of New Jersey’s knowledge, innovation, and technology businesses and industries.
- NJIT has seen tremendous growth in its doctoral programs. In fall 2013, NJIT had 384 Ph.D. students. That number had grown to 509 by fall 2019. NJIT support for doctoral students in FY14 totaled $9.1 million and was $12.5 million in FY20.

**Academic/Research Facilities Costs**
- Due to the technical complexity of our research and teaching labs and the underlying infrastructure necessary for a university that delivers programs that are almost all in STEM disciplines, NJIT spends significantly more than a liberal arts institution to maintain its campus.
- This year, due to financial uncertainty, NJIT was forced to significantly reduce capital renewal and replacement funding to $10 million, which is less than half of the $21.9 million of anticipated need for FY21.

**Information Technology Infrastructure**
- To meet the demands placed on our information technology infrastructure, NJIT must invest in systems and research architecture, embrace cloud options, and enable faculty and students to conduct research and learn in cost effective ways. We must do the following, among other identified needs:
  - Provide cloud-based, high performance computing simulation platforms
○ Develop hybrid infrastructure that enables cloud-ready, on-premise computing workloads
○ Upgrade our high-performance cluster
○ Offer software to support data visualization and computation

● NJIT must make investments totaling at least $1.5 million to create a technology infrastructure on par with our R1 peers.

Summary

If New Jersey is to succeed in developing the workforce necessary to support a knowledge, innovation, and technology economy, we must provide resources that support the students in the STEM disciplines and the colleges and universities educating those students. Therefore, I recommend that number of degrees awarded to students in the strictly defined STEM disciplines be included in the OBA funding model. This would be determined by the Classification of Instructional Programs codes, which are submitted to the State in each institution’s Student Unit Record file every September.

I have been encouraged by the initial steps taken by Governor Murphy, former Secretary of Higher Education Zakiya Smith-Ellis, and our state’s legislative leaders to partner with New Jersey’s public colleges and universities for the benefit of our students and our state. We, however, now are facing major fiscal challenges across the higher education sector. If we do not address those challenges and recognize the importance of investing in the STEM workforce that will be the foundation of our future economic strength, we risk long-term negative consequences and will deprive students from low-income and underrepresented groups of opportunities to pursue careers in high-income and high-demand fields. These are careers that transform the lives of students who often are the first in their family to attend college.

I am grateful for this opportunity to offer testimony on the FY21 budget proposal as it pertains to higher education funding allocations, and I would welcome the opportunity to engage in further discussion, particularly regarding the inclusion of research outcomes in the OBA funding model, increasing the state approved FTE employee caps for those universities that are on a growth trajectory like NJIT, as well as a future facilities bond act. Thank you for your commitment to New Jersey’s public colleges and universities, as well as the students we serve.

Sincerely,

Joel S. Bloom
President